TECHNICAL MANUAL

MAINTENANCE INSTRUCTIONS

AIRFRAME SYSTEMS

NAVY MODEL

OV-10A

AIRCRAFT

(ROCKWELL INTERNATIONAL CORPORATION)
NOw 65-0118f
N00600-76-D-0942

Each transmittal of this document outside of the Department of Defense must have approval of the issuing Service.

This manual supersedes NAVAIR 01-60GCB-2-2 dated 1 January 1969, including Interim Change Numbers 1 and 2, Changes 1 through 15, and Rapid Action Changes 1 through 7.

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LIST OF EFFECTIVE PAGES

Insert latest changed pages; dispose of superseded pages in accordance with applicable regulations.

NOTE: On a changed page, the portion of the text affected by the latest change is indicated by a vertical line, or other change symbol, in the outer margin of the page. Changes to illustrations are indicated by miniature pointing hands. Changes to wiring diagrams are indicated by shaded areas.

Dates of issue for original and changed pages are:

Original . . . . . 0 . . . . . 15 Jan 77

Total number of pages in this manual is 704 consisting of the following:

Page No.	# Change No.	Page No.	# Change No.	Page No.	# Change No.
Title	0				
A	0				
Flyleaf 1	0				
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5-1 — 5-186	0				
6-1 — 6-37	0				
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Zero in this column indicates an original page.

RAPID ACTION CHANGE SUMMARY

THE FOLLOWING RAPID ACTION CHANGES HAVE BEEN CANCELLED OR PREVIOUSLY INCORPORATED IN THIS MANUAL	
CHANGE NUMBER(S)	REMARKS
1 through 6	Incorporated by change 13 dated 15 October 1973

THE FOLLOWING RAPID ACTION CHANGES HAVE BEEN INCORPORATED IN THIS CHANGE/REVISION		
CHANGE NUMBER	CHANGE DATE	PURPOSE
7	29 August 1975	Revised Ground Safety Switch Adjustment
		Procedure

RAPID ACTION CHANGES OUTSTANDING – TO BE MAINTAINED BY HOLDER OF THIS MANUAL			
CHANGE NUMBER AND DATE	DATE CHANGE MADE	CHANGE NUMBER AND DATE	DATE CHANGE MADE

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OV-10A
BRONCO

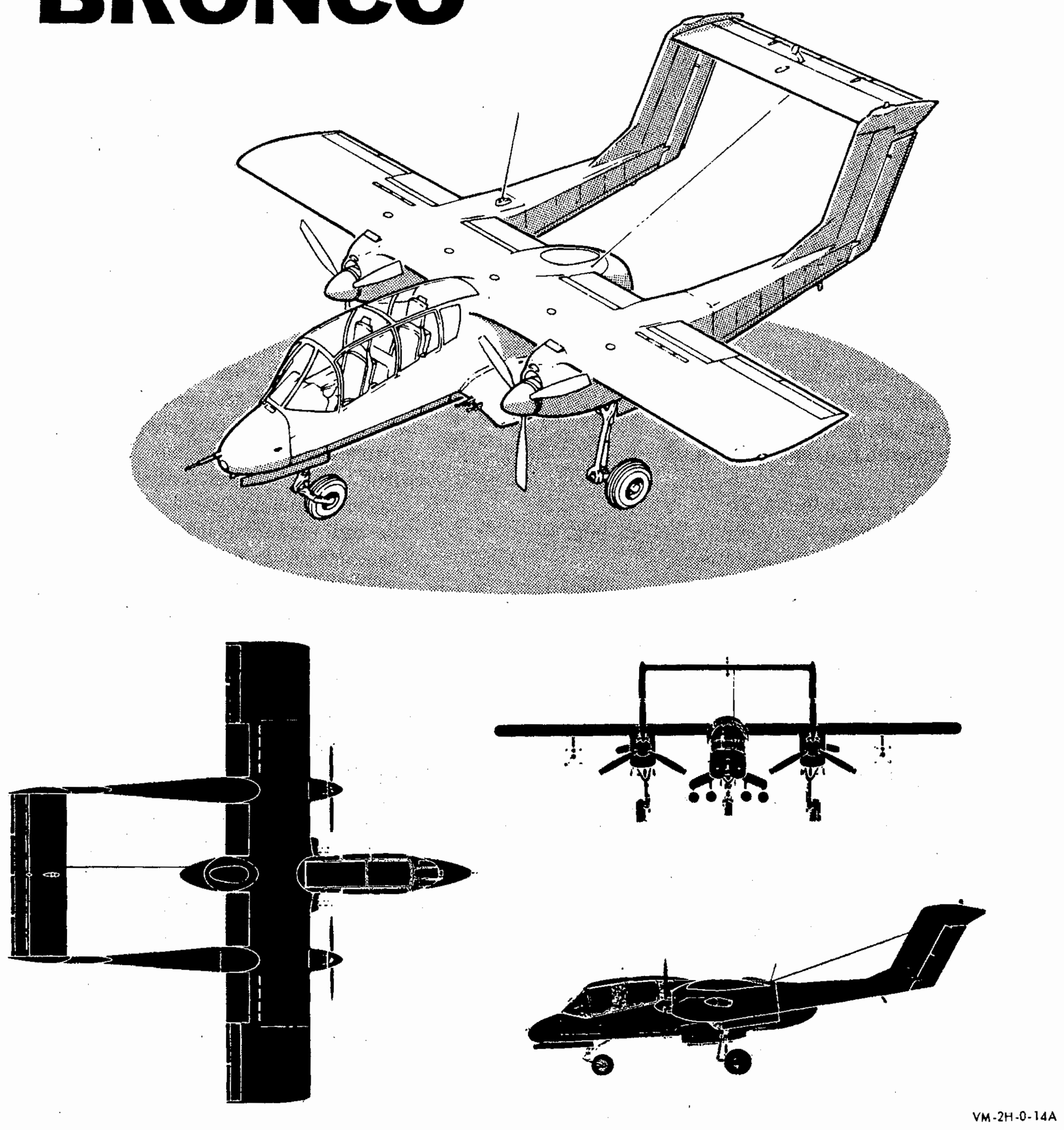


Figure 1-0. OV-10A Aircraft

CHAPTER 1
INTRODUCTION

1-1. GENERAL.

1-2. This volume is one of a series of seven volumes which contain instructions to perform organizational, intermediate, and depot level maintenance on the model OV-10A "Bronco" aircraft (figure 1-0). Each volume is a system-type maintenance instructions manual. Each major aircraft system, with related components, is covered in a particular chapter in its corresponding volume.

1-3. SCOPE AND ARRANGEMENT.

1-4. Information under scope and arrangement includes a breakdown of the Maintenance Instructions Manual by volume and NAVAIR number. Explanations of the organization of material in the volumes by chapter breakdown and the methods of presentation used for compatibility between volumes are also included.

1-5. MAINTENANCE INSTRUCTIONS MANUAL BREAKDOWN. The complete OV-10A Maintenance Instructions Manual consists of seven separately bound volumes. Each volume is assigned an individual publication number for identification purposes. The series is divided into groups of volumes containing related data or related systems. The last dash number is the only number in the series that is different for each volume. Table 1-1 lists all the volumes of the Maintenance Instructions Manual by title and publication number.

Table 1-1. Maintenance Instructions Manual Breakdown

PUBLICATION NUMBER AND TITLE		CHAPTER NUMBER AND TITLE	
NAVAIR 01-60GCB-2-1	GENERAL INFORMATION AND SERVICING	1	Introduction
		2	General Information
		3	Ground Handling
		4	Servicing
		5	Emergency Procedures
NAVAIR 01-60GCB-2-2	AIRFRAME SYSTEMS	1	Introduction
		2	Airframe Systems
		3	Flight Control Systems
		4	Hydraulic Power Systems
		5	Landing Gear System
		6	Wheel Brake System
		7	Nose Wheel Steering System
NAVAIR 01-60GCB-2-3	ENVIRONMENTAL SYSTEMS	1	Introduction
		2	Heat, Vent, and Related Systems
		3	Oxygen System
		4	Escape System
NAVAIR 01-60GCB-2-4	POWER PLANTS AND FUEL SYSTEMS	1	Introduction
		2	Power Plants
		3	Fuel System
		4	Auxiliary Fuel System
NAVAIR 01-60GCB-2-5	AVIONICS SYSTEMS	1	Introduction
		2	Avionics Systems
		3	Electrical Systems
		4	Instruments
NAVAIR 01-60GCB-2-6	ARMAMENT SYSTEMS	1	Introduction
		2	Armament Systems
NAVAIR 01-60GCB-2-7	WIRING DATA	1	Introduction
		2	Wiring Data
		3	Wiring Diagrams
		4	Connector and Terminal Board Wiring

1-6. LIST OF EFFECTIVE PAGES. A list of Effective Pages is prepared for each volume and immediately follows the title page. This page is identified by the letter "A" in the lower left corner This is a complete listing of all manual pages, including title page, "A" page, blank pages, deleted and added pages. As changes are made to the manual, each page changed will show a change number in the "Change No." column. The figure "0" shall be used for the basic manual, "1" for the first change to the manual, etc. The words "Deleted" or "Blank" shall be placed along side the page numbers of those pages affected.

1-7. TABLE OF CONTENTS. The Table of Contents in each volume lists the chapters, sections and major paragraphs covered in that particular volume. The Table of Contents is not intended as a substitute for the index, but it does provide a quick location of data for personnel familiar with the volume.

1-8. ILLUSTRATION AND TABLE LISTS. A list of illustrations and a list of tables are located in each volume following the Table of Contents. These lists contain the figure number or table number, title, and page number of all the illustrations and tables in the volume in order of appearance.

1-9. NUMBERING AND PARAGRAPHING. Pages, paragraphs, figures, and tables are all numbered separately and consecutively within each chapter of the volume. The numbers are assigned a two-part number separated by a dash; the first represents the chapter number, and the second, the order of appearance within the chapter. Paragraphs are arranged in descending order from general to specific information. Table numbers and titles appear at the top of tables and figure numbers and titles appear below the illustrations.

1-10. INDEX. An alphabetical index of all systems and components is provided in the last portion of the manual. The index of systems and components will be referenced to paragraph.

1-11. MAINTENANCE PROCEDURES. All maintenance procedures are presented as procedural text with illustrations located immediately after the step they represent. The step illustration title consists of step number (s) and the paragraph number. The procedural text paragraph titles consist of the noun name first, for easy identification and then the descriptive portion of the title. The subheadings denote the action being performed, such as removing, adjusting, etc, and then the noun name. The centered headings contain information to aid maintenance personnel in preparing for the task to be performed by providing the following data:

a. Tools and Equipment List—Provides a listing of general, standard, and special tools and equipused in the procedure. This listing includes the noun name of the item and Government standard number, where possible. If this number is not availthe manufacturer's part number and federal supply code number will be given. The item and number is also called out in the appropriate step of the maintenance procedure. A consolidated listing of all items is provided in this section and in the General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

b. Materials List—Provides a listing of consumable materials and expendable items used in the procedure. This listing includes the noun name, materspecification or Government standard number, or manufacturer's part number and size (when applicable). The item and number are also called out in the appropriate step of the maintenance procedure. A consolidated listing of all items is provided in the General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

c. Maintenance Assurance—Steps which are underlined represent an inspection requirement for maintenance procedures that could cause equipment failure or jeopardize personnel. These procedures must be properly completed and inspected for safe flight.

d. Notes, cautions, and warnings are incorporated in the maintenance procedures to emphasize important and critical instructions and will precede the text to which each applies.

1-12. PUBLICATIONS LIST.

1-13. Maintenance instructions for Government-furnished equipment are included only to the extent that they are peculiar to these aircraft. Separate manuals are issued and should be consulted for instructions which apply to this equipment. Data necessary for obtaining replacement parts and for complete identification of parts are contained in the Illustrated Parts Breakdown (NAVAIR 01-60GCB-4). Table 1-2 contains associated manuals which are applicable to this manual.

1-14. TECHNICAL DIRECTIVES.

1-15. The technical directives listed in table 1-3 have been incorporated in this manual. These directives are divided into specific groups relating to: Airframe Changes (AFC), Avionics Changes (AVC), Photographic Changes (PHC), etc. Technical directives that have been incorporated on the aircraft are listed in the applicable aircraft logbook. Data made obsolete by the incorporation of a technical directive shall be deleted from the manual as soon as the technical directive has been incorporated on all applicable aircraft or in accordance with the following directive category schedule:

a. Immediate category–Delete prior coverage data at the same time new data is incorporated.

b. Urgent category–Retain prior coverage data for 2 years, then delete.

c. Routine category–Retain prior coverage data for 3 years, then delete.

The "PRIOR COVERAGE STATUS" data column of table 1-3 will state "Deleted" when the obsolete data caused by the incorporation of the applicable technical directive is removed from the manual, and "Retained" when the prior coverage data is not removed from the manual.

1-16. STANDARD SUPPORT EQUIPMENT.

1-17. For a listing of the standard support equipment referenced in this manual, refer to table 1-4. For a complete listing of the standard support equipment required to maintain the OV-10A aircraft, refer to the General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

1-18. SPECIAL SUPPORT EQUIPMENT.

1-19. Table 1-5 contains all special support equipment required to perform the maintenance procedures in this volume. For a complete list of special support equipment required to maintain the OV-10A aircraft, refer to the General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

1-20. MATERIALS LIST.

1-21. For a complete listing of all consumable materials and expendable items used in performing the maintenance procedures described in this volume, refer to table 1-6.

1-22. GROUND SAFETY LOCKS AND PINS.

1-23. Ground safety locks and pins are used in some of the maintenance procedures and are so noted in the instructions. For general use of ground safety locks and pins, refer to the General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

1-24. TEST POINT TROUBLESHOOTING.

1-25. To ease and expedite electrical maintenance, test point troubleshooting data is incorporated in the system trouble isolation procedures. The test point symbols are shown on the system wiring diagrams of the Wiring Data Manual (NAVAIR 01-60GCB-2-7). As any system failure or malfunction can result from any one of a combination of electrical, hydraulic, pneumatic, or mechanical reasons, all probable causes (reasons) for a stated trouble are covered in the same trouble isolation chart. There are three types of test points: major, secondary, and minor. Textual references to these test points are made within each system troubleshooting paragraph and the specific location of each test point may be determined by referring to the applicable system wiring diagram in the Wiring Data Manual (NAVAIR 01-60GCB-2-7). No test point designation is duplicated, nor is more than one test designation given to any test point. Test point identification symbols are assigned consecutively within a system or within a component.

WARNING

Never disconnect wires or disengage disconnects with electrical power applied to the aircraft. Always ground the aircraft and any attached ground power equipment.

1-26. **MAJOR TEST POINTS.** Major test points are used to isolate a power system failure to a physical portion of the aircraft or to a group of systems. Major test point symbols are star-encircled arabic numerals. They are referred to in text as test point 1, test point 2, etc. Some examples of major test points are: generator and inverter outputs, power distribution connections, etc.

1-27. **SECONDARY TEST POINTS.** Secondary test points are used to isolate failures to a specific system or to a specific item within a system. Secondary test point symbols are encircled capital letters. They are referred to in text as test point A, test point AA, etc. Some examples of secondary test points are: power input to individual units, switches, relays, etc. The letters "I" and "O" are not used to avoid confusion with the numerals 1 and 0.

1-28. **MINOR TEST POINTS.** Minor test points are used to isolate a failure within a unit. Minor test point symbols are encircled capital letters and arabic numerals. They are referred to in text as A1, AB1, etc. Some examples of minor test points are: continuity through a switch or relay that is part of a unit, resistance readings of items within a unit, etc. The letters "I" and "O" are not used to avoid confusion with the numerals 1 and 0. Different letters are assigned to each unit.

1-29. **USE OF TROUBLESHOOTING CHARTS.** The best troubleshooting aid is preventive maintenance and cleanliness. The next best trouble shooting aid is thorough knowledge of the theory and operation of the system in question. A thorough knowledge of the system permits rapid determination of the most likely probable cause for any given trouble and thereby reduces trouble shooting time and effort. The third most important aid is safety. Observe all safety rules, ensure that the aircraft and any attached ground power equipment is properly grounded, verify that all ground safeties are installed, follow the trouble shooting instructions and if it is a two-man job, get another man to help. What is the trouble? Check the squawks, observe or perform an operational or functional check of the system in question. Check the troubleshooting charts of the system for the determined trouble. Select the most probable cause(s) and proceed to isolate the trouble; set up the system as specified in the "system conditions" portion of the chart. Use the appropriate meters. Do not make ohmmeter tests or continuity checks on an electrically "hot" aircraft. Complete checkout of the system in question without correction of the trouble may indicate that a parallel or interrelated system is at fault. If so, refer to that system for appropriate trouble shooting information. When a remedy is performed that does not correct the trouble, select the next most probable cause and continue trouble shooting. Isolation procedures are set up to require a minimum of effort. Each procedure should either isolate the trouble itself or isolate the portion of the circuit that contains the trouble. When a test point procedure is called out for an item (for example, a valve solenoid), parts of that procedure not spelled out which may lead to isolating the fault are visual inspection for signs of physical damage, check of the ground connection or bonding, and check for good electrical connections. Similarly, when test points are called out for relay terminals, the switch section of the relay involved should be checked for proper action and continuity. The various portions and functions of the troubleshooting charts are as follows:

1. TEST EQUIPMENT—The test equipment required to perform the trouble shooting procedure is listed in the Tools and Equipment List of each trouble shooting paragraph.

2. SYSTEM CONDITIONS—The system conditions are given in the isolation procedure column of the trouble shooting chart.

3. TROUBLE—This is the observed symptom, malfunction, or fault.

4. PROBABLE CAUSE—The probable cause(s) states the condition or reason causing the trouble. Probable causes are listed in their most likely order. The probable causes may be electrical,

mechanical, hydraulic, pneumatic, etc, or a combination of these reasons.

5. ISOLATION PROCEDURE–This portion of the charts is a positive statement of action. Isolation procedures are listed in their most likely or accessible order. What meter is to be used will be determined by the required meter reading(s). Use the appropriate system wiring diagram to locate test points and to perform wire segment continuity checks. Many isolation procedures require the use of test points located at a pin of a connector. In such cases, it is necessary to disengage the connector and to apply the test probe to the plug or receptacle portion of the connector, as shown on the system wiring diagram. Connectors should never be disengaged with electrical power applied to the aircraft. Do not damage connector sockets by inserting test probes.

6. METER READING–The meter reading, when required, is given in the isolation procedure column of the trouble shooting chart. If test points have been specified in the isolation procedure, the value and type of reading will be stated. Resistance and voltage readings are the type most commonly required for the isolation procedures; values given will indicate their type and the corresponding type of meter should be used to obtain the reading.

7. REMEDY–For nonelectrical isolation procedures, the remedy will indicate the maintenance action required depending upon the results of the isolation procedure. For electrical isolation procedures, the remedy will indicate the maintenance action required for the meter reading obtained. Most remedies will indicate a definite maintenance action, but some remedies will indicate that further isolation procedures should be performed. Some meter readings will indicate that the aircraft wiring is at fault (open or shorted) and the remedy will be to perform a wire segment continuity check. Such continuity checks should be performed to minimize effort. Remove power and disconnect wires as necessary; then, check for continuity at the most accessible midpoint of the circuit; thus, several wire segments can be checked for continuity at one time.

Table 1-2. Related Publications

PUBLICATION NUMBER	PUBLICATION TITLE
NAVAIR 01-1A-1	General Manual for Structural Repair, Handbook
NAVAIR 01-1A-8	Structural Hardware for Aircraft Repair, Handbook
NAVAIR 01-1A-12	Fabrication, Maintenance and Repair of Transparent Plastics, Handbook
NAVAIR 01-1A-16	Non-Destructive Inspection Methods
NAVAIR 01-1A-17	Aviation Hydraulics Manual
NAVAIR 01-1A-20	Aviation Hose and Tube Repair
NAVAIR 01-1A-501	Fabrication and Repair of Reinforced Plastics, Handbook
NAVAIR 01-1A-503	Maintenance of Aeronautical Antifriction Bearings
NAVAIR 01-1A-507	General Use of Cements and Sealants, Handbook
NAVAIR 01-1A-509	Aircraft Weapons Systems Cleaning and Corrosion Control
NAVAIR 01-60GCB-2-1	General Information and Servicing, Maintenance Instructions Manual
NAVAIR 01-60GCB-2-3	Environmental Systems, Maintenance Instructions Manual
NAVAIR 01-60GCB-2-4	Power Plants and Fuel Systems, Maintenance Instructions Manual
NAVAIR 01-60GCB-2-5	Avionics Systems, Maintenance Instructions Manual
NAVAIR 01-60GCB-2-6	Armament Systems, Maintenance Instructions Manual
NAVAIR 01-60GCB-2-7	Wiring Data, Maintenance Instructions Manual
NAVAIR 01-60GCB-3	Structural Repair Manual
NAVAIR 01-60GCB-4	Illustrated Parts Breakdown
NAVAIR 01-60GCB-6	Periodic Maintenance Information Manual
NAVAIR 01-60GCB-6-1	Aircraft Maintenance/Turnaround Checklist
NAVAIR 01-60GCB-6-3	Daily/Servicing/Special Maintenance Requirements Manual
NAVAIR 01-60GCB-6-4	Phased Maintenance Requirements Cards (MRC)
NAVAIR 04-10-1	Aircraft Wheel Maintenance Instructions Manual
NAVAIR 04-10-506	Inspection, Maintenance Instructions, Storage and Disposition of Aircraft Tires and Inner Tubes Manual
NAVAIR 15-01-500	Naval Aircraft, Preservation for Shipment and Storage of, Manual
T.O. 10A1-6-6-2	Panoramic Strike Camera, KB-18A, Service Instructions
T.O. 10A1-6-6-4	Panoramic Strike Camera, KB-18A, IPB

Table 1-3. Record of Technical Directives

TYPE/ NO.	DATE	TITLE/ECP	CATEGORY	CHANGE/ REVISION DATE	PRIOR COVERAGE STATUS	PARAGRAPH/ FIGURE
AFC 6 (IAFC 6)	4/17/72 (3/31/69)	Nose Gear Strut Metal Piston Scraper Ring, Replacement of	Urgent	9/1/68	Retained	5-268/5-42
AFC 17 (IAFC 17)	4/17/72 (11/1/68)	Hydraulic System Package Line Assembly, Replacement of	Urgent	1/1/69	Retained	4-37/
AFC 19 (IAFC 19)	8/27/71 (1/1/69)	Flight Controls–Spoiler Shift System, Improvement of (ECP-OV-10A-269)	Routine	9/15/71	Retained	3-46, 3-50
AFC 20	3/13/69	KB-18A Camera and AN/USQ-42 Radio, Installation of (ECP-OV-10A-289)	Urgent	5/1/69	Retained	3-6, 3-40/3-4
AFC 27	6/20/69	AN/APN-171 Altimeter Installation (ECP-OV-10A-87A)	Urgent	5/1/69	Retained	3-1/
AFC 29	5/16/69	Canopies–Modification of Canopy Door Locking Mechanism (ECP-OV-10A-271)	Urgent	2/15/70	Retained	2-92/2-14
AFC 33	10/25/71	Aileron Fittings, Modification of (ECP-OV-10A-310)	Routine	9/15/71	Retained	3-38/
IAFC 33	10/1/69	Modification of Wing Inboard and Outboard Support Fittings (ECP-OV-10A-292)	Urgent	11/1/69	Retained	3-38/
AFC 43	7/15/70	Main Landing Gear High-temperature Brake Seals, Installation of (ECP-OV-10A-276)	Routine	10/1/70	Retained	6-22, 6-46/
AFC 47	7/1/71	Main Landing Gear, Improvement of (ECP-OV-10A-298)	Routine	4/15/71	Retained	5-82, 5-242/ 5-35
AFC 59	10/16/72	Canopies–Modification of Canopy Door Locking Mechanism; Addition of Aft Lockbar	Routine	2/1/73	Retained	2-74, 2-89, 2-92/2-14
AFC 60	1/12/72	Flight Controls–Forward Cockpit Rudder Mechanism Cover; Installation of	Urgent	6/15/73	Retained	2-135, 3-135/
AFC 72	6/10/75	Vertical Stabilizer Tip Antenna Installation, Modification of	Urgent	3/10/77	Retained	2-131

Table 1-3. Record of Technical Directives (Cont)

TYPE/ NO.	DATE	TITLE/ECP	CATEGORY	CHANGE/ REVISION DATE	PRIOR COVERAGE STATUS	PARAGRAPH/ FIGURE
AFC 73		Flight Controls—Spoiler Authority System; Removal of	Routine	10/15/76	Retained	3-4/3-2, 3-6/ 3-3, 3-7/3-4 3-8/ 3-5,
AFC 75	1/7/76	Nose Landing Gear Steer Damper Assembly, Modification of	Routine	3/10/77	Retained	7-43, 7-45 7-48, 7-50 7-52/7-7, 7-8
AFC 76	2/3/76	Canopy Door Locking Mechanism Indicating System	Routine	3/10/77	Retained	2-75, 2-90, 2-93/2-14
AYC 315	5/22/72	Rudder Trim Actuator-Sealing Boot for (ECP-OV-10A-323)	Routine	8/1/72	Retained	3-112, 3-237 3-280/3-44

Table 1-4. Standard Support Equipment

NOMENCLATURE	PART NO., MODEL, OR TYPE	REMARKS
Adapter, coast	AT1061-2 (81039)	Used in depot maintenance of longitudinal trim actuator
Breaker, bead, tire	5033	For tire removal
Bridge, impedance	Model 1650-A (24655) or equivalent	Used to measure capacitance
Bridge, megohm	Model 544B (24655) or equivalent	Used to measure insulation resistance
Bridge, Wheatstone	Model RN-1 (88939) or equivalent	Used to measure coil resistance of field assembly
Brush, soft-bristle	Commercial	Used in maintenance of nose landing gear
Cleaner, ultrasonic	BUC 518 x 25 (06840/99251)	Used in depot maintenance cleaning
Cylinder, air, portable	60A80D1 (10001)	For servicing landing gear struts
Cylinder, graduated	Commercial	Test apparatus for wing flap motor gearbox
Filter, cartridge	035065 (90005)	Used in checking out wheel brake actuator
Filter, cartridge	28724, size 1, T-type, series 2872 (90005)	Used in checking out wheel brake actuator
Fixture, brush alignment	AT431 (81039)	Used in depot maintenance of longitudinal trim actuator
Fixture, end play checking	AT2037 (81039)	Used in depot maintenance of longitudinal trim actuator
Fixture, motor holding	AT916 (81039)	Used in depot maintenance of longitudinal trim actuator
Gage, force, push-pull	DPPH100MRP (11710)	0–100-pound capacity, used to rig flight control systems
Gage, pressure	Commercial (72100)	0–1500 psig capacity, used to measure hydraulic force
Gage, pressure	Commercial (72100)	0–3000 psig capacity, used to measure hydraulic force
Jack, hydraulic, tripod	50J25178	10-ton capacity, for jacking aircraft
Jack, hydraulic, tripod	MIL-J-7028 (Model II)	For jacking aircraft
Jack, axle	Type A-5 USAF 53D22020	5-ton capacity, for jacking aircraft
Kit, inspection, fluorescent penetrant	MIL-F-38762 (81349)	For hydraulic valve maintenance
Lugger, plug pin	MS3191-1	Used for stick grip removal and installation
Machine, swaging, bench-type, hand-operated	MIL-S-6180, Type 2 (81349)	System cable manufacturing
Machine, cable testing, hydraulically operated	TA 19802	4000-pound capacity, system cable
Multimeter	AN/PSM-4C	For electrical checkout and trouble-shooting of systems, assemblies, and components

Table 1-4. Standard Support Equipment (Cont)

NOMENCLATURE	PART NO., MODEL, OR TYPE	REMARKS
Oscilloscope	AN/USM-140B (80009)	For electrical checkout and trouble shooting of systems, assemblies, and components
Oven, equipment heating		Used for landing gear wheel maintenance
Panel, control	Model NT131 (12511) or equivalent	Provides electrical control during testing
Plate, bearing removal	AT770-1 (81039)	Used to remove bearings from shaft of trim actuator armature
Plate, bearing removal	AT770-2 (81093)	Used to remove bearings from shaft of trim actuator armature
Platform, aircraft maintenance	Type B-1	General aircraft maintenance
Power supply, electrical	Model LH125 (80103)	Used to perform intermediate maintenance on directional trim actuator
Power supply, electrical	Powertron 12815 (99060)	Used to perform intermediate maintenance on yaw damper amplifier
Power unit, mobile	NC-8A (26738)	Used to provide 28 volts dc on flight line
Press, arbor, hydraulic	1 1-2 (15746)	Used for landing gear wheel maintenance
Puller, bearing	5519-CG250 (55719) or 4331-P-136-A (43331)	Used in wheel maintenance
Pulley, motor load test	AT1901-2 (81039)	Used in depot maintenance of longitudinal trim actuator
Refrigerator	MIL-R-4582 (81349)	Used for landing gear wheel maintenance
Scale, spring	L-30M	Used to measure spring force
Stand, test, hydraulic	S-610	Used to checkout, trouble shoot, and test hydraulic system and components
Stand, test linear actuator	Model NV-200 (26337)	Flap preload bungee, intermediate maintenance
Tachometer		Used to perform intermediate maintenance on wing flap motor gearbox
Tensiometer, cable	T5-8002-105-00	For rigging flight controls
Tester, air data	VPT-10F-11072 (03025)	Used in rigging lateral control system
Tester, dielectric	Type 411	Used in performing intermediate maintenance on hydraulic solenoid selector valve
Tester, spring resiliency	Type PB4-D	Used to test bungee springs
Tester, spring resiliency	MST500	Used to test bungee springs

Table 1-4. Standard Support Equipment (Cont)

NOMENCLATURE	PART NO., MODEL, OR TYPE	REMARKS
Tester, hypot	Model 404 (04227)	Used to measure dielectric
Thermogun	Model 500 (08795)	Used to shrink tubing
Timer, electric, millisecond	Model MST 500 (56631)	Used to measure motor rpm
Tool, plug pin, insertion	MS24256A20	Used to remove and install stick grip
Tool, plug pin, removal	MS24256R20	Used to remove and install stick grip
Valve, globe	P3004V, model 300 (97399)	0–3000 psig capacity, used in performing maintenance on main landing gear wheel brake actuators
Valve, relief	P670-1-1/4D$_2$P	100–1200 psig capacity, used in performing maintenance on main landing gear wheel brake actuators
Voltmeter, vacuum tube	AN/URM-45 (or equivalent)	Used in checking out electrical systems and components
Wrench, special	AT226-1 (81039)	Used to remove trim actuator motor and brake assembly retaining screw
Wrench, torque	GGG-W-686, type 1, size No. 6	3/8-inch square drive, 0–200 inch-pounds capacity, used to tighten attaching parts
Wrench, torque	GGG-W-686, type 1, size No. 9	1/2-inch square drive, 0–600 inch-pounds capacity, used to tighten attaching parts
Wrench, torque	GGG-W-686, type 1, size No. 11	1/2-inch square drive, 0–1800 inch-pounds capacity, used to tighten attaching parts

Table 1-5. Special Support Equipment

NOMENCLATURE	PART NO., MODEL, OR TYPE	REMARKS
Adapter, pressing	AT3479 (81039)	Used in depot maintenance of longitudinal trim actuator
Adapter, splined shaft, universal	T105344	Used in performing maintenance on flap motor gearbox
Attachment, variable load	AT2904 (81039)	Used in depot maintenance of longitudinal trim actuator
Bundle, adapter, jacking and mooring	E13710	Used in jacking and mooring aircraft
Bundle, rig pin, flight controls	T3382	Used in rigging flight control systems

Table 1-5. Special Support Equipment (Cont)

NOMENCLATURE	PART NO., MODEL, OR TYPE	REMARKS
Bushing, split	AT2037-6 (81039)	Used in depot maintenance of longitudinal trim actuator
Bushing, split	AT2500-13 (81039)	Used in depot maintenance of longitudinal trim actuator
Bushing, split	AT2500-14 (81039)	Used in depot maintenance of longitudinal trim actuator
Cam, load test	AT2904-14 (81039)	Used in depot maintenance of longitudinal trim actuator
Cam, load test	AT2904-16 (81039)	Used in depot maintenance of longitudinal trim actuator
Dolly, landing gear buildup	93034-64A-101	Used in depot maintenance of main landing gear
Fixture, aileron rigging	T3392	Rigging lateral control system
Fixture, elevator rigging	T3391	Rigging longitudinal control system
Fixture, pressing	AT3347 (81039)	Used in depot maintenance of longitudinal trim actuator
Fixture, load limit test, hydraulic	AT2400 (81039)	Used in depot maintenance of longitudinal trim actuator
Fixture, rudder rigging	T3393	Rigging directional control system
Fixture, test	T56339	Used in performing maintenance on main landing gear wheel brake actuators
Fixture, test	T105767	Used in performing maintenance on wing flap actuator
Pin, end play checking	AT3556 (81039)	Used in depot maintenance of longitudinal trim actuator
Pins	AT2500-4 (81039)	Used in depot maintenance of longitudinal trim actuator
Puller, brake disk	AT2156 (81039)	Used to remove disk brake from trim actuator armature
Stand, test, load	T105349	Used in performing maintenance on wing flap actuator
Tool, staking	T105345	Used in performing maintenance on wing flap actuator
Wrench, special	AT1795 (81039)	Used to remove trim actuator motor and brake assembly
Wrench, torque	Model F32-I-0 (58332)	Used to measure brake holding torque of longitudinal trim actuator motor and brake assembly

Table 1-6. Consumable Materials and Expendable Items

NOMENCLATURE	SPECIFICATION OR PART NO. AND MANUFACTURER
1. Acetone	O-A-51C
2. Acid, sulphuric (technical, 93%)	O-S-809, Type I, Class I
3. Acid, chromic (Chromium Trioxide)	O-C-303
4. Acrylic sheet, heat-resistant (0.187-inch)	MIL-P-8184
5. Adhesive, rubber base, general-purpose	MIL-A-5092
6. Adhesive	Type EC-870 (55101)
7. Adhesive, (enamel) glyptal	ZV903 (24451)
8. Adhesive, (enamel) glyptal	MIL-E-22118
9. Adhesive	Silastic 140 (71984)
10. Alcohol, Isopropyl	TT-I-738, Grade B
11. Alloy, brazing, silver wire	QQ-B-654
12. Bar stock, aluminum alloy	QQ-A-200/3 (2024-T4)
13. Barrier Material, greaseproof, waterproof, flexible	MIL-B-121, Grade A
14. Bushing	300-333020-3 (89372)
15. Bushing	4B19B4-008 (89372)
16. Cartridge	873364 (33525)
17. Cement, bonding	Delta Bond 152 (85163)
18. Cement, (adhesive) epoxy	MMM-A-187
19. Cleaner	P-P-560
20. Clips, locking	MS21256-2
21. Cloth, abrasive, aluminum oxide	P-C-451
22. (No. 600-800 grade)	
23. Cloth, crocus	P-C-458
24. Coating, chromate conversion	MIL-C-81706, Class 1A
25. Compound, antiseize	Led-Plate No. 250 (84180)
26. Compound, antiseize	MIL-T-5544
27. Compound, cleaning, aluminum surface, non-flame sustaining	MIL-C-5410
28. Compound, cleaning	MIL-C-25769
29. Compound, cleaning solvent, trichlorotrifluoroethane	MIL-C-81302, Type II
30. Compound, potting	MIL-S-8516, Type II, Class I
31. Compound, rubbing	TT-R-771
32. Compound, sealing	MIL-S-8516, Type II
33. Compound, sealing	MIL-S-8802, Class B 1/2 or B-2
34. Compound, sealing	Stabond C-136 (FMSC 25670)
35. Compound, sealing	MIL-S-22473
36. Compound, steam cleaning	MIL-C-22542
37. Compound, walkway, nonslip	MIL-W-5044, Type II
38. Cupric (Copper) Sulphate	O-C-828
39. Desiccant (drying agent)	MIL-D-3464
40. Dichloromethane, technical	MIL-D-6998
41. Duck, cotton	CC-D-741, Type IV
42. Flannel, cotton	CCC-F-548
43. Flannel, outing	CCC-F-466
44. Fluid, hydraulic	MIL-H-5606
45. Fluid, hydraulic, preservative	MIL-H-6083
46. Fluid, silicone, 20 centistokes	VV-D-1078 (Dow Corning 200) (71984)

Table 1-6. Consumable Materials and Expendable Items (Cont)

NOMENCLATURE	SPECIFICATION OR PART NO. AND MANUFACTURER
47. Fluid, silicone, 70,000 centistokes	510 Fluid (71984)
48. Flux, brazing, silver wire	
49. Gasket	AN4045-1
50. Gasket	HP848115 (84685)
51. Gasket	4820189-1 (81039)
52. Gasket, motor, wing flap	641041-1 (22907)
53. Gasket, motor, wing flap	641043-1 (22907)
54. Glyptal	No. 1286 (01139) General Electric Co., Waterford, N.Y. 12188
55. Grease, aircraft and instrument, gear and actuator screw	MIL-G-23827
56. Grease, aircraft, wheel and bearing	MIL-G-81322
57. Grease, plug valve	MIL-G-6032
58. Compound, Silicone	DC-7 (71984)
59. Humiseal	1B12
60. Kit, cure date, nitrocellulose, gloss	HP-8486 (84685)
61. Lacquer, acrylic,	MIL-L-81352
62. Lacquer, camouflage	TT-L-20
63. Lock washer	2W15-6
64. Lockwire (0.032-inch diameter steel)	MS20995F32
65. Lockwire (0.032-inch diameter nickle copper)	MS20995NC32
66. Lockwire (0.041-inch diameter steel)	MS20995F41
67. Lubricant	Aero-Lubriplate (73219)
68. Lubricant, solid film	MIL-L-8937 and MIL-L-46147
69. Methyl-ethyl-ketone	TT-M-261
70. Molybdenum, disulfide, technical	MIL-M-7866
71. Napha, Aliphatic	TT-N-95
72. Oil, lubricating, aircraft instrument, low volatility	MIL-L-6085
73. Oil, lubricant	MIL-L-7870
74. Packing	MS9021-043
75. Packing	MS28775-009
76. Packing	MS28775-010
77. Packing	MS28775-012
78. Packing	MS28775-013
79. Packing	MS28775-015
80. Packing	MS28775-016
81. Packing	MS28775-017
82. Packing	MS28775-018
83. Packing	MS28775-110
84. Packing	MS28775-113
85. Packing	MS28775-211
86. Packing	MS28775-212
87. Packing	MS28775-217
88. Packing	MS28775-218

Table 1-6. Consumable Materials and Expendable Items (Cont)

NOMENCLATURE	SPECIFICATION OR PART NO. AND MANUFACTURER
89. Packing	MS28775-225
90. Packing	MS28775-228
91. Packing	MS28775-236
92. Packing	MS28775-325
93. Packing	MS28775-326
94. Packing	MS28775-329
95. Packing	MS28775-337
96. Packing	MS28778-4
97. Packing	MS28778-6
98. Packing	MS28778-8
99. Packing	MS28778-10
100. Packing	MS28778-24
101. Packing	56733 (75250)
102. Packing	68-826 (97153)
103. Paint, red	Commercial
104. Paper, waterproof	PPP-B-1055
105. Petrolatum	VV-P-236
106. Pin, cotter	MS24665-5
107. Pin, cotter	MS24665-22
108. Pin, cotter	MS24665-132
109. Pin, cotter	MS24665-134
110. Pin, cotter	MS24665-136
111. Pin, cotter	MS24665-140
112. Pin, cotter	MS24665-151
113. Pin, cotter	MS24665-153
114. Pin, cotter	MS24665-155
115. Pin, cotter	MS24665-283
116. Pin, cotter	MS24665-285
117. Pin, cotter	MS24665-304
118. Pin, cotter	MS24665-306
119. Pin, cotter	MS24665-360
120. Pin, hinge	MS20253P2
121. Pin, hinge	MS20392-3061
122. Pin, straight	MS20392-1C13
123. Plug, crimp-type, connector	MS3126F14-19P-6703
124. Primer, epoxy	MIL-P-23377
125. Primer, coating, vinyl, zinc-chromate	MIL-P-15930
126. Primer, zinc-chromate	MIL-P-8585 or TT-P-1757
127. Remover, paint,	MIL-R-81294
128. Retainer	MS16625-1168
129. Retainer	MS28774-110
130. Retainer	MS28774-225
131. Retainer	MS28782-8

Table 1-6. Consumable Materials and Expendable Items (Cont)

NOMENCLATURE	SPECIFICATION OR PART NO. AND MANUFACTURER
132. Retainer	MS28782-16
133. Retainer	MS28782-29
134. Ring, backup	MS9058-04
135. Ring, backup	MS9058-06
136. Ring, backup	MS28783-6
137. Ring, backup	MS28774-009
138. Ring, backup	MS28774-013
139. Ring, backup	MS28774-015
140. Ring, backup	MS28774-016
141. Ring, backup	MS28774-018
142. Ring, backup	MS28774-217
143. Ring, backup	MS28774-218
144. Ring, backup	MS28774-236
145. Ring, backup	MS28774-325
146. Ring, backup	MS28774-337
147. Rivet	AN470AD4
148. Rivet	AN470AD5
149. Rivet, aluminum alloy	MS20447DD6-20
150. Rod, aluminum alloy (1/2-inch diameter)	QQ-A-200/3 (2024-T4)
151. Rod, steel (9/16-inch diameter)	MIL-S-6758
152. Rubber, hydraulic oil resistant (0.063 inch)	AMS3200
153. Seal, shaft	56613 (72250)
154. Compound, sealing and thread retaining (B)	MIL-S-22473
155. Sheet, aluminum alloy, (0.040, 0.063, 0.080 or 0.100 gage)	QQ-A-250/4 (2024-T3)
156. Shortening	EE-S-321
157. Silicone fluid, Dow-Corning 200, 20 centistokes	VV-D-1078
158. Sleeving, insulation	Vinylflex 4000 (81851) Nos. 8, 12, and 16
159. Sodium bicarbonate, technical	O-S-576
160. Solder, resin core	QQ-S-571
161. Solution, cleaning	AP 20
162. Solvent, dry-cleaning	P-D-680, Type I/Type II*
163. Solvent, naphtha	MIL-N-15178
164. Solvent, trichloroethane	MIL-T-81533
165. Spacers	NA543DD3-12
166. Tape, adhesive, rubber and cork composition	MIL-T-6841
167. Tape, masking	MIL-T-21595
168. Tape, pressure-sensitive adhesive, electrical	MIL-I-23594
169. Tetrachloroethylene	O-T-236
170. Thinner, type C	FMS25670
171. Thinner, toluene	TT-T-548
172. Tubing, aluminum alloy (1/2-inch diameter, 0.049-inch wall thickness) (2024-T4)	QQ-A-200/3C

*Specification P-D-680, Type I solvent should be used at Organizational level only if Type II is unsatisfactory for use.

Table 1-6. Consumable Materials and Expendable Items (Cont)

NOMENCLATURE	SPECIFICATION OR PART NO. AND MANUFACTURER
173. Tubing, heat-shrinkable	RNF-100 (08795) 3/16-, and 3/32-inch diameter block
174. Varnish, moisture and fungus resistant	MIL-V-173
175. Washer, felt	2W12-16
176. Washer, felt	2W12-27
177. Washers, shim	2W1LB-64-52-94
178. Washers, shim	2W1AL-48-36-64
179. Washers, shim	2W1LB16-32-125
180. Wire, electrical, insulated, high-temperature— E22 extruded teflon, white	MIL-W-16878/4

CHAPTER 2
AIRFRAME SYSTEMS

SECTION I
DESCRIPTION AND OPERATION

2-1. GENERAL.

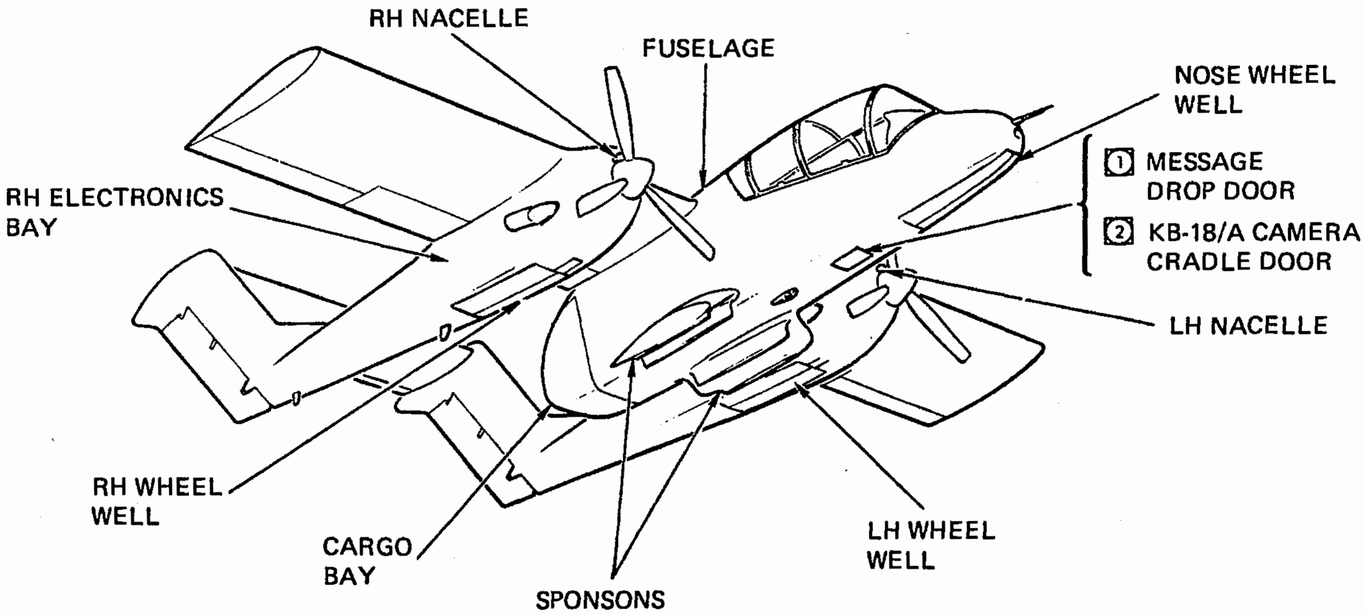
2-2. The airframe (figure 2-1) consists of the fuselage, wing, booms, empennage, and sponsons. The fuselage provides housing for the pilot, observer, cargo, and for passengers. The airframe contains internal systems and subsystems with their associated components and assemblies. The wing, vertical stabilizers, and horizontal stabilizer provide the required lift and means to control the attitude and direction of the aircraft. A center stores station, located on the lower fuselage, provides facilities for numerous stores configurations or an external droppable fuel tank. Sponsons, containing four 7.62mm machine guns and four additional external store stations, may be installed on four lower fuselage hard points. The airframe also contains a retractable landing gear system consisting of a nose landing gear and two main landing gear.

2-3. FUSELAGE.

2-4. General fuselage construction consists of a metal structure supporting riveted aluminum skin. The fuselage is a conventional, semimonocoque structure made of side panels, top and bottom decks, bulkheads, and floor and is bolted to the wing at four main fittings. The fuselage is divided into two primary sections: forward and aft. The forward fuselage section from station 0 to station 166.3 includes the pilot's and observer's cockpits, nose landing gear support structure, and nose cover. The pilot's cockpit contains all equipment and controls to fly the aircraft under all flight conditions. The observer's cockpit contains sufficient equipment to allow for safe flying and landing of the aircraft under emergency conditions. Access to the cockpits is provided by a ladder and steps in the right side panel of the fuselage. Each cockpit has a right- and left-hand access door. The right-hand doors are bungee-controlled for normal usage. The left-hand doors are used for emergency exit. Ejection seat provisions for each cockpit are integrated with the seat support structure. The fiberglas nose provides a cover for the nose wheel and support for the pitot system and landing light. The aft fuselage section from fuselage station 166.3 to station 305 includes the wing-to-fuselage attach fittings, sponson attach fittings, centerline external store station, and cargo bay. An external power receptacle is located in the right-hand side panel forward of station 256.5. The cargo bay can accommodate 3200 pounds of cargo or personnel. A honeycomb fiberglas access door is located at the rear of the cargo bay. The door may be opened 180 degrees to allow loading directly into the cargo bay from a vehicle. Fuselage components and their location are listed in table 2-1.

2-5. MESSAGE DROP DOOR.

2-6. A foot-operated message drop door is provided in the observer's compartment. The door is spring-loaded and incorporates interior and exterior door and a fiberglas chute approximately 9 inches in diameter. On aircraft having AFC No. 20 incorporated, the message drop door is removed. See figure 2-2 for component locator.



1 AIRCRAFT NOT HAVING AFC 20 INCORPORATED

2 AIRCRAFT HAVING AFC 20 INCORPORATED

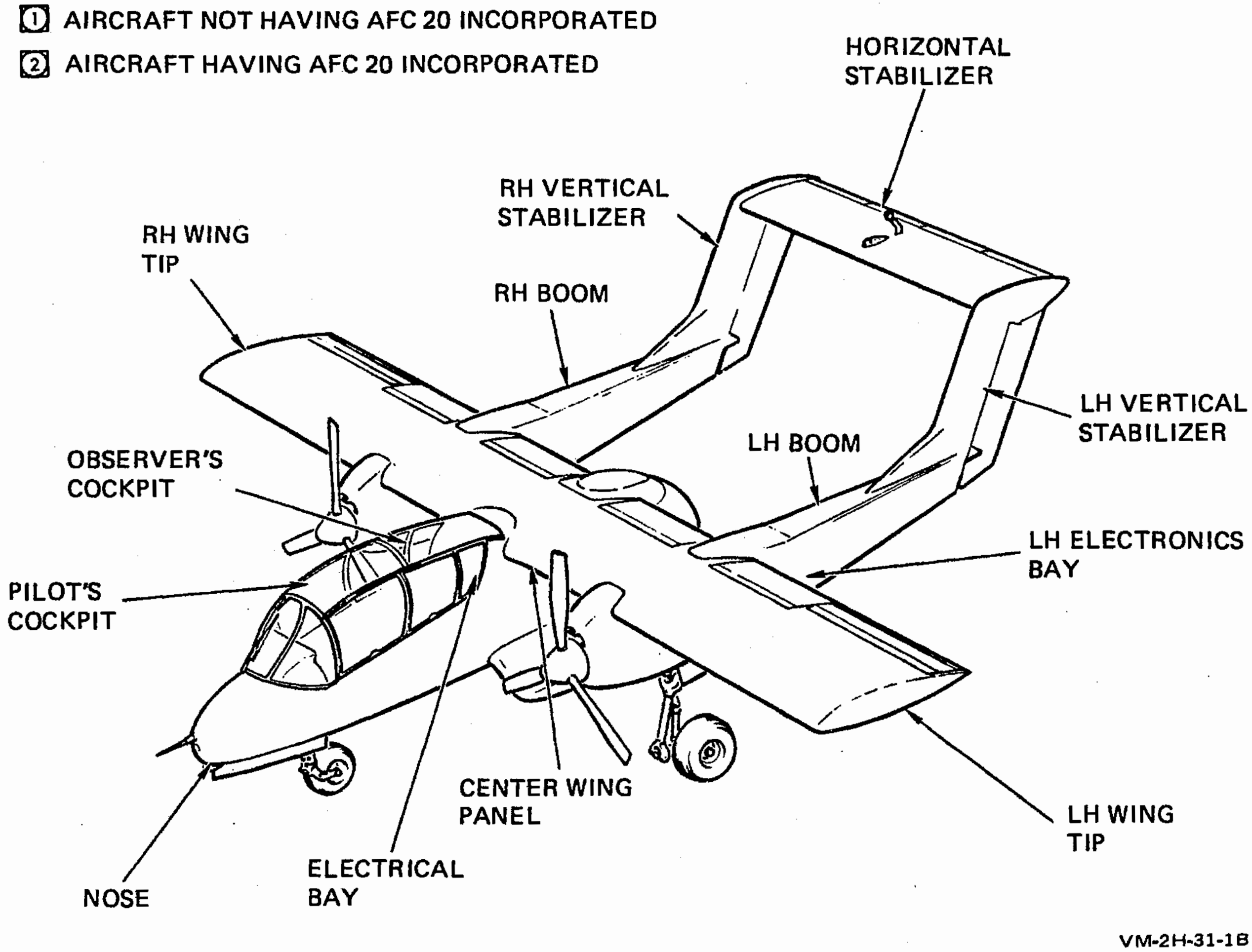


Figure 2-1. Airframe Locator

Table 2-1. Fuselage Components and Location

COMPONENT - LOCATION
NOSE
Pitot-static boom
Windshield wiper motor
Landing/taxi light
Air temperature probe
Formation lights
Heat and vent mixing chamber
Nose land gear
Nose gear steering actuator
LOWER FUSELAGE - FORWARD
Master brake cylinders
Anticollision light
UHF-ADF antenna
PILOT'S COCKPIT
Canopy door (right-hand side)
Canopy emergency door (left-hand side)
Armor glass windshield
Windshield wiper
Instrument panel
Consoles (left- and right-hand)
Oxygen regulator
Anti-G suit valve
Relief tube
Ejection seat
Center pedestal
Air temperature probe
Gunsight
Mirrors
Armor plate package
OBSERVER'S COCKPIT
Canopy door (right-hand side)
Canopy emergency door (left-hand side)
Instrument panel
Oxygen regulator
Anti-G suit valve
Relief tube
Ejection seat
Message drop door*
Camera cradle and actuator assembly**
Armor plate package

Table 2-1 Fuselage Components and Location (Cont)

COMPONENT - LOCATION
ELECTRICAL BAY
D-C miscellaneous circuit breaker panel
No. 1 auxiliary d-c circuit breaker panel
Armament d-c circuit breaker panel
Primary d-c circuit breaker panel
Secondary d-c circuit breaker panel
CARGO BAY
Hydraulic equipment power unit
Oxygen containers
Nose gear steering selector valve
Upper fuselage fuel supply tank
HF-SSB antenna
Landing gear control valve
Hydraulic and fuel lines
HF-SSB receiver-transmitter
Paratroop intercom panel
3200 pounds of cargo/or
Two litter patients and medical attendant/o
Five paratroops/or
Six combat troops
Cargo bay access door
Accelerometer
Cargo bay lights
Relay panel
Yaw damper and yaw damper gyro
HF-SSB antenna coupler
FUSELAGE - LOWER
Centerline external stores station
One 150-gallon drop tank (center station)
Numerous stores configurations
SPONSONS (REMOVABLE)
Four additional external stores stations
Four 7.62 mm guns/or
Numerous store configurations

* Aircraft not having AFC No. 20 incorporated
** Aircraft having AFC No. 20 incorporated

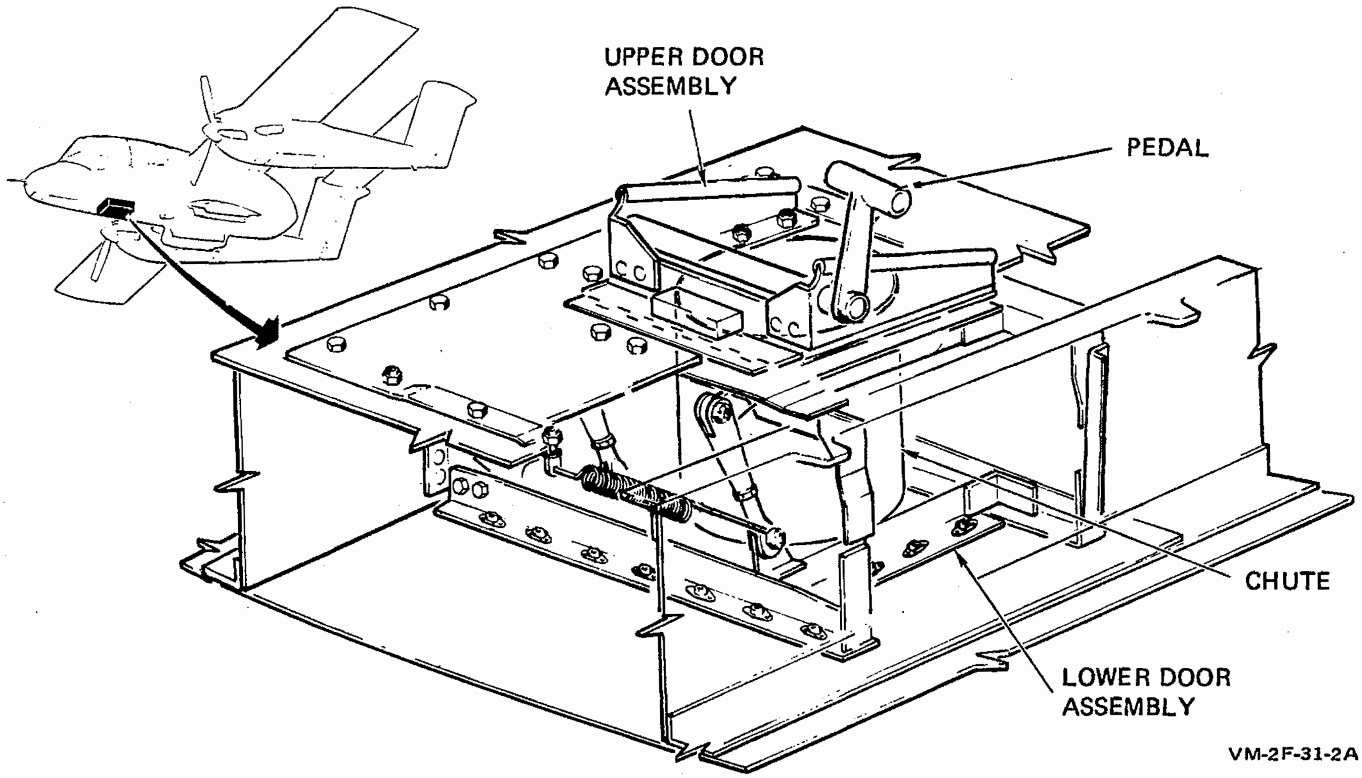


Figure 2-2. Message Drop Door Locator—Aircraft Not Having AFC No. 20 Incorporated

2-7. CAMERA CRADLE AND ACTUATOR MECHANISM-AIRCRAFT HAVING AFC NO. 20 INCORPORATED.

2-8. On aircraft having AFC No. 20 incorporated, the camera cradle and actuator mechanism (figure 2-3) for the KB-18A camera is installed in the observer's compartment in lieu of the message drop door. The camera cradle is extended by raising the cradle lever handle and positioning forward. The camera cradle is retracted by raising the cradle lever handle and pulling aft to the locked position. Camera doors located on the underside of the aircraft open when the cradle is extended, and close when the cradle is retracted. When not in use, the level handle and camera control electrical cable are stowed and the cradle cover is installed.

2-9. WING.

2-10. The OV-10A wing is a constant chord, straight, untapered surface having a span of 40 feet and a chord of 87.25 inches. The wing consists of five major assemblies: a center wing section, two intermediate panels, and two outer panels. Surface and engine controls are located in the leading edge box and aft of the rear spar. The center wing section contains three self-sealing fuel cells and has attaching points for installing two inboard flaps, and fuselage and boom assemblies. The two intermediate panels contain two self-sealing fuel cells and attaching points for spoiler plates, outboard flaps, and under-the-wing missile pylons. Aircraft wing jacking and tie-down fittings are provided in the underside of each intermediate panel. The two outer panels provide attaching points for ailerons and wing position lights. Wing components and location are listed in table 2-2.

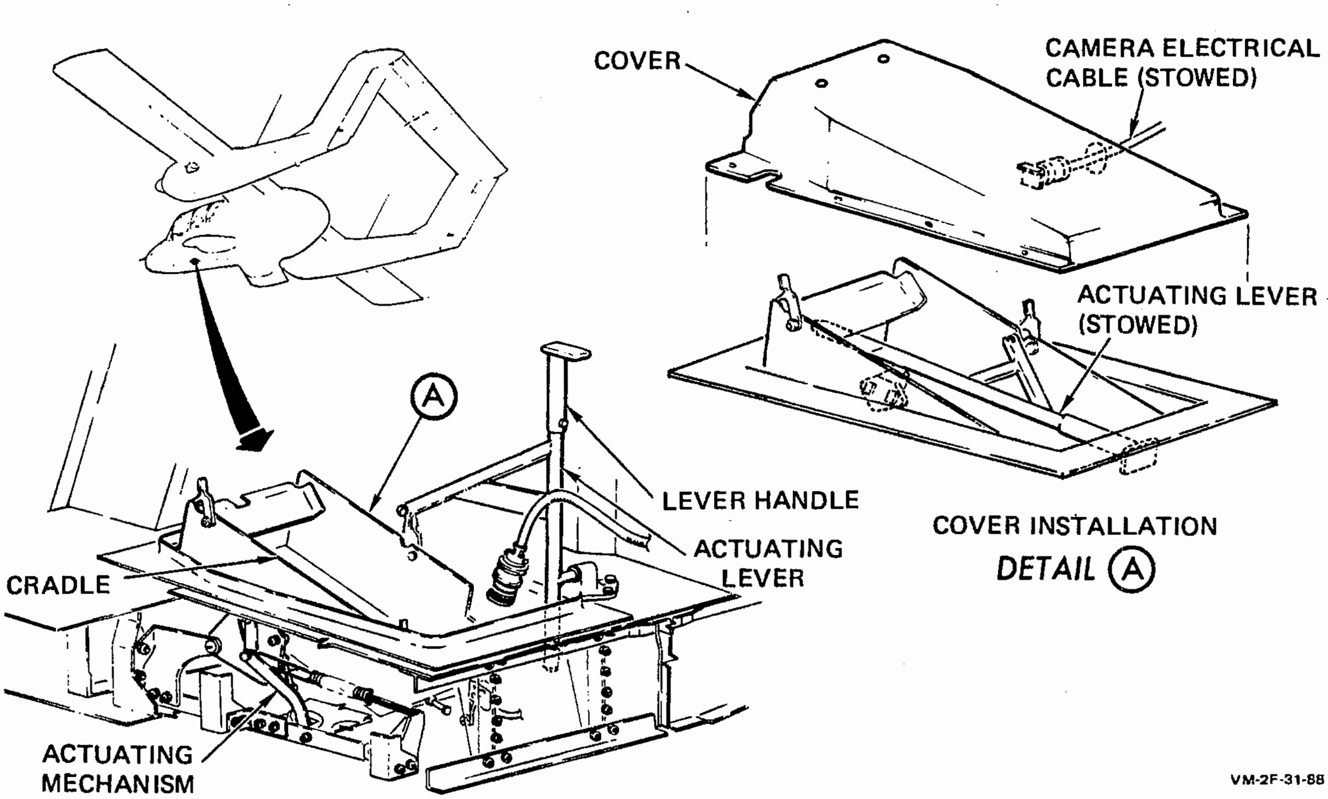


Figure 2-3. Camera Cradle and Actuator Mechanism—Aircraft Having AFC No. 20 Incorporated

Table 2-2. Wing Components and Location

COMPONENT-LOCATION
CENTER SECTION
Flight control linkage
Center fuel tank
Two inboard fuel tanks
Fuel tank probes
Three fuel ejector pumps
Three fuel tank float switches
Wing flap motor
Wing flap selector valve
Wing flap linkage
Two wing flaps
INTERMEDIATE PANEL (LEFT OR RIGHT)
Flight control cables
Two outboard fuel tanks

Table 2-2. Wing Components and Location (Cont)

COMPONENT-LOCATION
Two fuel probes
Two fuel vent valves
Two fuel ejector pumps
Sidewinder missile (wing station 166)
Jacking points (station 143)
OUTER PANEL (LEFT OR RIGHT)
Two wing flaps
Four spoiler plates
Ailerons
Clearance lights
Position light (wing tip)

2-11. NACELLE/BOOM ASSEMBLIES.

2-12. There are two interchangeable nacelle/boom assemblies installed on the aircraft, extending from station 181.6 to canted station 459.1. The nacelle is of conventional construction, extending from canted station 181.6 to a field break at station 256.0. It includes forward and aft wing-to-nacelle attach fittings, engine mount support structure, main landing gear support structure, wheel well, and attach fittings for mating the boom. A battery compartment is located in the center of the nacelle at station 204.25, accessible from the wheel well. The location of components in each boom and nacelle assembly are listed in tables 2-3 and 2-4. Boom is of typical stringer and frame construction, extending from canted station 256.0 to canted station 459.1. The boom provides attaching points for the horizontal stabilizer and hardware to support and route control cables and electrical wiring connected to control surfaces and electrical components in the empennage. An electronics bay aft of canted station 256.0 provides hardware to house and support electronics equipment.

Table 2-3. Left Nacelle/Boom Components and Location

COMPONENT - LOCATION
NACELLE
Left engine installation
Left main landing gear
Battery
ELECTRONICS BAY
AN/ASN-75 compass system
TACAN receiver-transmitter
UHF-AM receiver
TACAN cooling fan
Fire warning control unit
Relay panel
UHF-ADF amplifier-relay assembly
Juliet-28 (provisions)
BOOM
UHF-AM antenna
MA-1 compass
Cables and controls
Electrical wiring
Left vertical stabilizer
Formation light

Table 2-4. Right Nacelle/Boom Components and Location

COMPONENT - LOCATION
NACELLE
Right engine installation
Right main landing gear
Battery
ELECTRONICS BAY
No. 1 inverter
No. 2 inverter
Y-delta transformer
Instrument power transformer
IFF-SIF receiver-transmitter
VHF-FM receiver-transmitter
Dy-107/AR, dynamotor
KIT-1/T SEC crypto - computer (provisions)
Relays
Fire warning control unit
Fuse panel
Juliet-28 (provisions)
VHF-FM whip antenna
BOOM
IFF-SIF antenna
Cables
Controls
Electrical wiring
Right-hand vertical stabilizer
Formation light
IFF transponder test set

2-13. EMPENNAGE.

2-14. The empennage consists of two vertical stabilizers attached to the aft end of each boom, with a horizontal stabilizer installed between the two, attached at each vertical stabilizer tip. Both vertical stabilizers and the horizontal stabilizer are of conventional construction. Each vertical stabilizer contains attach points for a rudder. A nonstructural fiberglas tip is attached to the upper end of each vertical stabilizer and to the outboard end of the horizontal stabilizer. A formed channel dorsal fin at the forward intersection of the vertical stabilizer and boom provides additional strength between the boom upper spar and forward vertical spar and leading edge skin. The horizontal stabilizer contains attach points for the elevator. Two geared tabs are mounted inboard, and two spring tabs are mounted outboard on the trailing edge of the elevator. The empennage components and locations are listed in table 2-5.

Table 2-5. Empennage Components and Location

COMPONENT - LOCATION
LEFT VERTICAL STABILIZER
Left rudder
TACAN antenna
Vertical stabilizer tip
Tail position light
RIGHT VERTICAL STABILIZER
Right rudder
Vertical stabilizer tip
HORIZONTAL STABILIZER
Elevator
Elevator trim actuator
HF-SSB antenna
Compass transmitter (AN/ASN-75)

2-15. SPONSONS.

2-16. The sponsons are a separate aircraft package (sponson package 300-860104 or 305-860204) and are of conventional construction with spars, ribs, and skins. The forward and rear spars support two external munition stations of 600-pound carrying capacity. Each sponson has internal provisions for mounting two M60C (7.62mm) machine guns and for carrying 500 rounds of ammunition per gun. A large access door on the upper surface of the sponson provides access to remove, to install, and to service the guns. Each sponson is attached to the fuselage with three bolts at station 166.3 and three bolts at station 204.0. Sheet metal fairings are attached to the fuselage with Phillips screws and Torq-Set fasteners.

2-17. AIRFRAME EQUIPMENT PACKAGES.

2-18. Various airframe equipment packages are available for installation in the airframe. These packages are not required for flight but enable the aircraft to carry cargo, litter patients, or paratroops. The conversion equipment package consists of items common to the paratroop, cargo, and litter equipment packages. Refer to table 2-6 for a listing of the major components of these packages. An armorplate package is also available but is normally installed in the aircraft.

2-19. ARMOR PLATE PACKAGE (305-865016). The pilot's and observer's compartments are equipped with a protective armor plate package. The package is designed to provide maximum protection from small arms ground fire. The armor plate panels installed on the floor of both compartments are 1/2-inch face-hardened aluminum. The armor panels installed on both seat bulkheads are 3/8-inch face-hardened steel. The panels are installed so that the hardened surfaces are exposed to the projectile. The weight of the complete package is 319 pounds.

2-20. SPONSON EXTERNAL STORE PACKAGE (300-860104). Two sponson assemblies, left- and right-hand, are attached to the fuselage at fuselage stations 166.3 and 204.0. The sponsons are attached with four bolts and have fairing installed over them. The sponsons consist of a metal structure supporting riveted aluminum skin and contain the necessary provisions for mounting four (two in each sponson) M60C machine guns internally in addition to two store stations (buttock planes 18 and 36) per sponson.

2-21. CARGO BARRIER PACKAGE (305-860012). With the cargo barrier package and components from the conversion equipment package installed, the aircraft is capable of carrying 3200 pounds of cargo internally. Cargo is secured to the floor by using the cargo tie-down straps provided or rope of equivalent strength.

2-22. PARATROOP EQUIPMENT PACKAGE (305-860011). With the paratroop equipment package installed, the aircraft is capable of transporting and air-dropping five fully equipped paratroops or six combat troops. In this configuration, the observer's seat and support and cargo bay door are removed. The troops are seated in tandem on the floor, facing the rear. The paratroop equipment package consists of the paratroop alarm signal, lap

Table 2-6. Airframe Equipment Packages and Components

AIRFRAME PACKAGE	COMPONENTS	REMARKS
Conversion Equipment Package (305-860015)	Aft flooring and cargo tie-down fittings.	Normally installed in basic configuration and used in the litter, paratroop, and cargo configuration.
	Forward flooring.	Installed only with the litter or paratroop package.
	Backrest, fixtures and back lap belt.	Installed only with the litter or paratroop package.
	Forward, middle, aft side panels (left and right), and hand-held closeouts.	Normally installed in basic configuration and used with litter, paratroop, and cargo packages.
Cargo Barrier Package (3305-860012)	Barrier assembly.	One barrier assembly is installed in forward cargo bay.
	Strap assemblies.	To be used to retain cargo.
Litter Equipment Package (305-860014)	Strap assemblies.	Forward and aft right-hand stretcher supports, and lower stretcher tie-down straps.
	Bracket assemblies.	Forward and aft left-hand stretcher supports.
Paratroop Equipment Package (305-860011)	Jump alarm and jump light panel and control panel.	Electrical indication and control panels.
	Anchor line and bracket assembly.	Installed on left-hand side of cargo bay.
	Lap belts.	Lap belts are installed at fuselage stations 142.0, 163.0, 185.9, and 217.5, in addition to the lap belt installed from the conversion equipment package.
Armor Plate Package (305-865016)	Armor plates.	Armor plates and fasteners required to install plates are included in this package. The armor plates are normally installed in the pilot's and observer's compartments.
Sponson External Store Package (300-860104 or 305-860204)	Two sponson assemblies with fairings.	The sponsons provide facilities for installing four 7.62mm machine guns and 2000 rounds of ammunition. In addition, two external store stations are included in the structure of each sponson.

safety belts, static line, brackets, and attaching hardware.

2-23. LITTER EQUIPMENT PACKAGE (305-860014). The upper and lower litters are secured to the left cargo bay wall with litter retaining hooks, and suspended from ceiling attach points by web straps and litter retaining hooks. In addition, both litters are secured to the right wall tie-down brackets by web straps secured to the lower litter retaining hooks. The attendant is seated facing rearward, using a backrest and lap safety belt.

2-24. CONVERSION EQUIPMENT PACKAGE (305-860015). The conversion equipment includes common items between the paratroop, cargo, and litter packages. It consists of the flooring, backrest, sidewalls, lap belt, and cargo tie-down hooks.

2-25. FASTENERS.

2-26. Various types of fasteners are used on the aircraft, such as Torq-Set screws and Taper-Lok fasteners. The engine cowling utilizes hook-type latches for easy access. Ninety percent of the wing area utilizes flush-head fasteners to reduce drag. Anchor nuts and cage nuts are used in areas where frequent access is necessary. Torq-Set screws are used in stress areas and Phillips screws are used in normal (unstressed) areas. Areas requiring numerous, repeated enterings, incorporate quick-acting fasteners such as hand-operated latches or Airloc fasteners. Ball-Lok quick-acting fasteners are used on fiberglas covers, such as the electrical and electronics bay covers. Piano hinge-wire securing devices are used on swing-down accesses such as wing leading edges.

2-27. CORROSION CONTROL.

2-28. The word corrosion means destruction of metal by chemical or electrochemical means. Cleaning and surface maintenance must be used to reduce the possibility of corrosion. For instructions on cleaning and surface maintenance to prevent corrosion, refer to the Handbook of Aircraft Maintenance Cleaning (NAVAIR 01-1A-509).

2-29. CORROSION REMOVAL. Included in Section II are instructions to remove corrosion from damaged surfaces and to prepare those surfaces for touchup painting.

2-30. TOUCHUP PAINTING. Included in Section II are instructions to repaint the surface finish where it has become scratched, nicked, or otherwise damaged.

2-31. CLEANING. Instructions and materials necessary to clean the exterior and interior of the aircraft are given in Section II under organizational maintenance.

2-32. SEALING. Sealing the aircraft as routine maintenance is performed will minimize water entry into the various components of the airframe and thereby reduce the possibility of corrosion to both the components and the aircraft structure. Detailed structural sealing procedures are given in the Structural Repair Manual (NAVAIR 01-60GCB-3).

2-33. EXTERIOR MARKINGS.

2-34. Instructions, drawings, and lists of equipment and materials necessary to maintain the exterior finish and proper aircraft markings are contained in this section under organizational maintenance.

SECTION II
ORGANIZATIONAL MAINTENANCE

2-35. GENERAL.

2-36. Organizational maintenance for the OV-10A airframe consists of information and instructions necessary to remove, install, and adjust fuselage components, using components, nacelle/boom components, empennage components, and the sponsons. Information necessary to properly remove and install various types of fasteners is also provided. Instructions are included to control corrosion and maintain the exterior finish of the aircraft.

2-37. COMPLETE AIRCRAFT DISASSEMBLY AND ASSEMBLY.

2-38. The complete aircraft assembly may be disassembled into five major component groups for repair, overhaul, or shipping. These major component groups are the fuselage group, wing group, two boom/nacelles and the empennage group.

2-39. DISASSEMBLY. To disassemble the aircraft for shipping, most of the components may remain installed in the aircraft. If either of the boom/nacelles or the fuselage is to be replaced with a different assembly, the various individual components within that component will have to be removed and installed as deemed necessary by the maintenance officer. This may require some deviation from the disassembly instructions.

Tools and Equipment List

Sling, Complete Aircraft	E13701

2-40. PREPARATION FOR DISASSEMBLY.

Note

Identify any component, line, or wire with a tag or sticker as it is removed or disconnected. This will aid in component installation.

1. Check that the aircraft is safetied as follows:

a. All wheels chocked.

b. All safety locks and pins installed.

c. Electrical equipment deenergized.

d. Engine power levers are in GATE position, and condition levers in FUEL SHUT-OFF position.

e. Fuel tank vents clear.

f. Required fire equipment on stand-by.

g. Aircraft and all equipment properly grounded.

2. Remove access covers shown in figure 2-4 and cargo bay sidewall panels.

3. Remove armament and bomb racks, if installed. Refer to Armament Systems Manual (NAVAIR 01-60GCB-2-6).

4. Remove both sponsons. Refer to paragraph 2-138.

5. Defuel aircraft and purge fuel systems. Refer to Power Plants and Fuel Systems Manual (NAVAIR 01-60GCB-2-4) and observe the following:

a. Remove fuel tank filler caps and defuel aircraft.

b. Drain residual fuel from tanks by use of fuel tank drain valve.

c. Check that drains and drain valves are closed and filler caps are installed and locked.

d. Remove bonding/grounding cables from aircraft.

e. Purge all fuel systems.

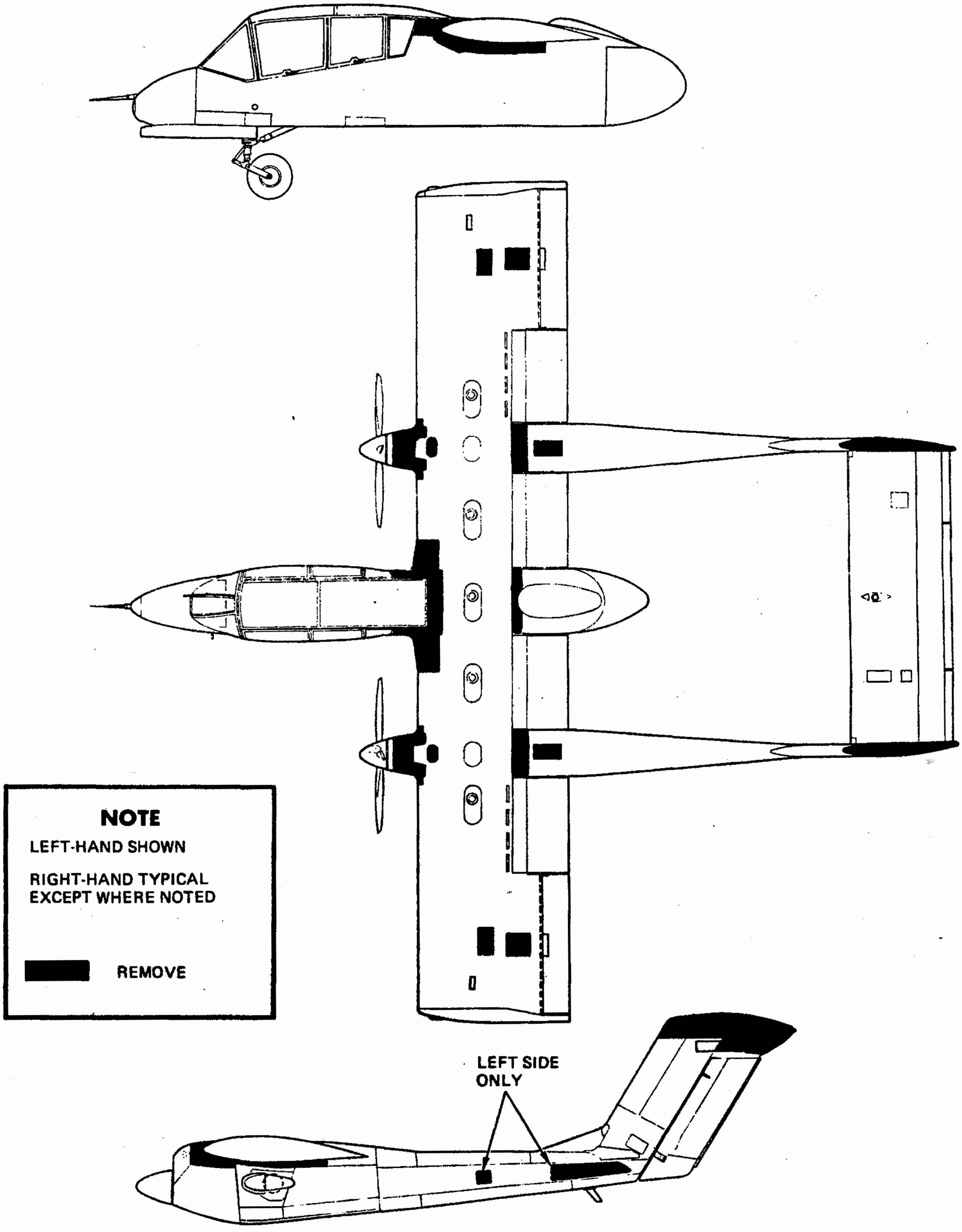


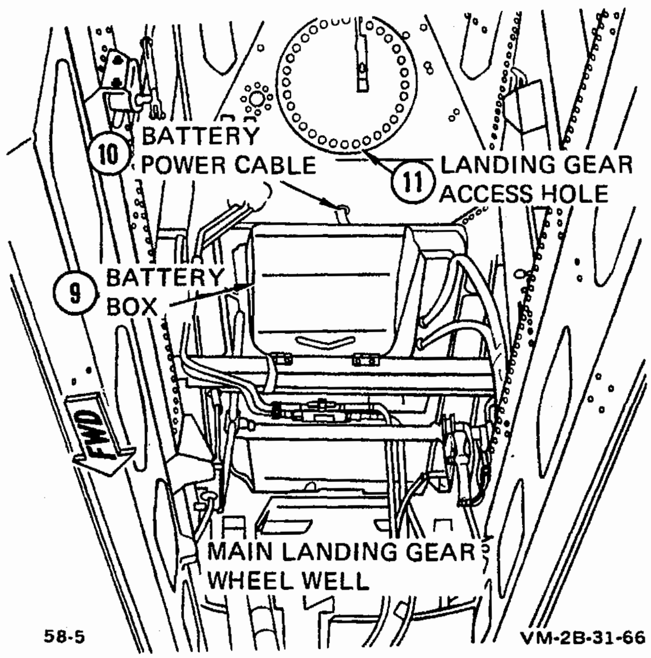
Figure 2-4. Aircraft Preparation for Disassembly

6. Disconnect both lines from oxygen bottles in cargo bay.

7. Remove pitot-static head from nose cover. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

8. Construct shipping containers for wing, boom-nacelle, and fuselage. Refer to Structural Repair Manual (NAVAIR 01-60GCB-3).

9. Disconnect both batteries at battery box.



Steps 9 through 11—Para. 2-40

10. Disconnect d-c power cables from back side of battery boxes.

11. Remove cover at landing gear access hole in upper main landing gear wheel wells.

12. Remove all antenna protruding from the fuselage, booms, and nacelles. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

13. Secure a wire to both main landing gear trailing arm mooring rings of sufficient length to route wire up through landing gear access hole.

14. Remove propellers. Refer to Power Plants and Fuel Systems Manual (NAVAIR 01-60GCB-2-4).

15. Remove horizontal stabilizer assembly. Refer to paragraph 2-127.

16. Jack the complete aircraft in accordance with General Information and Servicing Manual (NAVAIR 01-60GCB-2-1), with all flight controls neutralized and flaps up.

17. With external power applied, raise all landing gear to the "up and locked" position and wire landing gear handle to "up" position.

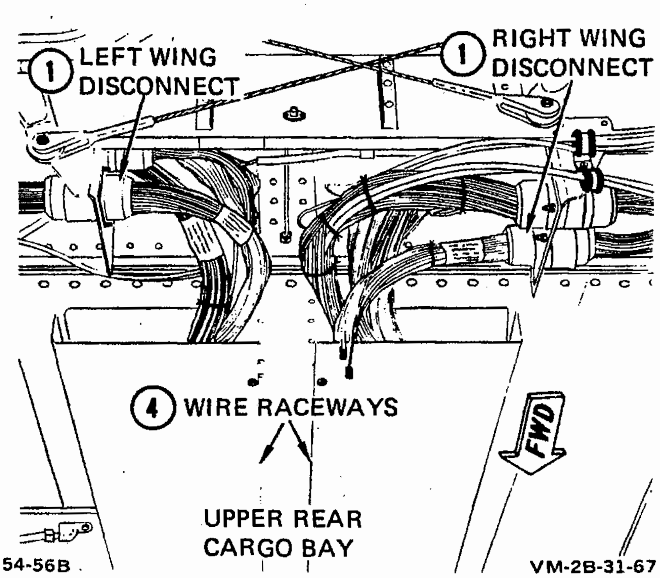
2-41. EJECTION SEATS.

1. With all safety pins installed, disconnect the initiators at quick-disconnects (two each side) in front of and below each seat.

2. Wire parachute release handle to the stowed position.

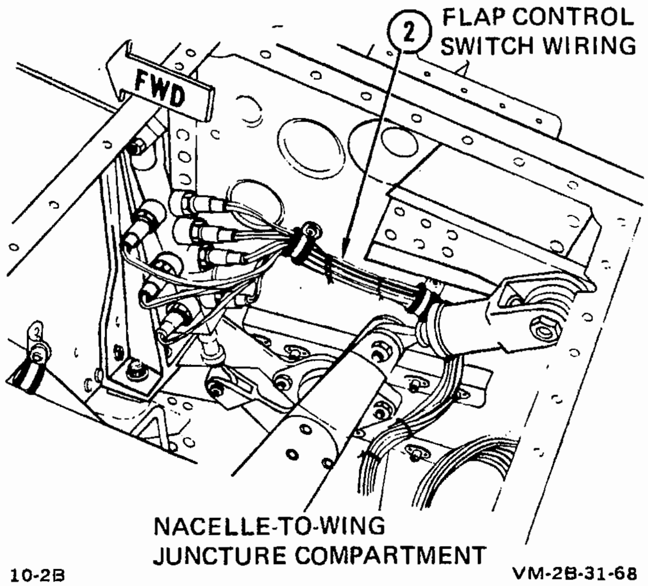
2-42. ELECTRICAL SYSTEMS.

1. Disconnect wing at rear wing disconnects (plug) and pull wiring back through wing to nacelle compartment. Coil wire and stow.



Steps 1 and 4—Para. 2-42

2. Disconnect flap control switch wiring from terminal strip 83 in right nacelle.

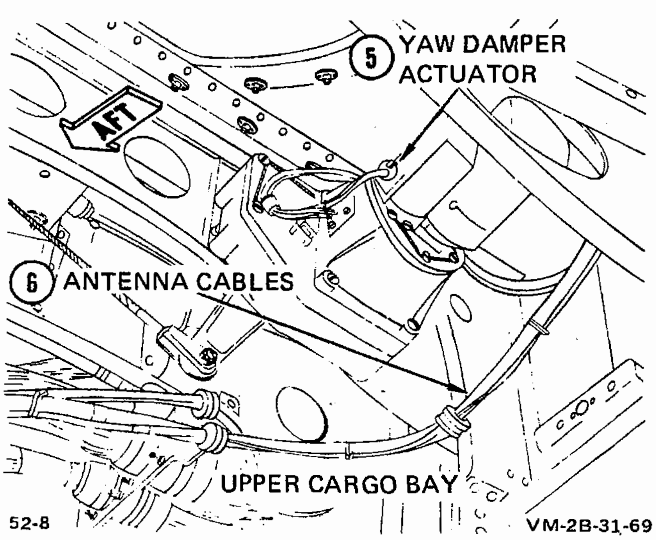


Step 2—Para. 2-42

3. Remove receptacle (screw-mounted) from aft wing wiring brackets.

4. Remove wire raceway covers in upper cargo.

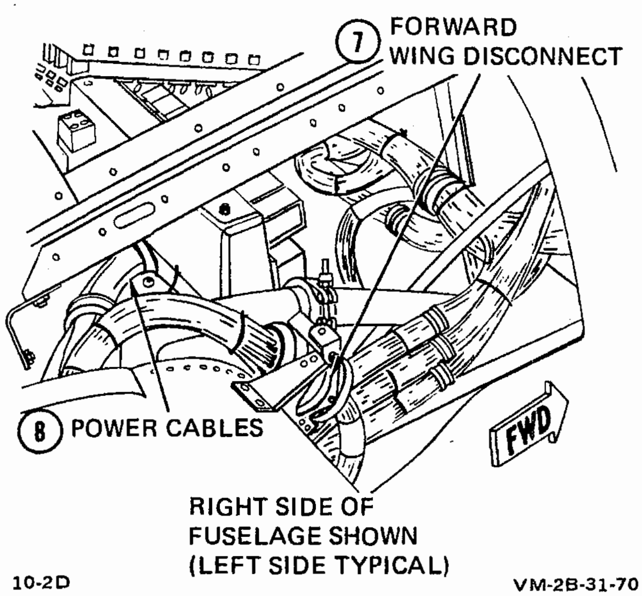
5. Disconnect wiring from and remove yaw damper actuator. Refer to Airframe Systems Manual (NAVAIR 01-60GCB-2-2).



Steps 5 and 6—Para. 2-42

6. Remove antenna cable from antenna and remove all fuselage-mounted clamps.

7. Disconnect forward wing wiring at disconnects on both sides.



Steps 7 and 8—Para. 2-42

8. Disconnect power cables from studs behind circuit-breaker panels.

9. Disconnect inverter leads at terminal strip 24 (fuselage station 221) in right side of cargo compartment. Both leads to circuit-breaker panel and to inverter must be disconnected, coiled, and stowed.

10. Disconnect electrical wiring from engine components; coil and stow.

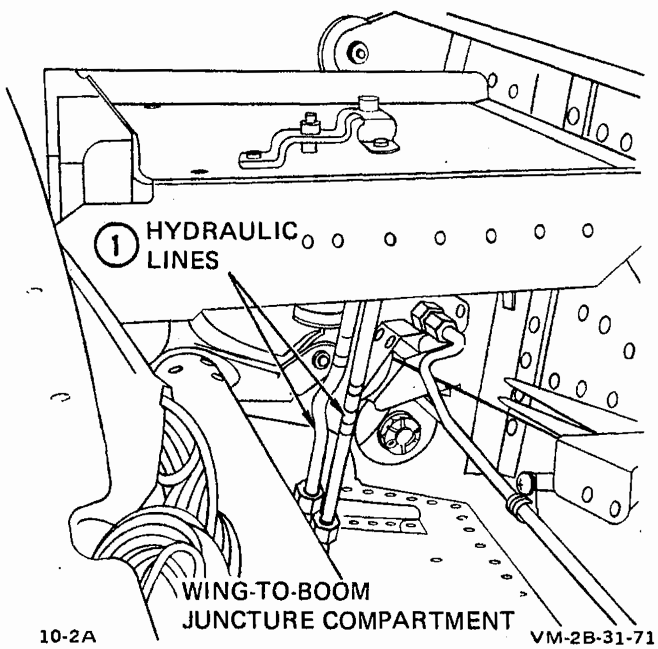
11. Check that all electrical wires which pass through the wing are disconnected, identified, coiled, and stowed.

2-43. HYDRAULIC AND FUEL LINES.

Note

Drain hydraulic fluid from reservoir before disconnecting hydraulic lines.

1. Disconnect nacelle hydraulic lines at the bulkhead fittings in wing-to-boom juncture compartment. There are three in each compartment.



Step 1—Para. 2-43

2. Disconnect hydraulic lines at trailing edge of wing in upper cargo bay.

Note

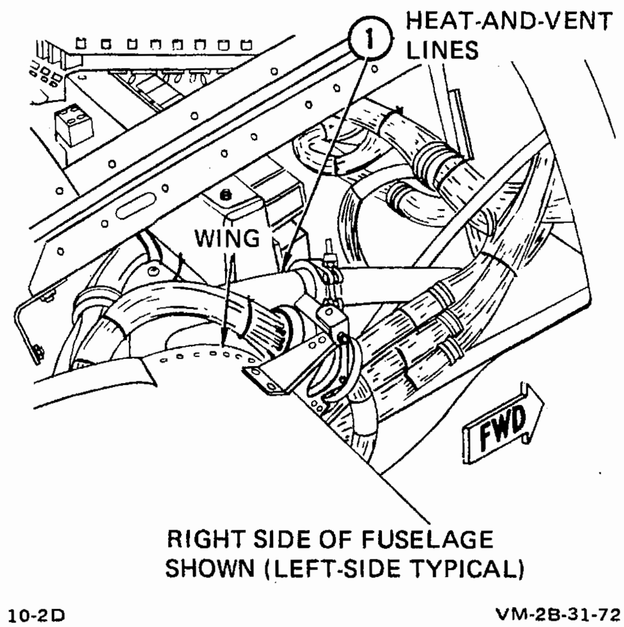
It will be necessary for maintenance personnel to determine which hydraulic lines should be disconnected. In some instances, a short section of tubing will be removed for ease of demating.

3. Disconnect fuel lines in engine compartments.

2-44. HEAT AND VENT.

1. Disconnect heat and vent lines at wing leading edge behind circuit-breaker panels.

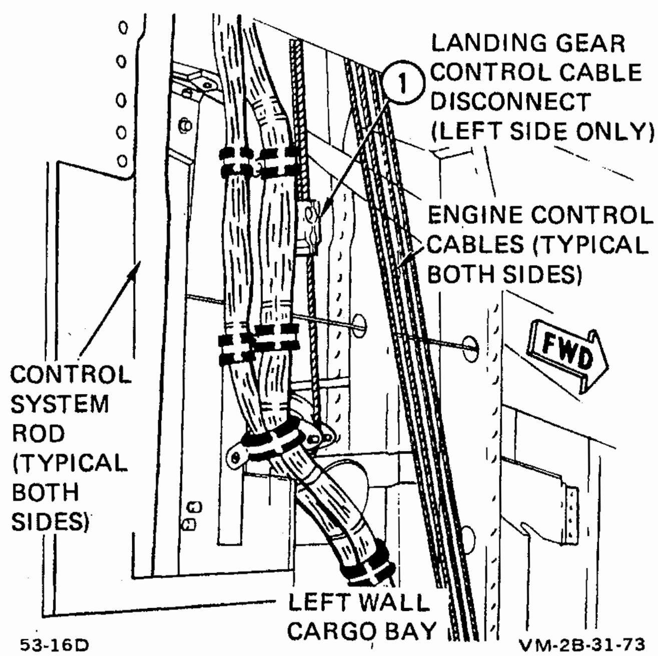
2. Disconnect heat and vent line in each engine compartment at wing leading edge.



Step 1—Para. 2-44

2-45. ENGINE CONTROLS.

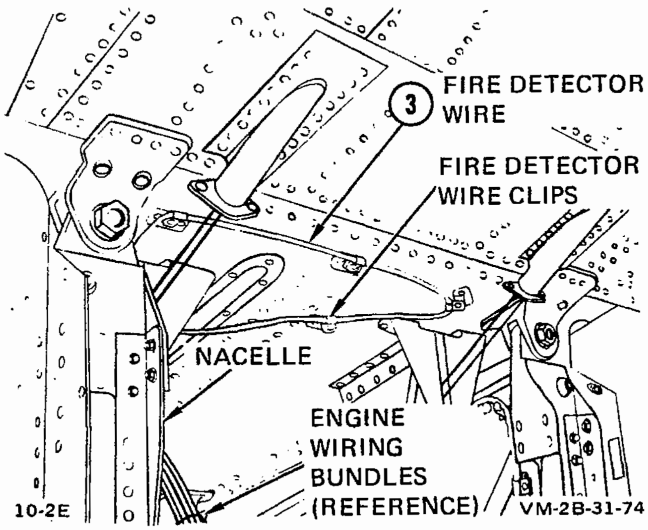
1. Disconnect control cables in cargo bay at turnbuckles in forward cargo bay.



Step 1—Para. 2-45

2. Disconnect power control cables in each nacelle.

3. Remove fire detector sensing wires from clips in upper engine compartment.



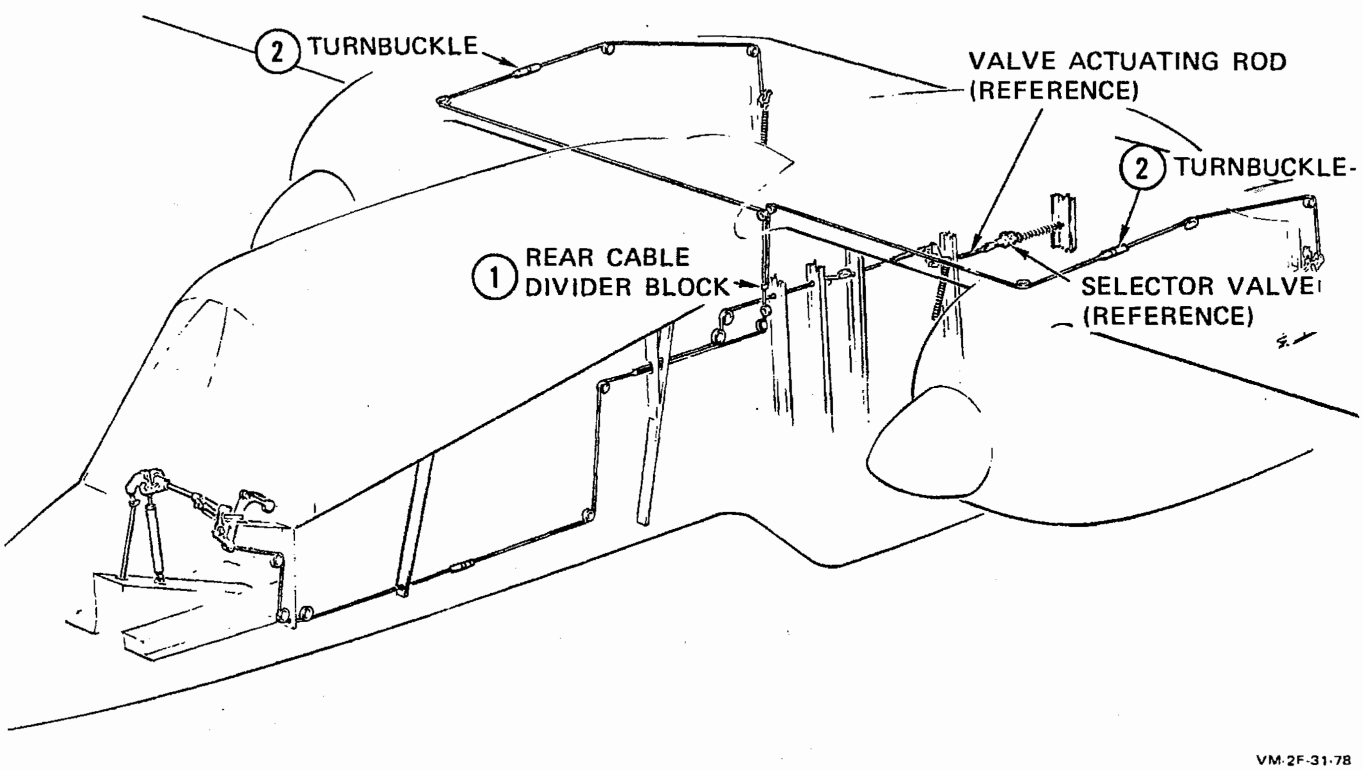
Step 3—Para. 2-45

2-46. FLIGHT AND LANDING GEAR CONTROLS.

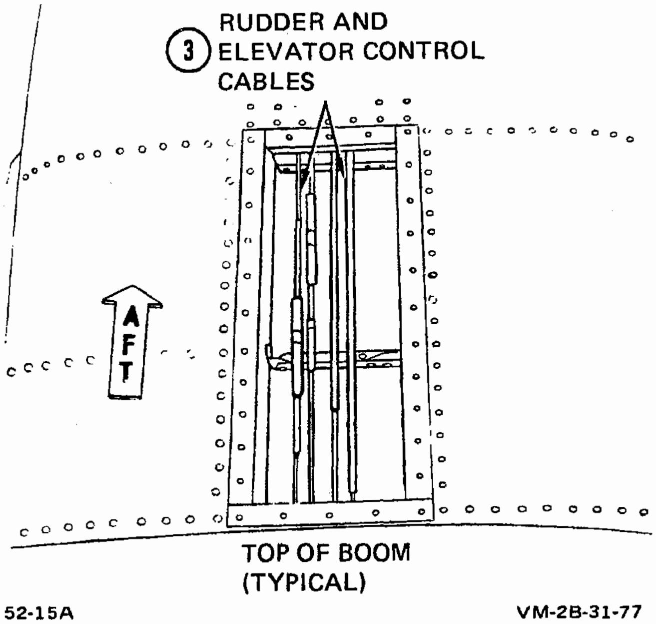
1. Disconnect landing gear control cables at rear cable divider block in forward cargo bay, left side.

2. Disconnect cable in wing at turnbuckles, also. Pull cables to landing gear back into wing-to-boom juncture; coil and stow.

3. Disconnect rudder and elevator control cables at boom access compartment.



Steps 1 and 2—Para. 2-46



Step 3—Para. 2-46

4. In cargo compartment, remove one control rod on each side and disconnect rudder cables, one on each side, of cargo compartment.

2-47. GENERAL DISASSEMBLY.

1. Check that all hydraulic and fuel lines, electrical wiring, control cables and rods, and fairings and covers are free of the wing parting areas.

2. Position the shipping crates for boom/nacelle assembly so that centerlines are approximately 175.0 inches apart.

3. Install complete aircraft sling (E13701), using overhead crane.

2-48. DEMATING FUSELAGE FROM WING AND NACELLE/BOOM.

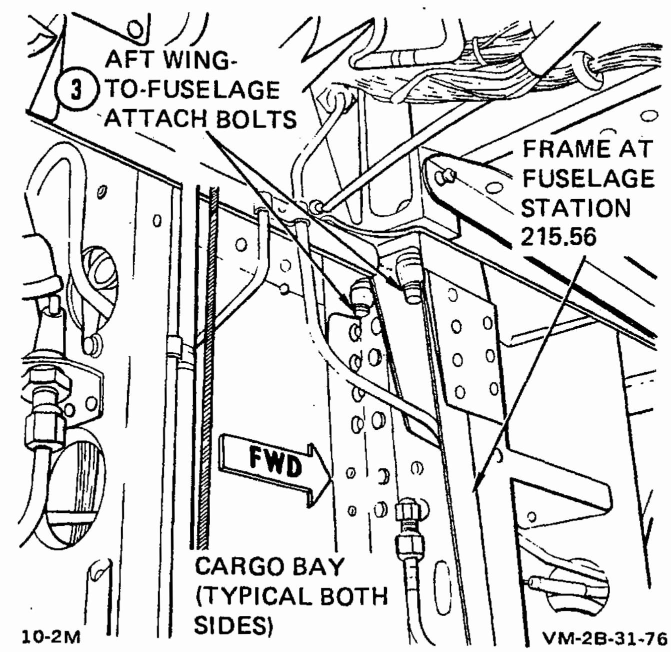
1. Lift complete aircraft assembly off of jacks, using complete aircraft sling (E13701) and overhead crane.

2. Place fuselage in shipping crate (with hold-down portion removed) so that primary crate supports are under fuselage stations 34.0, 136.0, and 256.0.

Note

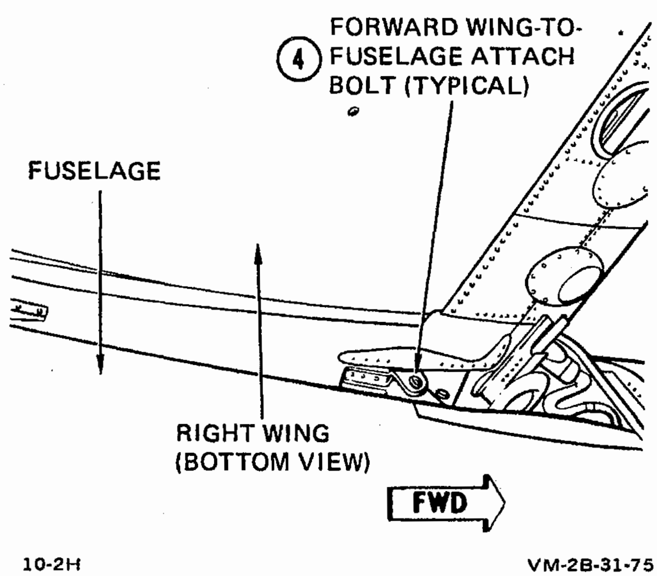
Place padding in nacelle areas during demating procedures to protect nacelles from hitting floor.

3. Remove four internal wrenching bolts (two each side) in upper aft cargo bay.



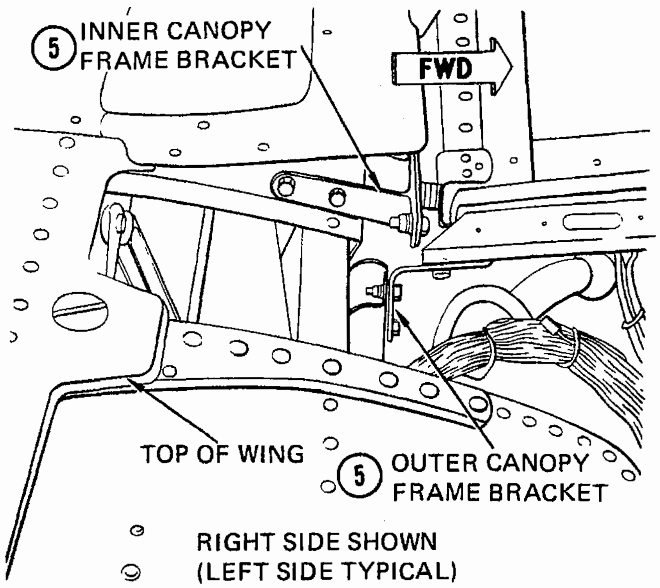
Step 3—Para. 2-48

4. Remove two forward attach bolts.



Step 4—Para. 2-48

5. Make certain that inner and outer top canopy brackets have been removed.



Step 5—Para. 2-48

6. Slowly lift wing and nacelle/boom assembly off of fuselage so that wing trailing edge is up about 10 degrees and move rearward when flaps clear fuselage side panel skins.

CAUTION

Move wing slowly so that wing flaps and other components will not be damaged during separation.

7. Place hold-down portion of crate over wing cutout on fuselage and over back edge of nose cover.

Note

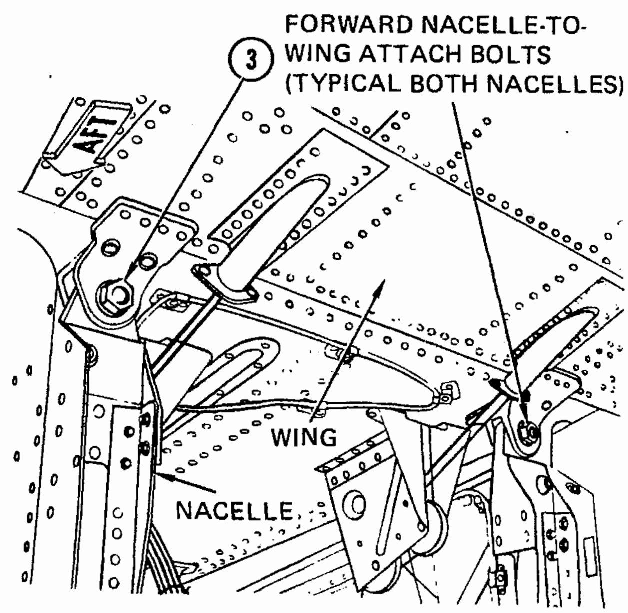
Ensure that front hold-down portion of crate is tight against fuselage to assist in holding the nose landing gear in position in the wheel well.

2-49. DEMATING WING FROM NACELLE/BOOM.

1. Position wing and boom/nacelle assembly so that the bottom surface of booms are parallel to floor.

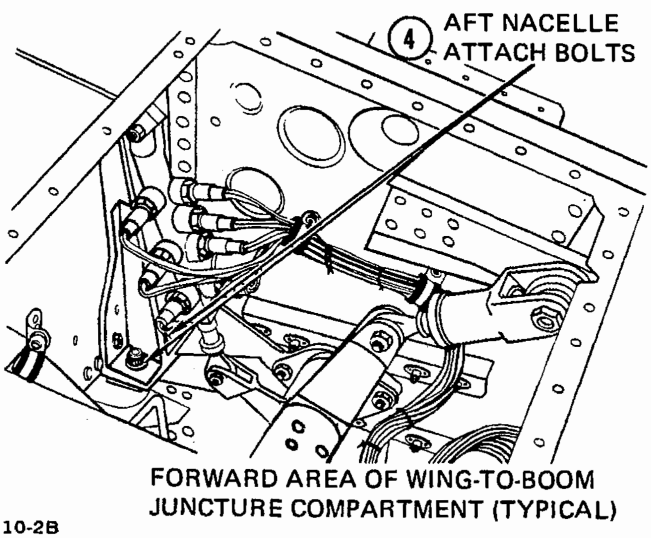
2. Slowly lower the boom/nacelle assemblies into the shipping cradles so that shipping crate supports are at canted fuselage stations 181.6, 256.0, and 347.0.

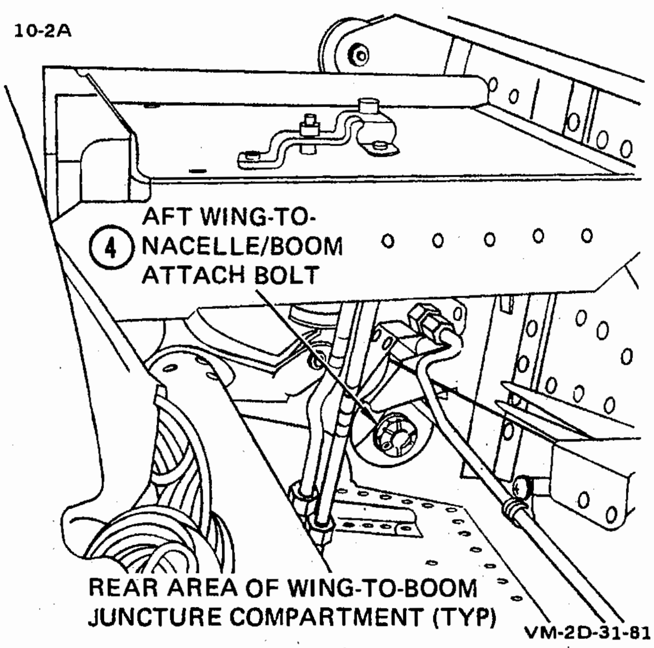
3. Remove two forward nacelle-to-wing attaching bolts at each nacelle.



Step 3—Para. 2-49

4. Remove two aft nacelle-to-wing attaching bolts at each nacelle.





Step 4—Para. 2-49

5. Slowly lift wing assembly off left and right nacelle/boom assemblies.

6. Install hold-down portion of crate over nacelle. Pull wire taut through landing gear access hole and attach it to hold-down part of crate.

7. Position wing in shipping cradle.

2-50. ASSEMBLY. The assembly procedure may have to be altered if an individual nacelle/boom or the fuselage is being replaced. Installation procedures for each component may be found in the applicable maintenance manual.

Tools and Equipment List

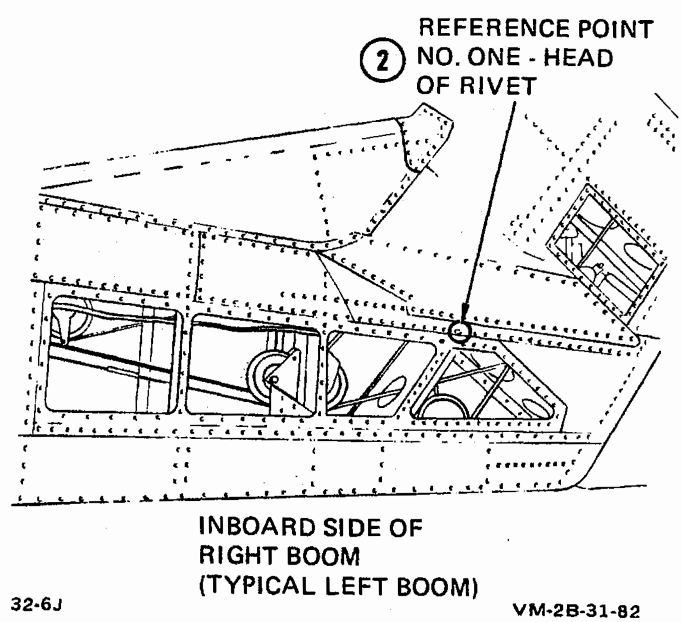
Sling, Complete Aircraft	E13701

2-51. MATING WING TO BOOM/NACELLE ASSEMBLIES.

1. Attach complete aircraft sling (E13701) to wing.

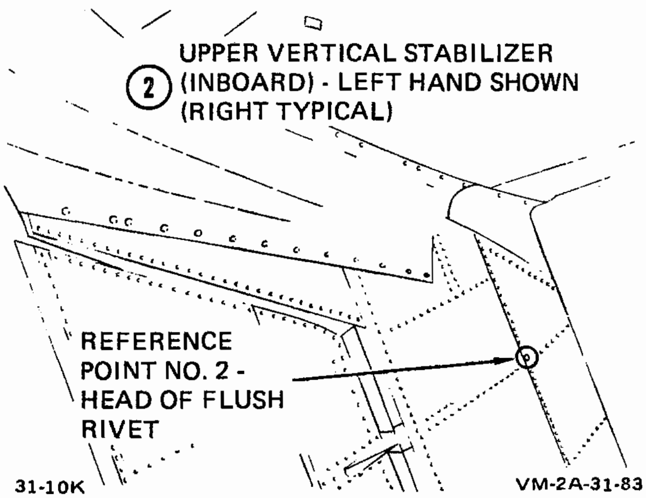
2. Position right and left boom/nacelle assemblies parallel to one another and make the following measurements:

a. From point one on inboard side of right boom to point one on inboard side of left boom equals 165.75 inches.



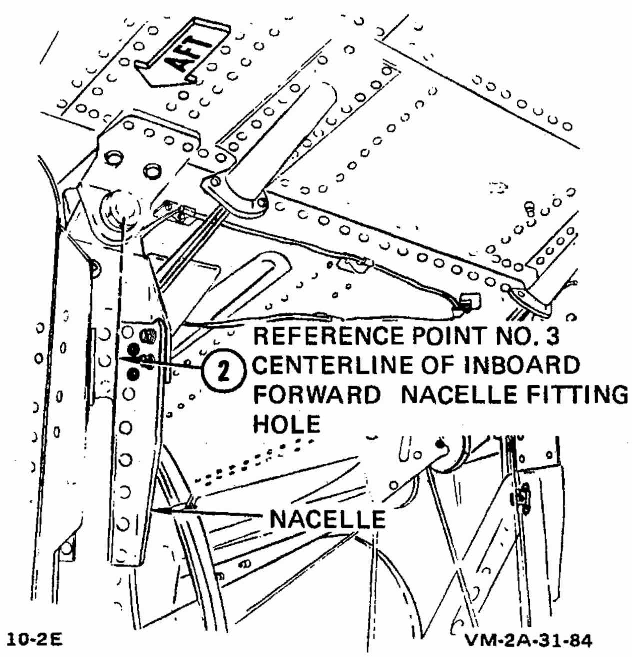
Step 2—Para. 2-51

b. From point two on inboard side of right vertical stabilizer to point two on inboard side of left vertical stabilizer equals 168.50 inches.



Step 2—Para 2-51

c. From point three (inboard forward nacelle fitting hole centerline) on right nacelle to point three (inboard forward nacelle fitting hole centerline) on left nacelle equals 152.00 inches.



Step 2—Para. 2-51

3. Cut wire retaining main landing gear from crate hold-down members and remove all crating from wing area.

Note

A thin piece of sheet metal taped to the sides of the nacelle/boom assemblies and the fuselage assembly will aid in preventing damage to the flaps and the fuselage and boom assemblies during wing installation.

4. Slowly lower wing onto nacelle, making certain that flaps clear nacelle side panels and mating fitting holes align properly.

5. Install bolts through each fitting (four per nacelle).

Note

Forward bolts must be installed from leading edge and rear bolts must be installed with bolthead on inboard side of fitting.

Washers are to be installed as shown in **figure 2-5.**

Before installing nut on rear bolts, check that bolt shoulder protrudes through nacelle fitting.

6. Torque forward bolts on nut side to 10-30 inch-pounds and safety with cotter pins (MS24665-362).

7. Torque rear bolts on nut side to 50 inch-pounds, back nut off to first castellation and safety with cotter pins (MS24665-360).

8. Check that a 1/4-inch (approximately) gap is maintained between flap end and nacelle side panels.

9. Slowly lift wing and nacelle/boom assembly out of shipping crates.

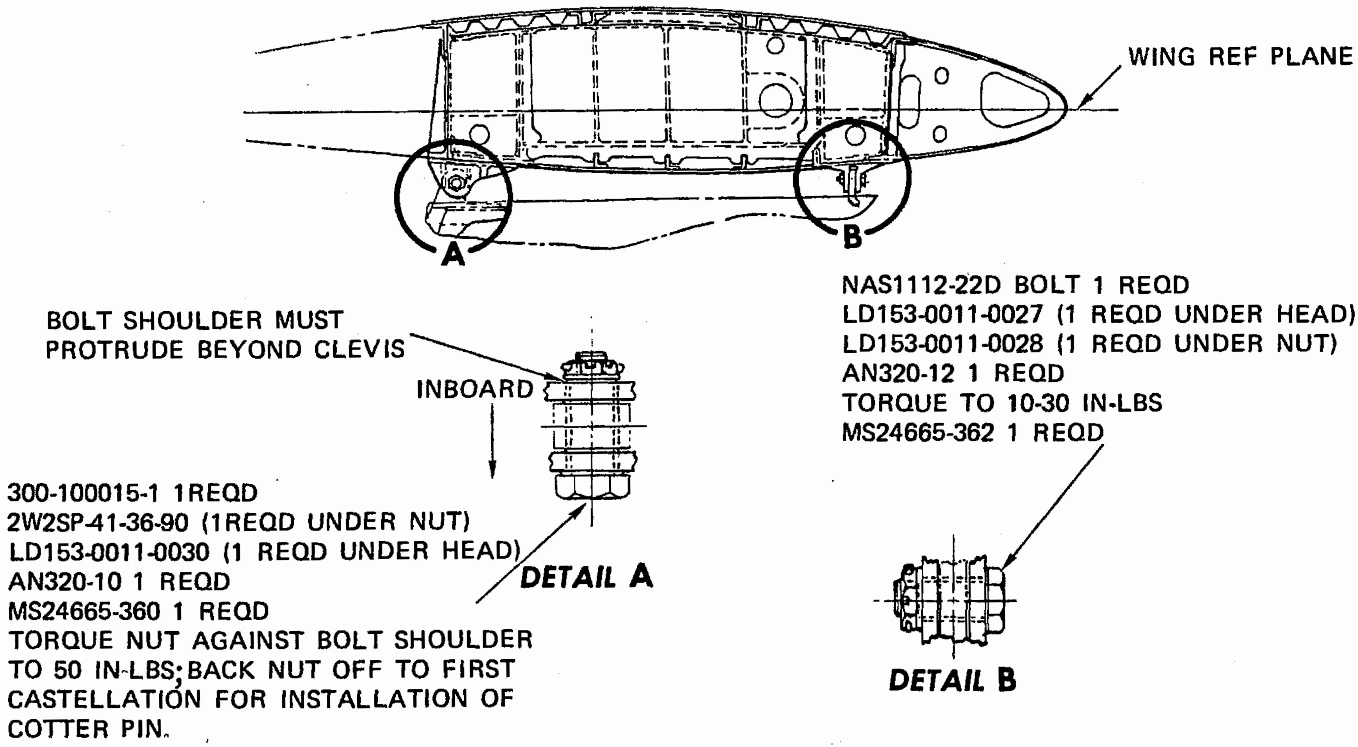


Figure 2-5. Boom/Nacelle Mating Points

Note

Since the boom is canted upward when assembled with wing and fuselage, it will be necessary to change the center of gravity on the sling so that wing is canted approximately 10-15 degrees trailing edge up attitude for fuselage installation.

2-52. MATING WING AND NACELLE/BOOM ASSEMBLIES TO FUSELAGE.

1. Clear all crating members from the mating area.

2. Lift the wing and nacelle/boom assembly over the fuselage in a 10- to 15-degree leading edge down attitude and align the forward fitting holes.

CAUTION

Use care so that canopy pin is not damaged when wing is moved forward into fuselage.

3. Install bolt and washers from outboard side on each side on forward fittings. Install nuts finger-tight.

4. Check that shim is securely bonded to bottom side of rear wing fitting. See figure 2-6.

5. Slowly lower wing trailing edge until bolt holes are aligned and install bolts and washers as shown in figure 2-6. Install nut finger-tight.

6. Check that bolt shoulders on forward bolts protrude past wing clevis fitting. Torque nut to 50 inch-pounds, back nut off to first castellation and safety with cotter pins (MS24665-289). See figure 2-6.

7. Torque rear fitting nuts to 1000-1100 inch-pounds.

8. Install angle brackets on outer canopy frame, using AN bolts.

9. Install spring washers, shims, and shear pin plate on shear pin on inner canopy frame. See figure 2-7.

10. Install angle brackets (two each side) on inner canopy frame, using three bolts.

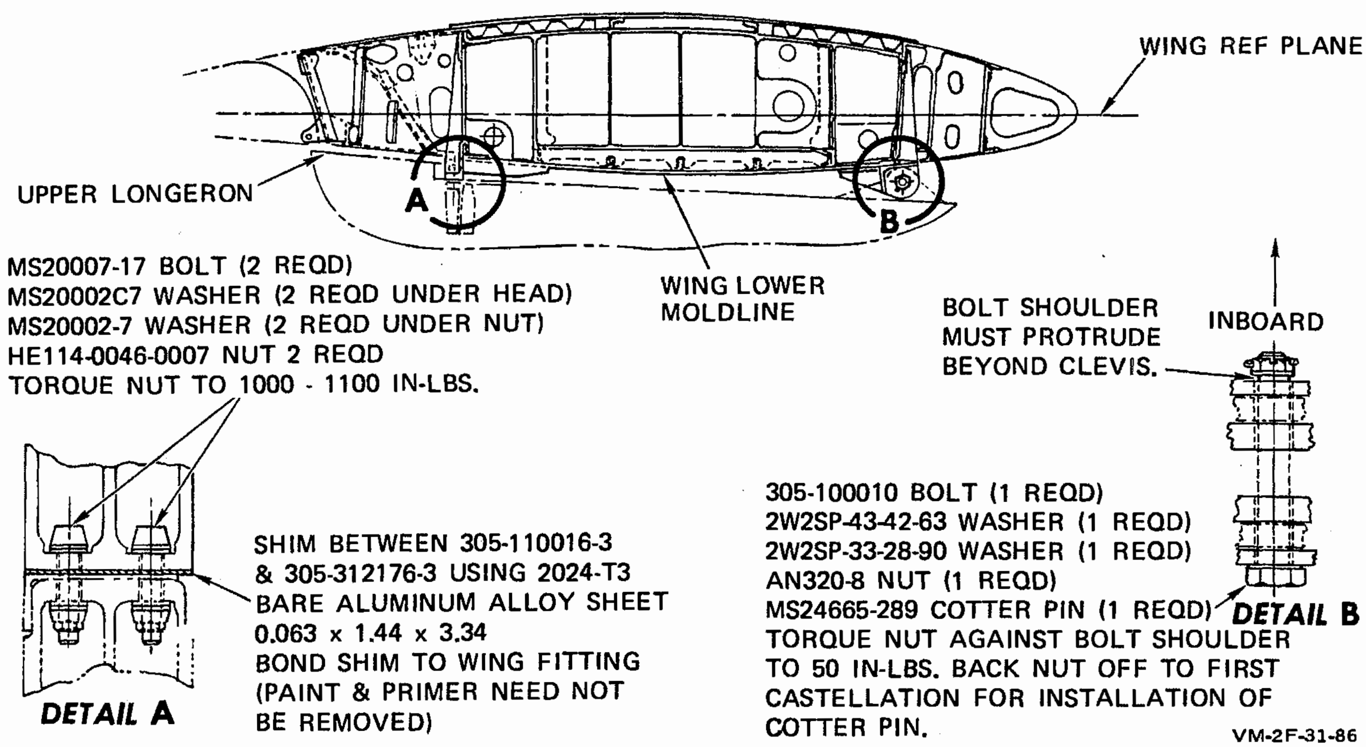


Figure 2-6. Fuselage Mating Points

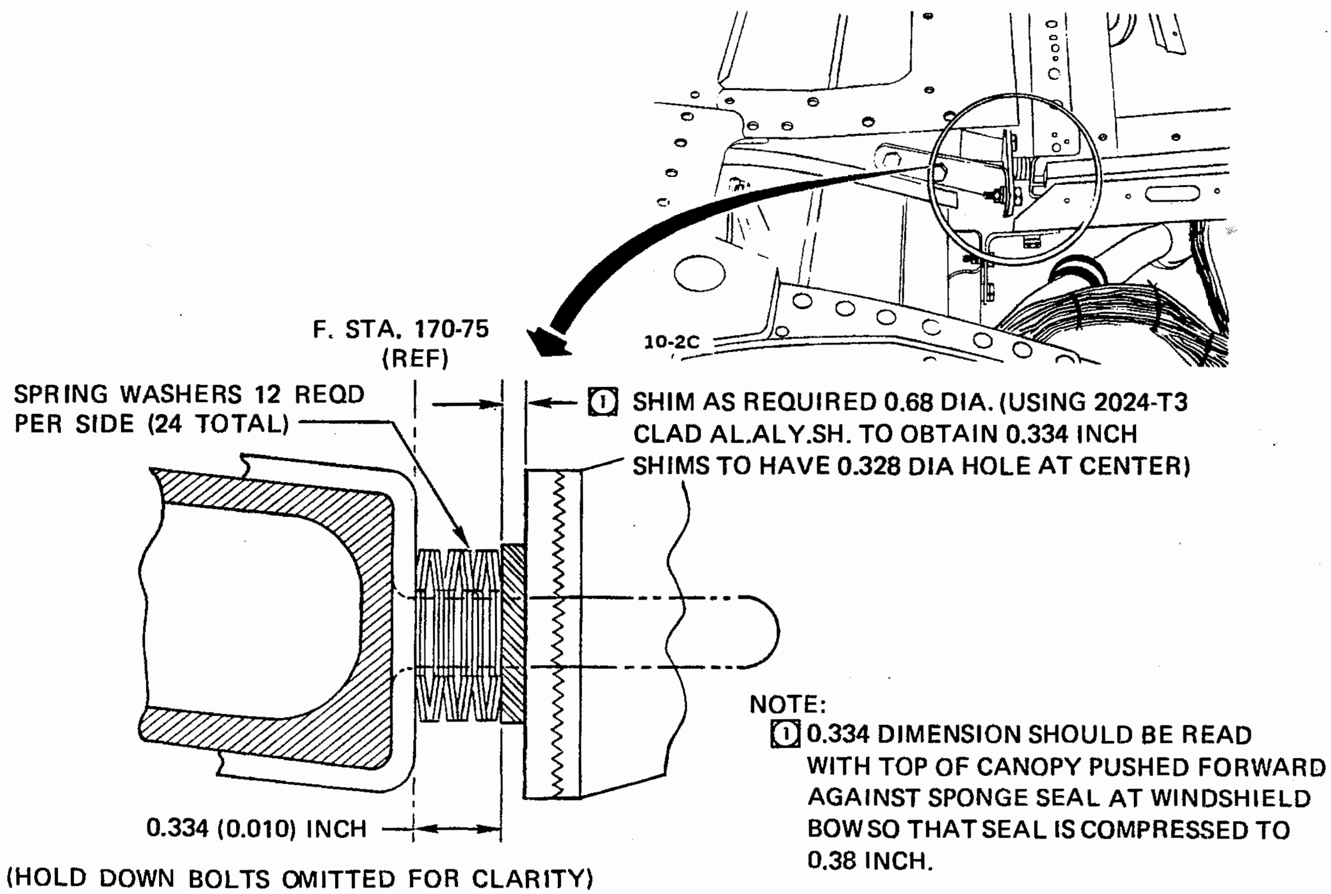


Figure 2-7. Canopy Frame Washer Installation

2-53. AIRCRAFT EQUIPMENT INSTALLATION.

1. Hook up right and left main landing gear cables at turnbuckles in wing and at cable divider block in forward cargo bay. Tension cable sufficiently to permit uplock hook release.

2. Raise aircraft, cut wire on landing gear handle, and "free-fall" landing gear to "down-and-locked" position by positioning landing gear handle to "down" position. Install landing gear safety pins.

3. Lower aircraft to rest on wheels. Check all wheels and remove aircraft sling.

4. Install both propellers. Refer to Power Plants and Fuel Systems Manual (NAVAIR 01-60GCB-2-4).

5. Install horizontal stabilizer assembly. Refer to paragraph 2-127.

6. Install lateral and longitudinal system control rods in cargo compartment.

7. Connect rudder control cable on cargo compartment.

8. Install yaw damper actuator. Refer to Chapter 3.

9. Uncoil wire bundles in wing to boom juncture compartment and route through wing at rear spar on both sides of fuselage. Tie and clamp wire bundles.

10. Route fuselage wire bundles through wire raceway; install plugs, using screws and nuts on brackets, and replace raceway covers.

11. Plug wire bundles into respective receptacle at aft wing disconnects.

12. Connect all hydraulic lines in cargo compartment.

13. Connect power control cables in cargo compartment and nacelles.

14. Install fire detector sensing wires in engine compartment (lower side of wing).

15. Connect three fuel lines in each engine compartment and two in cargo compartment.

16. Connect heat and vent lines in each engine compartment and at wing leading edge in fuselage.

17. Connect all wiring to engines. Refer to Power Plants and Fuel Systems Manual (NAVAIR 01-60GCB-2-4).

18. Install power cables on studs behind circuit-breaker panels and on battery terminals in each wheel well. Refer to Wiring Data Manual (NAVAIR 01-60GCB-2-7).

19. Install oxygen lines on oxygen bottles in forward cargo compartment.

20. Install sponsons. Refer to paragraph 2-138.

21. Install pitot-static head. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

22. Hook up batteries in each wheel well. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

23. With ejection seat safety pins installed, connect initiators (two places) at each ejection seat. Refer to Environmental Systems Manual (NAVAIR 01-60GCB-2-3).

24. Cut and remove wire from parachute release handle on both ejection seats.

25. Install antennae in fuselage, booms, and nacelles. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

26. Install landing gear access cover.

27. Connect inverter leads at terminal strip 24 (fuselage station 221) in right-hand cargo compartment. Refer to Wiring Data Manual (NAVAIR 01-60GCB-2-7).

28. Connect forward wing wire bundles at wing leading edge at fuselage right and left side.

29. Connect flap control switch wiring to terminal strip 83 in right-hand nacelle wing to boom juncture compartment. Refer to Wiring Data Manual (NAVAIR 01-60GCB-2-7).

30. Install directional and longitudinal control system cable turnbuckle at each boom compartment.

31. Rig sponson release cables. Refer to Armament Systems Manual (NAVAIR 01-60GCB-2-6).

32. Rig both power management systems. Refer to Power Plants and Fuel Systems Manual (NAVAIR 01-60GCB-2-4).

33. Rig all flight control systems. Refer to chapter 3.

34. Fill and bleed the hydraulic system. Refer to Chapter 4 for instructions.

35. Perform an operational check of the flight control systems, hydraulic systems, and landing gear systems. Refer to Chapters 3, 4, and 5, respectively.

36. Perform an operational check of the power plant and fuel systems. Refer to Power Plants and Fuel Systems Manual (NAVAIR 01-60GCB-2-4).

37. Perform a checkout and inspection of both ejection seats and heat and vent system. Refer to Environmental Systems Manual (NAVAIR 01-60GCB-2-3).

38. Perform an operational check of emergency jettison system. Refer to Armament Systems Manual (NAVAIR 01-60GCB-2-6).

39. Perform an operational check of all electrical and avionics systems. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

40. Install cargo bay sidewall panels and all access covers.

41. Perform an acceptance and functional check flight inspection. Refer to NAVAIR 01-60GCB-1.

2-54. FUSELAGE COMPONENTS.

2-55. The following paragraphs contain the information and instructions necessary to remove, to install, and to adjust various fuselage components at the organizational maintenance level.

2-56. NOSE COVER REMOVAL AND INSTALLATION. To remove and install the nose cover, see figure 2-8 and proceed as follows:

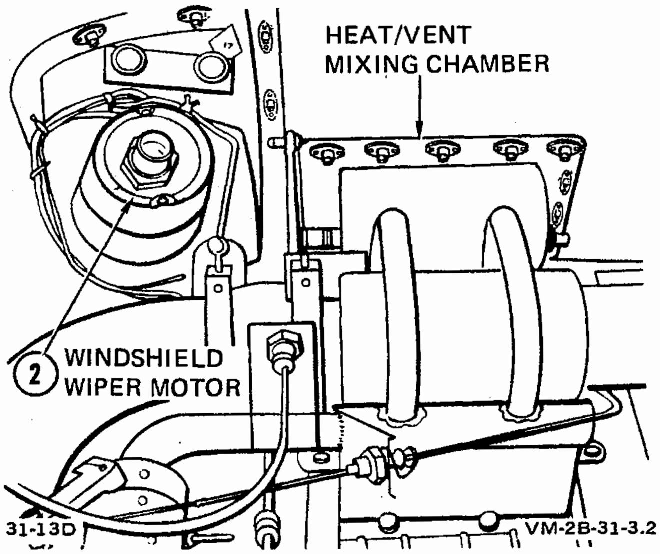
Tools and Equipment List

Countersink	(100 degrees x 0.299)
Drill No. 10	(0.193-inch diameter)
Drill No. 11	(0.191-inch diameter)
Drill No. 12	(0.189-inch diameter)
Scraper, Plexiglas	(local manufacture)

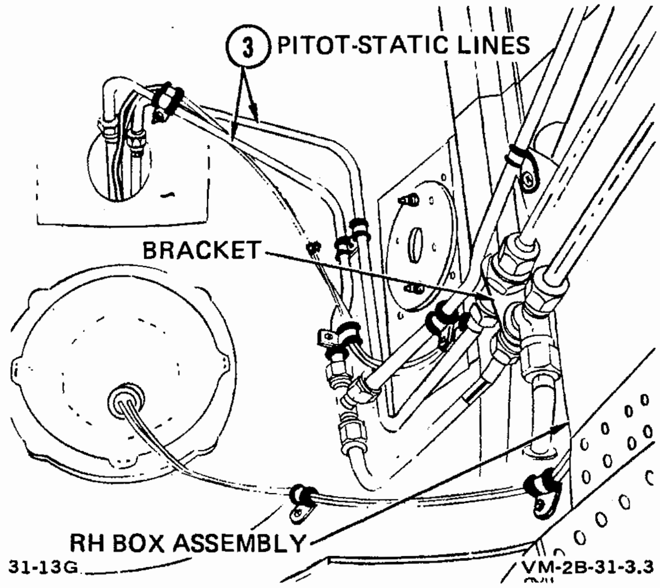
2-57. REMOVING NOSE COVER.

1. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5) for instructions, and remove pitot-static tube, landing and taxi light, and formation lights from nose cover.

2. Refer to Environmental Systems Manual (NAVAIR 01-60GCB-2-3) for instructions and remove windshield wiper, windshield wiper motor, and heat/vent mixing chamber. Remove nose bulkhead armor plate panels.



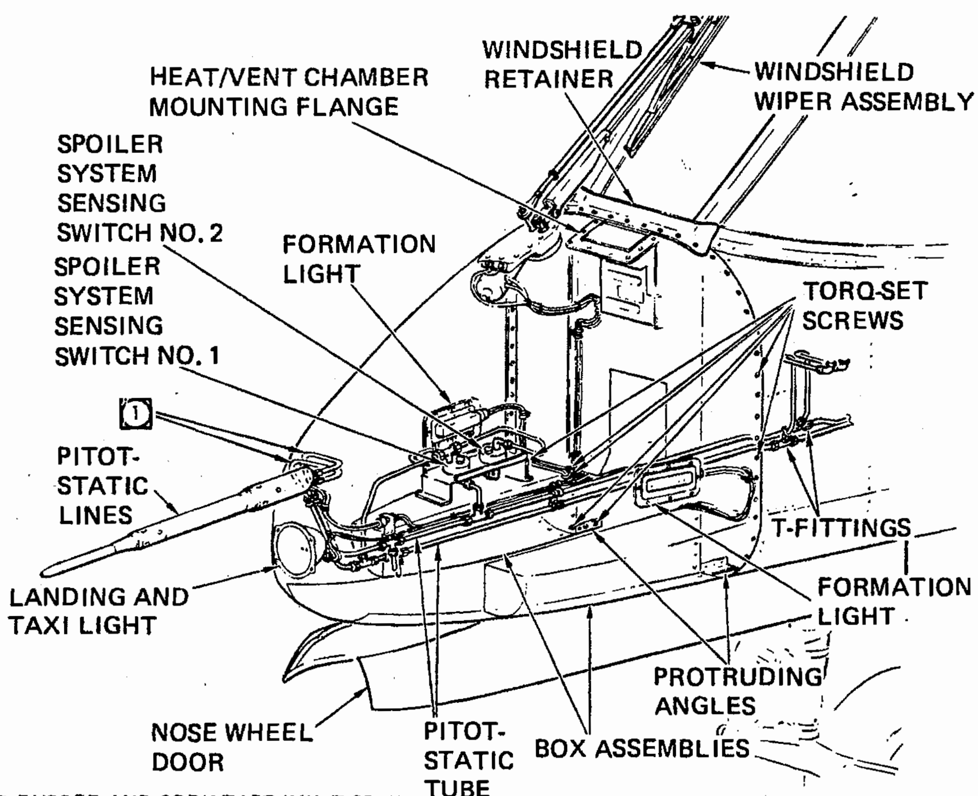
Step 2—Para. 2-57



Step 3—Para. 2-57

3. See figure 2-8 and remove pitot-static lines aft of pitot-static tube to bracket on front of right box assembly. Remove lines aft of bracket to spoiler system sensing switch No. 1 and "T" fittings on right wall of nose wheel well.

4. Remove gear door operating rods at door fittings and tie rods up in wheel well. Remove gear door hinge pins and doors.



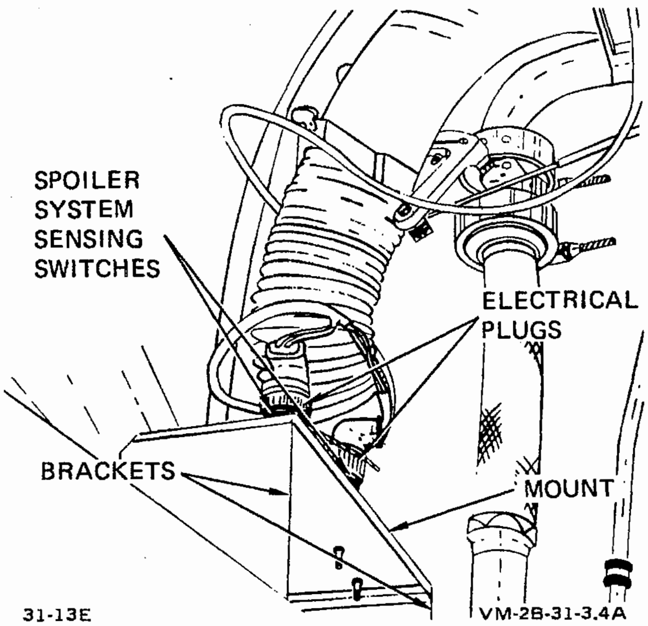
1 ADD RUBBER AND CORK TAPE (MIL-T-6841), AS REQUIRED, TO PREVENT CHAFING OF LINES.

VM-2G-31-3.13

Figure 2-8. Nose Cover

5. See figure 2-8 and remove Torq-Set screws from left and right nose cover box assemblies. Remove three Torq-Set screws from left and right nose gear door hinges.

6. Disconnect electrical plugs from spoiler system No. 1 and No. 2 sensing switches. Remove both switches and mount from brackets on top of right box assembly.



Step 6—Para. 2-57

7. See figure 2-8 and remove Torq-Set screws from aft edge of nose cover. Start from bottom and work upward toward windshield retainer. Remove cover from fuselage. If damaged and repairable, return to nearest maintenance facility for repair. If damaged beyond repair, do not discard. Hole patterns of old nose cover must be transferred to replacement cover.

2-58. INSTALLING NOSE COVER.

Materials List

Compound, Sealing	MIL-S-8802
Lockwire (0.032-inch diameter steel)	MS20995F32
Pins, Cotter (1/16-inch diameter steel)	MS24665-134

Materials List (Cont)

Pins, Cotter (1/32-inch diameter steel)	MS24665-5
Solvent, Dry-cleaning	P-D-680, Type II
Tape, Masking	MIL-T-21595
Tape, Rubber and Cork	MIL-T-6841
Toluene, Technical	TT-T-548

Note

If new nose cover is to be installed, using a suitable material as templates transfer hole pattern from old cover to new cover. Use a No. 10 drill to drill holes in aft end of both box assemblies and in both protruding angles. Use a No. 11 drill and 100 degrees x 0.299 countersink to drill and countersink new holes for heat/vent assembly. Use a No. 12 drill and 100 degrees x 0.299 countersink to drill and countersink holes around aft perimeter of cover. Use a No. 11 drill to drill hole for landing and taxi lights and position lights. Countersink holes for position lights with 100 degrees x 0.299 countersink.

All Torq-Set screws used to install nose cover to fuselage, position lights, heat/vent chamber, and windshield retainer in the following steps must have sealing compound (MIL-S-8802) applied under heads of screws prior to installation. Wipe off excess compound with toluene (TT-T-548).

1. Have helper support front of cover. Slip protruding angles under nose gear door. Insert forward hinge pins in hinges and safety retainer with lockwire (MS20995F32). Install Torq-Set screws in protruding angles and in both box assemblies.

2. Install aft perimeter of nose cover to forward fuselage bulkhead. Install retainer at base of windshield. Using masking tape (MIL-T-21595), mask off area 1/4 inch around perimeter of retainer. Apply sealing compound (MIL-S-8802) to area. Remove tape when compound is dry.

3. Install nose bulkhead armor plate panels. For instructions and installation of heat/vent mixing chamber, windshield wiper motor, and windshield wiper, refer to Environmental Systems Manual (NAVAIR 01-60GCB-2-3).

4. For instructions and installation of pitot-static tube, landing and taxi light, and formation lights on nose cover, refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

5. Install reduced spoiler switches and mount to brackets on top of right box assembly. Connect electrical plugs to both switches and connect pitot-static line to No. 1 switch.

6. Connect pitot-static line to "T" fitting on right wall of nose wheel well. Connect pitot-static line from switches to "T" fitting aft of pitot tube.

Note

When any likelihood of chafing exists, protect lines with rubber and cork tape (MIL-T-6841).

7. Connect gear door operating rods to gear doors. Safety attach bolts with cotter pins MS24665-134).

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

8. Clean gap between rear edge of cover and fuselage bulkhead with plexiglas scraper. Wipe area with dry-cleaning solvent (P-D-680, Type II). Using masking tape (MIL-T-21595), mask off area and apply sealing compound (MIL-S-8802) to gap. Remove tape when compound is dry.

2-59. WINDSHIELD ARMOR GLASS REMOVAL AND INSTALLATION. To remove and install the windshield armor glass, see figure 2-9 and proceed as follows:

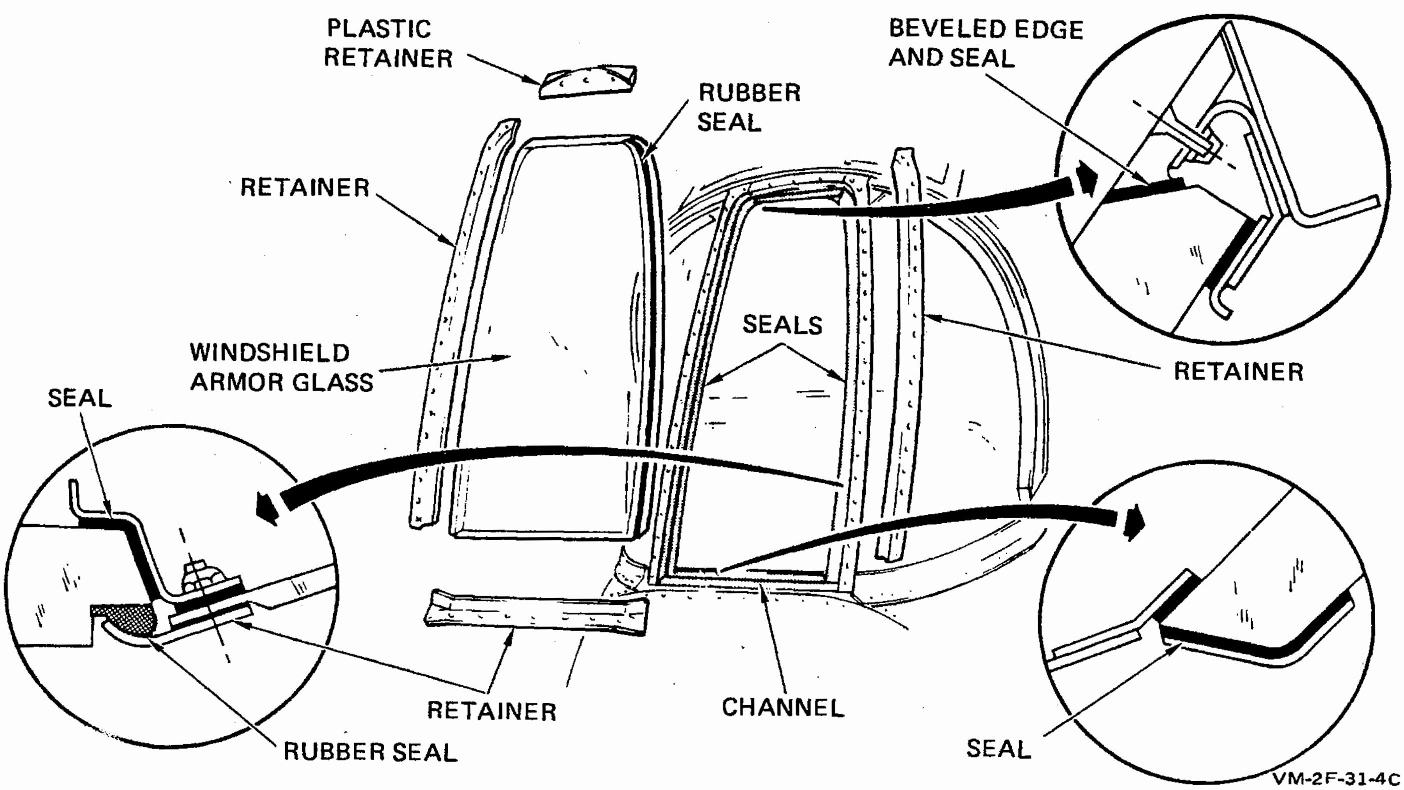


Figure 2-9. Windshield Armor Glass

Tools and Equipment List

Scraper, Plexiglas	(local manufacture)
Wrench, Torque (0-200 inch-pounds)	GGG-W-686, No. 6 (or equivalent)

2-60. REMOVING WINDSHIELD ARMOR GLASS.

1. Remove all Torq-Set screws from perimeter of windshield. Remove plastic retainer from top of glass and metal retainers from sides and bottom.

2. Push armor glass out at top and lift glass up and out of bottom channel.

2-61. INSTALLING WINDSHIELD ARMOR GLASS.

Materials List

Compound, Sealing	MIL-S-8802
Naphtha	TT-N-95
Solvent, Dry-cleaning	P-D-680, Type II
Tape, Adhesive, Rubber and Cork Composition	MIL-T-6841
Tape, Masking	MIL-T-21595

1. Using a plexiglas scraper (local manufacture), remove residual sealant from retainers and frames.

CAUTION

In the following step, use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors and keep away from open flames.

2. Clean all retainers and outer edge of frame by wiping with cloth dampened in dry-cleaning solvent (P-D-680, Type II). Before solvent dries, wipe off with clean cloth.

WARNING

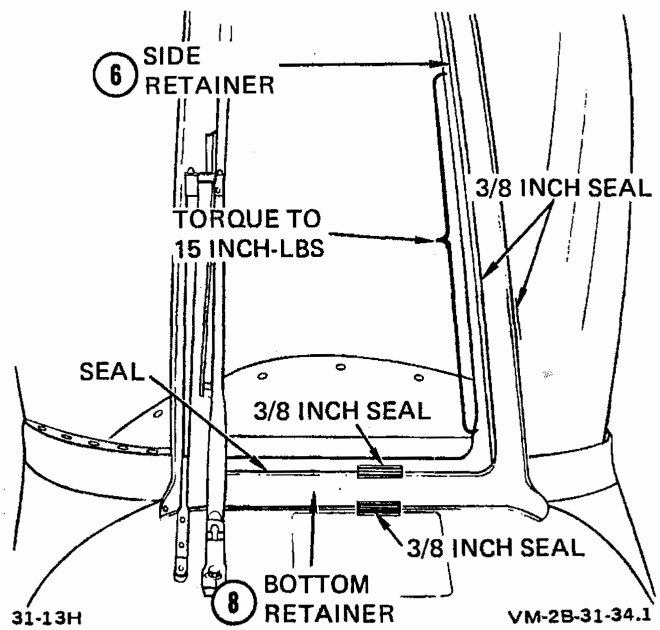
In the following step, naphtha should be used only with adequate ventilation. Avoid prolonged breathing of vapor.

3. If damaged while removing windshield, replace seal. Remove old seal and clean frame with cloth dampened in naphtha (TT-N-95). Wipe off immediately with dry cloth.

4. Cut strips of adhesive tape (MIL-T-6841) to fit sides of windshield frame, bottom channel, and top beveled edge of windshield. Remove backing from each strip and press firmly against respective surface.

5. Fit windshield into bottom frame channel.

6. Add sealant to side retainers and fasten with Torq-Set screws. Using a torque wrench (GGG-W-686, No. 6), tighten to 15 inch-pounds. Install top plastic retainer and fasten with Torq-Set screws. Install bottom channel retainer and fasten with Torq-Set screws.



Steps 6 and 8—Para. 2-61

7. Using masking tape (MIL-T-21595), mask off area 3/8 inch around outside perimeter of top plastic retainer. Fill in area with sealing compound (MIL-S-8802). Remove masking tape when compound is dry.

8. Using masking tape (MIL-T-21595), mask off area 3/8 inch around outside perimeter of bottom retainer. Fill in area with sealing compound (MIL-S-8802). Remove masking tape when compound is dry.

9. Using masking tape (MIL-T-21595), mask off area 3/8 inch from perimeter of side retainers. Fill in area with sealing compound (MIL-S-8802). Remove masking tape when compound is dry.

2-62. WINDSHIELD SIDE PANEL GLASS REMOVAL AND INSTALLATION. To remove and install the windshield side panel glass, see figure 2-10 and proceed as follows:

Tools and Equipment List

Scraper, Plexiglas	(local manufacture)
Wrench, Torque (0-200 inch-pounds)	GGG-W-686, Type I, No. 6 (or equivalent)

2-63. REMOVING WINDSHIELD SIDE PANEL GLASS.

Note

The following instructions may be used to remove either left or right windshield side panel glass.

1. Remove Torq-Set screws from perimeter of glass. Remove side and bottom armor glass retainers.

2. Pry panel out at top and slide up and out of bottom channel.

2-64. INSTALLING WINDSHIELD SIDE PANEL GLASS.

Materials List

Compound, Sealing	MIL-S-8802
Naphtha	TT-N-95
Tape, Adhesive, Rubber and Cork Composition	MIL-T-6841
Tape, Masking	MIL-T-21595
Toluene, Technical	TT-T-548

WARNING

In the following steps, naphtha must be used only with adequate ventilation. Avoid prolonged breathing of vapor.

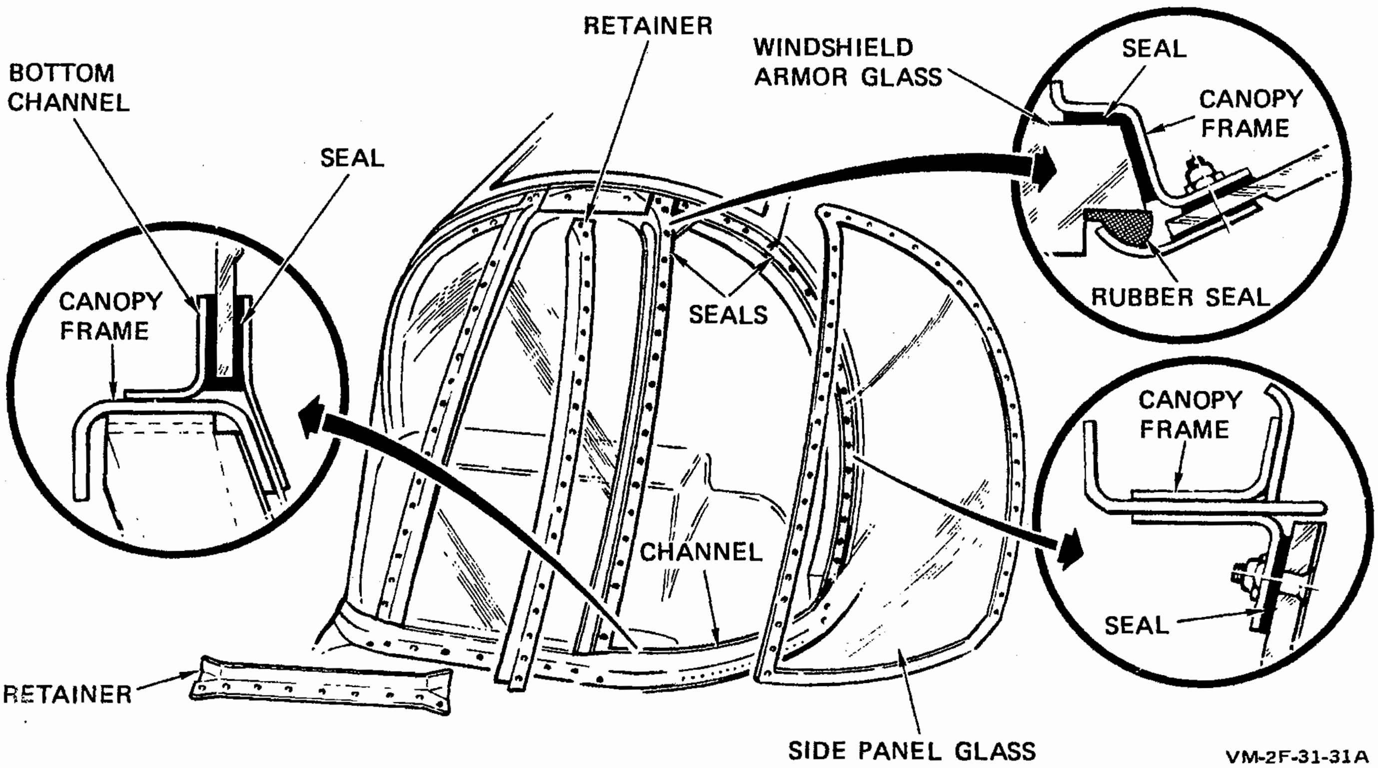


Figure 2-10. Windshield Side Panel Glass

1. Using a Plexiglas scraper, remove old sealing compound from windshield armor glass and from side and bottom retainers. Remove old compound from side panel frame. Clean edge of glass and retainers with cloth dampened in naphtha (TT-N-95). Wipe off immediately with dry cloth.

2. If damaged while removing side panel, replace frame seal. Remove old seal and clean frame with cloth dampened in naphtha (TT-N-95). Wipe off immediately with dry cloth.

3. Cut strips of adhesive tape (MIL-T-6841). Press tape to glass in wraparound manner. Peel backing from each strip and press firmly against respective surface.

Note

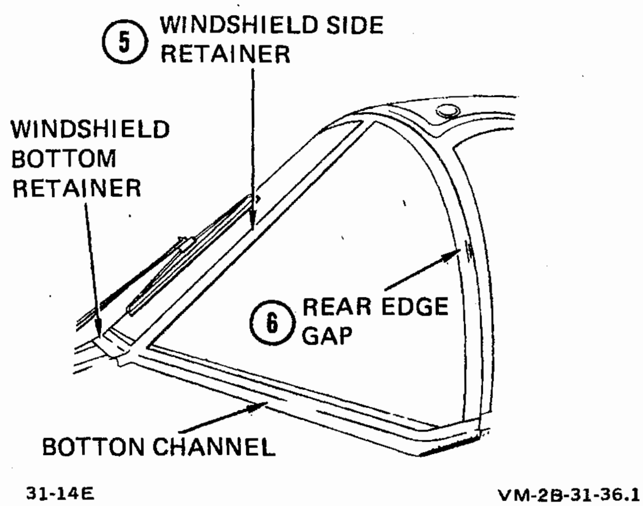
When installing side panel in frame channel, be careful not to damage cork seal.

4. Fit side panel glass into channel at bottom of frame.

Note

Apply sealing compound (MIL-S-8802) to underside of Torq-Set screw heads and washers before installing.

5. Install side windshield armor glass retainer and bottom armor glass retainer to frame with Torq-Set screws. Using a torque wrench (GGG-W-686, No. 6, or equivalent) tighten screws to 15 inch-pounds. Wipe off excess compound with toluene (TT-T-548). Install Torq-Set screws in aft edge of panel. Torque to 20 inch-pounds. Wipe off excess compound with toluene (TT-T-548).



Steps 5 and 6—Para. 2-64

6. For instructions to seal side and bottom windshield armor glass retainers, refer to paragraph 2-59.

2-65. PILOT'S CANOPY TOP GLASS REMOVAL AND INSTALLATION. To remove and install the pilot's canopy top glass, see figure 2-11 and proceed as follows:

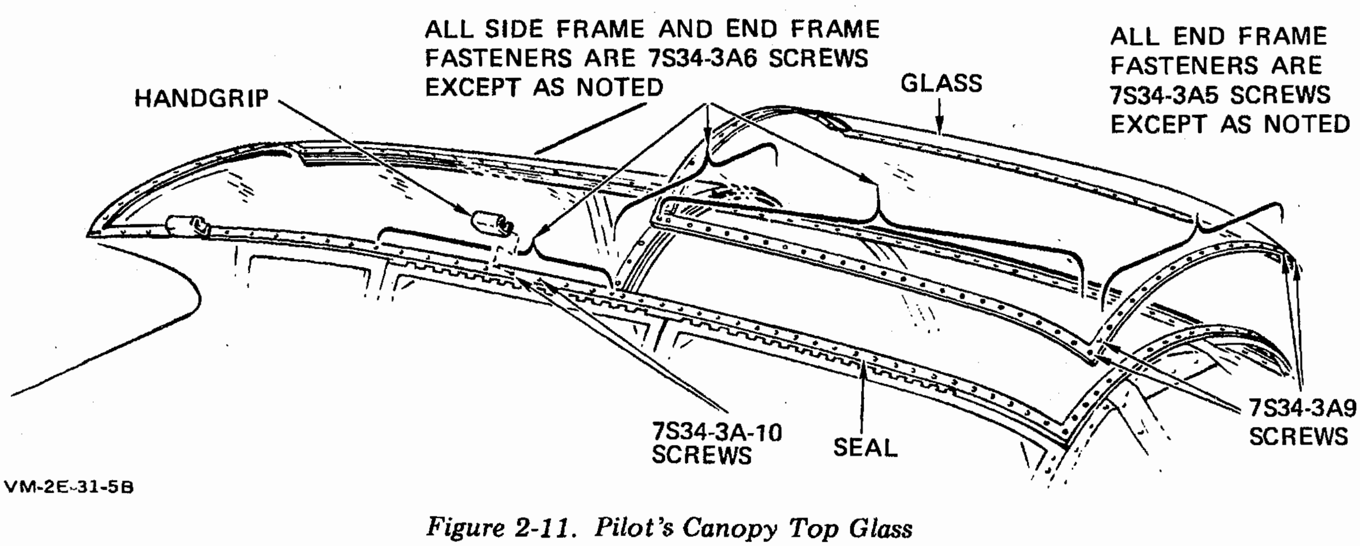


Figure 2-11. Pilot's Canopy Top Glass

Tools and Equipment List

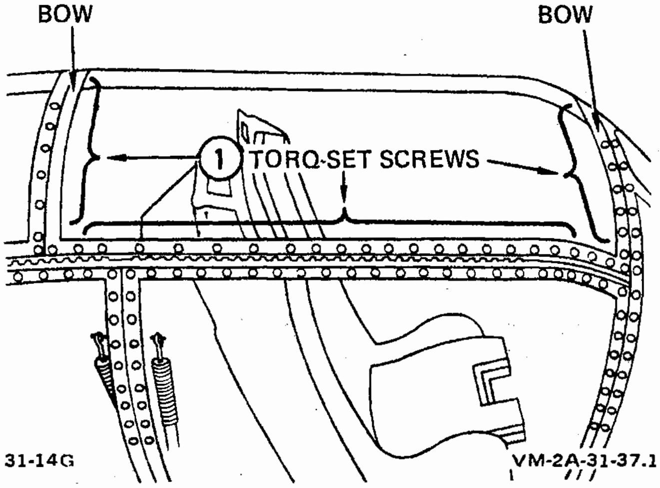
Scraper, Plexiglas	(local manufacture)
Wrench, Torque (0-200 inch-pounds)	GGG-W-686, No. 6 (or equivalent)

2-66. REMOVING PILOT'S CANOPY TOP GLASS.

Materials List

Naphtha	TT-N-95
Solvent, Dry-cleaning	P-D-680, Type II
Tape, Adhesive, Rubber and Cork Composition	MIL-T-6841

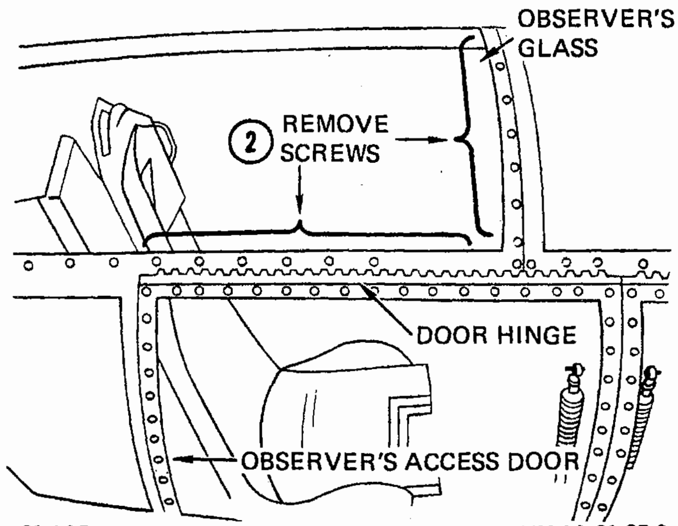
1. Remove Torq-Set screws, nuts, and washers from front bow, sides, and rear bow of pilot's canopy top glass.



Step 1—Para. 2-66

2. Remove Torq-Set screws, nuts, and washers from sides of observer's canopy top glass rearward to aft end of observer's canopy access door hinges.

3. Run sharp knife around perimeter of pilot's glass to free glass from sealing compound. Place 3/16-inch blocks under forward edge of observer's glass. Pry forward edge of pilot's glass up and pull forward to remove. Leave blocks under observer's glass.



Step 2--Para. 2-66

4. Using a Plexiglas scraper (local manufacture), remove residual sealing compound from canopy frame and outer edge of canopy glass.

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

5. Clean frame and outer edge of glass with a clean cloth dampened in dry-cleaning solvent (P-D-680, Type II). Before solvent dries, wipe off with a clean, dry cloth.

WARNING

In the following step, naphtha should be used only with adequate ventilation. Avoid prolonged breathing of vapor.

6. If damaged while removing glass, replace canopy frame seal. Remove old seal and clean frame with cloth dampened in naphtha (TT-N-95). Wipe off immediately with a clean, dry cloth.

7. Cut strips of adhesive tape (MIL-T-6841) to fit sides of frame. Peel backing from each strip and press firmly against respective surface. Back drill holes in seal to match holes in frame.

2-67. INSTALLING PILOT'S CANOPY TOP GLASS.

Materials List

Compound, Sealing	MIL-S-8802
Tape, Masking	MIL-T-21595

1. With 3/16-inch blocks under forward edge of observer's glass, slip rear edge lip of pilot's glass under forward edge of observer's glass. Align holes in glass with holes in frame.

Note

Apply sealing compound (MIL-S-8802) to underside of screw heads and under washers before installing in canopy and frame.

2. For proper size and location of Torq-Set screws, refer to figure 2-11. Torque screws according to information in table 2-7.

3. Mask off area between perimeter of pilot's canopy glass and frame with masking tape (MIL-T-21595). Mask off front and side edges of observer's canopy glass with masking tape (MIL-T-21595). Using a piece of Plexiglas, apply sealing compound (MIL-S-8802) to area. Remove tape when compound is dry.

2-68. OBSERVER'S CANOPY TOP GLASS REMOVAL AND INSTALLATION. To remove and install the observer's canopy top glass, see figure 2-12, and proceed as follows:

Tools and Equipment List

Scraper, Plexiglas	(local manufacture)
Wrench, Torque	GGG-W-686 No. 6 (or equivalent)

2-69. REMOVING OBSERVER'S CANOPY TOP GLASS.

Materials List

Naphtha	TT-N-95
Solvent, Dry-cleaning	P-D-680, Type II
Tape, Adhesive, Rubber and Cork Composition	MIL-T-6841

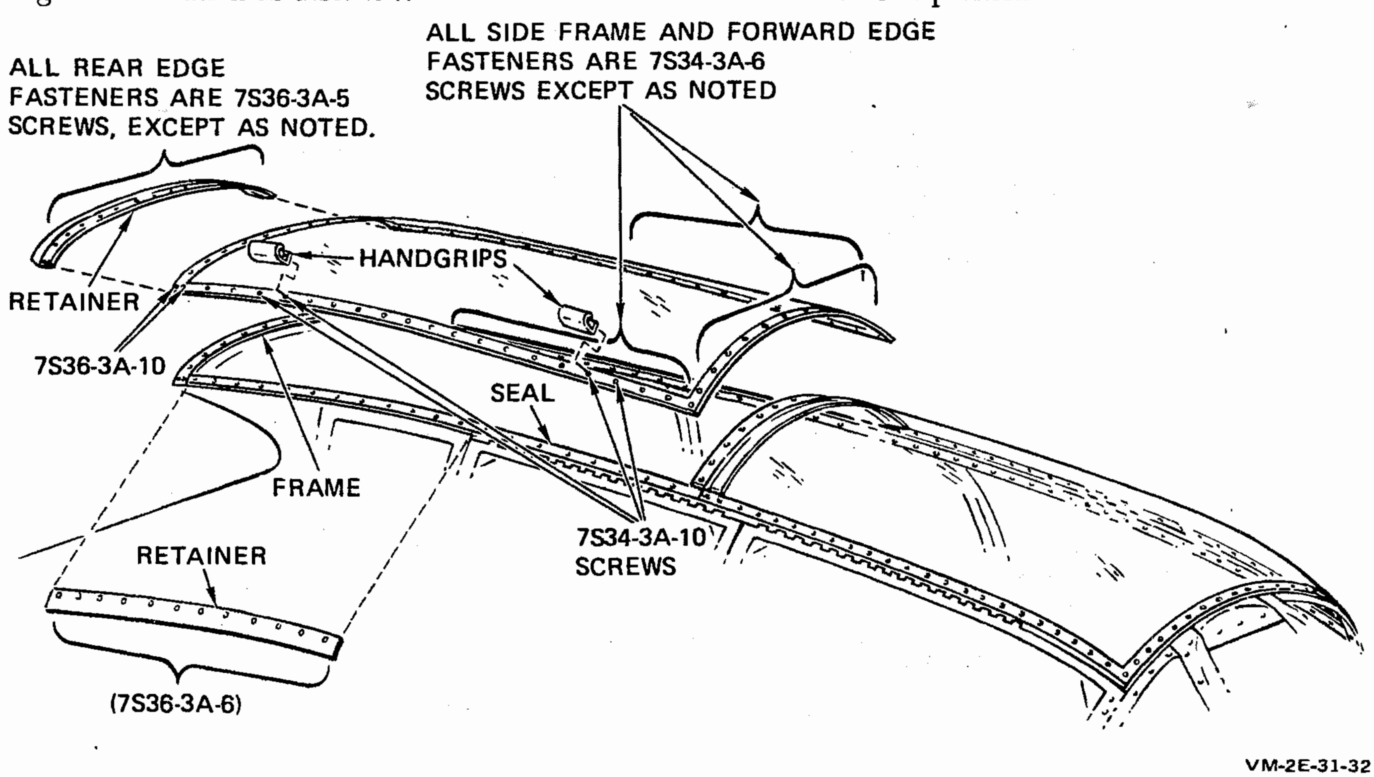
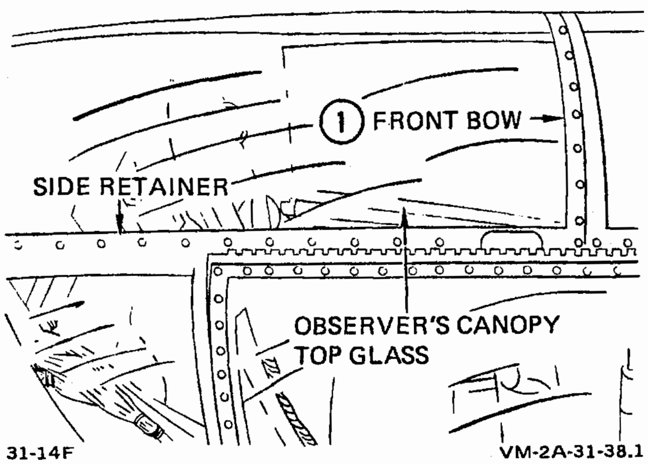


Figure 2-12. Observer's Canopy Top Glass

1. Remove Torq-Set screws, nuts, and washers, from front bow of glass, and screws, nuts, washers, and retainers from rear and aft sides of glass.



Step 1—Para. 2-69

2. Run sharp knife around perimeter of glass to separate glass from sealing compound. Pry up glass around edges and remove from frame.

3. Using a Plexiglas scraper, remove residual sealing compound from canopy frame and from outer edge of canopy glass.

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

4. Clean frame and outer edge of glass with clean cloth dampened in dry-cleaning solvent (P-D-680, Type II). Before solvent dries, wipe off with a clean, dry cloth.

WARNING

In the following step, naphtha should be used only with adequate ventilation. Avoid prolonged breathing of vapor.

5. If damaged while removing glass, replace canopy frame seal. Remove old seal and clean frame with cloth dampened in naphtha (TT-N-95). Wipe off immediately with a clean, dry cloth.

6. Cut strips of adhesive tape (MIL-T-6841) to fit sides of frame. Peel backing from each strip and press firmly against respective surface. Back drill holes in seal to match holes in frame.

2-70. INSTALLING OBSERVER'S CANOPY TOP GLASS.

Materials List

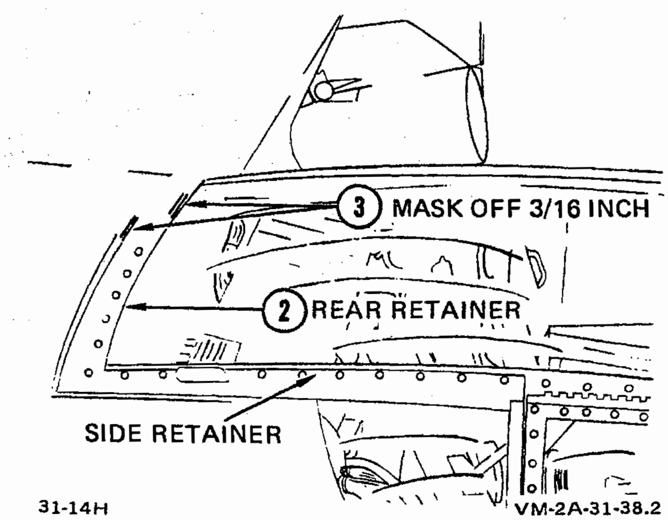
Compound, Sealing	MIL-S-8802
Tape, Masking	MIL-T-21595
Toluene, Technical	TT-T-548

1. Place canopy glass on frame. Align holes in glass with holes in frame.

Note

Apply sealing compound (MIL-S-8802) under Torq-Set screw heads and under washers before installing in canopy and frame. Wipe off excess compound with toluene (TT-T-548).

2. For proper size and location of Torq-Set screws, refer to figure 2-12. Install rear and side retainers on glass and tighten screws according to information in table 2-7.

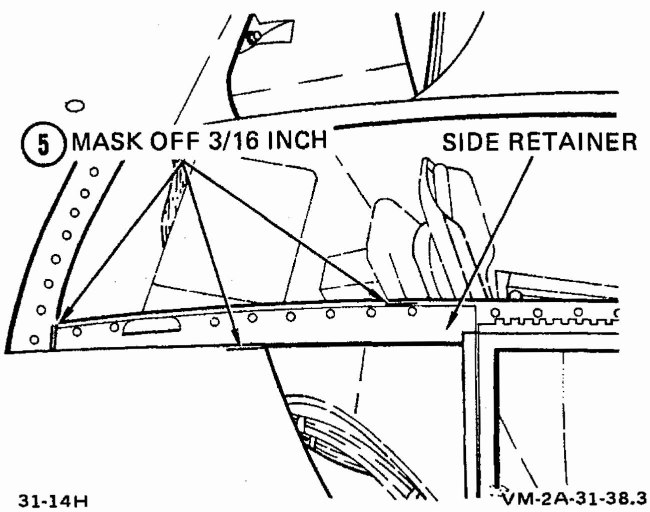


Steps 2 and 3—Para. 2-70

3. Mask off area 3/16 inch around perimeter of aft retainer with masking tape (MIL-T-21595). Using a small piece of Plexiglas, apply sealing compound (MIL-S-8802) to area. Remove tape when compound is dry.

4. Mask off gap between front edge of glass and rear edge of pilot's canopy top glass. Fill in gap with sealing compound (MIL-S-8802). Remove tape when compound is dry.

5. Mask off area 3/16 inch around perimeter of side retainers. Apply sealing compound (MIL-S-8802) to area. Remove tape when compound is dry.



Step 5—Para. 2-70

6. Mask off area between side edges of canopy glass and door frame. Apply sealing compound (MIL-S-8802) in gap. When dry, remove masking tape.

2-71. OBSERVER'S COCKPIT SIDE PANEL GLASS REMOVAL AND INSTALLATION. To remove and install the observer's cockpit side panel glass, proceed as follows:

Tools and Equipment List

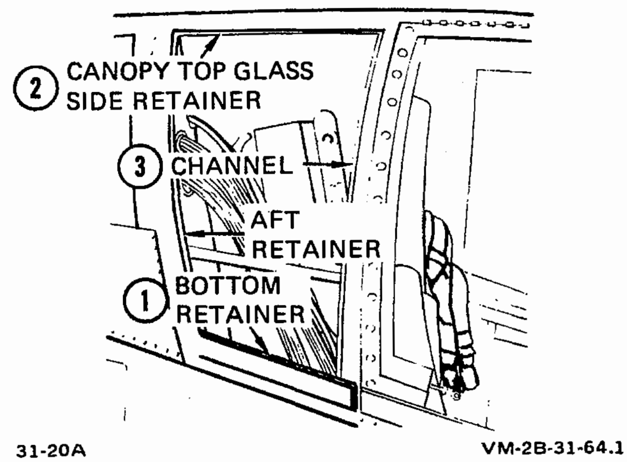
Scraper, Plexiglas	(local manufacture)
Wrench, Torque (0-200 inch-pounds)	GGG-W-686, No. 6 (or equivalent)

2-72. REMOVING OBSERVER'S COCKPIT SIDE PANEL GLASS.

1. Remove bottom and aft retainers from side panel glass. Keep Torq-Set screws with respective retainers for ease of installation.

2. Remove canopy top glass side retainer and handgrip from observer's canopy top glass. Keep Torq-Set screws with retainer for ease of installation.

3. Slip side panel rearward and out of frame channel.



Steps 1 through 3—Para. 2-72

2-73. INSTALLING OBSERVER'S COCKPIT SIDE PANEL GLASS.

Materials List

Compound, Sealing	MIL-S-8802
Naphtha	TT-N-95
Tape, Adhesive, Rubber and Cork Composition	MIL-T-6841
Tape, Masking	MIL-T-21595
Toluene, Technical	TT-T-548

1. Using a Plexiglas scraper (local manufacture), scrape away residual sealing compound from panel frame and retainers.

WARNING

In the following steps, naphtha must be used only with adequate ventilation. Avoid prolonged breathing of solvent vapor.

2. Clean panel frame and retainers with cloth dampened in naphtha (TT-N-95). Wipe off immediately with dry cloth.

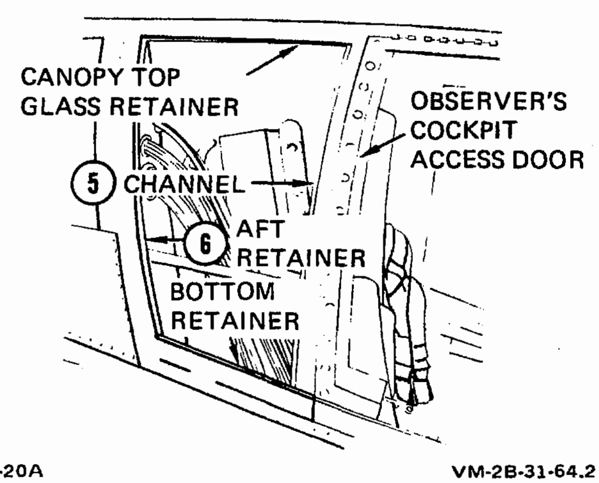
3. If damaged while removing side panel, scrape away old frame seal, clean frame with cloth dampened in naphtha (TT-N-95). Wipe off immediately with dry cloth.

4. Cut strips of adhesive tape (MIL-T-6841) to fit sides of frame. Peel backing from each strip and press firmly against respective surface.

5. Slide side panel glass into channel.

Note

In the following step, apply sealing compound (MIL-S-8802) to underside of Torq-Set screw heads before installing side panel retainers.



Steps 5 and 6—Para. 2-73

6. Refer to table 2-8 for correct torque values and, using a torque wrench (GGG-W-686, No. 6, or equivalent) install aft and bottom side panel retainers and canopy top glass side retainer and handgrip. Wipe off excess sealing compound from around screw heads with toluene (TT-T-548).

7. Using masking tape (MIL-S-21595), mask off area 1/4 inch around perimeter of side panel and edge of retainers and side channel. Apply sealing compound (MIL-S-8802) to area. Remove masking tape when compound is dry.

8. Using masking tape (MIL-T-21595), mask off area 1/4 inch around perimeter of observer's canopy top glass retainer. Apply sealing compound (MIL-S-8802) to area. Remove masking tape when compound is dry.

2-74. CANOPY ACCESS DOOR GLASS REMOVAL AND INSTALLATION. To remove and install the canopy access door glass, see figure 2-13 and proceed as follows:

Tools and Equipment List

Scraper, Plexiglas	(local manufacture)
Wrench, Torque	GGG-W-686 No. 6 (or equivalent)

2-75. REMOVING CANOPY ACCESS DOOR GLASS.

Materials List

Naphtha	TT-N-95
Solvent, Dry-cleaning	P-D-680, Type II
Tape, Adhesive, Rubber and Cork Composition	MIL-T-6841

Note

The following procedure is typical for removing and installing the door glass on any canopy access door. If necessary, refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5) to remove and install the outside air temperature thermometer in the pilot's left canopy emergency access door.

1. Remove bolt from canopy release bell crank and remove external handle from door. Remove two bolts from bottom of frames, two flush-head

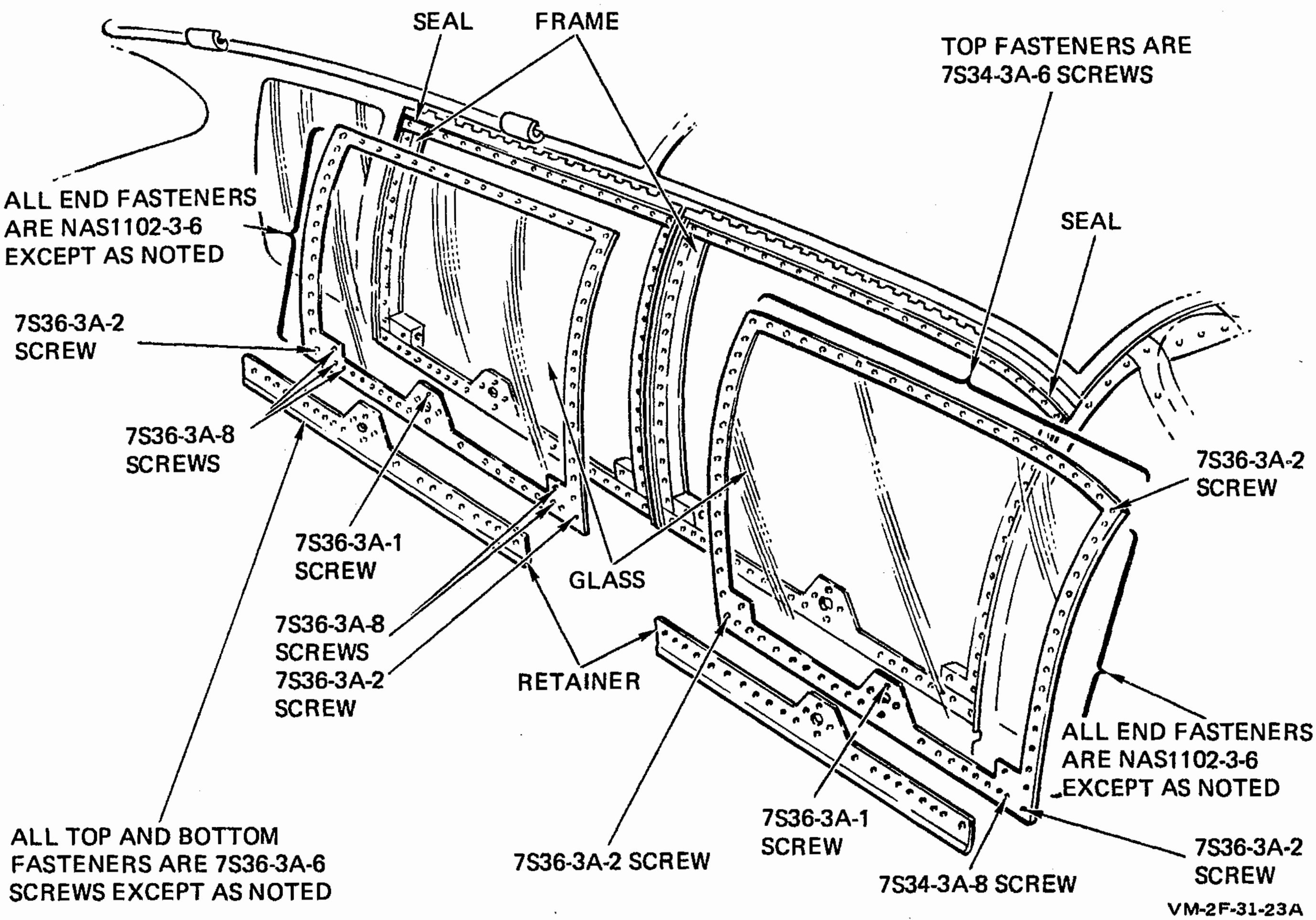
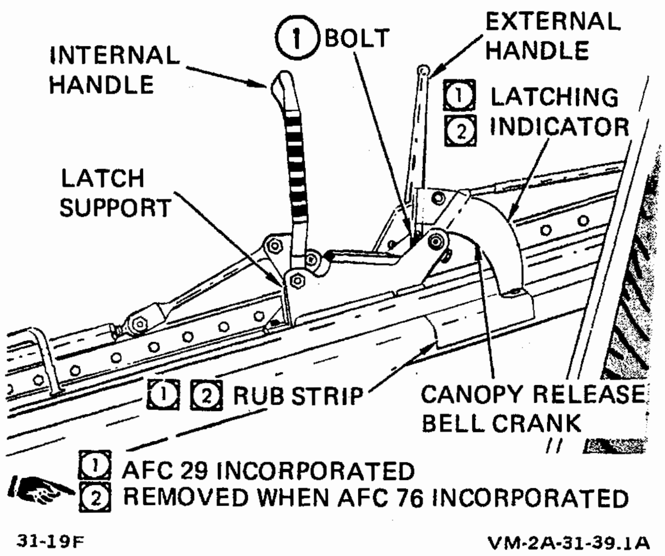


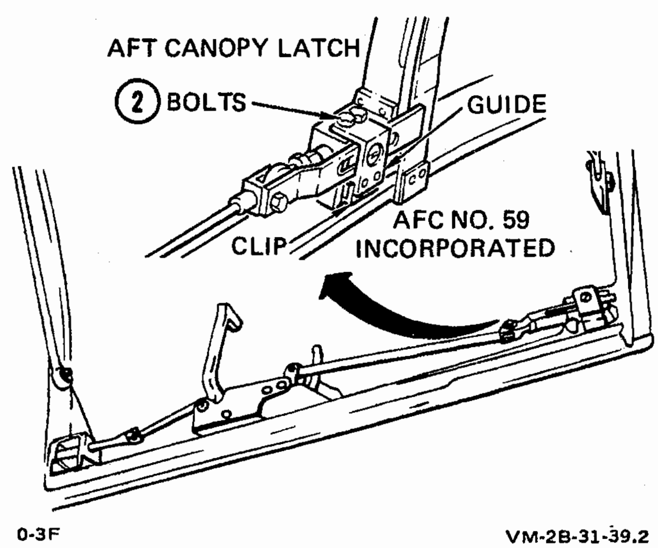
Figure 2-13. Canopy Access Door Glass

bolts from door frame, and remove door latch and support.



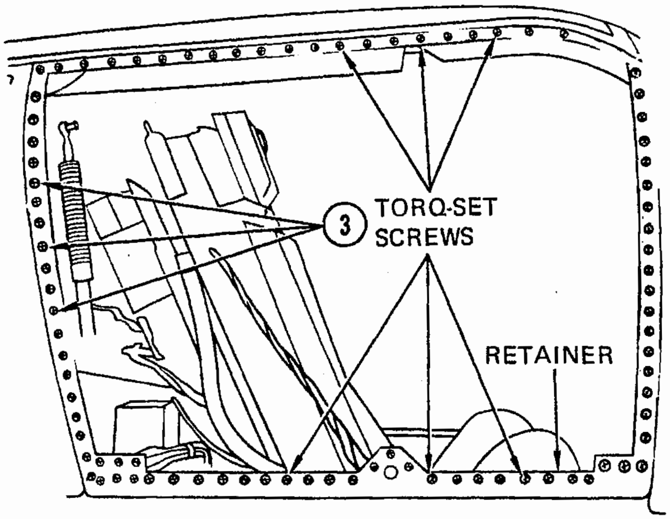
Step 1—Para. 2-75

2. AFC No. 59 Incorporated—Remove bolts, washers, and guide and clip from aft canopy latch fitting.



Step 2—Para. 2-75

3. See figure 2-13, remove Torq-Set fasteners from perimeter of glass. Remove retainer from bottom of frame.



Step 3—Para. 2-75

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

4. Using a Plexiglas scraper, remove residual sealing compound from door frame. Clean frame with clean cloth dampened in solvent (P-D-680, Type II). Before solvent dries, wipe off with a clean, dry cloth.

WARNING

In the following step, naphtha should be used only with adequate ventilation. Avoid prolonged breathing of vapor.

5. If damaged while removing glass, replace door glass frame seal. Remove old seal and clean frame with cloth dampened in naphtha (TT-N-95). Wipe off immediately with a clean, dry cloth.

6. Cut strips of adhesive tape (MIL-T-6841) to fit sides of door frame. Peel backing from each strip and press firmly against respective surface. Back drill holes in seal to match holes in frame.

2-76. INSTALLING CANOPY ACCESS DOOR GLASS.

Materials List

Compound, Sealing	MIL-S-8802
Tape, Masking	MIL-T-21595
Toluene, Technical	TT-T-548

Note

If replacement glass is not predrilled, it will be necessary to back drill glass through frame.

1. Place door glass on frame. Align holes in glass with holes in frame.

Note

In the following step, apply sealing compound (MIL-S-8802) to underside of Torq-Set screw heads and under washers before installing in glass and frame. Wipe off excess compound with toluene (TT-T-548).

2. For proper size and location of Torq-Set screws, refer to figure 2-13. Install screws, washers, and locknuts. Using a torque wrench (GGG-W-686 No. 6 or equivalent), tighten screws along top of frame to 20 inch-pounds, along sides of frame to 25 inch-pounds, and bottom of frame to 15 inch-pounds.

3. Using masking tape (MIL-T-21595), mask off area 3/16 inch above top edge of retainer. Apply sealing compound (MIL-S-8802) to area. Remove tape when dry.

4. AFC No. 59 Incorporated—Install guide and clip with attaching hardware.

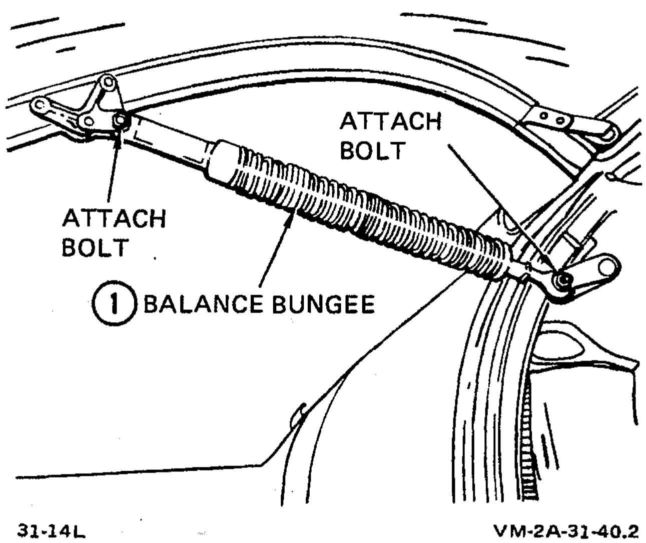
5. Install front and rear latch pins in door frame fittings and rear lockbar through guide assembly (AFC No. 59 incorporated). Bolt door latch and support to frame. Install external door handle on latch. Install bolt in canopy release bell crank to fasten handle to latch.

6. Check fit and alignment of door. For instructions to adjust door latch, refer to paragraph 2-105.

2-77. PILOT'S CANOPY ACCESS DOOR REMOVAL AND INSTALLATION. To remove and install the pilot's canopy access door, proceed as follows.

2-78. REMOVING PILOT'S CANOPY ACCESS DOOR.

1. Attach door hold-open rod to canopy frame. Disconnect canopy door balance bungee from door frame and canopy frame.

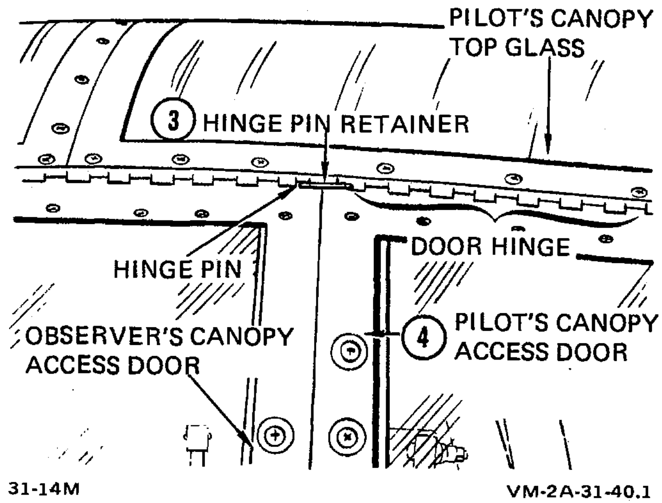


Step 1—Para. 2-78

2. Detach hold-open rod from canopy frame and stow on door frame. Close but do not lock door.

3. Locate hinge pin retainer at aft end of door hinge and remove cotter pins. Slide retainer to the rear.

4. Have helper hold bottom edge of door frame. Pull hinge pin rearward out of hinge.



Steps 3 and 4—Para. 2-78

2-79. INSTALLING PILOT'S CANOPY ACCESS DOOR.

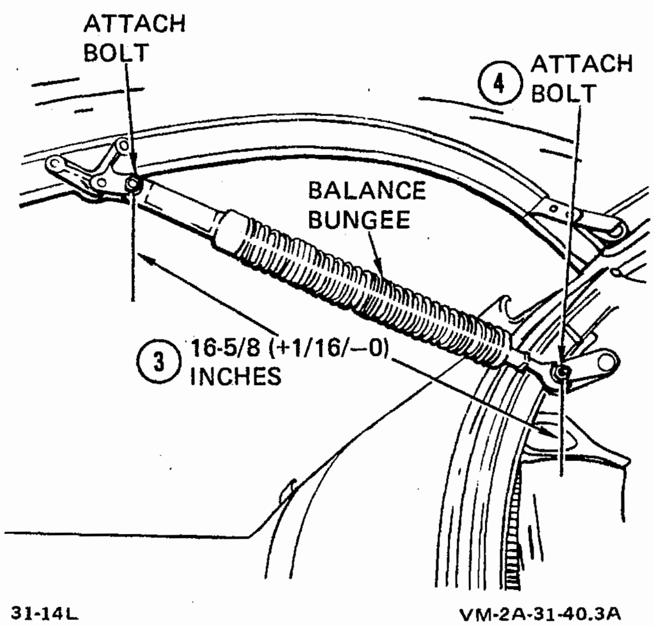
Materials List

Lockwire (0.032-inch diameter steel)	MS20995F32
Pins, Cotter (1/32-inch diameter steel)	MS24665-22
Pin, Cotter (1/16-inch diameter steel)	MS24665-134
Pin, Hinge (0.089-inch diameter steel)	MS20253P2

1. Align door hinge with frame hinge and install hinge pin (MS20253P2).

2. Slide hinge pin retainer forward over hinge pin and safety with cotter pins (MS24665-22).

3. Extend door hold-open rod and attach to canopy frame. Adjust canopy balance bungee rod end so that bungee length is 16 5/8 (+1/16/-0) inches from center of body attach fitting bolt hole to center of rod end bolt hole. Tighten jamnut against lock washer and safety with lockwire (MS20995F32).



Steps 3 and 4—Para. 2-79

4. Install canopy balance bungee between door frame and canopy frame. Install bungee attach bolts. Safety bolts with cotter pins (MS24665-134).

5. Check fit and alignment of door. For instructions to adjust door latch, refer to paragraph 2-105.

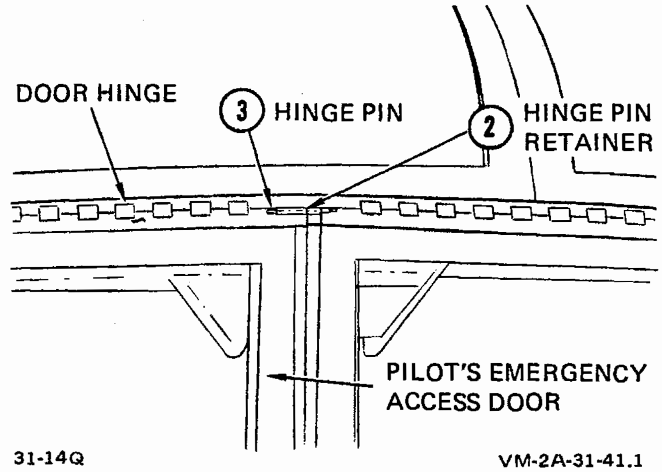
2-80. PILOT'S CANOPY EMERGENCY ACCESS DOOR (LEFT-HAND) REMOVAL AND INSTALLATION. To remove and install the pilot's canopy emergency access door, proceed as follows:

2-81. REMOVING PILOT'S CANOPY EMERGENCY ACCESS DOOR.

1. Remove outside air temperature thermometer from door glass panel. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

2. Locate hinge pin retainer at aft end of door hinge and remove cotter pin. Slide retainer to the rear.

3. Have helper hold bottom edge of door frame. Pull hinge pin rearward out of hinge and remove door.



Steps 2 and 3—Para. 2-81

2-82. INSTALLING PILOT'S CANOPY EMERGENCY ACCESS DOOR.

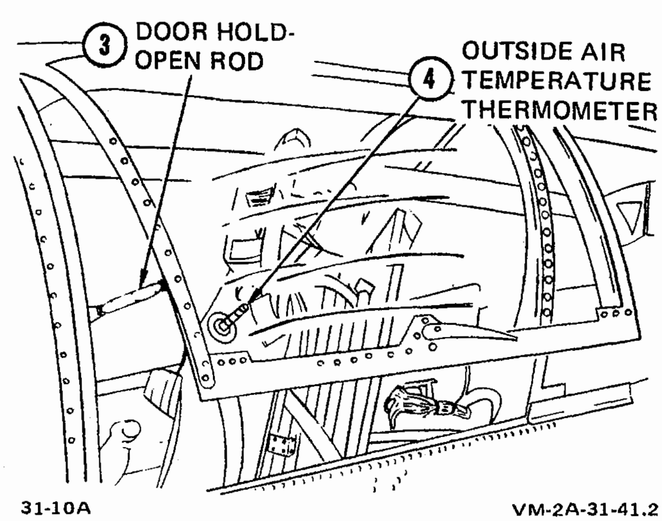
Materials List

Pin, Cotter (1/32-inch diameter steel)	MS24665-22
Pin, Hinge (0.089-inch diameter steel)	MS20253P2

1. Align door hinge with frame hinge and install hinge pin (MS20253P2).

2. Slide hinge pin retainer forward over hinge pin and safety with cotter pins (MS24665-134).

3. Open door and attach hold-open rod on canopy door frame.



Steps 3 and 4—Para. 2-82

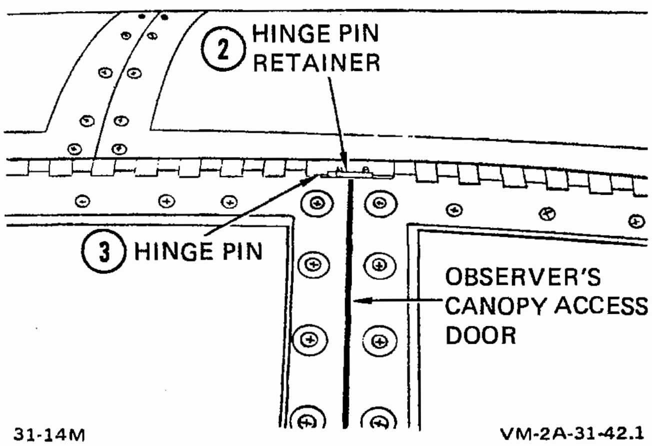
4. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5) for information to install outside air temperature thermometer.

2-83. OBSERVER'S CANOPY ACCESS DOOR REMOVAL AND INSTALLATION. To remove and install the observer's canopy access door, proceed as follows.

2-84. REMOVING OBSERVER'S CANOPY ACCESS DOOR.

1. Disconnect canopy door balance bungee from door frame and canopy frame.

2. Locate hinge pin retainer at forward end of door hinge and remove cotter pins. Slide retainer forward.



Steps 2 and 3—Para. 2-84

3. Have helper hold bottom edge of door frame. Pull hinge pin forward out of hinge and remove door.

2-85. INSTALLING OBSERVER'S CANOPY ACCESS DOOR.

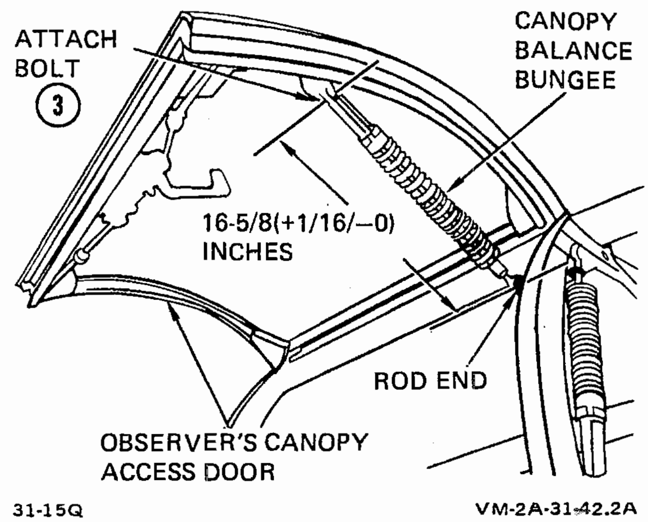
Materials List

Lockwire (0.032-inch diameter steel)	MS24665F32
Pin, Cotter (0.032-inch diameter steel)	MS24665-22
Pin, Cotter (1/16-inch diameter steel)	MS24665-134
Pin, Hinge (0.089-inch diameter steel)	MS20253P2

1. Align door hinge with frame hinge and install hinge pin (MS20253P2).

2. Slide hinge pin retainer aft over hinge pin and safety with cotter pins (MS24665-22).

3. Extend door hold-open rod and attach to canopy frame. Adjust canopy balance bungee rod end so that bungee length is 16-5/8 (+1/16/-0) inches from center of body attach fitting bolt hole to center of rod and bolt hole. Tighten jamnut against lock washer and safety with lockwire (MS20995F32).



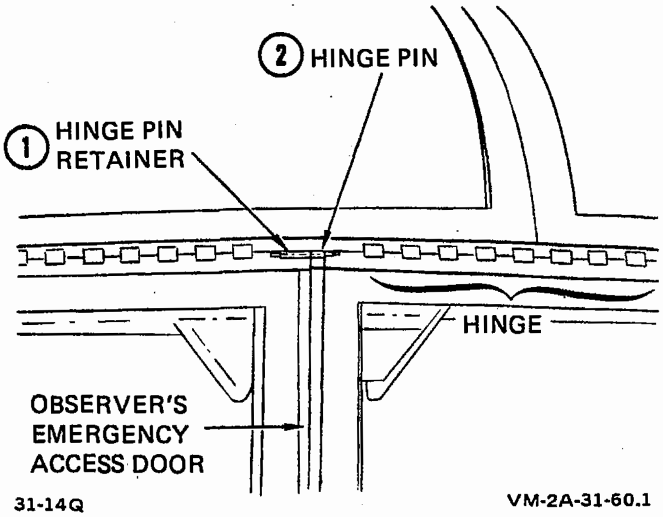
Step 3—Para. 2-85

4. Install canopy balance bungee between door frame and canopy frame. Safety attach bolts with cotter pins (MS24665-134).

2-86. OBSERVER'S CANOPY EMERGENCY ACCESS DOOR REMOVAL AND INSTALLATION. To remove and install the observer's canopy emergency access door, proceed as follows.

2-87. REMOVING CANOPY EMERGENCY ACCESS DOOR.

1. Locate hinge pin retainer at forward end of door hinge and remove cotter pins. Slide retainer forward.



Steps 1 and 2—Para. 2-87

2. Have helper hold bottom edge of door frame. Pull hinge pin forward and out of hinge.

2-88. INSTALLING CANOPY EMERGENCY ACCESS DOOR.

Materials List

Pin, Cotter (1/32-inch diameter steel)	MS24665-22
Pin, Hinge (0.089-inch diameter steel)	MS20253P2

1. Align door hinge with frame hinge and install hinge pin (MS20253P2).

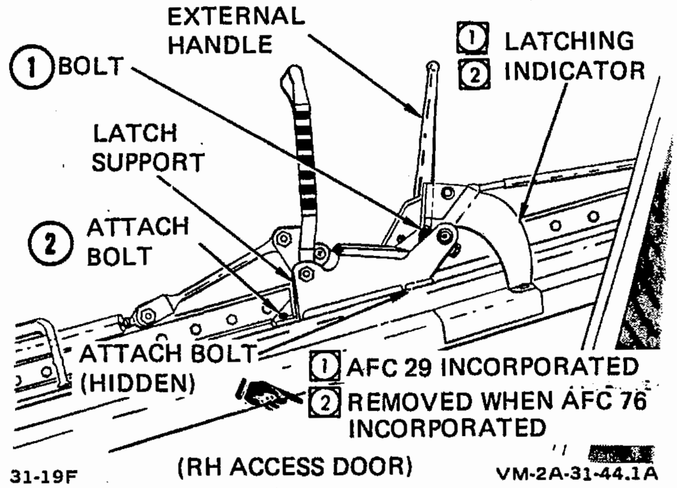
2. Slide hinge pin retainer aft over hinge pin and safety with cotter pins (MS24665-22).

2-89. CANOPY ACCESS DOOR LATCH REMOVAL AND INSTALLATION. To remove and install any of the four canopy access door latches, see figure 2-14 and proceed as follows.

2-90. REMOVING CANOPY ACCESS DOOR LATCH.

1. Remove bolt from canopy release bell crank and remove external handle from door.

2. Locate and remove two latch support attach bolts on underside of bottom door frame and two flush-head bolts from side of door frame.



Steps 1 and 2—Para. 2-90

3. Lift latch assembly up and off of bottom frame.

2-91. INSTALLING CANOPY ACCESS DOOR LATCH.

1. Insert forward and rear latch pins in door fittings and rear lockbar through guide assembly (AFC No. 59 incorporated) and align holes in latch support with holes in bottom door frame.

2. Install latch attach bolts through underside of bottom door frame into latch support and through side of door frame.

3. Check for fit and alignment of door. If necessary to adjust door latch, refer to paragraph 2-92.

2-92. CANOPY ACCESS DOOR LATCH ADJUSTMENT. To adjust any of the four canopy access door latches, proceed as follows.

2-93. ADJUSTING CANOPY ACCESS DOOR LATCH.

Tools and Equipment List

Pin, Rig (3/32-inch diameter steel)	(local manufacture)

Materials List

Lockwire (0.041-inch diameter steel)	MS20995F41
Pins, Cotter (1/16-inch diameter steel)	MS24665-134

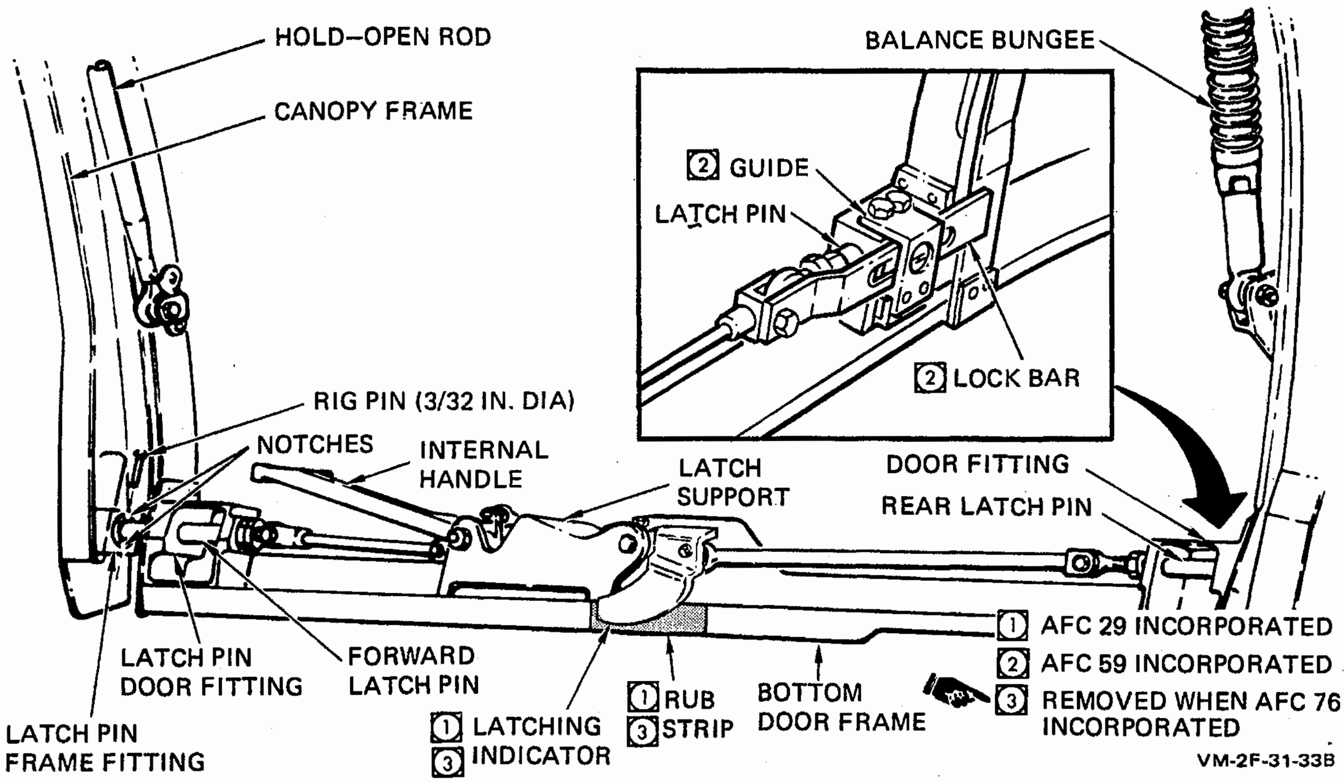


Figure 2-14. Canopy Access Door Latch

1. Open door and locate latch pin door fittings at each lower corner of the canopy frame.

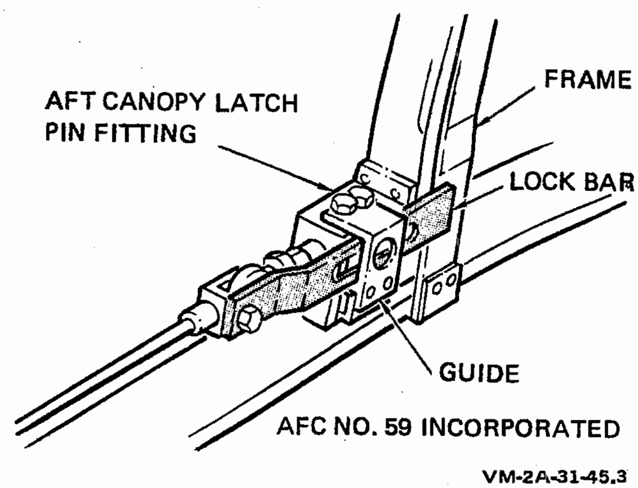
Note

Mounting bolt holes in fitting are oversize to allow for adjustment. Open door and adjust washers (one at a time) under head of each bolt to completely cover hole.

2. Loosen bolts through latching indicator (AFC No. 29 incorporated) far enough to eliminate interference during adjustment of the canopy latch mechanism.

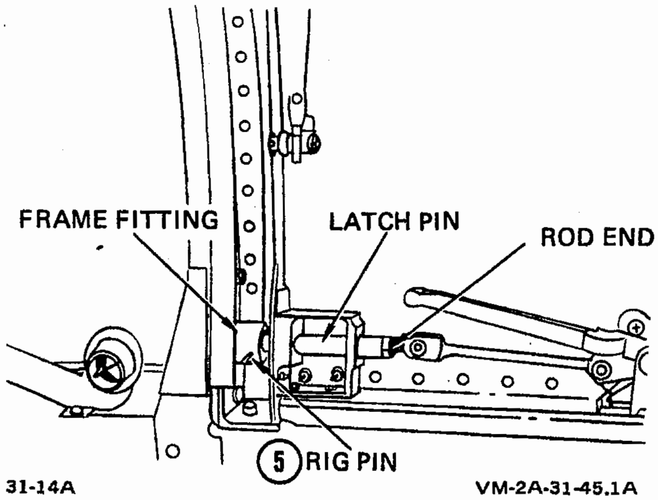
3. Close door from inside and check alignment of latch pins with door fitting. Misalignment will require excessive pressure to close and lock door. If necessary, readjust position of door fittings by loosening three mounting bolts and repositioning fitting.

4. Aircraft having AFC No. 59 incorporated–Close door from inside and check alignment of lockbar on aft latch pin fitting. Lockbar should slide freely through guide and over canopy frame. If necessary, for proper alignment of lockbar and latch pin, adjust position of door fittings by loosening three mounting bolts and repositioning fitting.



Step 4—Para. 2-93

5. Locate notches in latch pin frame fitting. Close and lock door from inside. Insert 3/32-inch diameter steel rig pin through front and rear latch pins. Holes in latch pins must align with notches in frame fittings. If necessary, cut away lockwire, remove bolt, and adjust latch pin rod end until rig pin holes in latch pins align with notches and rig pin can be installed.



Step 5—Para. 2-93

6. Tighten jamnuts against rod ends and safety against locking keys with lockwire (MS2099541). Tighten attach bolts and safety with cotter pins (MS24665-134).

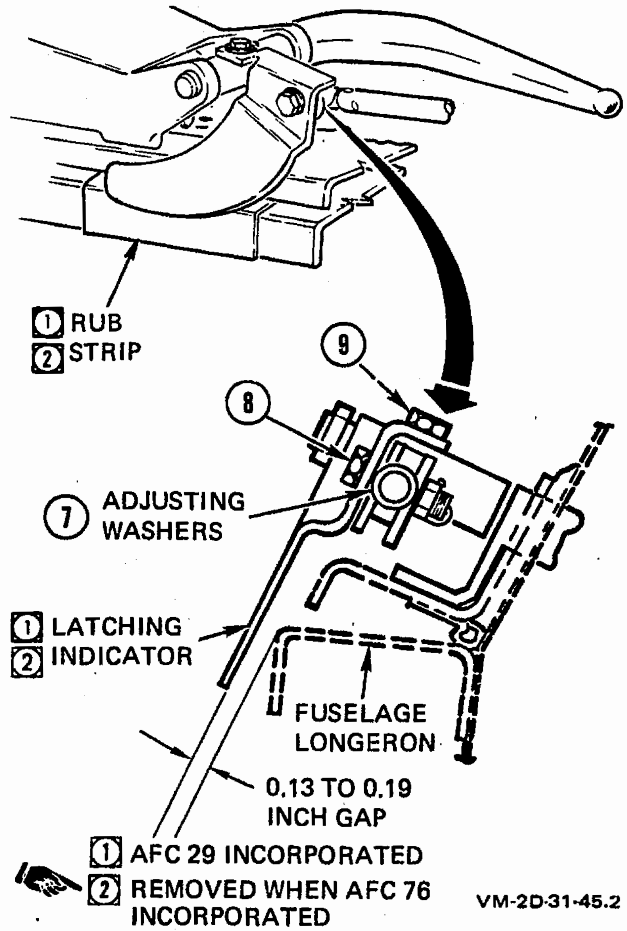
7. Adjust position of latching indicator, by increasing or decreasing the number of washers under the indicator, to attain an 0.13- to 0.19-inch gap between the fuselage longeron and the indicator.

Note

Perform additional steps 2, and 7 through 9 on aircraft having AFC 29 incorporated and AFC 76 not incorporated.

8. Install bolt, washers, nut, and cotter pin (MS24665-134) after adjustment has been accomplished.

9. Tighten bolt on the end of the latching indicator.



Steps 7 through 9—Para. 2-93

10. Open, close, and latch canopy several times to ensure proper operation and locking.

2-94. CANOPY ACCESS DOOR BALANCE BUNGEE REMOVAL AND INSTALLATION. To remove and install a canopy access door balance bungee, proceed as follows:

Tools and Equipment List

Wrench, Torque (0-200 inch-pounds)	GGG-W-686, Type I, No. 6 (or equivalent)

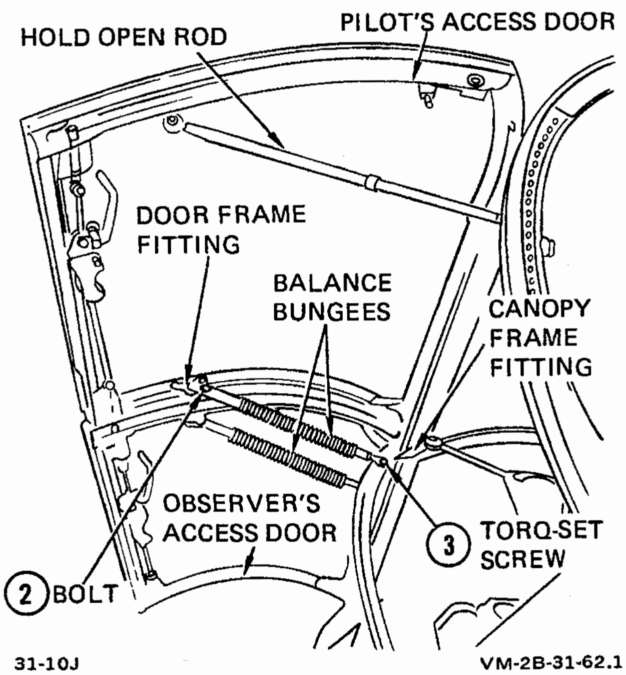
Note

The following procedure may be used to remove the balance bungee from either the pilot's or the observer's canopy access door.

2-95. REMOVING CANOPY ACCESS DOOR BALANCE BUNGEE.

1. Open canopy access door. Install hold-open rod if bungee is to be removed from pilot's access door. Have helper hold door open if bungee is to be removed from observer's access door.

2. Remove cotter pin, nut, washers, and bolt from end cap bearing and door frame fitting.



Steps 2 and 3—Para. 2-95

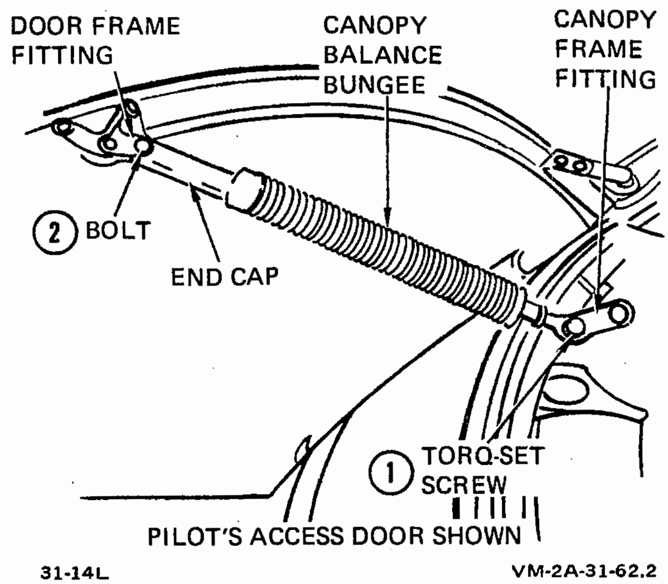
3. Remove cotter pin, nut, washer, and Torq-Set screw from bungee rod end and canopy frame fitting.

2-96. INSTALLING CANOPY ACCESS DOOR BALANCE BUNGEE.

Materials List

Pins, Cotter (1/16-inch diameter steel)	MS24665-134

1. Install bungee rod end bearing on canopy frame fitting, using Torq-Set screw, washer, and locknut. Using a torque wrench (GGG-W-686, Type I, No. 6), tighten locknut from 70 to 90 inch-pounds.



Steps 1 and 2—Para. 2-96

2. Install end cap bearing on door fitting using bolt, washers, and nuts. Using a torque wrench (GGG-W-686, Type I, No. 6), tighten nut 30 to 40 inch-pounds. Safety nut with cotter pin (MS24665-134).

2-97. CANOPY ACCESS DOOR BALANCE BUNGEE ADJUSTMENT. To adjust the canopy access door balance bungee, proceed as follows:

Tools and Equipment List

Wrench, Torque (0-200 inch-pounds)	GGG-W-686, Type I, No. 6 (or equivalent)

Materials List

Lockwire (0.32-inch diameter steel)	MS20995F32
Pins, Cotter (1/16-inch diameter steel)	MS24665-134

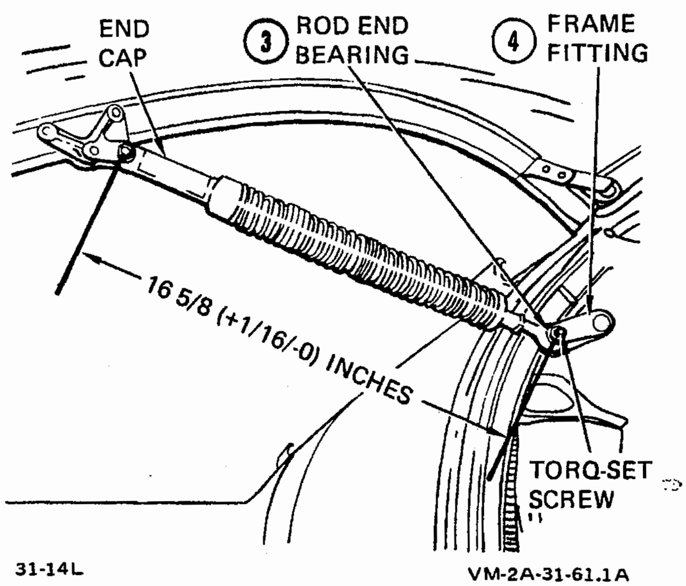
Note

The following procedure may be used to adjust either the pilot's or the observer's canopy access door balance bungee.

1. Open canopy access door. Install hold-open rod if pilot's access door bungee is to be adjusted. Have helper hold open door if observer's access door bungee is to be adjusted.

2. Cut and remove lockwire from rod end bearing check nut. Loosen check nut and screw to neck of rod end bearing. Slide lock washer from shaft.

3. Remove locknut, washer, and Torq-Set screw from rod end and canopy frame fitting. Adjust rod end to provide a dimension of 16-5/8 (+1/16/-0) inches from center or end cap bearing to center of rod end bearing.



Steps 3 and 4—Para. 2-97

4. When properly adjusted, install bungee rod end bearing on canopy frame fitting using Torq-Set screws.

2-98. CAMERA CRADLE AND ACTUATOR MECHANISM REMOVAL AND INSTALLATION. To remove and install the camera cradle and actuator mechanism, proceed as follows:

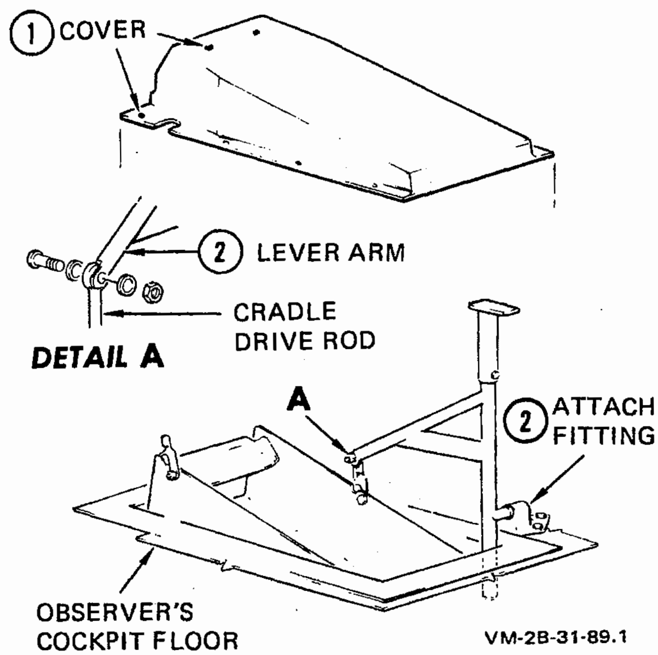
2-99. REMOVING CAMERA CRADLE AND ACTUATOR MECHANISM.

1. If installed, remove camera bay access cover on floor of observer's cockpit by removing bolts from perimeter and screws from top of cover.

Note

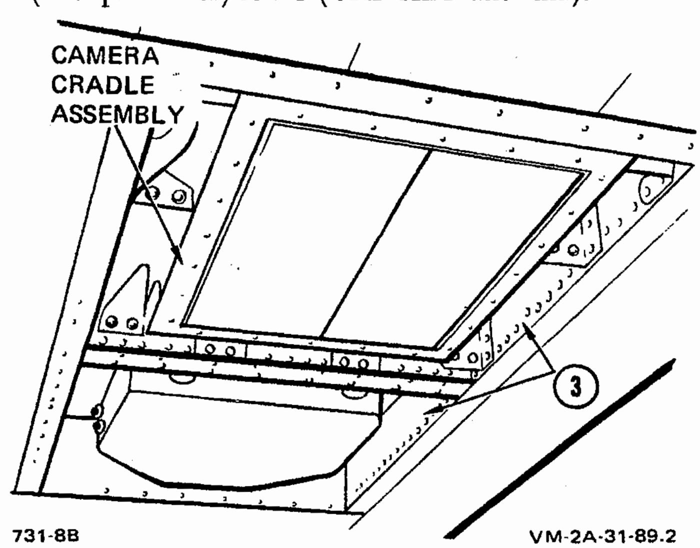
If lever handle is stowed in camera cradle, omit step 2.

2. Remove lever assembly from right side of cradle assembly by disconnecting lever arm from cradle drive rod and removing three bolts securing attach fitting to floor of cockpit.



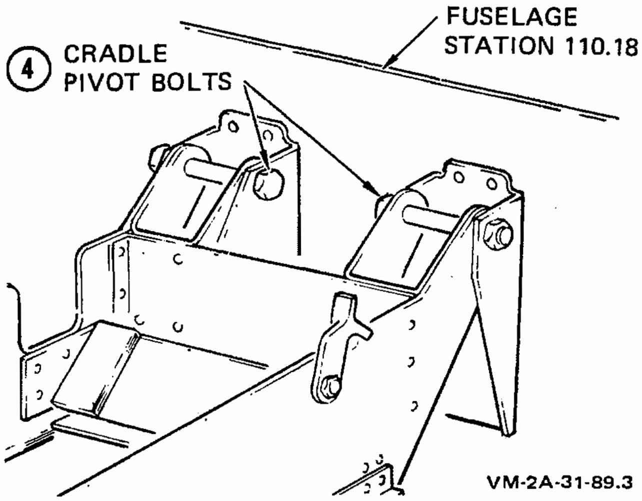
Steps 1 and 2—Para. 2-99

3. Remove lower fuselage access panels 74 (cockpit access) and 5 (UHF-ADF antenna).



Step 3—Para. 2-99

4. Remove cradle pivot bolts installed through channels located at fuselage station 110.18.



Step 4—Para. 2-99

CAUTION

Observe care during this operation to preclude damage to camera cradle window.

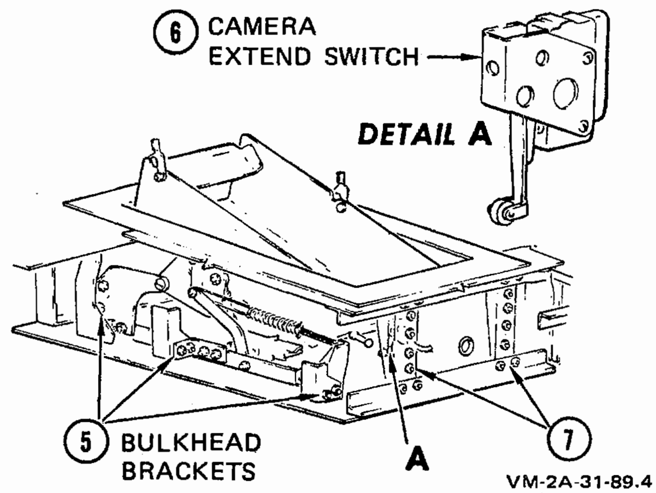
5. Support cradle and actuator mechanism at lower frame. Remove bolts from six bulkhead brackets and cradle frame attach fittings. Lower cradle and actuator mechanism through underside of fuselage.

Note

Perform steps 6 and 7 only when the cradle pivot channels and/or camera extend switch located on the left-hand pivot channel are to be removed.

6. Remove camera extend switch from left-hand pivot channel. Disconnect and stow wiring.

7. Remove pivot channels from bulkhead by removing 16 bolts.



Steps 5, 6, and 7—Para. 2-99

2-100. INSTALLING CAMERA CRADLE AND ACTUATOR MECHANISM.

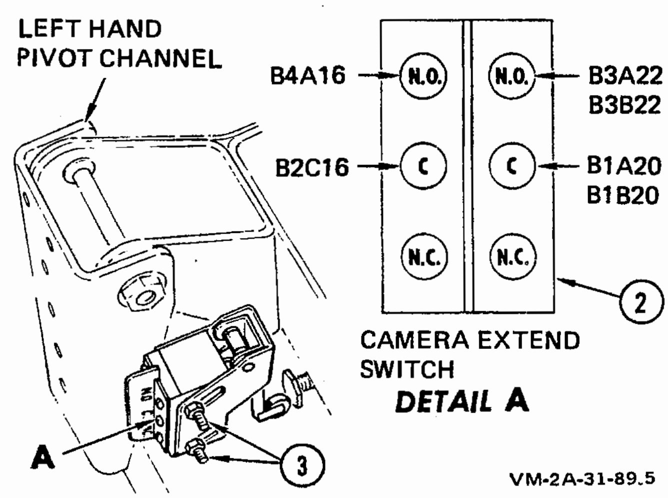
Materials List

Rod (1/2-inch diameter)	Obtain locally

1. Install left- and right-hand pivot channels to bulkhead at fuselage station 110.18 and secure with 16 bolts.

2. Reconnect electrical wiring to camera extend switch.

3. Install camera extend switch on left-hand pivot channel and secure, using two screws.



Steps 2 and 3—Para. 2-100

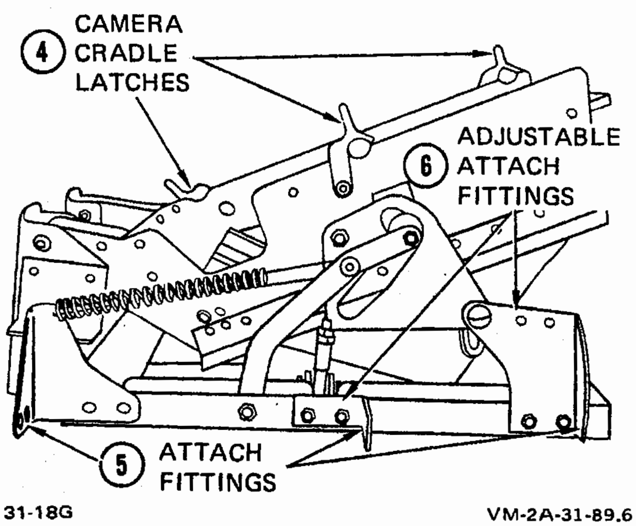
4. Adjust latches to fit firmly over a 1/2-inch diameter rod. (Camera trunnions are 1/2-inch diameter.)

5. Position cradle and actuator mechanism in underside of fuselage camera bay. Install bolts and secure through six lower frame attach fittings and bulkhead brackets.

Note

Attach fitting holes in lower frame are slotted to permit cradle assembly adjustment.

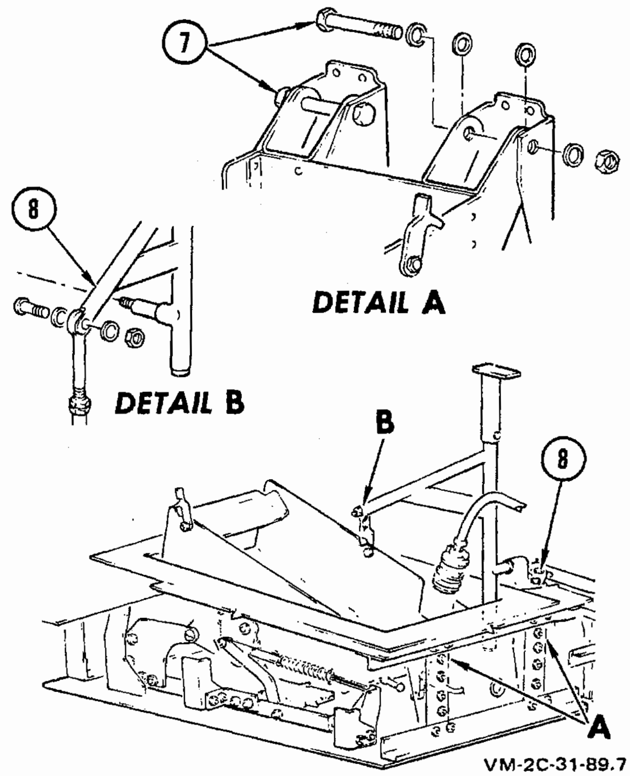
6. Loosen eight bolts securing attach fittings to lower frame. Temporarily place access panel 74 in position on lower frame assembly and adjust so that holes on outside of access panel match fasteners in bulkhead. Remove access panel and tighten attach fittings to frame.



Steps 4, 5, and 6—Para. 2-100

7. Install pivot bolts through cradle hinge fittings and channels. Tighten bolts to eliminate side play. Extend cradle and check for freedom of movement. Loosen pivot bolts in small increments if binding occurs.

8. Install lever assembly attach fitting to floor of cockpit and connect lever arm to cradle drive rod.



Steps 7 and 8—Para. 2-100

9. Rig and adjust camera cradle in accordance with paragraph 2-101.

10. Stow lever handle in cradle assembly (figure 2-3) and install camera bay access cover on floor of observer's cockpit.

11. Install lower fuselage access doors.

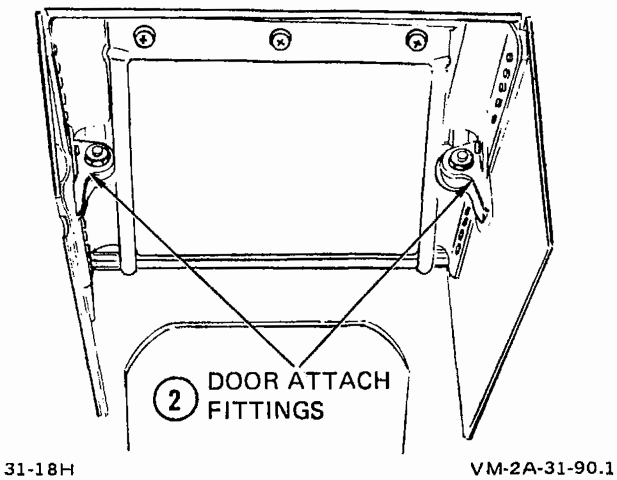
2-101. CAMERA CRADLE AND ACTUATOR MECHANISM RIGGING AND ADJUSTMENT. To rig and adjust the camera cradle and actuator mechanism, proceed as follows:

1. Refer to General Information and Servicing (NAVAIR 01-60GCB-2-1) and remove access panels 74 (cockpit access) and 5 (UHF-ADF antenna).

Note

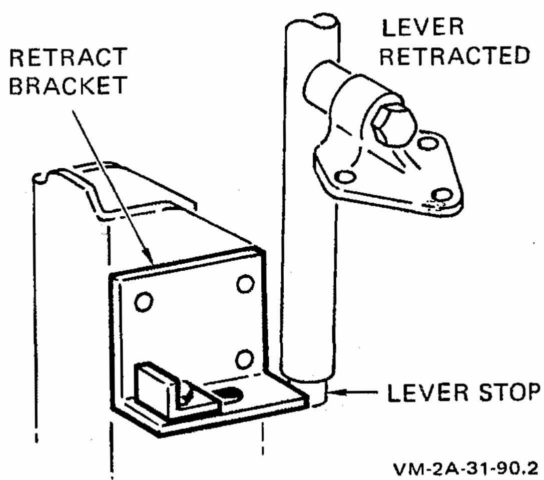
Camera bay access cover must be removed and cradle lever handle installed.

2. Extend and lock camera cradle. Remove drive rods from camera door attach fittings.



Step 2—Para. 2-101

3. Retract cradle and adjust cradle drive rod until lever stop is firmly against forward edge of retract bracket. Tighten jamnut against rod end bearing.

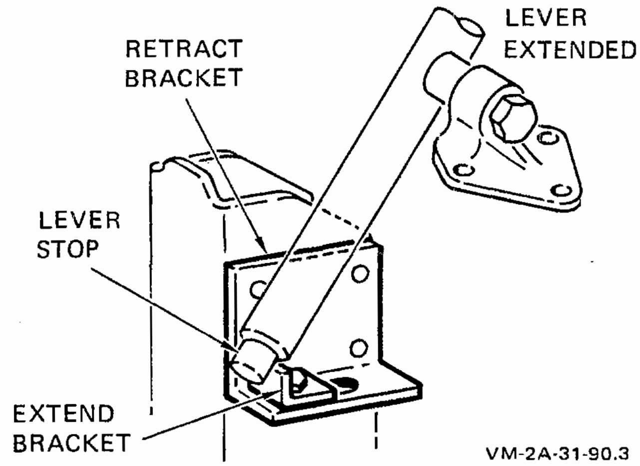


Step 3—Para. 2-101

Note

A force of approximately 10 pounds is required to extend the cradle without the camera installed.

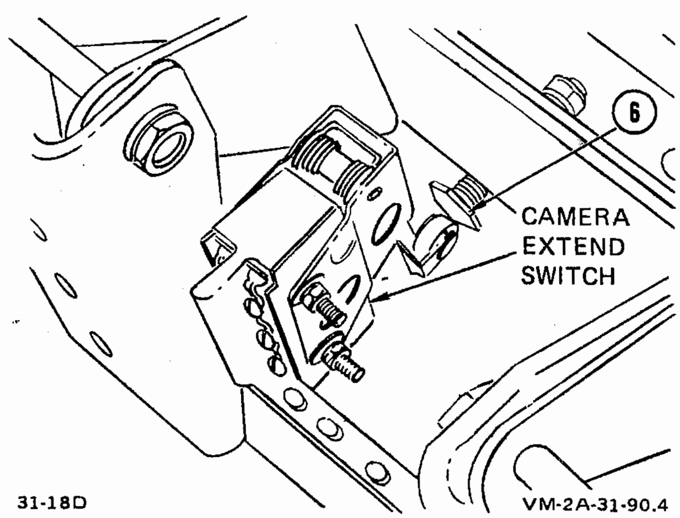
4. Extend cradle and adjust extend bracket until lever stop rests firmly against retract bracket. Tighten bolt fastening extend bracket to retract bracket.



Step 4—Para. 2-101

5. Adjust doors (lengthen or shorten door rod ends) so that left-hand door precedes the right-hand door and both doors fit flush with the lower fuselage skin when the cradle is retracted and locked. Tighten jamnut against rod end.

6. Adjust bolt on aft end of cradle chassis to actuate extend switch when the cradle is in the extended and locked position.



Step 6—Para. 2-101

7. Extend and retract camera cradle assembly and ensure the following:

a. Cradle operates without binding.

b. Camera doors open and close in proper sequence.

c. Doors fit flush with lower fuselage skin.

d. Camera extend switch actuates when cradle is extended.

8. Install lower fuselage access doors.

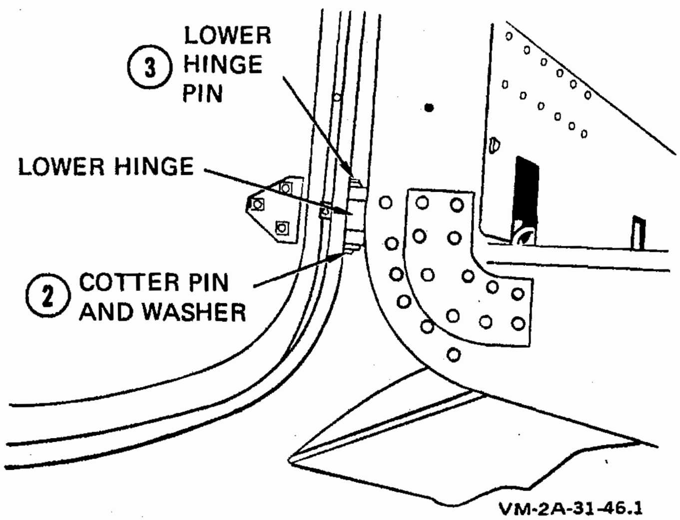
9. If required, stow cradle lever handle in cradle assembly and install camera bay access cover (figure 2-3).

2-102. CARGO BAY ACCESS DOOR REMOVAL AND INSTALLATION. To remove and install the cargo bay access door, proceed as follows:

2-103. REMOVING CARGO BAY ACCESS DOOR.

1. Open door and have helper hold bottom edge and rear of door.

2. Remove cotter pins and washers from upper and lower hinge pins.



Steps 2 and 3—Para. 2-103

3. Remove hinge pins from lower and upper hinges and remove door.

2-104. INSTALLING CARGO BAY ACCESS DOOR.

Materials List

Pins, Cotter (1/16-inch diameter steel)	MS24665-134
Pins, Hinge (1/4-inch diameter steel)	MS20392-3061

1. Align door hinge halves with frame hinge halves and install hinge pins (MS20392-3061).

2. Install washer over end of each hinge pin and safety with cotter pin (MS24665-134).

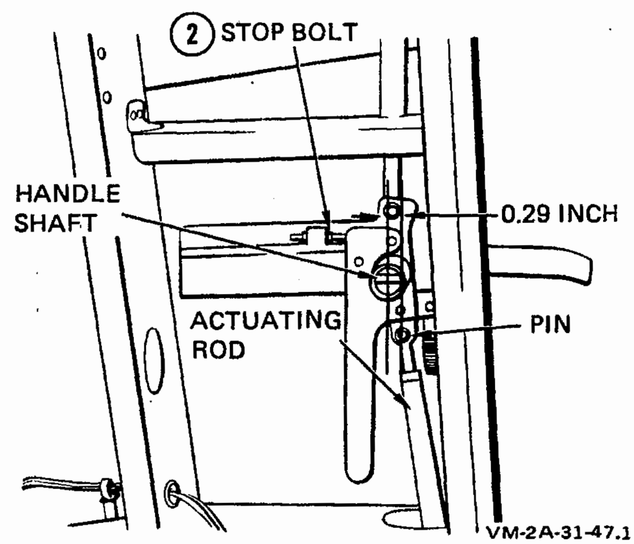
2-105. CARGO BAY ACCESS DOOR LATCH ADJUSTMENT. To adjust the cargo bay access door latch, proceed as follows:

Materials List

Pins, Cotter (1/16-inch diameter steel)	MS24665-134

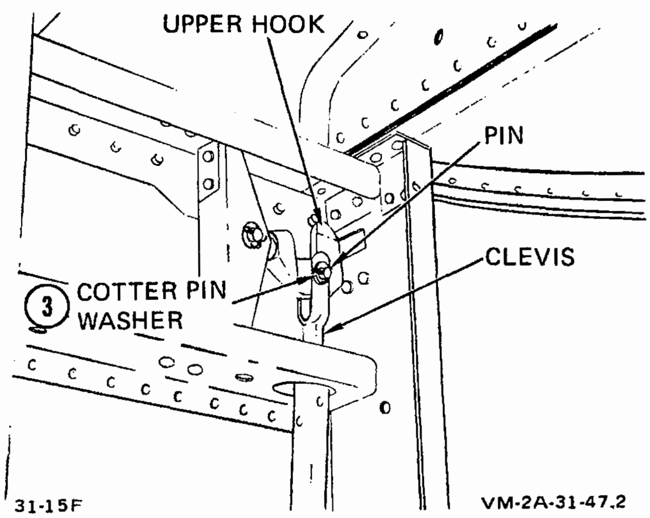
1. Open cargo bay access door and attach hold-open latch to left boom fitting. Raise external door handle to LOCK position. Remove right rear cargo bay wall panel to gain access to cargo door latch installation.

2. Locate internal door handle stop bolt and loosen jamnut. Adjust stop bolt to obtain a 0.29-inch distance between centerline of the handle shaft and centerline of the actuating rod pin. Tighten stop bolt jamnut against bracket.



Step 2—Para. 2-105

3. Locate clevis at end of upper hook actuating rod. Remove cotter pin, washer, and pin from clevis.

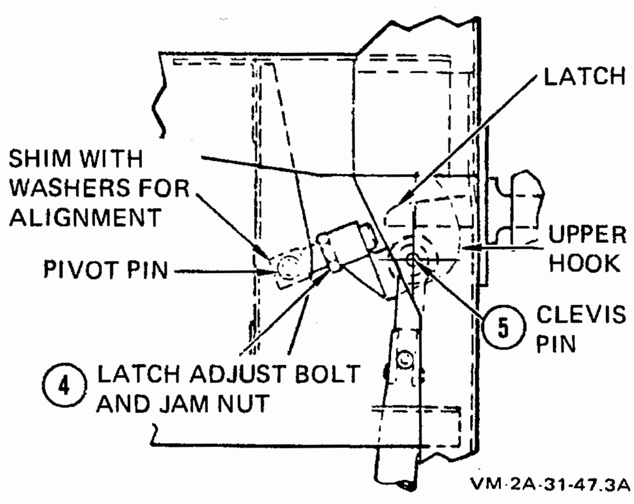


Step 3—Para. 2-105

4. Locate latch hook adjust bolt and loosen jamnut. Simultaneously adjust clevis and hook adjust bolt until hook fits squarely against upper door latch when door is closed and locked.

Note

If necessary, remove hook adjust bolt pivot pin and shim both sides of adjust bolthead so that hook will fit in center of latch. Install washer over end of pivot pin and safety with cotter pin (MS24665-134).



Steps 4 and 5—Para. 2-105

5. Install washer over end of clevis pin and safety with cotter pin (MS24665-134). Tighten jamnut against hook.

6. Repeat steps 3 through 5 to adjust lower latch hook.

2-106. CARGO COMPARTMENT FLOOR REMOVAL AND INSTALLATION. To remove and install the cargo compartment floor, see figure 2-15 and proceed as follows.

2-107. REMOVING CARGO COMPARTMENT FLOOR. Remove panels as follows.

2-108. REMOVING CENTER PANEL.

1. Remove avionics shelf and equipment in forward portion of cargo compartment. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

2. Remove eight Phillips screws (three in each longitudinal "T" and two in rear of floor panel).

3. Slide panel rearward and lift from structure.

2-109. REMOVING SIDE PANELS. Remove 13 screws and washers from each side floor panel and remove floor panels.

2-110. INSTALLING CARGO COMPARTMENT FLOOR. Install panels as follows.

2-111. INSTALLING SIDE PANELS. Position side floor panels in aircraft and install 13 screws and washers in each floor panel.

2-112. INSTALLING CENTER PANEL.

1. Position center panel on structure and align screw holes.

2. Install eight Phillips screws (three in each longitudinal "T" and two in rear of floor panel).

3. Install avionics shelf and equipment in cargo compartment. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

2-113. WING COMPONENTS.

2-114. The following paragraphs contain the information and instructions necessary to remove, install,

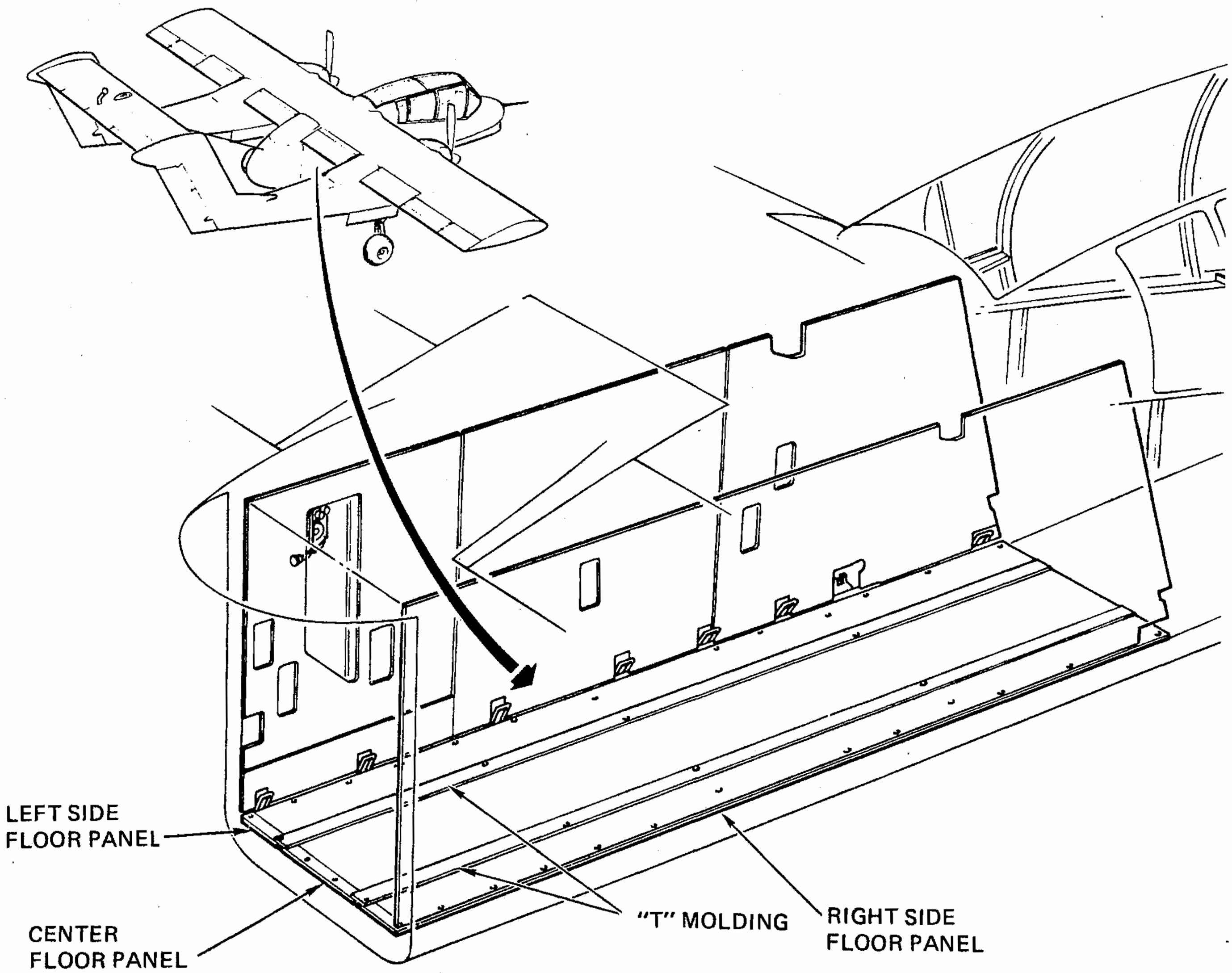


Figure 2-15. Cargo Compartment Floor

and, in some cases to adjust, wing components at the organizational maintenance level.

2-115. AILERON REMOVAL AND INSTALLATION. Refer to Flight Control Systems, Chapter 3, to remove and to install the ailerons.

2-116. SPOILER PLATE REMOVAL AND INSTALLATION. Refer to Flight Control Systems, Chapter 3, to remove and to install the spoilers.

2-117. FLAP REMOVAL AND INSTALLATION. Refer to Flight Control Systems, Chapter 3, to remove and install the flaps.

2-118. NACELLE/BOOM ASSEMBLY COMPONENTS.

2-119. The following paragraphs contain the information and instructions necessary to remove and install nacelle/boom assembly components.

2-120. BOOM REMOVAL AND INSTALLATION. To remove and install a boom from the nacelle/boom assembly, proceed as follows:

Note

A field break is incorporated on each boom at canted fuselage station 256.0. Structurally, the left- and right-hand booms are identical and require very little preparation for interchanging. On aircraft 155390 through 155411, the shims are bonded to the aft side of the nacelle bulkhead at fuselage station 256.0. On aircraft 155412 and subsequent, the shims are riveted to the nacelle bulkhead. Any boom can be mated with any nacelle configuration.

Tools and Equipment List

Torque Wrench, Type I Class 1 (0-600 inch-pounds)	GGG-W-686, Type I, No. 9 (or equivalent)

2-121. REMOVING BOOM FROM NACELLE.

Note

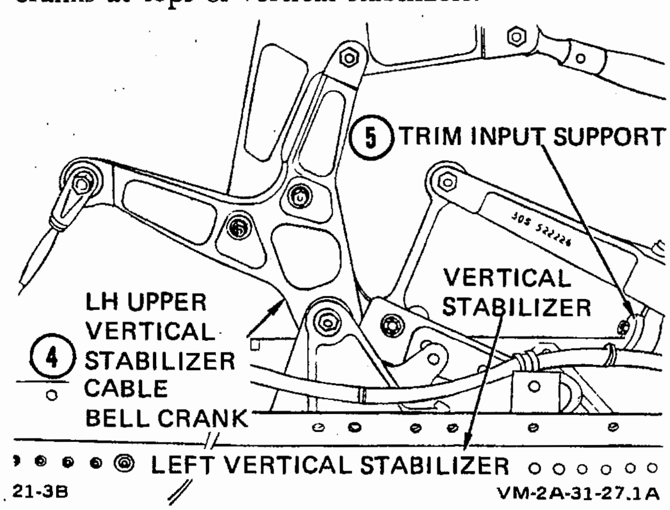
Identify all components as they are removed.

1. Chock the wheels.

2. Remove vertical stabilizer tip assembly. Refer to paragraph 2-130.

3. Remove horizontal stabilizer assembly. Refer to paragraph 2-127.

4. Remove upper vertical stabilizer cable bell cranks at tops of vertical stabilizers.



Steps 4 and 5—Para. 2-121

5. If the left-hand boom is being changed, remove the elevator trim actuator trim input support (just aft of the cable attach bell crank) on top of the left vertical stabilizer.

6. Remove the electronics bay closeout curtain in wheel well by removing Phillips screws at top of curtain.

7. Remove all antennas and other electrical and electronic components in the boom. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

8. Disconnect all electrical wiring bundles and antenna coaxial cables and pull forward for storage in nacelle area.

Note

In the following step, it will be necessary to remove the lock-clad cables. Each cable should be identified as it is removed.

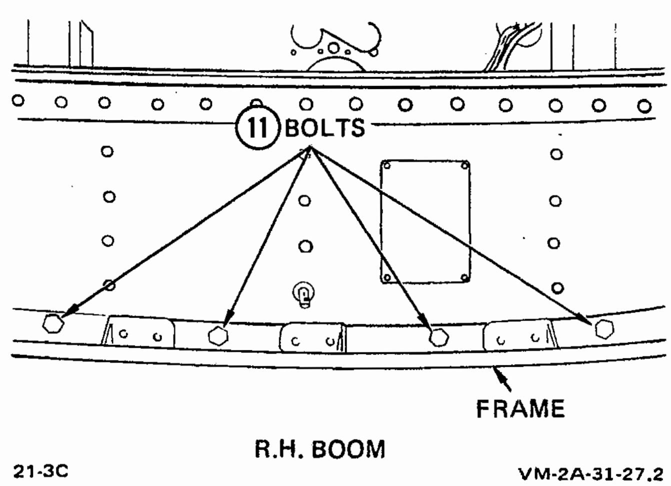
9. Disconnect all flight control cables and pull forward for storage in nacelle area.

Note

The boom assembly with the contents removed weighs approximately 250 pounds. Before proceeding to the following step, supports capable of withstanding 250 pounds each should be provided to accept the boom once it is removed from the nacelle.

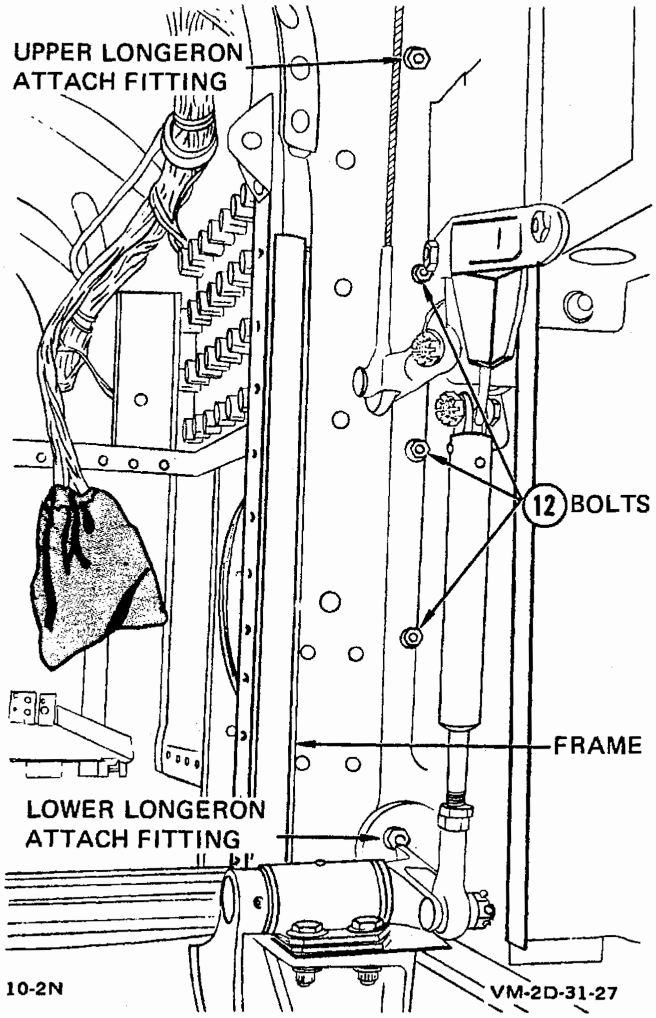
10. Position suitable supports (with padding) under the boom, just aft of mating frame and under the vertical stabilizer.

11. Remove the four bolts on lower portion of frame.



Step 11—Para. 2-121

12. Remove the three bolts on each side of the frame between the upper and lower longeron attach fittings.



Step 12—Para. 2-121

13. Gain access to the 15 bolts in the upper frame through the electronics bay and remove these bolts.

14. Remove the two nuts (one each side) on the upper longeron attach fitting by gaining access through the electronics bay.

15. Remove the 14 bolts (seven on each side) on the angle around the periphery to the electronics bay access.

Note

In the following step, it will be necessary to have two helpers raise the boom slightly at the vertical stabilizer to prevent binding on the bolts. Another helper should be present at a forward position of the boom assembly as the final bolts are removed to help move the boom back.

16. Remove the remaining 10 bolts at the longeron attach fittings.

Note

In the following step, it will be necessary to lay the boom assembly on its side with the vertical stabilizer properly supported.

17. Slide the boom back and rest it on the supports.

2-122. INSTALLING BOOM ON NACELLE.

Materials List

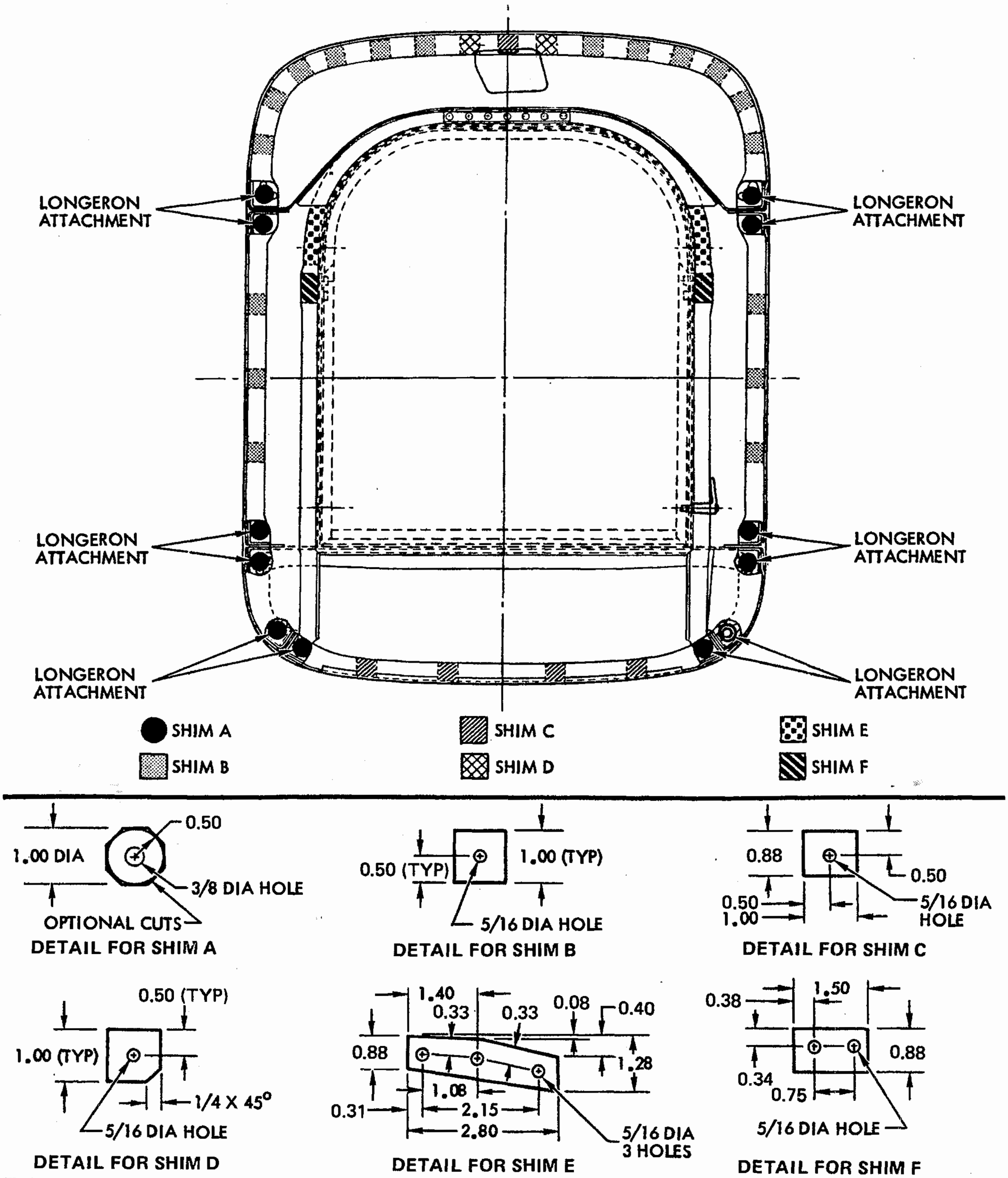
Aluminum Alloy Sheet	2024-T3
Compound, Sealing	MIL-S-8802
Methyl-ethyl-ketone	TT-M-261
Naphtha	TT-N-95
Solvent, Trichloroethane	O-T-620

CAUTION

Chlorinated solvents such as trichloroethylene, O-T-634; trichloroethane, O-T-620; and trichlorotrifluoroethane (freon 113), MIL-C-81302, may be hydrolyzed in contact with free water and form highly corrosive acids. Free water is often found in hydraulic systems, therefore the use of chlorinated solvents should be restricted to external surfaces of hydraulic systems. Chlorinated solvents may be applied to internal surfaces of disassembled hydraulic components for cleaning purposes provided none of the liquid solvent is allowed to remain in the component after cleaning.

Note

Any OV-10A boom assembly can be installed on any nacelle assembly. Aircraft 155390 through 155411 incorporate shims bonded onto the nacelle frame at canted fuselage station 256.0. Aircraft 155412 and subsequent utilize permanently riveted shims at this nacelle frame. If the bonded shims are lost or damaged, new shims must be constructed from standard gages of 2024-T3 aluminum alloy sheet. See figure **2-16** for shim construction procedures and bonding instructions. See figure **2-17** for bolt locations.

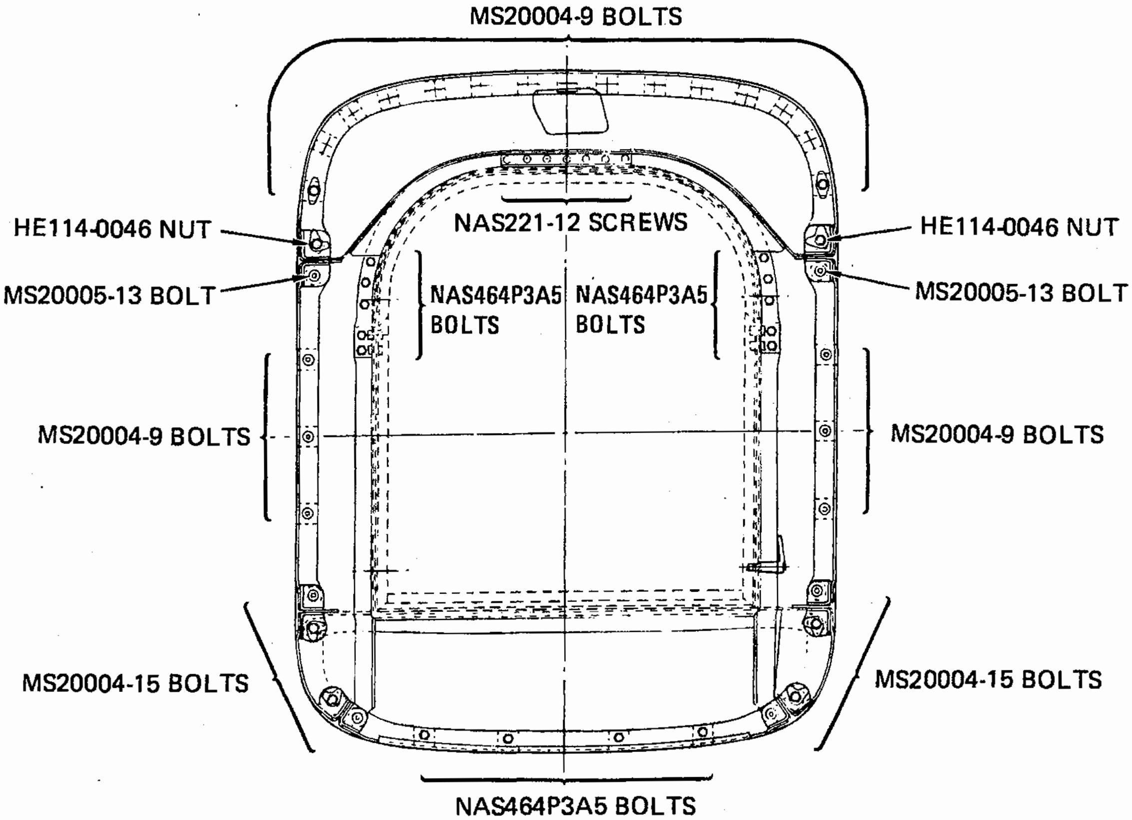


SHIM A 0.063 X 1.00 X 1.00
SHIM E 0.063 X 2.80 X 1.29
SHIM F 0.063 X 1.50 X 0.88
SHIM MAT'L 2024-T3 CLAD AL ALY SHT

MAKE SHIMS B, C AND D FROM 2024-T3 CLAD AL ALY SHT TO CONFIGURATIONS SHOWN AND OF MAT'L GAGE 0.040, 0.063, 0.080 OR 0.100

PVM-2H-31-27

Figure 2-16. Shim Arrangement and Installation on Nacelle Frame at Fuselage Station 256.0 - Aircraft 155390 through 155411



BOOM MATING FASTENER TORQUE TABLE

FASTENER PART NO.	TYPE OF HEAD	NO. REQUIRED	TORQUE RANGE
MS20005-13	INTERNAL WRENCHING	2	215-235 INCH-POUNDS
MS20004-9	INTERNAL WRENCHING	21	90-110 INCH-POUNDS
MS20004-15	INTERNAL WRENCHING	8	90-110 INCH-POUNDS
NAS464P3A5	HEX HEAD	18	50-70 INCH-POUNDS

NOTE A NAS625-14 "captured" bolt is installed in each upper hole of the upper right and left longerons. The bolt head is in a "blind" area of the nacelle. Torque the two self-locking external wrenching nuts to 100-140 inch-pounds.

PVM-2L-31-28

Figure 2-17. Fastener Locations for Installing Boom to Nacelle

1. On aircraft 155390 through 155411, prepare nacelle frame as follows:

WARNING

Naphtha (TT-N-95) and methyl-ethyl-ketone (TT-M-261) are poisonous, flammable, and volatile liquids. They should only be used with adequate ventilation. Avoid prolonged breathing of vapors. Avoid skin contact whenever possible.

a. Clean both the nacelle and boom frame mating surfaces with methyl-ethyl-ketone (TT-M-261) or naphtha (TT-N-95). Paint removal is not necessary unless the primer is loose.

b. Check condition of shims and their attachment to the nacelle at the longeron attachment points. If existing nacelle does not have any shims or longeron attachment shims are lost, see figure 2-16 for list of materials and dimensions necessary to fabricate new shims.

c. Mate the boom to the nacelle assembly with proper shims installed at longeron points. Install proper bolts and longeron attachment points and torque. See figure 2-17 for bolt locations and torquing instructions.

d. With shims at nacelle longeron bolting points and longeron bolt torqued, measure gaps at 25 intermediate bolting points (bolt holes other than longeron attachment fittings), using a feeler gage. Record each gap and its hole location.

e. Remove longeron bolts and slide boom away from nacelle.

f. Construct shim Type B, C, and D of sufficient thickness to reduce gap at each bolt hole to 0.015 inch or less. See figure 2-16 for shim construction dimensions.

g. Clean area around nacelle frame bolt holes with naphtha (TT-N-95) and dry with cloth.

h. Mix sealant (MIL-S-8802) in accordance with directions on container.

i. Apply a thin coat of sealant (MIL-S-8802) to both shim mating surface and nacelle mating surface.

j. Place shim on nacelle, align bolt holes, and clamp each shim until sealant has cured.

Note

Cure time of sealant at room temperature (77° F) is 24 hours, while at 140° F, it is only 2 hours. Heat lamps may be used to reduce cure time.

k. Clean off excess cured sealant.

2. Using a stiff-bristled brush and trichloroethane solvent (O-T-620), clean both nacelle and boom mating surfaces. Paint removal is not required.

3. Mate the boom to nacelle and install all bolts at proper location. See figure 2-17 for fastener locations.

4. Torque all bolts in criss-cross order. See figure 2-17 for torque values.

5. Check that external skin gap is no less than 0.03 inch. If required, file edge of skin.

6. Clean all joggles, slots, cutouts, holes, and skin gaps with naphtha (TT-N-95) and seal with MIL-S-8802 sealant.

7. Install cable attach bell crank at top of vertical stabilizer.

8. If left boom has been replaced, install elevator trim actuator trim input support (aft of cable attach bell crank) on top of vertical stabilizer.

9. Install horizontal stabilizer assembly. Refer to paragraph 2-127.

10. Install flight control cables.

11. Refer to Chapter 3 and rig the longitudinal and directional flight control systems.

12. Install all avionics and electrical equipment. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

13. Install electrical wire bundles. Refer to Wiring Data Manual (NAVAIR 01-60GCB-2-7).

14. Install vertical stabilizer tip assembly. Refer to paragraph 2-130.

15. Install electronics bay closeout curtain. See figure 2-17 for fastener locations.

16. Perform an operational check of all affected avionics and electrical components. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

17. Refer to Chapter 3, and perform an operational check of the longitudinal and directional flight control systems.

2-123. EMPENNAGE COMPONENTS.

2-124. The following paragraphs contain the information and instructions necessary to remove, install, and in some cases, to adjust empennage components at the organizational maintenance level.

2-125. ELEVATOR REMOVAL AND INSTALLATION. Refer to Chapter 3 for information and instructions to remove and install the elevator.

2-126. RUDDER REMOVAL AND INSTALLATION. Refer to Chapter 3 for information and instructions to remove and install one or both rudders.

2-127. HORIZONTAL STABILIZER REMOVAL AND INSTALLATION. To remove and install the horizontal stabilizer assembly it will be necessary to fabricate the torque wrench adapter shown in figure 2-19. As an aid to more easily install and prevent damage to the horizontal stabilizer attach bolts, the attach bolt installation tools in figure 2-20 should be manufactured. To remove and install the horizontal stabilizer, proceed as follows:

2-128. REMOVING HORIZONTAL STABILIZER.

Tools and Equipment List

Adapter Bundle, Jacking and Mooring	E13710
Bundle, Rig Pin	T3382
Platform, Aircraft Maintenance (Type B-1)	MIL-M-577 (81349)
Trailer—Loading (Type MJ-3)	3DIJ-7, Model 2000
Wrench, Torque (0-200 inch-pounds)	GGG-W-686, No. 6 (or equivalent)

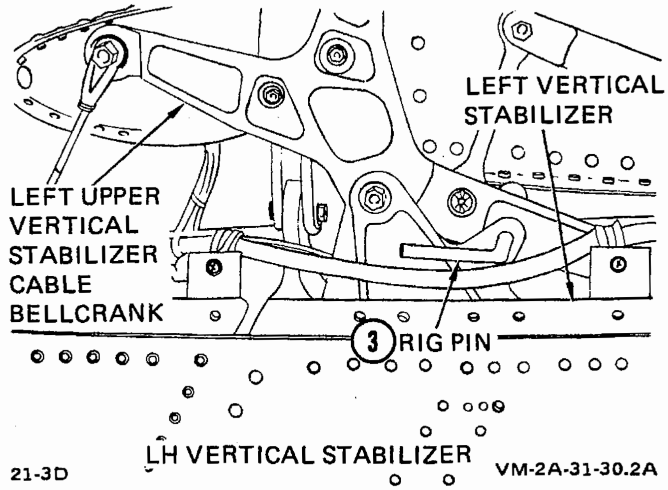
1. Place a maintenance platform (Type B-1 or equivalent) at outside of each vertical stabilizer to gain access to the horizontal stabilizer attach points.

Note

An alternate method for gaining access to the horizontal stabilizer, when aircraft maintenance platforms are not available, is contained in General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

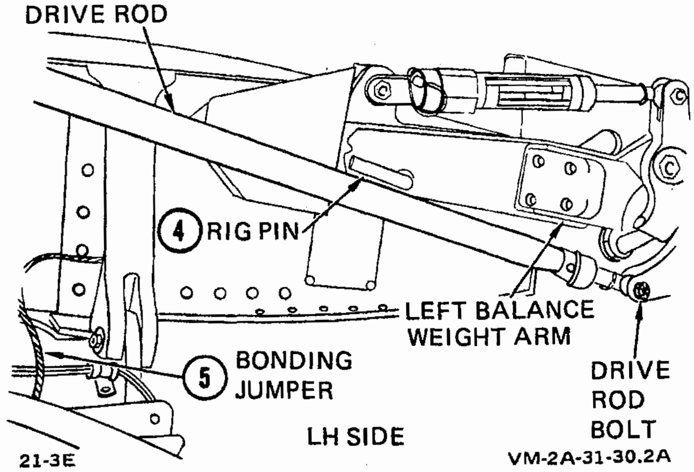
2. Remove the HF-SSB wire antenna from horizontal stabilizer. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5). Refer to paragraph 2-130 and remove both vertical stabilizer tip assemblies.

3. Install rig pins (-7, rig pin bundle, T3382) in left- and right-hand upper cable bell cranks.



Step 3—Para. 2-128

4. Install a rig pin (-9, rig pin bundle, T3382) in balance weight arm on left and right side of horizontal stabilizer and remove spring tab drive rod bolts on both sides.



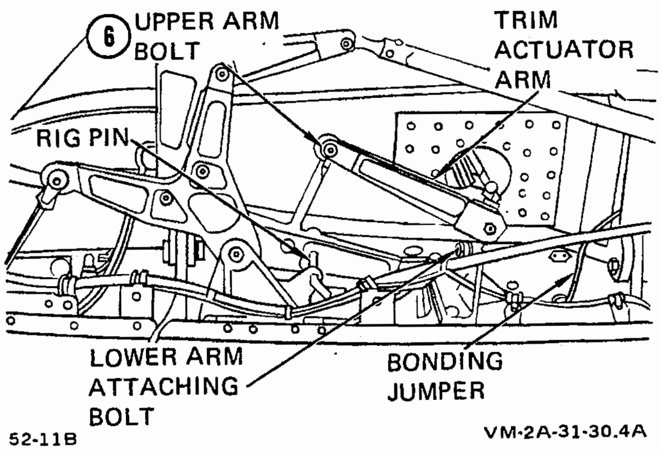
Steps 4 and 5—Para. 2-128

5. Disconnect bonding jumper on left and right side of horizontal stabilizer.

Note

The horizontal stabilizer assembly weighs approximately 230 pounds and can be readily removed by four men.

6. Remove upper and lower trim actuator arm bolts on the left side of horizontal stabilizer.

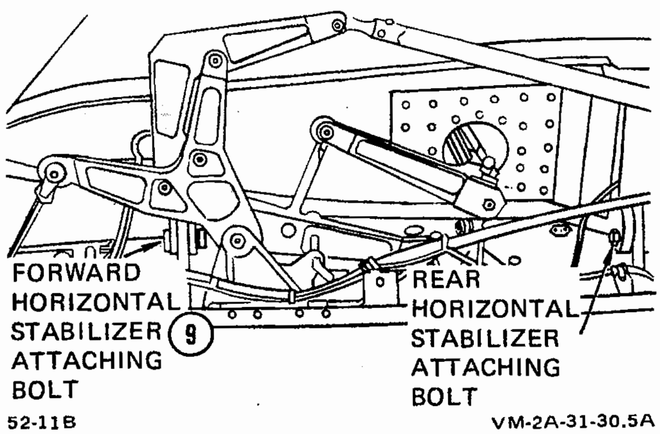


Step 6—Para. 2-128

7. Disconnect electrical wiring at most convenient point. Refer to Wiring Data Manual (NAVAIR 01-60GCB-2-7).

8. Station two helpers at the leading edge of the horizontal stabilizer and two helpers at the trailing edge of the assembly to support and remove it as the four supporting bolts are removed.

9. Remove cotter pin, nut, and washer from all four horizontal stabilizer attach bolts. See figures 2-18 and 2-20. If available, thread respective tools on corresponding bolts until snug. Press or tap on each bolt until free.



Step 9—Para. 2-128

10. Lift the horizontal stabilizer assembly up and off of vertical stabilizers and lay on flat padded surface.

2-129. INSTALLING HORIZONTAL STABILIZER.

Materials List

Lubricant, solid film (non-graphite) (aerosol can)	MIL-L-46147
Pins, Cotter (1/16-inch diameter steel)	MS24665-134

Materials List (Cont)

Pins, Cotter (3/32-inch diameter steel)	MS24665-285

1. Apply non-graphite solid film lubricant, Specification MIL-L-46147 by aerosol spray can to mating surfaces of horizontal stabilizer-to-vertical stabilizer attach fittings. Mask holes so as not to deposit lubricant in bushings. Air dry minimum of six hours. Lightly buff surfaces of lubricant with a soft rag.

2. Position horizontal stabilizer assembly on top of vertical stabilizers and align horizontal stabilizer mounting brackets with vertical stabilizer fittings.

Note

In the following step, the longest attach bolts are to be installed through the forward stabilizer mounting fittings. The shortest attach bolts are to be installed through the rear mounting fittings.

3. See figures 2-18 and 2-20. If available, thread respective tools on corresponding bolts. Lightly snug up each tool against the bushing segments. Install each bolt through each mounting fitting.

4. See figure 2-19 for instructions to manufacture special tool necessary to torque horizontal stabilizer forward attach bolts. Attach special tool to torque wrench (GGG-W-686, No. 6) in line with wrench. Torque forward attach bolts 100 to 145 inch-pounds (reading on wrench). Remove special tool and torque rear attach bolts 70 to 90 inch-pounds. Safety all four attach bolts with cotter pins (MS24665-285).

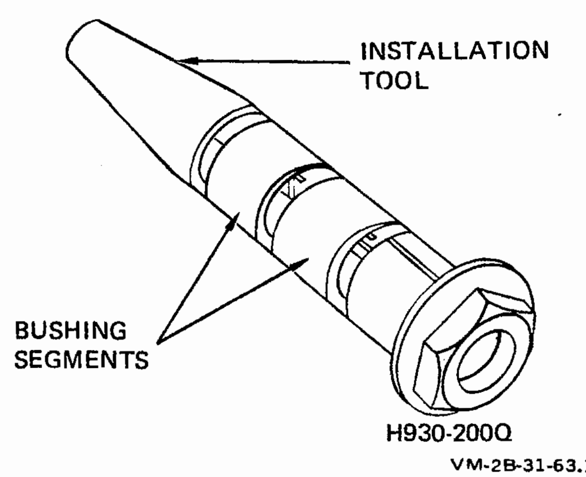


Figure 2-18. Installation Tool Installed on Horizontal Stabilizer Attach Bolt

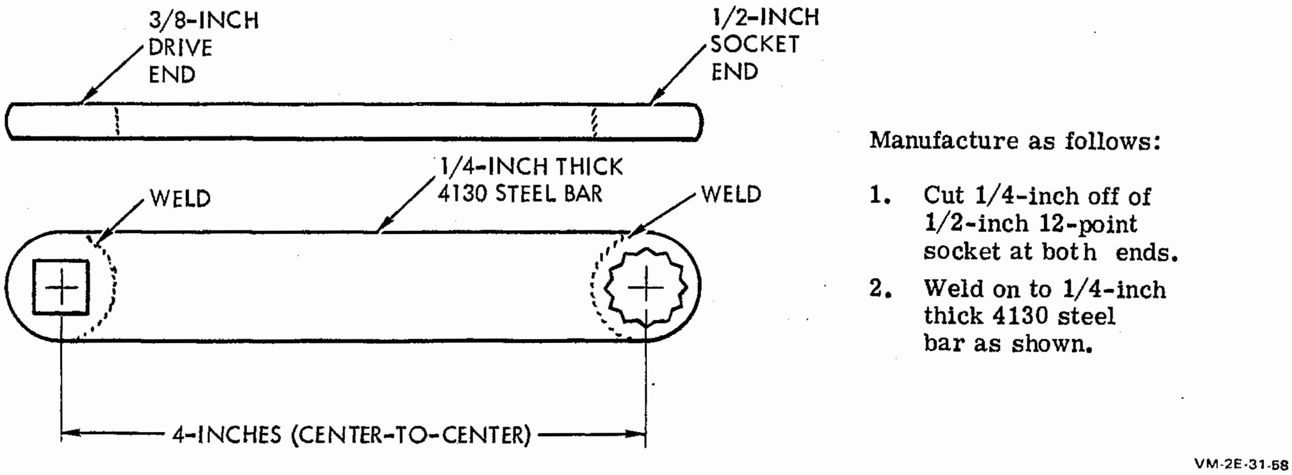
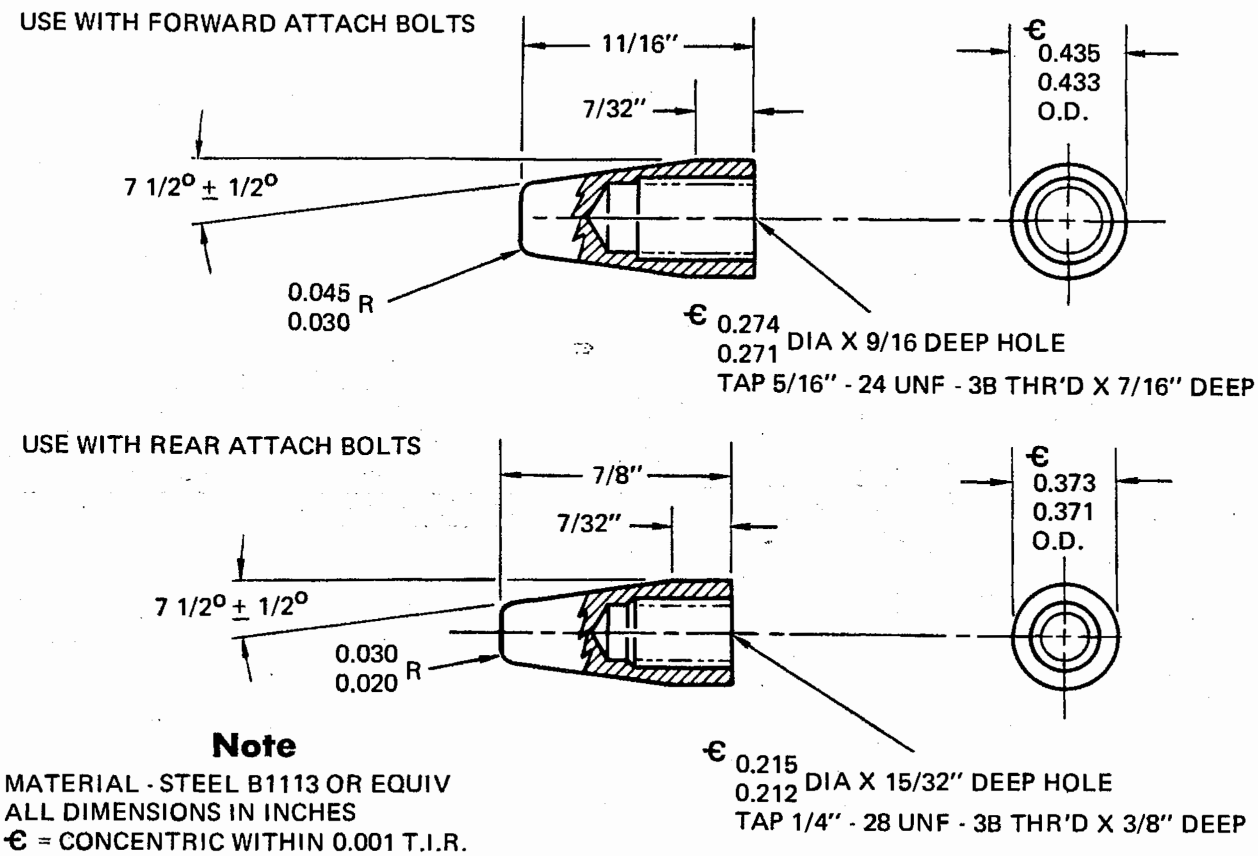


Figure 2-19. Torque Wrench Adapter Fabrication



Note

1 MATERIAL - STEEL B1113 OR EQUIV
2 ALL DIMENSIONS IN INCHES
3 € = CONCENTRIC WITHIN 0.001 T.I.R.
4 MACHINE FINISH 64
5 FRACTIONAL TOLERANCES ± 1/16"
6 REMOVE BURRS & BREAK EDGES 0.005 MAX

VM-2G-31-63.2

Figure 2-20. Manufacture of Horizontal Stabilizer Attach Bolt Installation Tools

5. Install bonding jumpers on left and right sides.

6. Install tab drive rods on left and right side and safety with cotter pins (MS24665-134).

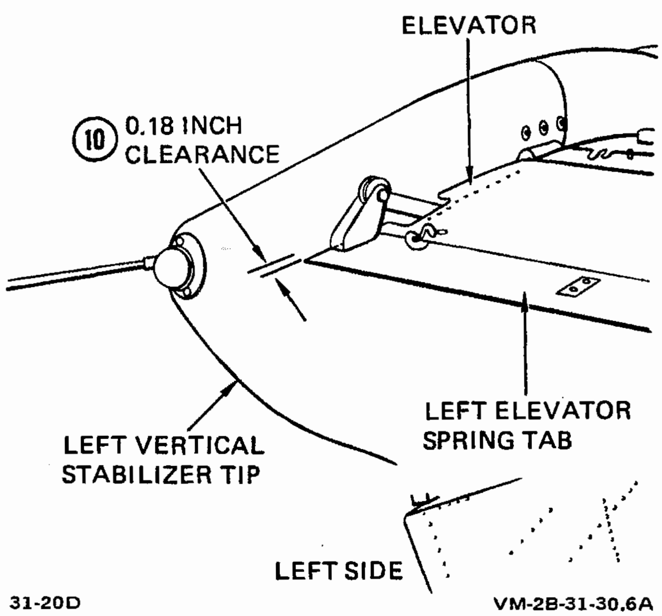
7. Install upper and lower actuator arm bolts on left side of horizontal stabilizer. Safety with cotter pins (MS24665-134).

8. Install electrical wiring. Refer to Wiring Data Manual (NAVAIR 01-60GCB-2-7).

9. Remove all rig pins and check that longitudinal control system is properly rigged. Refer to Chapter 3.

10. Refer to paragraph 2-130 and install the vertical stabilizer tip assemblies.

11. Check that elevator assembly has 0.18-inch clearance through complete range of travel.



Step 11—Para. 2-129

12. Install HF-SSB wire antenna on horizontal stabilizer. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

13. Perform operational check of longitudinal control system. Refer to Chapter 3.

14. Remove maintenance stands and MJ-3 loader.

2-130. VERTICAL STABILIZER TIP ASSEMBLY REMOVAL AND INSTALLATION. A fiberglas tip assembly is installed on the top of each vertical stabilizer. A TACAN antenna, tail light, and static discharger is installed on the left tip assembly and a static discharger is also mounted on the right tip assembly. To remove and install either assembly, proceed as follows:

Tools and Equipment List

Platform, Aircraft Maintenance, Type B-1	MIL-M-5777 (81349) (or equivalent)

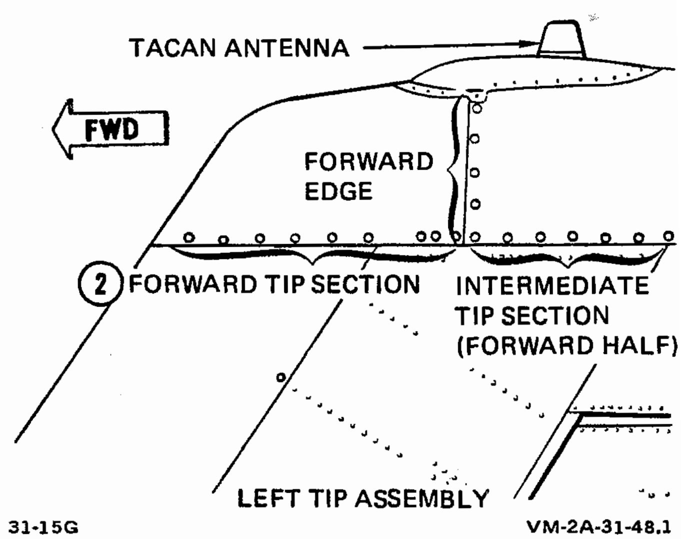
2-131. REMOVING VERTICAL STABILIZER TIP ASSEMBLY.

Note

Removal and installation procedures for right- and left-hand vertical stabilizer tip assemblies are identical except as noted.

1. Position maintenance platform (Type B-1) on outboard side of vertical stabilizer.

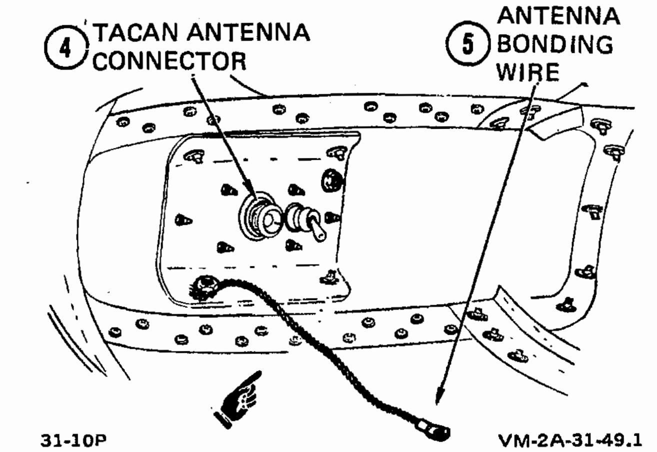
2. Remove fasteners from forward tip section and forward edge of intermediate tip section.



Step 2—Para. 2-131

3. Remove forward tip section by pulling forward and lifting vertically after it has cleared the intermediate tip section.

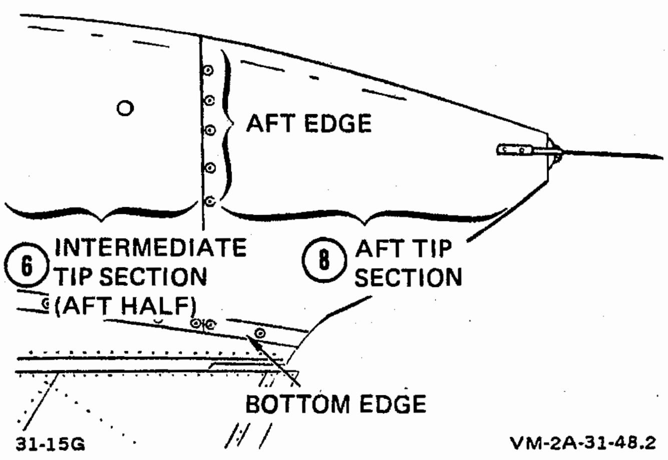
4. Gain access through opening at forward end of vertical stabilizer intermediate tip section, disconnect coaxial cable at coaxial TACAN antenna connector.



Steps 4 and 5—Para. 2-131

5. Remove antenna bonding wire terminal from horizontal stabilizer mounting fixture. (On aircraft having AFC 72 incorporated, the bonding wire is attached to aft end of antenna bracket.)

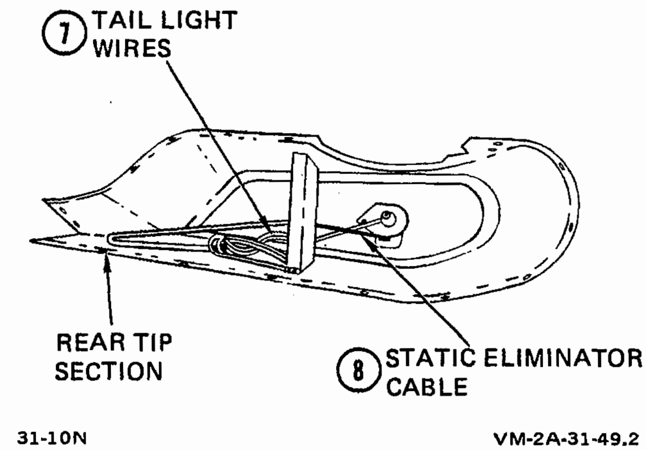
6. Remove fasteners from bottom and aft edges of intermediate tip section and lift section from stabilizer.



Steps 6 and 8—Para. 2-131

7. Disconnect tail light electrical plug from rear of aft tip bulkhead.

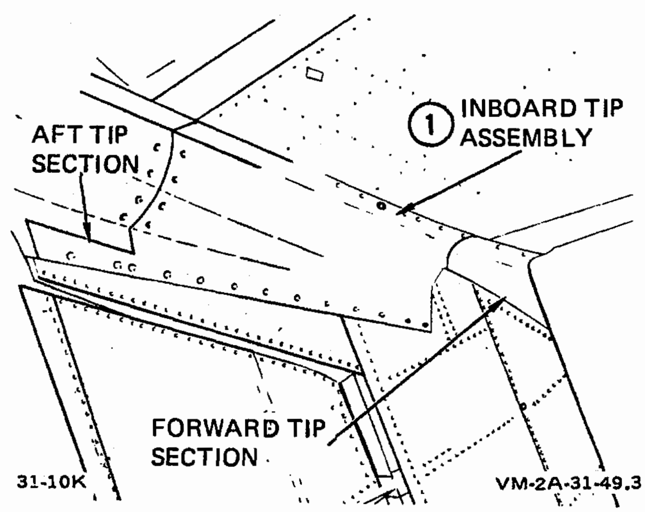
8. Disconnect static eliminator cable. Remove fasteners from aft tip section and remove aft section.



Steps 7 and 8-Para. 2-131

2-132. INSTALLING VERTICAL STABILIZER TIP ASSEMBLY.

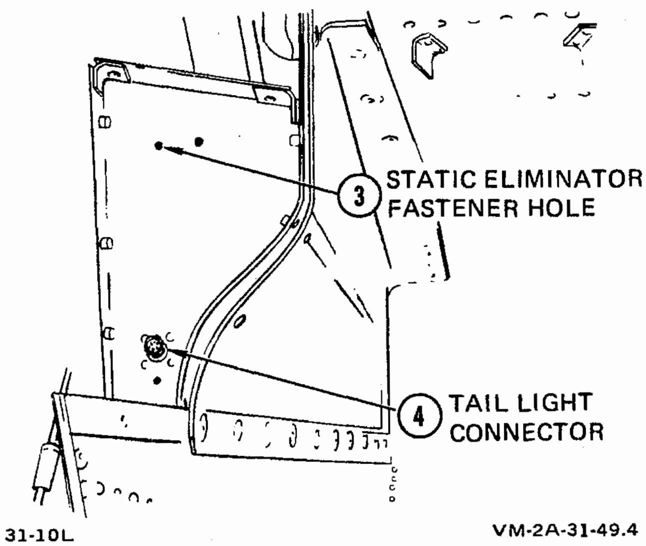
1. If inboard portion of tip section has been removed, position piece below horizontal stabilizer and on inboard side of vertical stabilizer, and install fasteners.



Step 1—Para. 2-132

2. Position rear piece of tip section on structure, and install fasteners.

3. Connect static eliminator cable to structure at fuselage station 448.8.

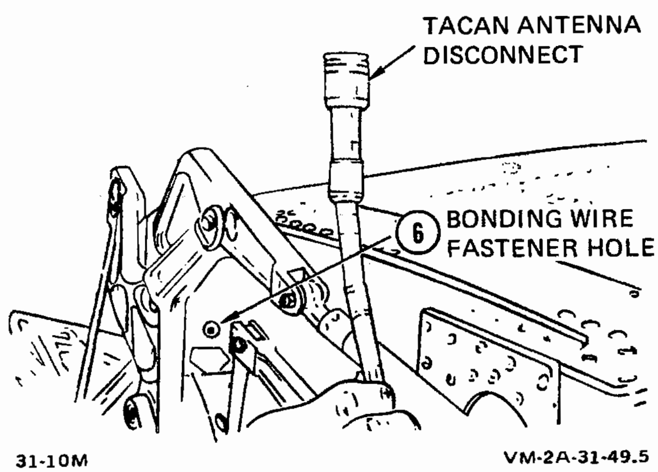


Steps 3 and 4—Para. 2-132

4. On left-hand side, connect tail light at plug.

5. Install intermediate tip section and fasteners at structural attach point and between aft and intermediate tip sections.

6. Install coaxial cable and bonding wire for antenna on left-hand tip assembly.



Step 6—Para. 2-132

7. Install forward tip section with attaching hardware.

2-133. AIRFRAME EQUIPMENT PACKAGES.

2-134. The airframe equipment packages permit the aircraft to be adapted to various types of missions. Conversion equipment package (305-860015) contains items which are common to at least two of the other packages. Most of the items in this package are already installed in the aircraft. Cargo barrier package (305-860012) contains all items necessary to convert the aircraft to a cargo mission and may be installed without removing any of the components from the observer's compartment. To convert the primary mission of the aircraft to carrying litter patients or paratroops, it is necessary to remove observer's seat package (305-860002), observer's equipment package (305-860010), and a portion of armor plate package (305-865016). Once these items have been removed, the aircraft mission configuration can be quickly changed by installing paratroop equipment package (305-860011) or litter equipment package (305-860014).

2-135. ARMOR PLATE PACKAGE REMOVAL AND INSTALLATION. To remove and install the armor plate package (305-865016), see figure 2-21 and proceed as follows:

Tools and Equipment List

Bundle, Rig Pin	T3382

2-136. REMOVING ARMOR PLATE PACKAGE.

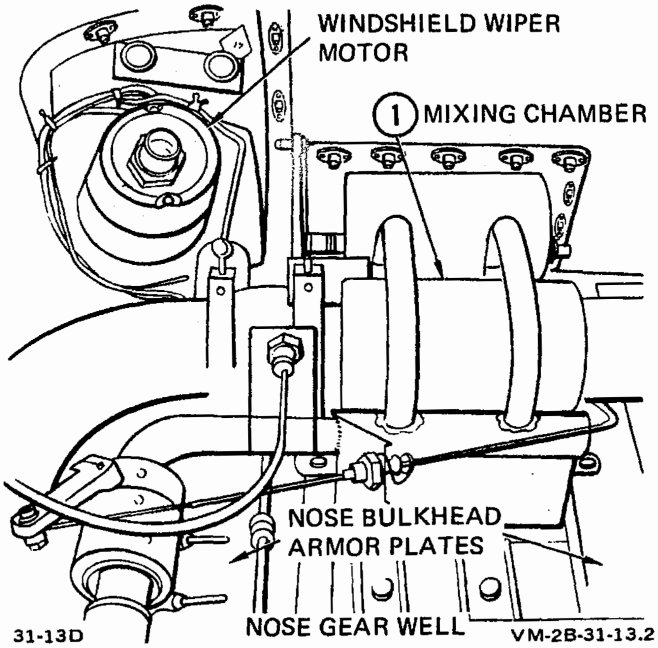
Materials List

Pins, Cotter (1/16-inch diameter steel)	MS24665-134
Pins, Locking (0.028-inch diameter steel)	MS21256-2

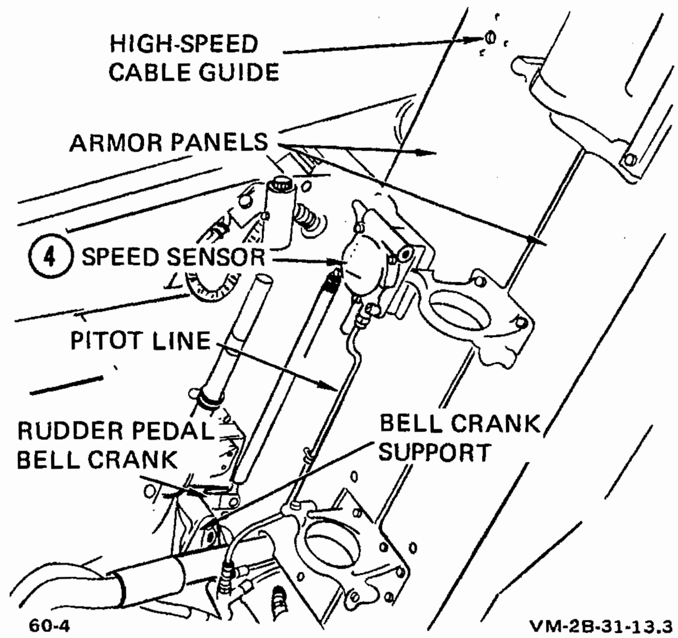
Note

As each armor plate panel is removed in the following steps, take care to keep all Torq-Set screws and washers with their respective panels. Store each panel and attaching hardware together to aid in reinstallation.

1. Refer to Environmental Systems Manual (NAVAIR 01-60GCB-2-3) for information and instructions and remove the heat/vent mixing chamber from nose wheel well.



Step 1—Para. 2-136



Step 5—Para. 2-136

2. Refer to paragraphs 2-65 and 2-68 for information and instructions, and remove pilot's and observer's top canopy glass.

3. Refer to Environmental Systems Manual (NAVAIR 01-60GCB-2-3), for information and instructions, and remove both ejection seats.

4. Remove forward cockpit rudder control cover assembly (AFC No. 60 incorporated). Store retaining screws and washers with the cover assembly.

5. Remove speed sensor and attach pitot line from right armor panel on front seat bulkhead. Remove rudder pedal bell crank and support from bottom of bulkhead. Remove high-speed cable guide and reinstall at alternate (no armor) position on right side of seat support.

Note

Twelve Torq-Set bolts (NAS1134-4) and 12 washers (2W18-416) must be installed in the pilot's seat bulkhead after the two seat armor panels and mounting bolts are removed.

6. Remove both pilot's seat armor panels. Store mounting bolts and washers with respective panels. Install 12 Torq-Set (NAS1134-4) bolts with 12 washers (2W18-416) in pilot's seat bulkhead.

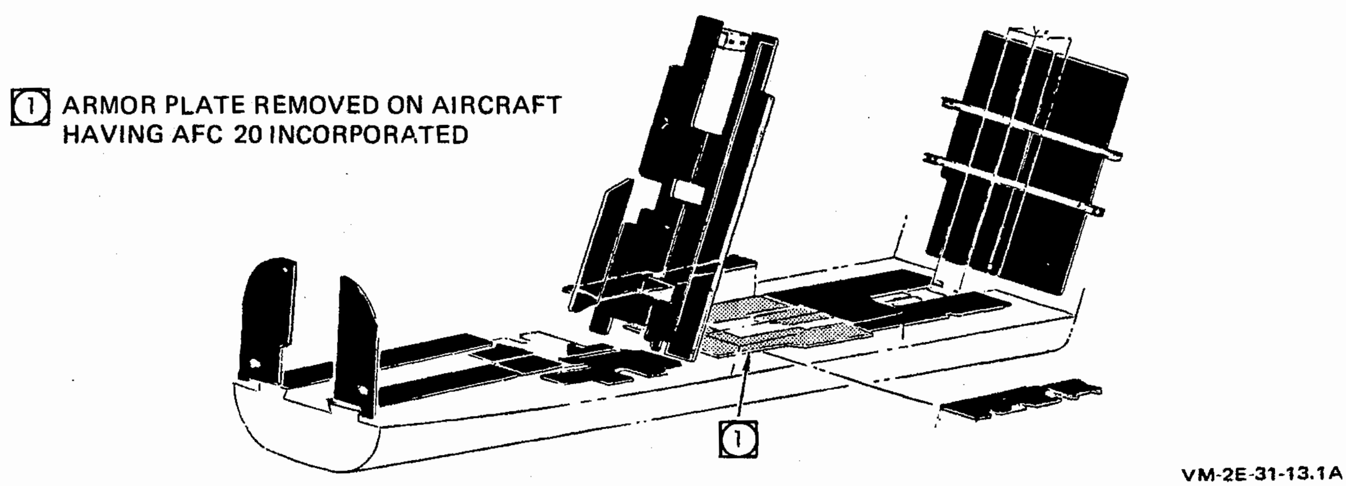
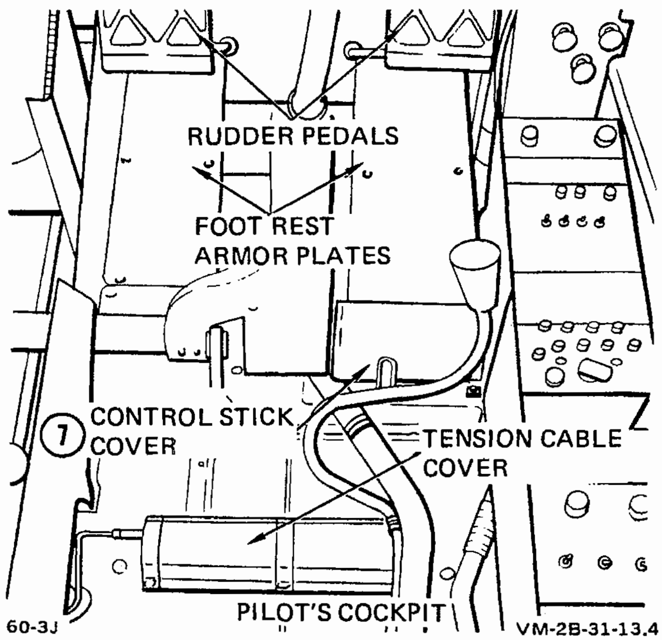


Figure 2-21. Armor Plate Package (305-865015)

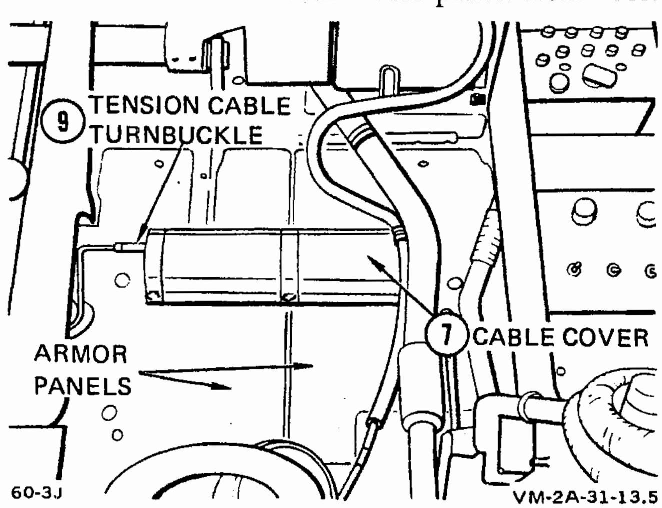
7. Remove control stick cover from base of pilot's stick and tension cable cover mounted on floor aft of stick. Remove foot rest armor panels beneath each rudder panel.



Step 7—Para. 2-136

8. Refer to rigging and adjusting directional control system, Chapter 3, and insert rig pins (rig pin bundle, T3382) in left and right directional control cable sector shafts.

9. Loosen tension cable turnbuckle and remove from cable. Remove both armor panels from floor.



Steps 7 and 9—Para. 2-136

10. Remove anti-G crossover line from rear base of pilot's seat support. Remove fiberglas lateral drive bell crank cover.

11. Tighten tension cable turnbuckle until both rig pins can be easily removed and reinstalled through sector shafts and into floor. Once adjusted, safety with locking clip (MS21256-2). Safety cable retention pins with cotter pins (MS24665-134).

12. Remove rig pins from cable sector shafts and replace access panels. Install fiberglas cover over tension cable. Refer to rigging and adjusting directional control system, Chapter 3 and perform an operational check of the directional control system. Reinstall anti-G crossover line.

13. Remove observer's floor and seat armor panels. Store mounting bolts and washers with respective panels.

14. Reinstall the forward cockpit rudder control cover assembly (AFC No. 60 incorporated). Spacers must be used when the armor plate is not installed. See figure 2-22.

15. Reinstall speed sensor, pitot line, and rudder pedal bell crank and support. Place high-speed cable guide at alternate position on pilot's seat bulkhead.

16. Refer to Environmental Systems Manual (NAVAIR 01-60GCB-2-3) for information and instructions and install heat/vent mixing chamber and ejection seats.

17. Refer to paragraphs 2-65 and 2-68 for instructions and install pilot's and observer's canopy top glass.

2-137. INSTALLING ARMOR PLATE PACKAGE.

Materials List

Adhesive, Rubber Base, General-purpose	MIL-A-5092
Clips, Locking	MS21256-2
Pins, Cotter (1/16-inch diameter steel)	MS24665-134
Washer, Plain, Synthetic Rubber	2W1SR20-20-125
Washer, Plain, Synthetic Rubber	2W1SR16-16-125

Note

Rubber washers (2W1SR20-20-125 or 2W1SR16-16-125), if not already installed, must be attached to each armor plate panel (except nose bulkhead armor) on side facing mounting surface. Washers must be installed around each mounting hole with rubber base adhesive (MIL-A-5092).

Note

Remove heat/air ducts at mixing chamber duct clamps, not at bulkhead.

1. Refer to Environmental Systems Manual (NAVAIR 01-60GCB-2-3) for information and instructions and remove heat/vent mixing chamber from nose wheel well, and both ejection seats from aircraft.

2. Refer to General Information and Servicing (NAVAIR 01-60GCB-2-1) Chapter 2 and remove access panels numbered 4 and 76 (CONTROLS).

3. Remove forward cockpit rudder control cover assembly (AFC No. 60 incorporated). Store retaining screws and washers with the cover assembly.

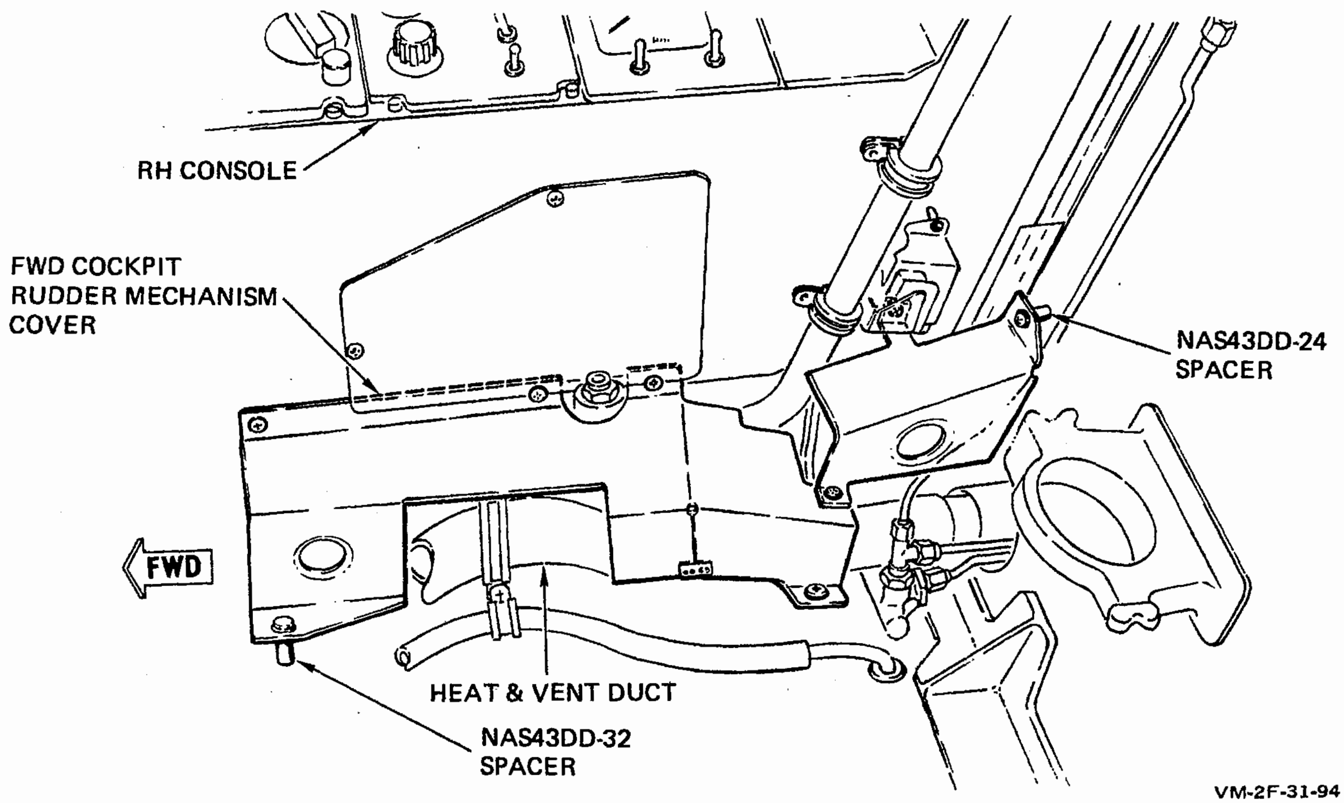


Figure 2-22. Forward Cockpit Rudder Mechanism Guard Installation

4. Remove speed sensor and pitot line, rudder pedal bell crank and support.

5. Remove high-speed cable guide and bracket from pilot's seat bulkhead.

6. Refer to paragraph 3-107 and install rig pins (rig pin bundle, T3382) in left and right directional cable sector shafts.

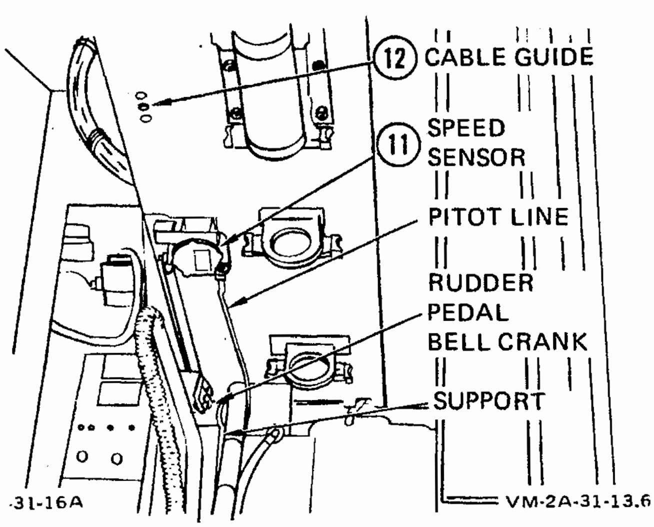
7. Remove anti-G crossover line at rear base of pilot's seat bulkhead, control stick and control cable covers from pilot's cockpit floor. Remove fiberglas lateral drive bell crank cover.

8. Loosen tension cable turnbuckle between directional cable sectors and remove cable.

9. Install left nose bulkhead armor plate panel with three AN4-15A bolts and three AN4-7A bolts with washers. Install right armor plate panel, using same attaching hardware. Tighten bolts.

10. Remove Torq-Set screws from seat bulkhead and install left and right armor panels with Torq-Set screws (7S34-4A7) and washers. Tighten screws.

11. Install armor plate panels under pilot's rudder pedals and over floor of pilot's cockpit. Install speed sensor, pitot line, and rudder pedal bell crank and support to right seat armor panel.



Steps 11 and 12—Para. 2-137

12. Install cable guide over rear of right seat armor panel.

13. Tighten tension cable until both rig pins can be removed from cable sectors. Safety turnbuckle with locking clip (MS21256-2). Reinstall cable cover over cable.

Note

On aircraft having AFC No. 20 incorporated, the armor plate panels located beneath the observer's rudder pedals are removed. See figure 2-21.

14. Install armor panels beneath observer's rudder pedals and on floor of observer's cockpit. Reinstall anti-G crossover line at base of pilot's seat bulkhead. Reinstall fiberglas lateral drive bell crank cover at right outboard end of observer's stick torque tube.

15. Reinstall access panels on lower side of fuselage.

16. Install armor panels to back of observer's seat.

17. Install forward cockpit rudder control cover assembly (AFC No. 60 incorporated). See figure 2-22.

18. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for instructions and install heat/vent mixing chamber in nose wheel well and both ejection seats in aircraft.

19. Refer to paragraphs 2-65 and 2-68 and install pilot's and observer's canopy top glass.

2-138. SPONSON EXTERNAL STORE PACKAGE REMOVAL AND INSTALLATION. To remove and install the sponson external store package (300-860104 or 305-860204), see figure 2-23 and proceed as follows:

Tools and Equipment List

Wrench, Torque (0-1800 inch-pounds)	GGG-W-686, No. 11 (or equivalent)

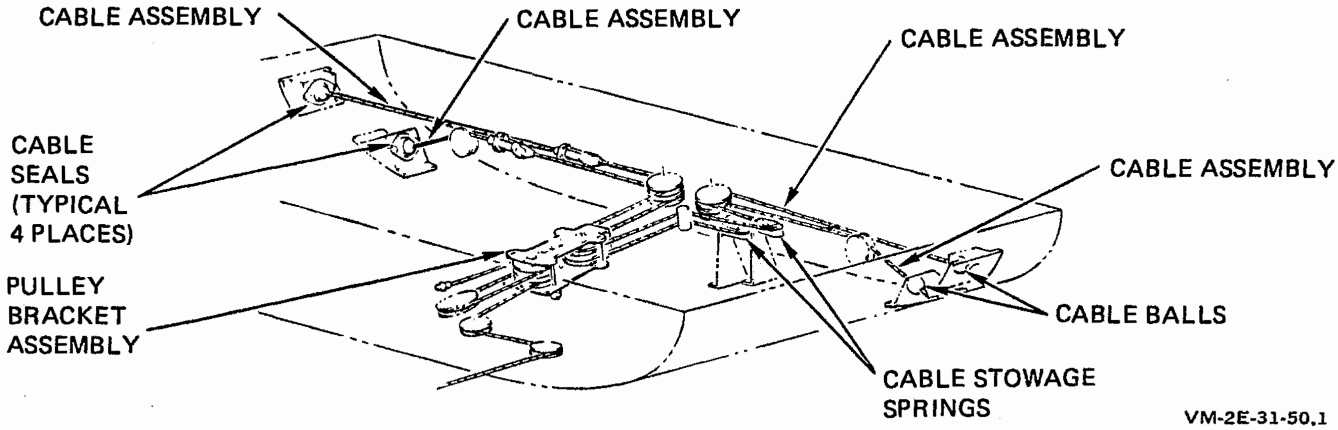


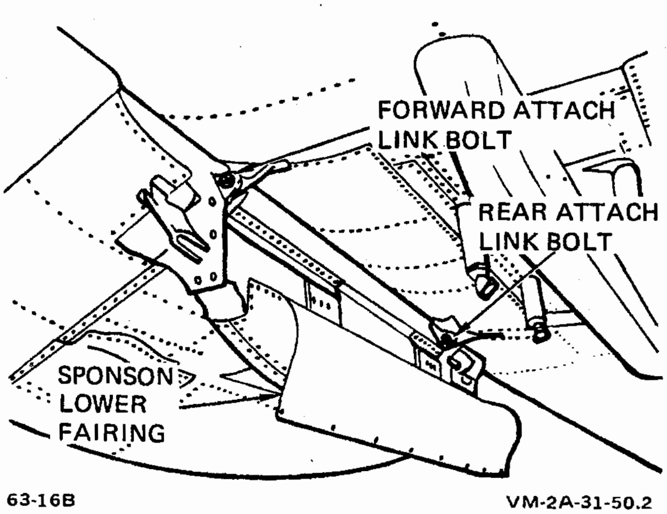
Figure 2-23. Emergency Jettison Release Cables Arrangement

Note

The following procedure can be used to remove and install either left or right sponson. Remove armament from sponson. Refer to Armament Systems Manual (NAVAIR 01-60GCB-2-6) for instructions to remove armament from sponsons.

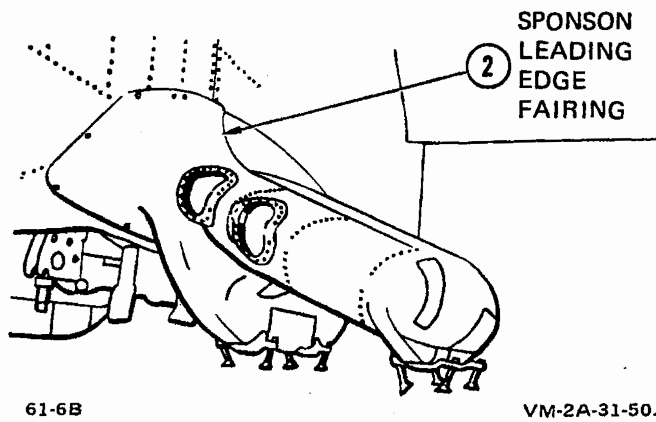
2-139. REMOVING SPONSONS.

1. Lower sponson lower fairing from sponson-fuselage juncture.



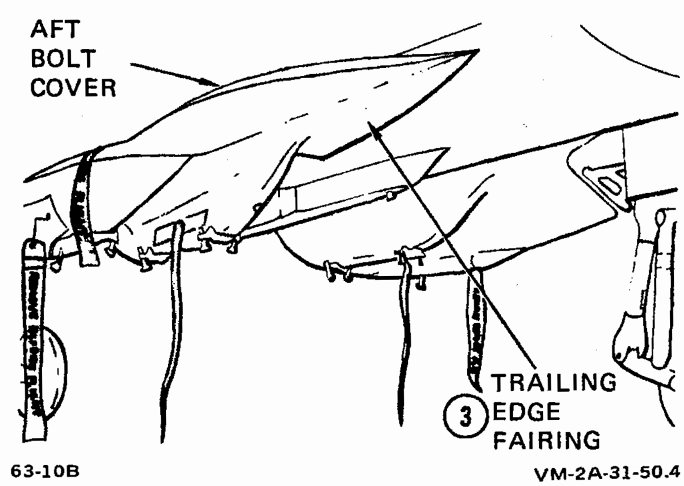
Step 1—Para. 2-139

2. Remove sponson leading edge fairing.



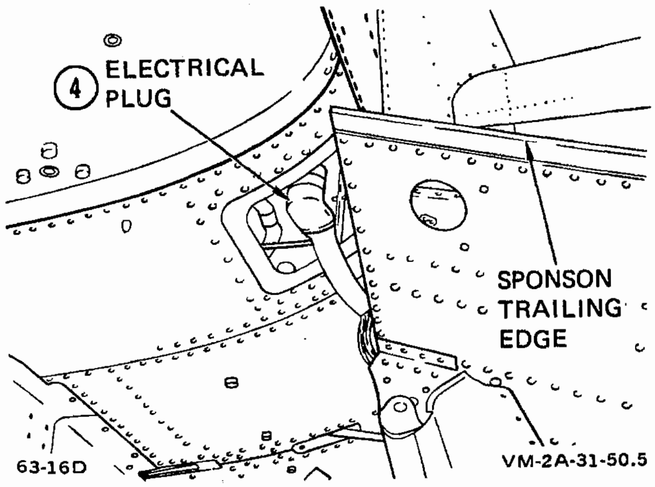
Step 2—Para. 2-139

3. Remove sponson trailing edge fairing and aft bolt cover.



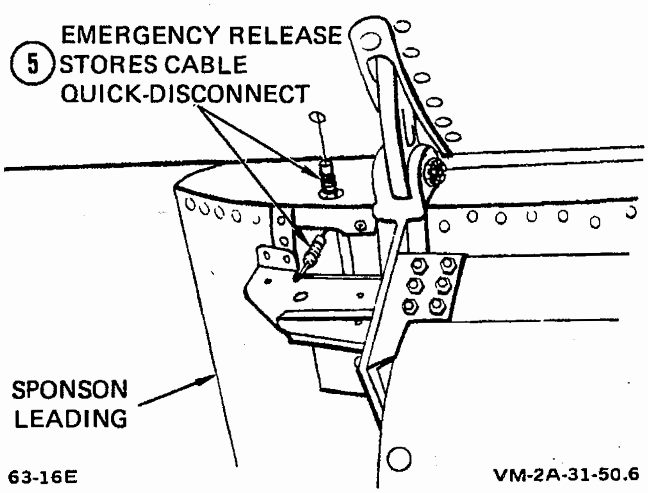
Step 3—Para. 2-139

4. Disconnect electrical plug at trailing edge of sponson.



Step 4—Para. 2-139

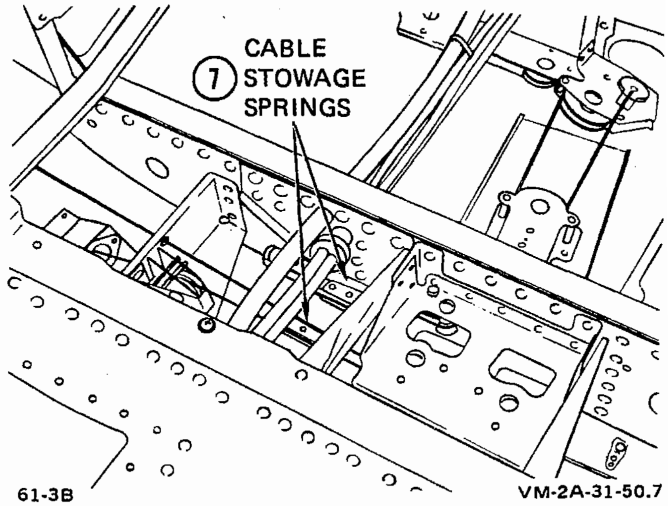
5. Disconnect the quick-disconnects for the emergency stores release cables located on the underside of the fuselage shoulder-sponson juncture near the leading edge of the sponson.



Step 5—Para. 2-139

6. Refer to paragraph 2-106 for instructions, and remove cargo bay center floor panel.

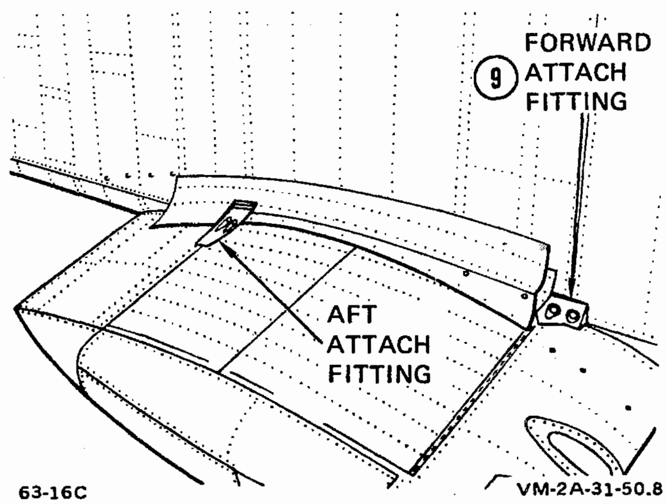
7. See figure 2-23. With cable balls against cable seals at fuselage mold line, stow cables around springs at fuselage station 160 near fuselage centerline.



Step 7—Para. 2-139

8. Refer to paragraph 2-106 and reinstall cargo bay center floor panel.

9. With two helpers supporting the sponson, remove two internal wrenching bolts at forward and rear attach fittings on upper side of sponson.



Step 9—Para. 2-139

10. Remove bolts from forward and rear attach links.

11. Pull sponson away from fuselage slowly while ensuring that electrical and cable disconnects are clear of sponson.

12. Install electrical disconnect door at fuselage station 217.3.

13. Install two attach link doors with one screw.

2-140. INSTALLING SPONSONS.

Materials List

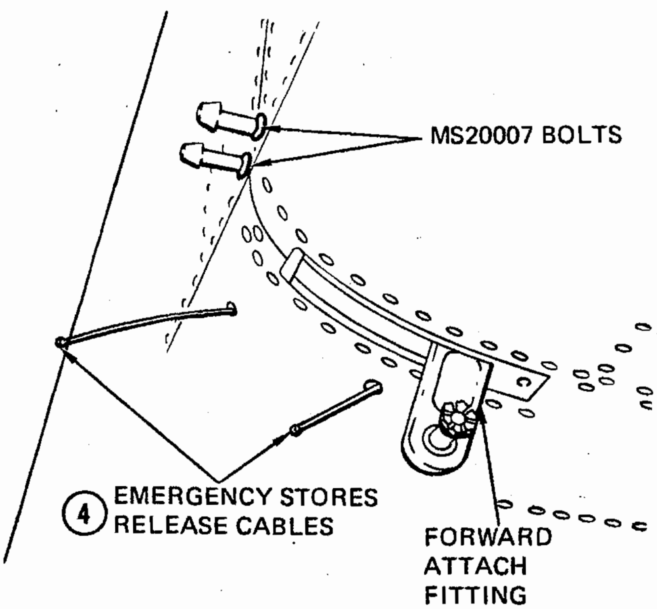
Pin, Cotter (3/32-inch diameter steel)	MS24665-306

1. Remove two attach link doors (if installed) and store for future use.

2. Remove electrical disconnect door at fuselage station 221.0. Store door and fasteners for future use.

3. **Refer to paragraph 2-106 and remove cargo bay center floor panel.**

4. Remove the emergency release munitions cables from the stowage springs in forward cargo bay and push cables out from fuselage mold line.



Step 4—Para. 2-140

5. Remove all fairing screws from fuselage and loosen all fairings and covers from sponson.

6. Instruct two helpers to lift sponson into place so that forward and rear attach bolt holes are aligned with sponson link bolt holes. Install NAS1108-22D bolts finger-tight.

7. Install four MS20007-18 internal wrenching bolts (two in each attach fitting).

8. Using a torque wrench (GGG-W-686, No. 11), torque MS20007-18 bolts to 700-750 inch-pounds and NAS1108 bolts to 290-410 inch-pounds. Install MS24665-306 cotter pins in attach link bolts.

9. Install emergency release stores cables from fuselage to sponson cables at sponson leading edge.

10. Install electrical connector in receptacle near sponson trailing edge.

11. Install leading and trailing edge sponson fairings.

12. Install bolt attach cover on upper side of sponson.

13. Install lower sponson fairing to fuselage and leading and trailing edge fairing.

14. Rig emergency release stores cables. Refer to Armament Systems Manual (NAVAIR 01-60GCB-2-6).

15. **Refer to paragraph 2-106 and reinstall the cargo bay center floor panel.**

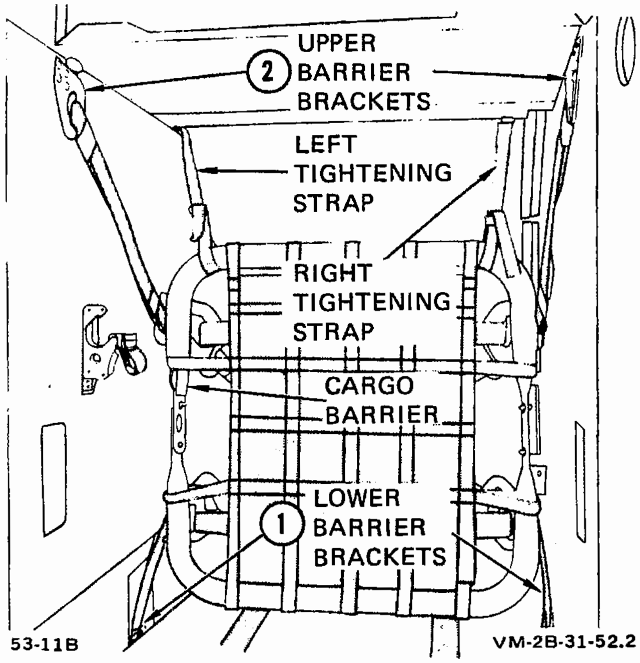
2-141. CARGO BARRIER PACKAGE INSTALLATION AND REMOVAL. **To install and remove the cargo barrier package (305-860012), see figure 2-24 and proceed as follows:**

2-142. INSTALLING CARGO BARRIER PACKAGE.

Note

The cargo barrier package may be installed with the AN/ARC-120 radio set, the oxygen bottles, the observer's seat and bulkhead, and the observer's control equipment package installed or removed.

1. Install four bolts in right- and left-hand lower barrier brackets.



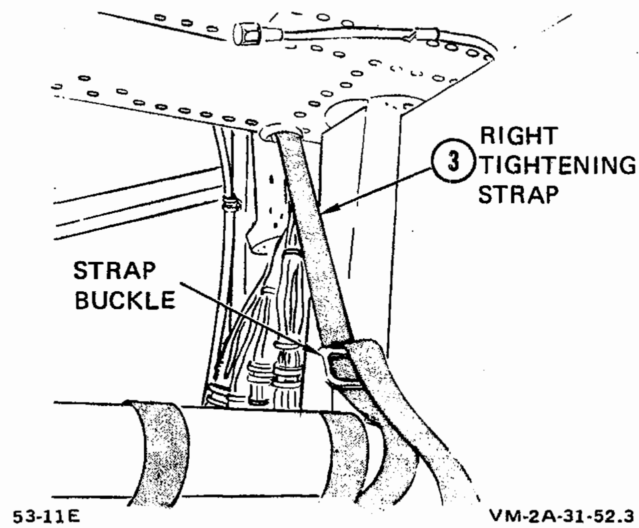
Steps 1 and 2—Para. 2-142

2. Install eight bolts in right- and left-hand upper barrier brackets.

Note

It will be necessary to remove the upper forward left panel fastener to install the left-hand tightening strap. Reinstall panel fastener after tightening strap has been installed.

3. Install right and left tightening straps.



Step 3—Para. 2-142

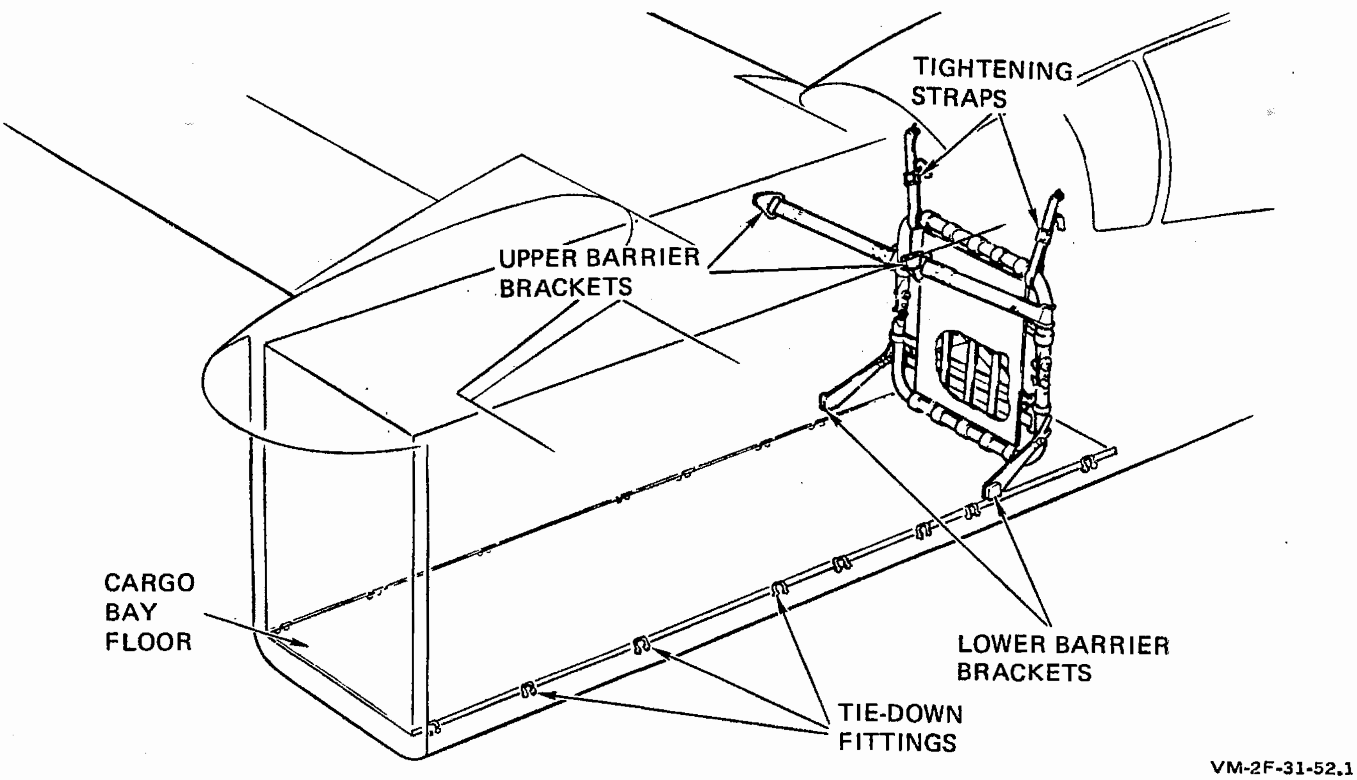
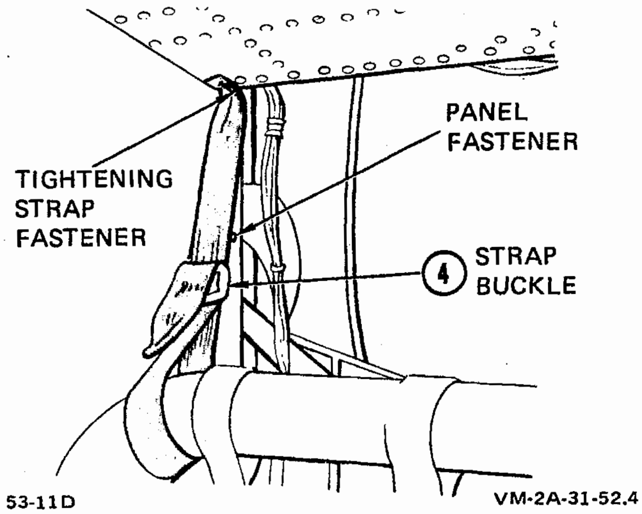


Figure 2-24. Cargo Barrier Package (305-860012)

4. Tighten straps at strap buckles.

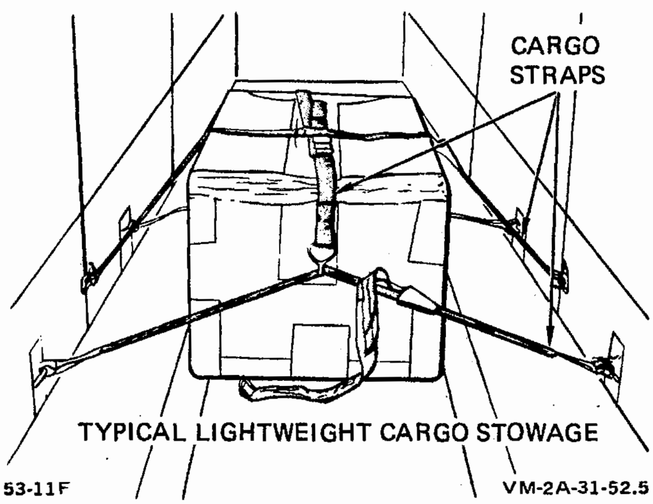


Step 4—Para. 2-142

Note

Heavy cargo must be secured against the cargo barrier.

5. Lightweight cargo may be installed as shown.



Step 5—Para. 2-142

6. If cargo is to be airdropped, refer to paragraph 2-102 and remove door. Store hinge pins for reinstallation.

2-143. REMOVING CARGO BARRIER PACKAGE.

1. Loosen straps on cargo barrier at buckles.

2. Remove upper forward left panel fastener and remove left-hand tightening strap. Reinstall panel fastener after bracket has been removed.

3. Remove right-hand tightening strap.

4. Remove right and left upper cargo barrier brackets.

5. Remove right and left lower cargo barrier bolts and remove barrier assembly.

6. If aircraft has been used for airdropping cargo, cargo bay access door must be installed. Refer to paragraph 2-102 and reinstall door.

2-144. AIRCRAFT PREPARATION FOR LITTER INSTALLATION AND REMOVAL OF PARATROOP OR LITTER EQUIPMENT PACKAGES.

To install and remove the litter equipment package, the aircraft must be in the basic configuration with side panels, flooring, and tie-downs installed. With aircraft in basic configuration, proceed as follows:

Materials List

Pins, Cotter (1/16-inch diameter steel)	MS24665-134

1. Remove AN/ARC-120 receiver-transmitter and mount from rear of observer's seat. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

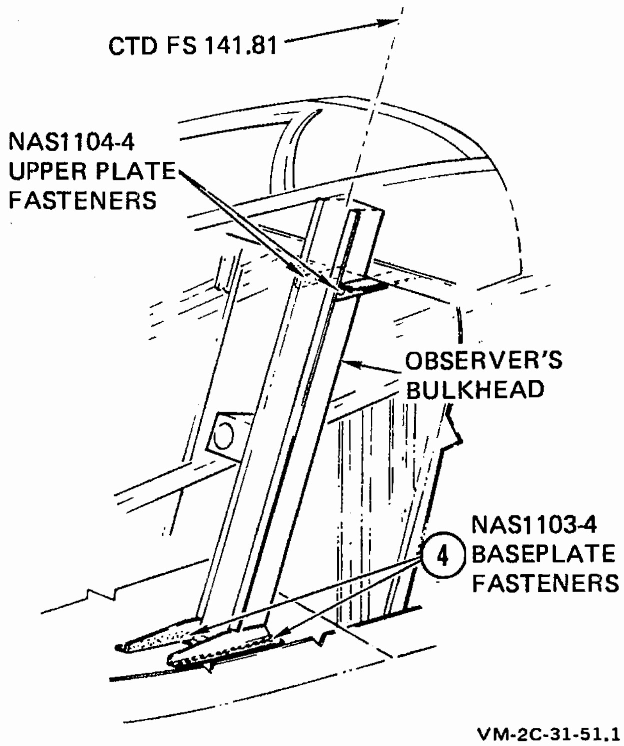
2. Remove observer's ejection seat package (seat and rail). Refer to Environmental Systems Manual (NAVAIR 01-60GCB-2-3).

3. Remove observer's floor and seat support armor plate panels (refer to paragraph 2-135). Store attaching hardware with respective panels for ease of reinstallation.

Note

It may be necessary to loosen eight bolts attaching upper plates to right and left sides of observer's bulkhead so that bulkhead can be removed.

4. Remove observer's seat support bulkhead by removing 38 NAS1103-4 bolts from baseplate and eight NAS1104-4 bolts from upper plate.

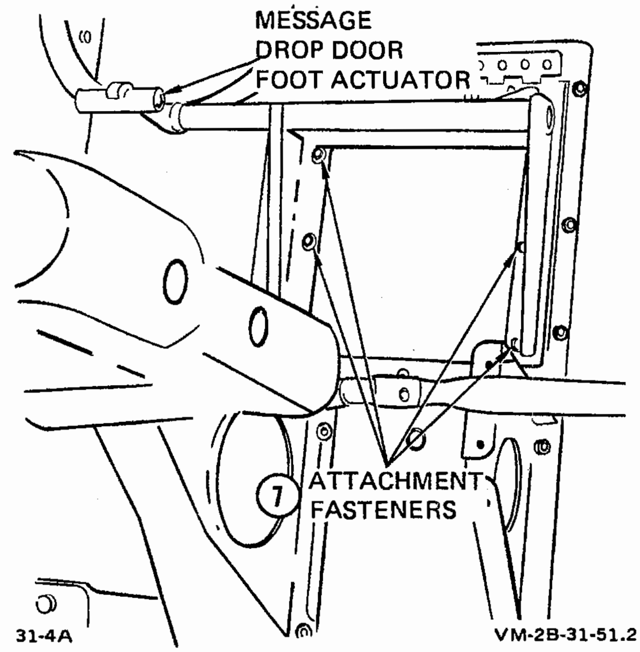


Step 4—Para. 2-144

5. Remove oxygen equipment package and oxygen regulator from aircraft. Refer to Environmental Systems Manual (NAVAIR 01-60GCB-2-3).

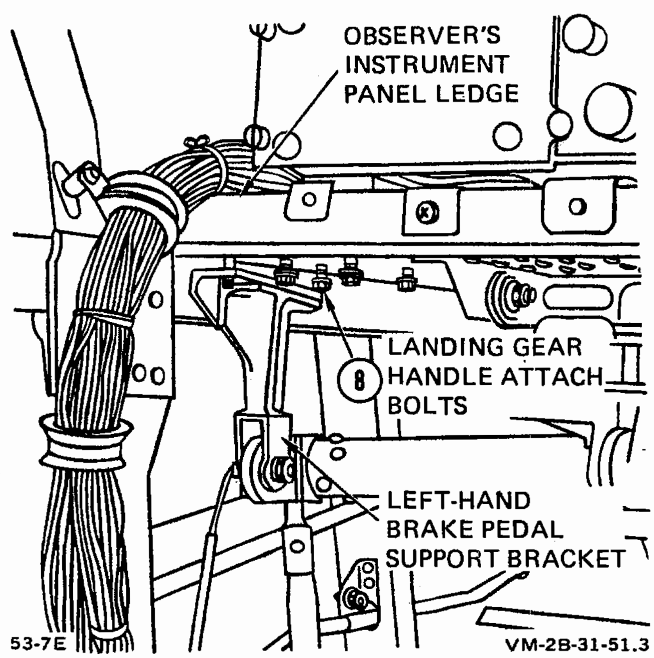
6. Remove observer's compartment power control quadrant. Refer to Power Plants and Fuel Systems Manual (NAVAIR 01-60GCB-2-4).

7. Remove six screws from message drop door foot actuator. Remove foot actuator.



Step 7—Para. 2-144

8. Remove observer's landing gear control handle and control interconnect cable. Remove left brake pedal support bracket.

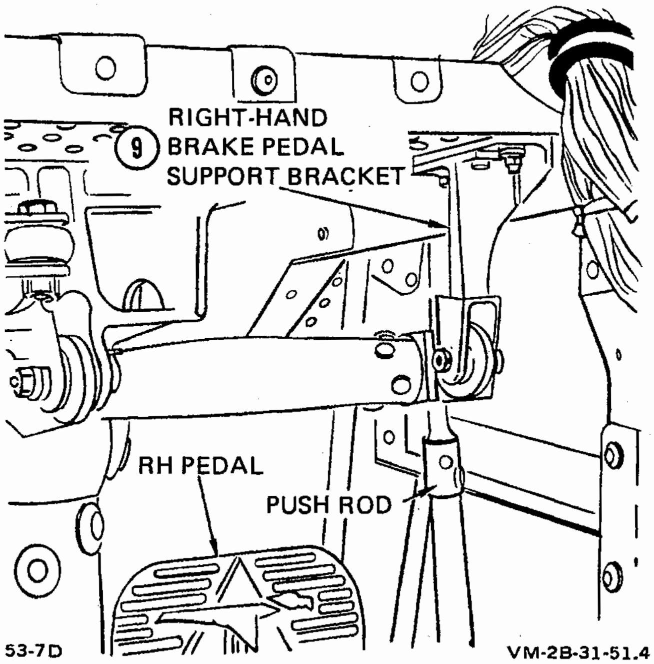


Step 8—Para. 2-144

Note

Observer's brake pedal support bracket (right-hand side of observer's instrument panel shelf) retaining boltheads can be reached with an open-end wrench. These bolts should be left in the aircraft for later use.

9. Refer to paragraph 3-193 and remove the observer's rudder pedals, support brackets, push rods, and attaching hardware.



Step 9—Para. 2-144

10. Install the forward piece of flooring from conversion equipment package (305-860015).

11. Install AN/ARC-120 receiver-transmitter in forward mounting position in accordance with instructions in Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

12. Remove forward and rear right-hand side panels.

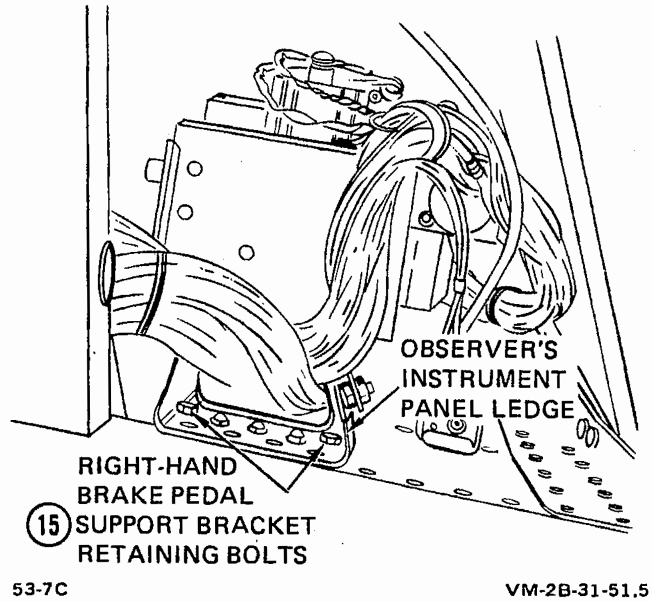
13. Fasten backrest feet to backrest [part of conversion equipment package (305-860015)]. Install cotter pins (MS24665-134).

14. Install tie-down rings on feet.

Note

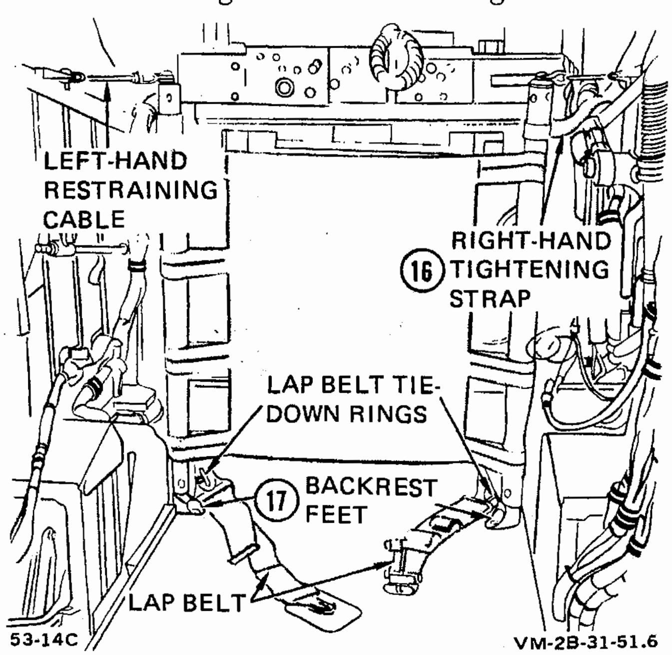
The right and left upper backrest support strap brackets utilize the left and right brake pedal support retaining bolts.

15. Install upper backrest support strap brackets; utilize the left and right brake pedal support retaining bolts.



Step 15—Para. 2-144

16. Install upper restraining cable fittings on right- and left-hand longerons. The bracket should be bolted to longeron before installing cable.



Steps 16 and 17—Para. 2-144

17. Bolt backrest feet to floor.

18. Position restraining cables on backrest and install cotter pins (MS24665-134).

19. Tighten both upper backrest straps at buckle until restraining cables are taut.

20. Snap lap belt in right and left tie-down rings.

21. Install forward and rear right-hand side panels.

2-145. PARATROOP EQUIPMENT PACKAGE INSTALLATION AND REMOVAL. The paratroop equipment package consists of safety belts, jump cable, intercom handset, paratroop warning panel, and necessary hardware. To install and remove the paratroop equipment package, see figure 2-25 and proceed as follows:

Note

To install and remove the paratroop equipment package, the aircraft must be in the basic configuration with side panels, flooring, and tie-downs installed. For this reason, it will be necessary to prepare the aircraft to receive the paratroop equipment package (figure 2-25).

Tools and Equipment List

Tensiometer, Cable	T-5-8002-105-00

2-146. INSTALLING PARATROOP EQUIPMENT PACKAGE.

Materials List

Pins, Cotter (1/16-inch diameter steel)	MS24665-134

Note

It is necessary to remove the four rear panels on the pilot's left-hand console to route the wiring for the switch panel. Each panel is held by four quick-release fasteners.

1. Prepare the aircraft in accordance with paragraph 2-144.

2. Install drop jump and paratroop radio intercommunication system panel in pilot's compartment, adjacent to voltammeter panel on pilot's

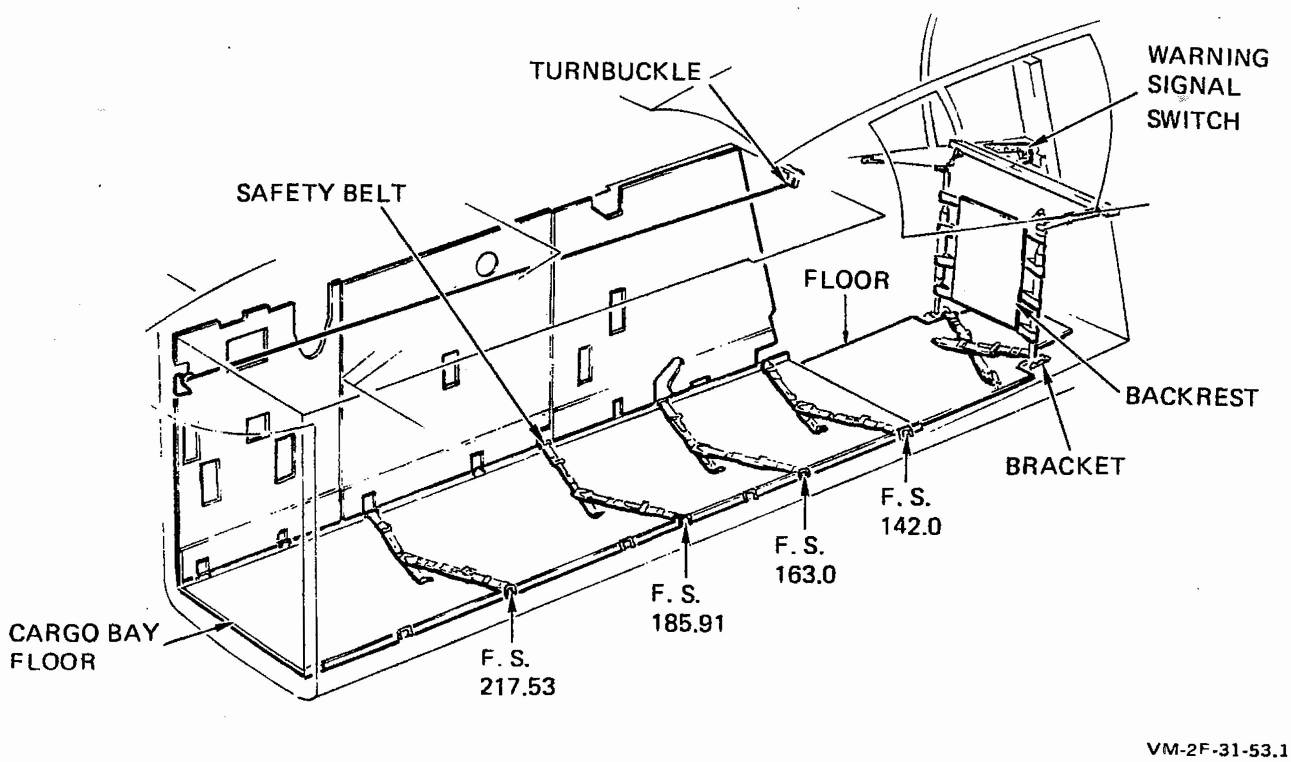
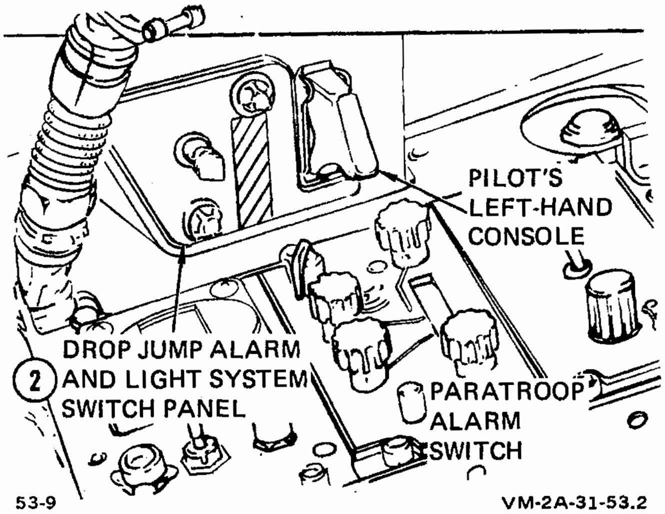


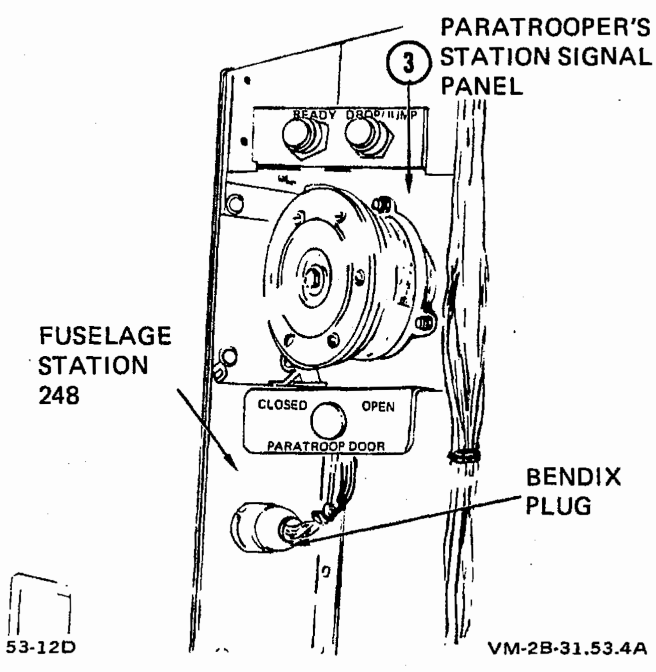
Figure 2-25. Paratroop Equipment Package (305-860011)

left-hand console. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5) for wiring installation. See figure 2-25.



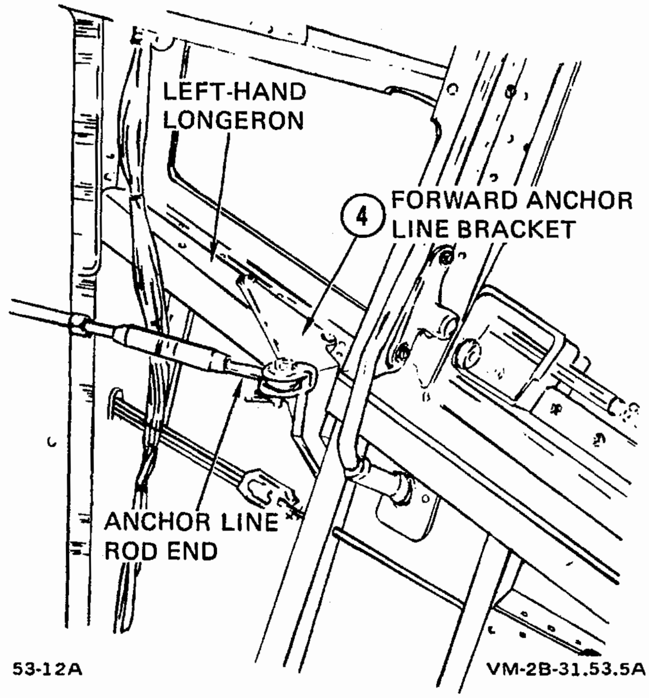
Step 2—Para. 2-146

3. Install paratroop's station signal panel at fuselage station 248, left-hand side. The panel attaches with five screws. Install Bendix plug.



Step 3—Para. 2-146

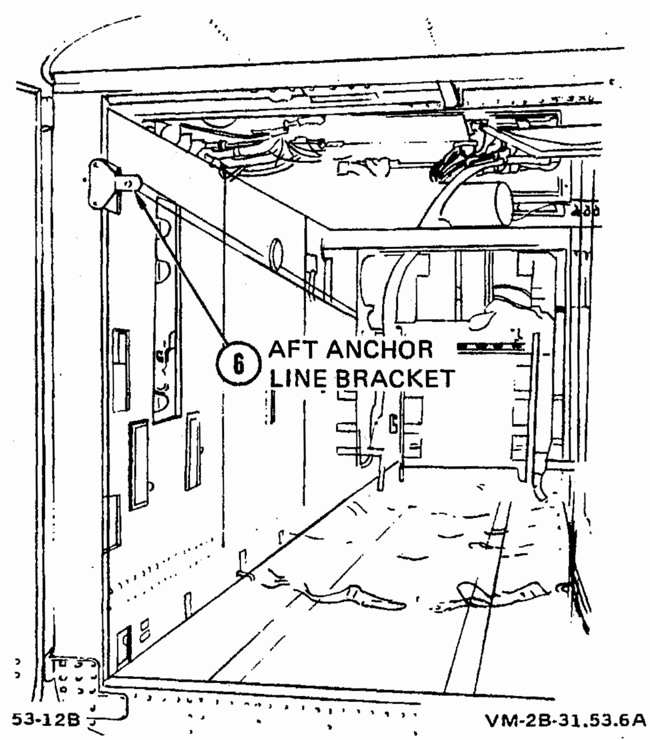
4. Install forward anchor line bracket on upper left-hand longeron.



Step 4—Para. 2-146

5. Refer to paragraph 2-102 and remove cargo bay access door.

6. Install aft anchor line bracket.



Step 6—Para. 2-146

7. Install side panels previously removed.

8. Install anchor line rod end and safety with cotter pin (MS24665-134).

9. Using a tensiometer (T-5-8002-105-00), adjust turnbuckle to obtain a cable tension of 200 (±10) pounds.

Note

All lap belt hook locations are stenciled on side panels.

10. Install four additional lap belts at indicated locations.

11. With external power applied, check operation of paratroop station signal panel as follows:

a. Pull out and position switch to RDY and check to see that amber READY light is lit.

b. Pull out and position switch to JUMP and check that green DROP/JUMP light is lit.

c. Lift safety guard on alarm switch and hold switch to up position. Horn should sound.

d. Disconnect external power.

2-147. REMOVING PARATROOP EQUIPMENT PACKAGE.

1. Remove four lap belts.

2. Relieve anchor line cable tension by unscrewing turnbuckle and then remove anchor line rod end.

3. Remove forward and aft anchor line bracket.

4. Disconnect Bendix plug below paratroop's station signal panel and remove signal panel.

5. Remove the paratroop radio intercommunication system aft switch, jack, and bracket. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

6. Remove the drop jump and paratroop radio intercommunication system switch panel in pilot's compartment. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5) for removal procedures for the paratroop radio intercommunication system.

7. Install cargo access door. Refer to paragraph 2-105.

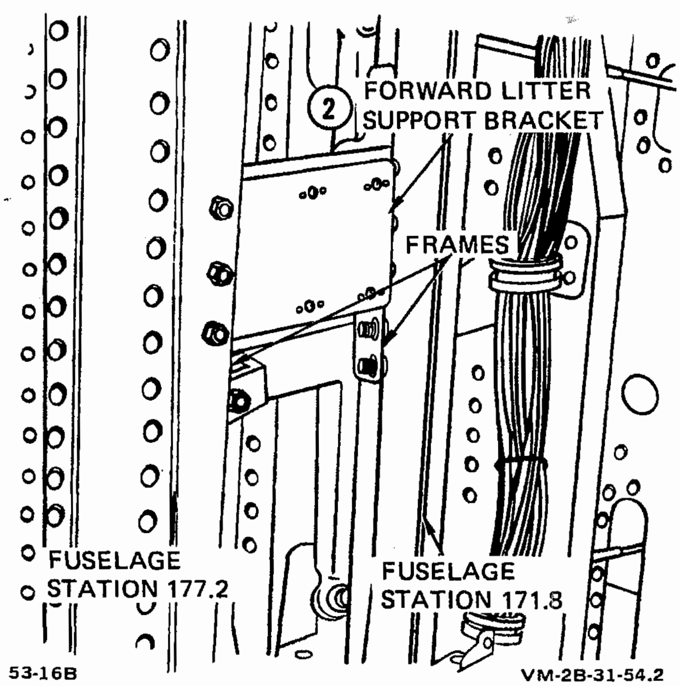
8. Perform procedures described in paragraph 2-151.

2-148. LITTER EQUIPMENT PACKAGE INSTALLATION AND REMOVAL. To install and remove the litter equipment package, the aircraft must be in the basic configuration with side panels, flooring, and tie-downs installed. See figure 2-26 and refer to paragraph 2-151. The litter equipment package consists of brackets, hardware, and straps. To install and remove the litter equipment package, see figure 2-27 and proceed as follows:

2-149. INSTALLING LITTER EQUIPMENT PACKAGE.

1. Remove forward and rear left-hand side panels.

2. Install forward litter bracket support between frames.



Step 2—Para. 2-149

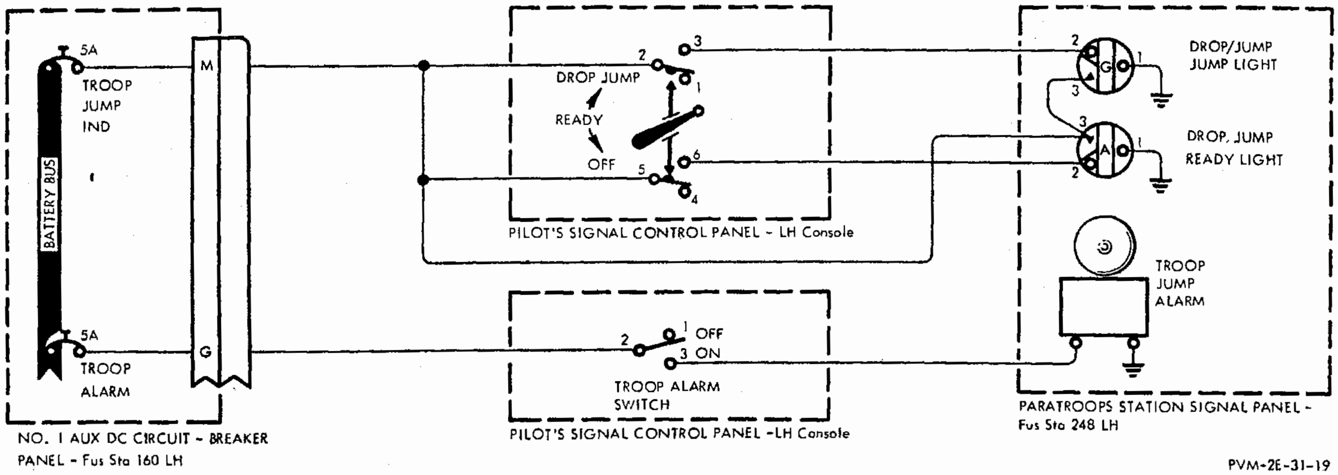


Figure 2-26. Paratroop Jump Alarm and Jump Light Electrical Schematic

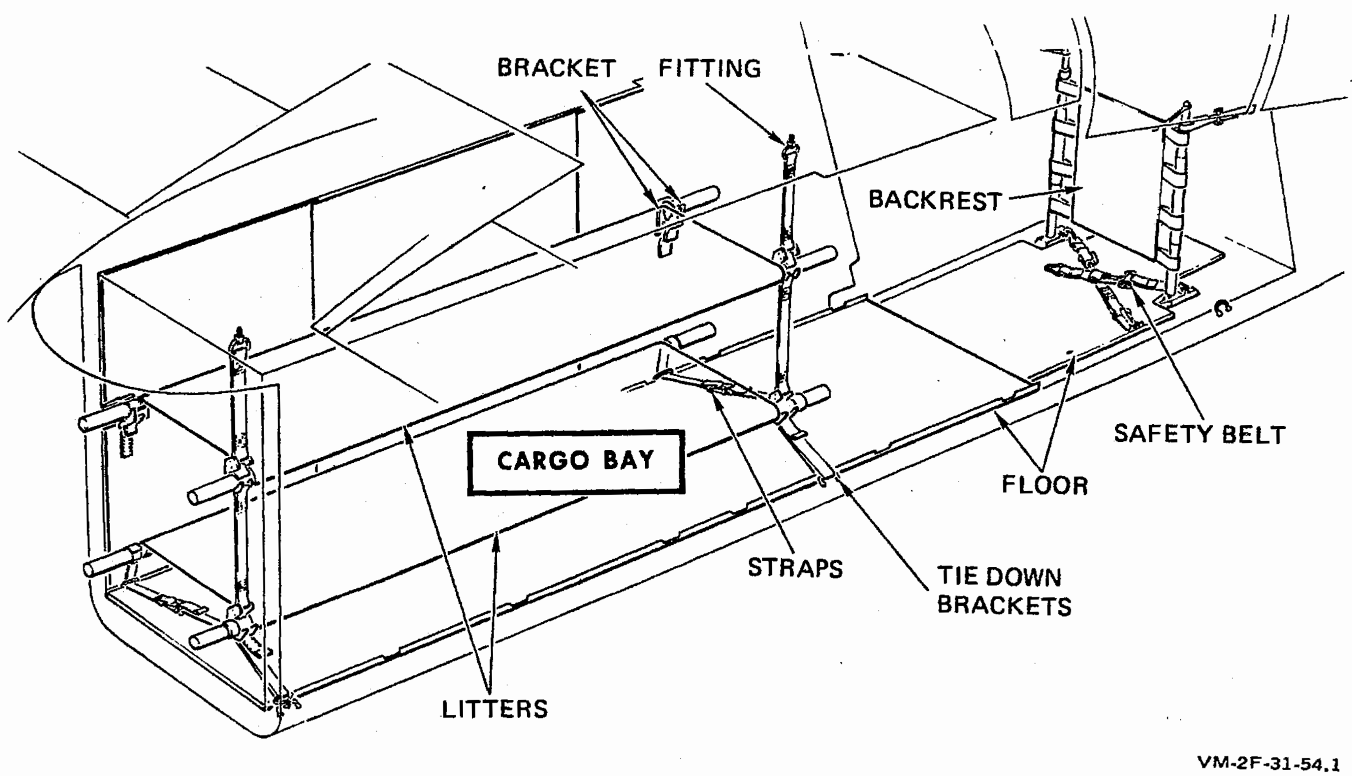
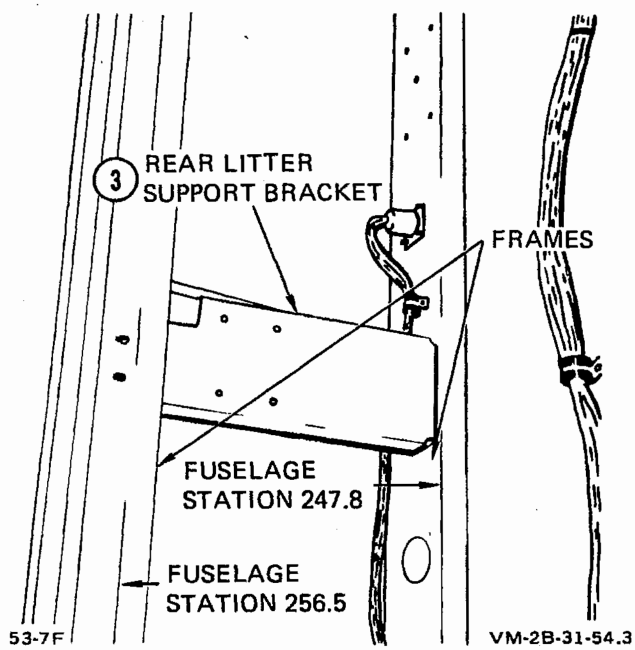


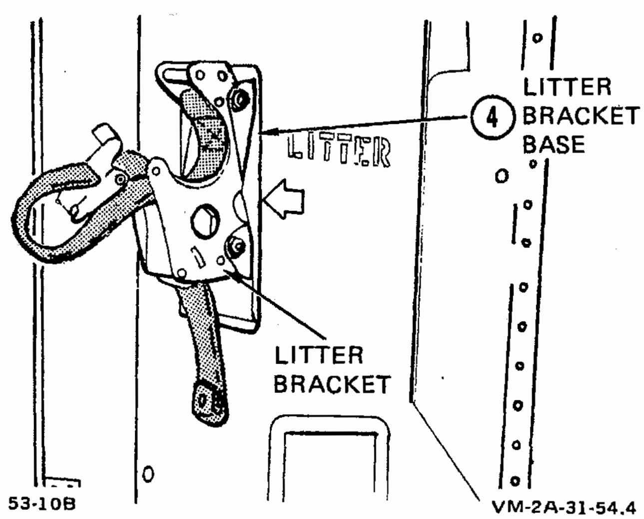
Figure 2-27. Litter Equipment Package

3. Install rear litter bracket support between frames.



Step 3—Para. 2-149

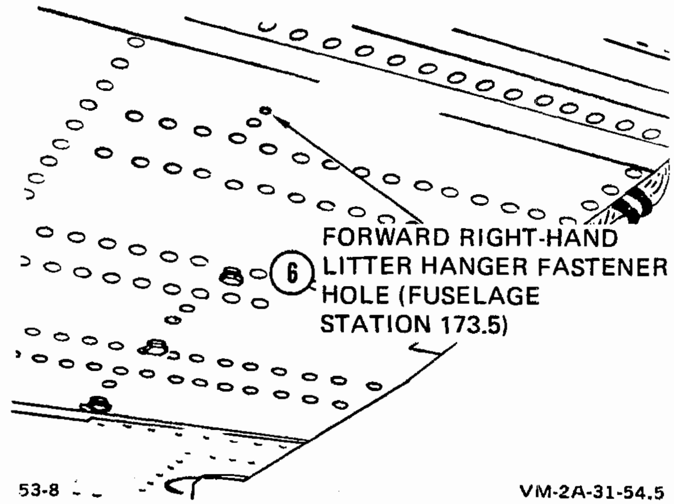
4. Install litter bracket bases on the forward and rear litter bracket supports.



Step 4—Para. 2-149

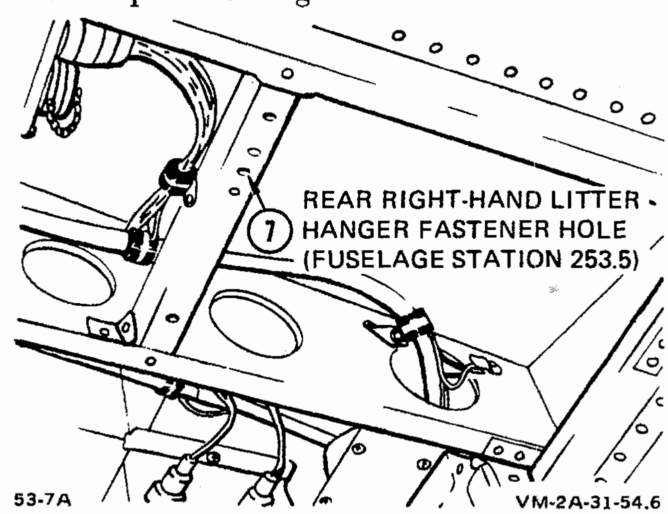
5. Install litter brackets on litter bracket bases.

6. Install forward right-hand litter hanger. Screw the hanger into the nut plate so that hook is open to the right side.



Step 6—Para. 2-149

7. Install rear right-hand litter hanger in same manner. Screw hanger into nut plate so that the hook is open to the right side.



Step 7—Para. 2-149

8. Install litters as follows:

a. Slide upper litter in on floor and lift it up and place in hooks. Fasten straps on left-hand forward and aft litter brackets.

b. Slide lower litter in on floor and place in hooks.

c. Install forward and rear lower straps in the following manner:

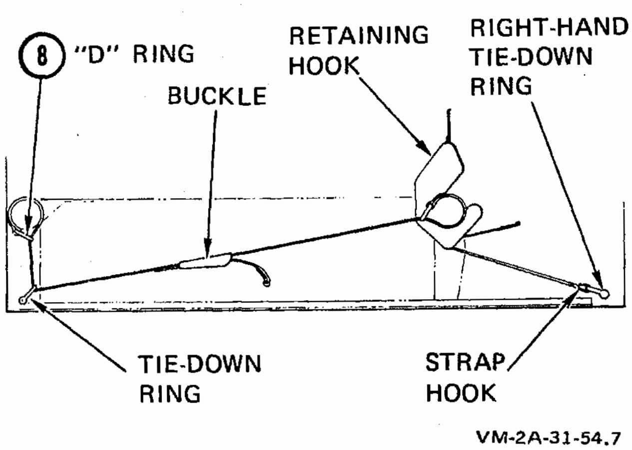
(1) Turn "D" ring sideways and slip it through left-hand tie-down ring.

(2) Make a loop in strap and slip it over left litter handle.

(3) Make a loop in right-hand end of strap and slip over right handle of litter so that bottom buckle faces upward.

(4) Tighten strap at buckle.

(5) Slip right-hand retaining hooks (forward and rear) over litter handles (open face to right). Engage strap hook on right tie-down and tighten by pulling loose end.



Step 8—Para. 2-149

2-150. REMOVING LITTER EQUIPMENT PACKAGE.

1. Remove upper and lower litters.

2. Remove forward and rear lower straps.

3. Remove forward and rear right-hand litter hangers.

4. Remove litter brackets and litter bracket bases.

5. Remove forward and rear litter bracket supports.

2-151. CONVERTING AIRFRAME TO BASIC CONFIGURATION. After the paratroop or litter equipment package has been removed, it is necessary to perform the following procedures to return the airframe to the basic observation configuration.

2-152. CONVERTING TO BASIC CONFIGURATION.

1. Remove the lap belt from the backrest snap rings.

2. Remove restraining cable from backrest.

3. Loosen tightening straps on backrest.

4. Remove fasteners from backrest feet.

5. Remove restraining cable fittings from longerons.

6. Remove upper backrest support strap bracket from instrument panel.

7. Remove backrest.

8. Remove receiver-transmitter (AN/ARC-120) from forward position and move to aft position. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

9. Remove the forward piece of flooring.

10. Install observer's rudder pedals, brackets, push rods, and hardware. Also install the observer's control stick. Refer to Chapter 3.

11. Install observer's landing gear control handle and cables.

12. Install message drop door foot actuator.

13. Install power control quadrant assembly. Refer to Power Plants and Fuel System Manual (NAVAIR 01-60GCB-2-4).

14. Install oxygen equipment package and oxygen regulator if required. Refer to Environmental Systems Manual (NAVAIR 01-60GCB-2-3).

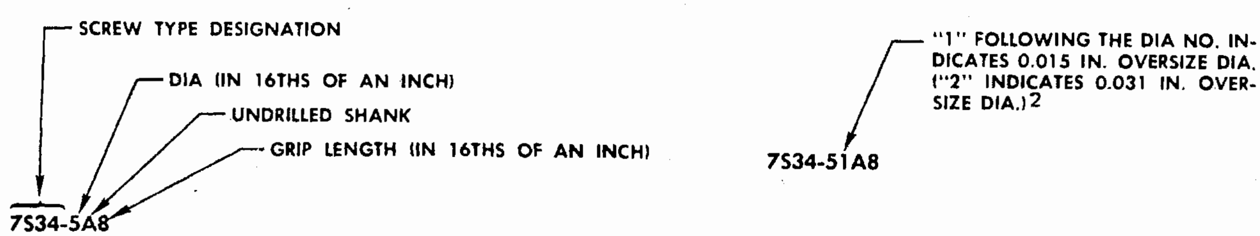
15. Install observer's bulkhead.

2-153. FASTENERS.

2-154. The fuselage, nacelle, and boom skins are attached with standard aluminum rivets. Hi-Shear rivets and screws are used where strength of assembly sequences require. Wing box skins are attached with standard flush-head rivets except in special critical areas where Taper-Lok and Hi-Shear fasteners are used. In addition, bonding adhesive is used on the upper skin-spar mating surface and spot welding is used on the leading edge and wing tip skins. Close-out areas generally utilize blind Cherry-bulb rivets. Empennage skins are attached by conventional and blind aluminum rivets. Wing fairings and other contoured areas are constructed of fiberglas and are attached with flush screws, rivets, or bonding. Access panels located throughout the airframe are attached by flush screws generally. This section is provided to assist the repairman in removal, repair, and installation of components in the simplest manner. The fastener information is to be used in conjunction with that provided in General Aircraft Hardware (NAVAIR 01-1A-8). Refer to tables 2-7, 2-8, and 2-9 for general torquing information.

Table 2-7. Torq-Set Screw Torque Table

MACHINE SCREWS					TORQUE INCH-POUNDS (FOR TENSION-TYPE NUT, OR FULL THD LENGTH)	TORQ-SET SCREWDRIVER	SQUARE DRIVE ADAPTER
NAR STANDARD				SIZE			
7S29-10A [1]	7S28A-3	7S34-3A	7S35-3A	10-32	25-35	EX-170-10	SC-108
7S29-416A [1]	7S28A-4	7S34-4A	7S35-4A	1/4-28	70-90	EX-170-1/4	SC-114
7S29-516A [1]	7S28A-5	7S34-5A	7S35-5A	5/16-24	140-203	EX-170-5/16	SC-314
7S29-616A [1]	7S28A-6	7S34-6A	6S35-6A	3/8-24	190-351	EX-170-3/8	SC-314
7S29-716A [1]	7S28A-7	7S34-7A	7S35-7A	7/16-20	500-756	EX-170-7/16	SC-314
7S29-816A [1]	7S28A-8	7S34-8A	7S35-8A	1/2-20	690-990	EX-170-1/2	HE-3320
7S29-916 [1]	7S28A-9	7S34-9	7S35-9	9/16-18	1,000-1,440	EX-170-9/16	HE-3320
SELF-TAPPING SCREW †							
COML NO. AIC114-00-2.5C1				6-32		EX-170-6	SC-108



Note

1. This is a Torq-Set data table for 100-degree flush screws (heat-treated to 160,000-180,000 psi). Torque values apply to all nuts except the shear type. The higher values should be used when torquing heads of screws; however, these values should not be exceeded by more than 10 percent.
2. The 7S35 fastener has shorter threaded length to save weight and is used with low-profile nuts.
3. For 7S29 screws, use torque values and drive-bit size of next size smaller fastener.
4. Oversize fasteners are used as salvage fasteners only and are never called out on drawings. A numeral "1" or "2" is stamped on the heads of oversize fasteners as shown in the sketch.

Table 2-8. Bolt, Stud, and Screw Torque Table

BOLT, STUD, OR SCREW SIZE		TORQUE VALUES IN INCH-POUNDS (1) FOR TIGHTENING NUTS (2 AND 3)		
		ON STANDARD BOLTS, STUDS, AND SCREWS HAVING A TENSILE STRENGTH OF 125,000-140,000 PSI		ON HIGH-STRENGTH BOLTS, STUDS, AND SCREWS HAVING A TENSILE STRENGTH OF160,000 PSI AND OVER
		SHEAR-TYPE NUTS (4 AND 5) (AN320, AN364, OR EQUIVALENT)	TENSION-TYPE NUTS AND THREADED MACHINE PARTS (AN310, AN365, OR EQUIVALENT)	ANY NUT (5) EXCEPT SHEAR-TYPE
8-32	8-36	7-9	12-15	15-18
10-24	10-32	12-15	20-25	25-35
1/4-20		25-30	40-50	50-68
	1/4-28	30-40	50-70	70-90
5/16-18		48-55	30-90	90-144
	5/16-24	60-85	100-140	140-203
3/8-16		95-110	160-185	185-248
	3/8-24	95-110	160-190	190-351
7/16-14		140-155	235-255	255-428
	7/16-20	270-300	450-500	500-756
1/2-13		240-290	400-480	480-792
	1/2-20	290-410	480-690	690-990
9/16-12		300-420	500-700	700-990
	9/16-18	480-600	800-1,000	1,000-1,440
5/8-11		420-540	700-900	900-1,350
	5/8-18	660-780	1,100-1,300	1,300-2,160
3/4-10		700-950	1,150-1,600	1,600-2,250
	3/4-16	1,300-1,500	2,300-2,500	2,500-4,500
7/8-9		1,300-1,800	2,200-3,000	3,000-4,140
	7/8-14	1,500-1,800	2,500-3,000	3,000-6,300
1-8		2,200-3,000	3,700-5,000	5,000-6,840
	1-14	2,200-3,300	3,700-5,500	5,500-9,000
1-1/8-8		3,300-4,000	5,500-6,500	6,500-10,800
	1-1/8-12	3,000-4,200	5,000-7,000	7,000-13,500
1-1/4-8		4,000-5,000	6,500-8,000	8,000-14,000
	1-1/4-12	5,400-6,600	9,000-11,000	11,000-22,500

Note

1. To obtain values in foot-pounds, divide inch-pound values by 12.

2. When nuts are to be secured to fasteners with cotter pins or lockwire, tighten nuts to low side of selected torque range unless otherwise shown on drawing and, if necessary, continue tightening until next slot aligns with hole. Nuts must not be loosened to obtain alignment.

3. When it is necessary to tighten fasteners from head side, high side of selected torque range should be approached whenever possible, but in no case should maximum torque exceed 10 percent above high side of selected torque listed in table unless otherwise shown on drawing.

4. For corrosion-resistant steel nuts, use torque values given for shear-type nuts.

5. Use of shear-type nuts on either standard or high-strength bolts and screws requires use of torque values given for shear-type nuts.

Table 2-9. Flared Tubing and Flex Hose Torque Table

TUBE OD (INCHES)	"B" NUT WRENCH SIZE	5052-O AL ALLOY TUBING		6061-T6 AL ALLOY TUBING AND EQUIVALENT FLEX HOSE ASSEMBLY[1]		SPEC MIL-T-6845 STAINLESS STEEL TUBING		ALUMINUM ALLOY TUBING FOR USE ON OXYGEN LINES ONLY	
		IN. LB MIN	IN. LB MAX	IN. LB MIN	IN. LB MAX	IN. LB MIN	IN. LB MAX	IN. LB MIN	IN. LB MAX
1/8	3/8	20	25						
3/16	7/16	25	35	30	70	90	140		
1/4	9/16	40	65	70	120	135	185		
5/16	5/8	60	80	70	120	180	230	100	125
3/8	11/16	75	125	130	180	270	345	200	250
1/2	7/8	150	250	300	400	450	525	300	400
5/8	1	200	350	430	550	650	750		
3/4	1-1/4	300	500	650	800	900	1100		
1	1-1/2	500	700	900	1100	1200	1400		
1-1/4	2	600	900	1200	1450	1500	1800		
1-1/2	2-1/4	600	900	1550	1850	2000	2300		
1-3/4	2-5/8	700	1000	2000	2350	2600	2900		
2	2-7/8	800	1100	2500	2900	3200	3600		

[1] GENERALLY NOT USED IN FUEL, ENGINE AND ACCESSORIES, OR HEAT AND VENT SYSTEMS.

Note

1. It is absolutely necessary that open ends of tubing and all fittings on units be kept capped right up to the time they are connected into the system.

2. Route tubing and flexible hose so that they clear adjacent structure, hot-air ducts, electrical cables and equipment, flight control cables, and oxygen lines and equipment. All fluid and fuel lines should be routed at least 6 inches from and below electrical cable, if possible, to prevent fire due to line leakage.

3. Apply lubricants to male threads of fittings sparingly and carefully. Allow none to enter system to cause a malfunction.

4. Before assembly, inspect tube flares for cracks, burrs, sharp edges, and equal roundness with sleeves. Tight sleeves will not be considered cause for rejection. Nuts should turn freely on the sleeves.

5. When tube is in position, the tube flares should meet the fittings squarely and fully. Never use a nut to draw flare to fitting, as flare might be easily spun off or damaged.

6. Start nuts on fittings, and turn until flares and sleeves are firmly seated. Never use a wrench until nut is finger-tight. Use a wrench on hex or flat of body of fitting to prevent turning of fitting.

2-155. CORROSION CONTROL.

2-156. Corrosion is caused by electrochemical or direct chemical reaction of the metal or material with other elements. Corrosion control on the aircraft pertains to arresting or limitation of these reactions. It is accomplished in two phases: preventive maintenance and maintenance. Preventive maintenance includes frequent inspections, cleaning, and sealing. Maintenance includes removal of corrosion products and renewal of protective coating materials or touch-up painting. Refer to paragraph 2-171 for general sealing information and refer to Structural Repair Manual (NAVAIR 01-60GCB-3) for specific structural sealing procedures. Refer to paragraph 2-164 for touch-up painting requirements and locations of insignias and decals on the interior and exterior of the aircraft. If corrosion has progressed unchecked, the parts, major components, or assemblies, may have to be replaced. Regular inspections may reveal scratches in the protective coatings or plated surfaces where corrosion could begin. Inspections will also locate areas which require touch-up painting. Frequent cleaning removes soil catalytic agents which could accelerate normal corrosion processes. For engine corrosion control maintenance, refer to Power Plants and Fuel Systems Manual (NAVAIR 01-60GCB-2-4).

2-157. CORROSION REMOVAL. To reduce the possibility of corrosion, surfaces on which the finish has been damaged should be repaired promptly. Surfaces which have been extensively damaged should be stripped down to the bare metal and completely refinished. Surfaces where minimal finish damage has occurred, should be repaired by removing all loose paint in the area, fairing the rough edges with 320 or 400 abrasive paper. Clean area with a cloth dampened with naphtha (TT-N-95) and reapply finish. Restrict touchup as much as possible to damaged area.

2-158. CLEANING. Cleaning shall be accomplished in accordance with NAVAIR 01-1A-509 except as noted below.

CAUTION

Chlorinated solvents such as trichloroethane, MIL-T-81533; and trichlorotrifluoroethane (freon 113), MIL-C-81302, may be hydrolyzed in contact with free water and form highly corrosive acids. Free water is often found in hydraulic systems, therefore the use of chlorinated solvents should be restricted to external surfaces of hydraulic systems. Chlorinated solvents may be applied to internal surfaces of disassembled hydraulic components for cleaning purposes provided none of the liquid solvent is allowed to remain in the component after cleaning.

2-159. CLEANING CANOPY TOP GLASS, WINGSHIELD SIDE PANEL GLASS, AND ACCESS DOOR PANEL GLASS. To clean the canopy top glass, windshield side panel glass, and access door glass panels, proceed as follows:

Materials List

Compound, Polishing	P-P-560
Flannel, Cotton	CCC-C-548
Flannel, Outing	CCC-F-466

CAUTION

Cleaning the canopy is critical.

Use only approved cleaning agents. Do not experiment with any others as they could contain solvents that will cause crazing either immediately or at a delayed interval.

Use care not to cause scratches with rings, keys, tools, or other hard or sharp objects.

1. Exterior surfaces:

a. Remove loose dust and residue with compressed air when available.

b. Flush with plenty of clean fresh water, using the bare hand gently to feel and dislodge any dirt, salt, mud, or particles.

CAUTION

Remove rings or other hard objects from hand before washing transparent plastics.

c. Wash gently with soap and water only. The water must be free of dirt or abrasive materials. Go over the surface with the bare hand only to seek out and carefully dislodge any dirt or particles. A *CLEAN* sponge may be used to carry the soap and water to the plastic, but not for scrubbing or washing.

d. Dry with a *CLEAN* damp chamois. Blot to dry. Do not rub.

e. Remove oil and grease residue by applying cleaning and polishing compound, transparent plastic aircraft materials (P-P-560) with a soft, clean cloth.

CAUTION

Do not use any of the following materials for cleaning or permit their fumes to contact transparent aircraft materials: Gasoline, alcohol, benzene, toluene, hexane, kerosene, xylene, ketones, including acetone, carbon tetrachloride, fire extinguisher or de-icing fluids, dope or lacquer thinners, window cleaning sprays, trichlorethylene, perchloroethylene, paint stripping compounds, degreasing compounds or other than specifically authorized cleaning and polishing compounds. These materials can soften the plastic and cause crazing.

f. If, after removing dirt and grease, the plastic surface is found marred by light scratches, restore the polished surface by repeating the application of compound (P-P-560) and polishing by hand. Several applications may be necessary.

g. If deep scratches exist, they should be removed by the procedures prescribed in Structural Repair Manual (NAVAIR 01-60GCB-3)

CAUTION

Do not attempt polishing until the surface is thoroughly clean. If dirt or grit is present, it may cause more serious damage than the original scratches. Power buffing shall only be used in accordance with the procedures prescribed in Structural Repair Manual (NAVAIR 01-60GCB-3).

h. Cloths used to apply cleaning and polishing compound should be soft and clean. Cotton flannel (CCC-C-548), outing flannel (CCC-F-466), Type I, flannelette and diaper cloth are satisfactory. Cloths should be set aside for use only on transparent plastic surfaces and kept in closed containers or in protected rolls to keep them clean and grit-free. Do not rub plastic surfaces with a dry cloth since this is not only likely to cause scratches but also builds up an electrostatic charge which attracts dust particles to the surface.

2. Interior surfaces:

a. Dust the plastic surfaces lightly with a soft, clean cloth. Do not *WIPE* the surface with a dry cloth.

b. Wipe carefully with a soft damp cloth or sponge. Keep the cloth or sponge free from soil and grit by rinsing it frequently in clean water.

3. Personnel should refer to Maintenance and Repair of Transparent Plastics (NAVAIR 01-1A-12) for applicable procedures on the repair, maintenance, and refinishing of transparent plastic materials.

2-160. CLEANING PILOT'S AND OBSERVER'S RELIEF SYSTEM. To clean the pilot's and observer's relief system, see figure 2-28 and use the materials and procedures in NAVAIR 01-1A-509.

2-161. CLEANING BATTERY COMPARTMENTS. Since nickel-cadmium batteries utilize a base-type electrolyte, the battery cases may be cleaned with water and a fiber brush.

2-162. CLEANING INSTALLED ENGINES. Generally, it will be unnecessary to clean aircraft en-

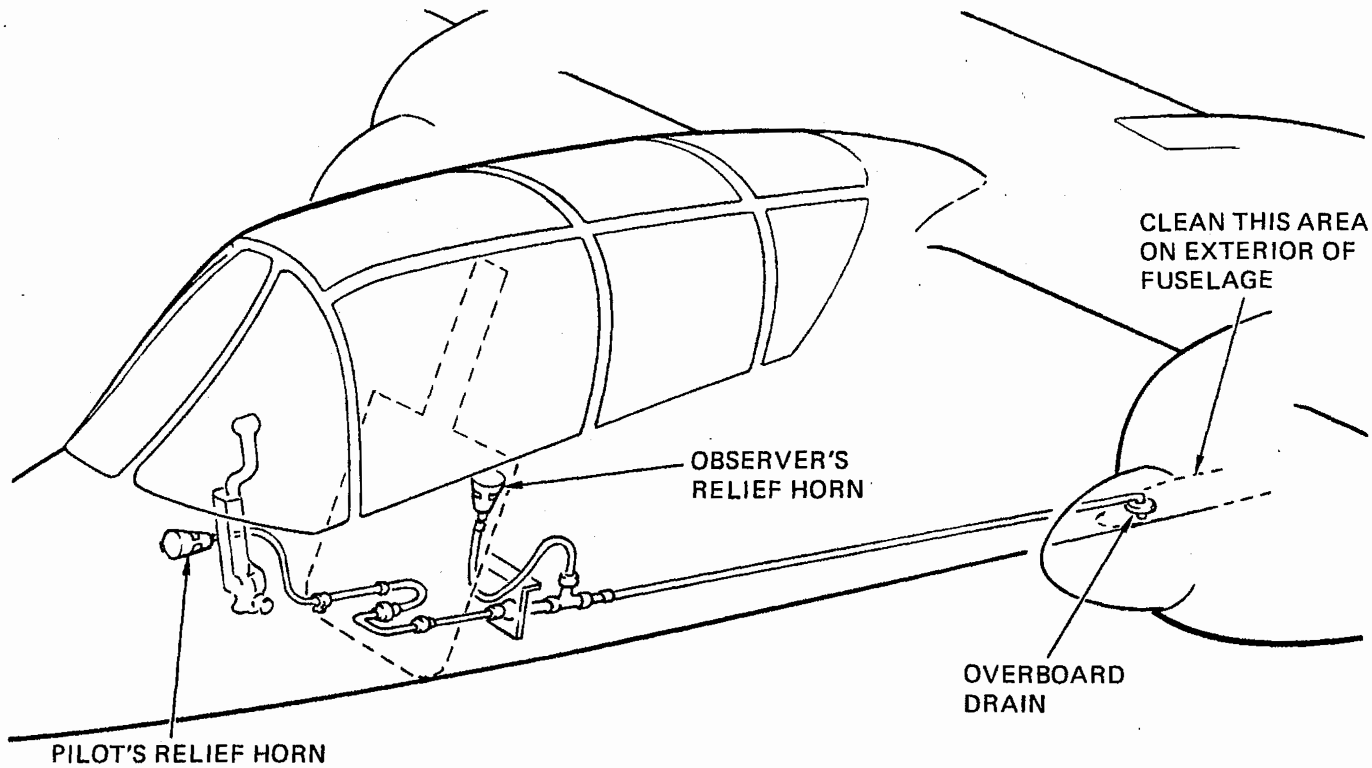


Figure 2-28. Cleaning Pilot's and Observer's Relief System

gines between periodic inspections. If the presence of heavy oil on the engine constitutes a fire hazard, then proceed as follows to clean the engines.

Materials List

Paint Thinner	TT-T-291, Grade I
Solvent, Dry-cleaning	P-D-680, Type II

WARNING

Ensure that the aircraft is grounded. Observe all fire regulations.

Mineral spirits and dry-cleaning solvent are flammable and must be used with care. Use with adequate ventilation; avoid prolonged breathing of vapors; keep away from open flames.

CAUTION

Use normal care in protecting nonmetal parts, lubricated surfaces, electrical equipment, and other items that could be damaged by solvent action or moisture.

1. Remove dirt and grease by spraying engine with dry-cleaning solvent (P-D-680, type II) or paint thinner (TT-T-291, grade I), whichever is available.

2. Thoroughly dry with compressed air or wipe down with clean cloth.

3. Closely examine engine and accessories for cracks and defects.

Note

- Because of the variety of metals and materials that make up the parts of the engine, thorough cleaning involves the disassembly of the individual components and exact cleaning and inspection processes. These procedures are obtained in the handbooks of the various engine manufacturers and other pertinent technical publications.
- Engines require a certain amount of protection during general aircraft maintenance. Install all duct plugs and covers and otherwise seal all openings into the

engine when conditions warrant. Do not permit water or cleaning compounds to collect in air inlets or exhaust outlets. Keep flammable materials from exhaust outlets. Keep flammable materials from exhaust areas to reduce the fire hazard. Leave the heavy duty cleaning to the engine shops.

2-163. EVALUATION AND TREATMENT OF CORROSION. Evaluation and treatment of corrosion shall be accomplished using the methods and materials contained in NAVAIR 01-1A-509.

2-164. APPLICATION OF FINISH COATS TO SURFACES IN TOUCHUP PAINTING.

2-165. Refinishing and touchup shall be accomplished using the methods and materials contained in NAVAIR 01-1A-509 and Table 2-10, except as noted below.

2-166. SPECIAL REQUIREMENTS. Before beginning any phase of touchup painting, the special requirements as follows should be considered.

2-167. BONDING CONTACTS. All areas serving as electrical, radio, or electrostatic bonds or connections shall have no finish on the contacting surfaces other than the original chromodizing or plating.

2-168. AIRCRAFT INTERIOR. Refinish or touchup internal areas using the methods contained in NAVAIR 01-1A-509 and the finishes contained in table 2-10. Zinc chromate primer, MIL-P-8585/TT-P-1757, or epoxy primer, MIL-P-23377 shall be applied prior to topcoating and shall be used to refinish or touchup primer coated areas.

2-169. WALKWAY COATING. When walkways develop holes or breaks that require repair, they may be refinished using aircraft walkway coating (MIL-W-5044, Type II, Class I) and the methods contained in NAVAIR 01-1A-509.

2-170. AREAS EXPOSED TO BATTERY FLUIDS. To touchup areas exposed to battery fluids, proceed as follows:

1. Clean, corrosion treat, and prepare surfaces in accordance with NAVAIR 01-1A-509.

2. Apply one coat of vinyl primer (MIL-P-15930) and allow to dry.

3. Apply two coats of enamel top coat (MIL-E-15936) and permit to dry to hard coat.

2-171. SEALING.

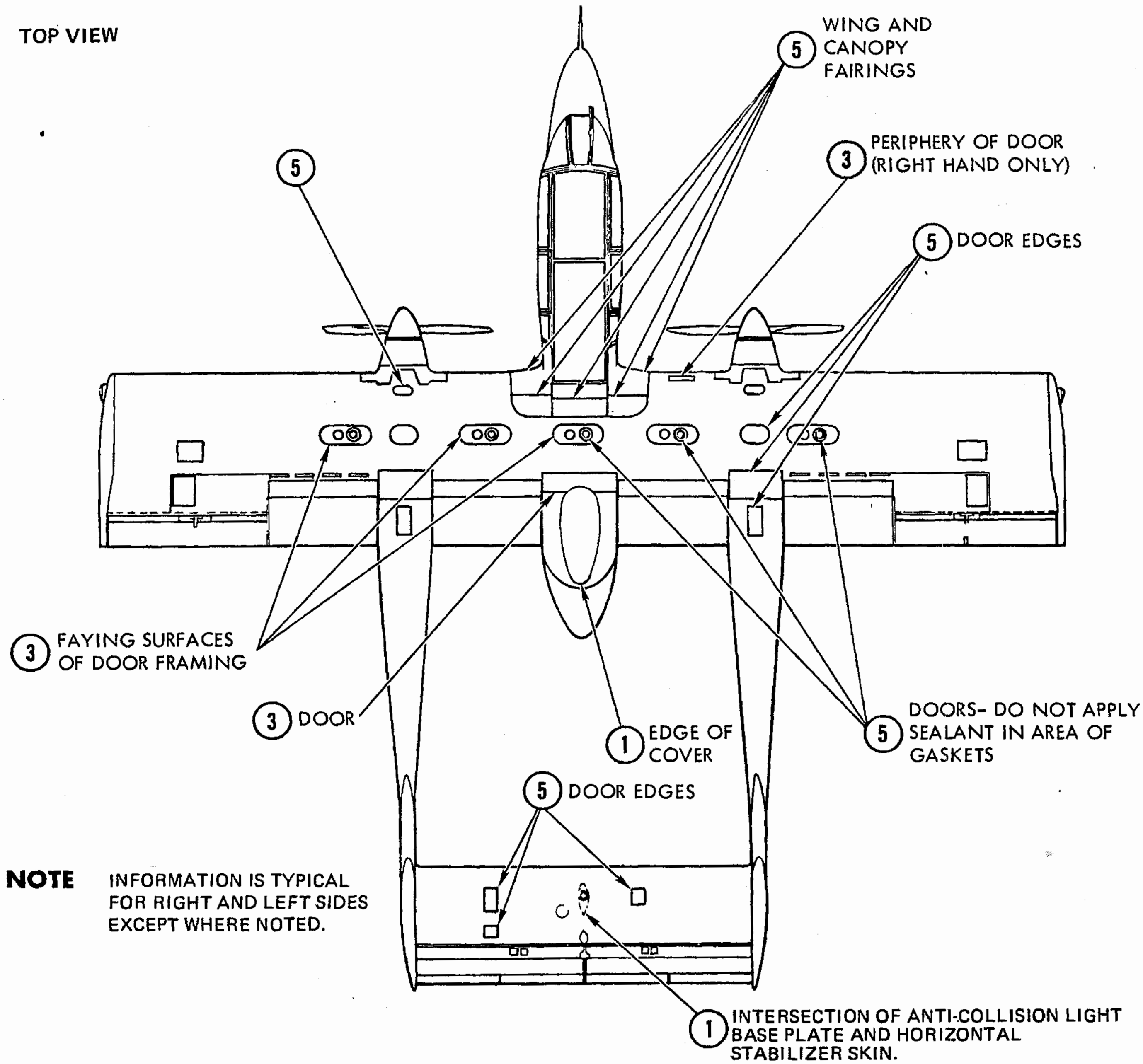
2-172. Sealing the aircraft as routine maintenance is performed will minimize water entry into the various components of the airframe and thereby reduce the possibility of corrosion to both the components and the aircraft structure. Detailed structural sealing procedures are given in the Structural Repair Manual (NAVAIR 01-60GCB-3). See figure 2-29 for the sealing requirements of the airframe during routine maintenance operations.

2-173. AIRCRAFT MARKINGS.

2-174. See figure 2-30 for locations and dimensions for markings. Refer to table 2-10 for proper color and federal standard number.

Table 2-10. Interior and Exterior Finishes

SURFACE	COLOR	MATERIAL
	EXTERIOR	
All exterior surfaces and all surfaces exposed to external environment during flight or on the ground such as fairings, wing flaps, and spoilers when extended, etc, except as noted.	Upper surfaces No. 14097 field green, under surfaces light gray color No. 16440	MIL-L-81352 acrylic lacquer
Insignia and markings	Federal Standard 595, black color 17038 Insignia white 17875 Insignia blue 15044 Insignia red 11136 Orange yellow 13538	MIL-L-81352 acrylic lacquer; for insignia blue use TT-L-32 nitrocellulose lacquer
Leading edges of air foils and frontal surfaces	No. 14097, field green	
Antiglare coatings	Federal Standard 595, color No. 37038, nonspecular black	MIL-L-81352 acrylic lacquer
Walkways	Federal Standard 595, color No. 37038, nonspecular black	MIL-W-5044, Type II
Wheel well interiors and landing gear, landing gear door interior	Federal Standard 595, color No. 17875, insignia white	MIL-L-81352 acrylic lacquer
Upper wing surface.	White No. 17875	MIL-L-81352 acrylic lacquer
	INTERIOR	
Upper surfaces of exposed flaps when extended.	Federal Standard 595, color No. 11136, red	MIL-L-81352 acrylic lacquer
All surfaces in pilot's and navigator's compartments except as noted.	Federal Standard 595, color No. 36231, dark dull gray	TT-L-20 camouflage lacquer
Instrument bezels mounting flanges and adjustment knobs, foot pedals.	Federal Standard 595, color No. 37038, nonspecular black	TT-L-20 camouflage lacquer
All horizontal surfaces at or above the windshield and canopy level, and all metal parts of canopy and windshield.	Federal Standard 595, color No. 37038, nonspecular black	TT-L-20 camouflage lacquer
Emergency control handles knobs.	Black and orange yellow stripe FED-STD 595 color No. 13538, orange yellow	TT-L-20 camouflage lacquer
All other surfaces.	Zinc chromate primer or natural metal as required	MIL-P-8585 or TT-P-1757 zinc chromate primer
Interior of steps, handholds and wells.	Federal Standard 595, color No. 11136, red	MIL-L-81352 nitrocellulose lacquer

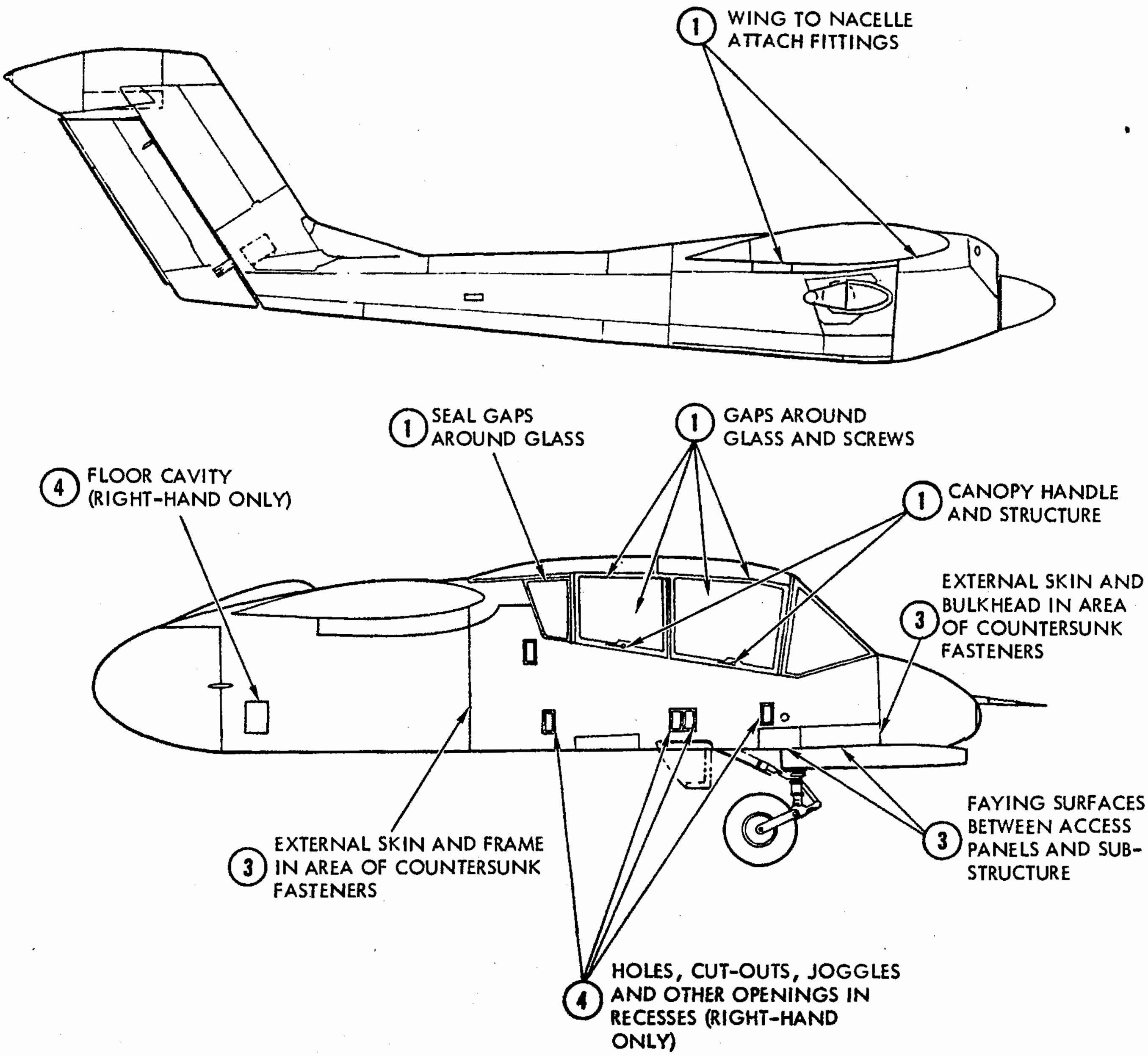


NOTE INFORMATION IS TYPICAL FOR RIGHT AND LEFT SIDES EXCEPT WHERE NOTED.

CODE	SEALING OPERATION	CODE	SEALING OPERATION
1	WATER TIGHT SEALING FOR AREAS WITH NORMAL OPERATING TEMPERATURE USING MIL-S-8802 SEALANT.	4	PRESSURE AND LIQUID-TIGHT SEALING FOR AREAS WITH NORMAL OPERATING TEMPERATURES USING MIL-S-8802 SEALANT.
2	ADHESIVE BONDING USING ROOM-TEMPERATURE VULCANIZING SILICONE RUBBER (RTV-90).	5	SELF-CONTOURING SEALING PADS FOR AREAS WHERE TEMPERATURES DO NOT EXCEED 225°F. USING MIL-S-8802 SEALANT.
3	FAYING SURFACE SEALING FOR AREAS WITH NORMAL OPERATING TEMPERATURES USING MIL-S-8802 SEALANT.		

VM-2H-31-57.1B(CP)

Figure 2-29. Sealing (Sheet 1 of 3)



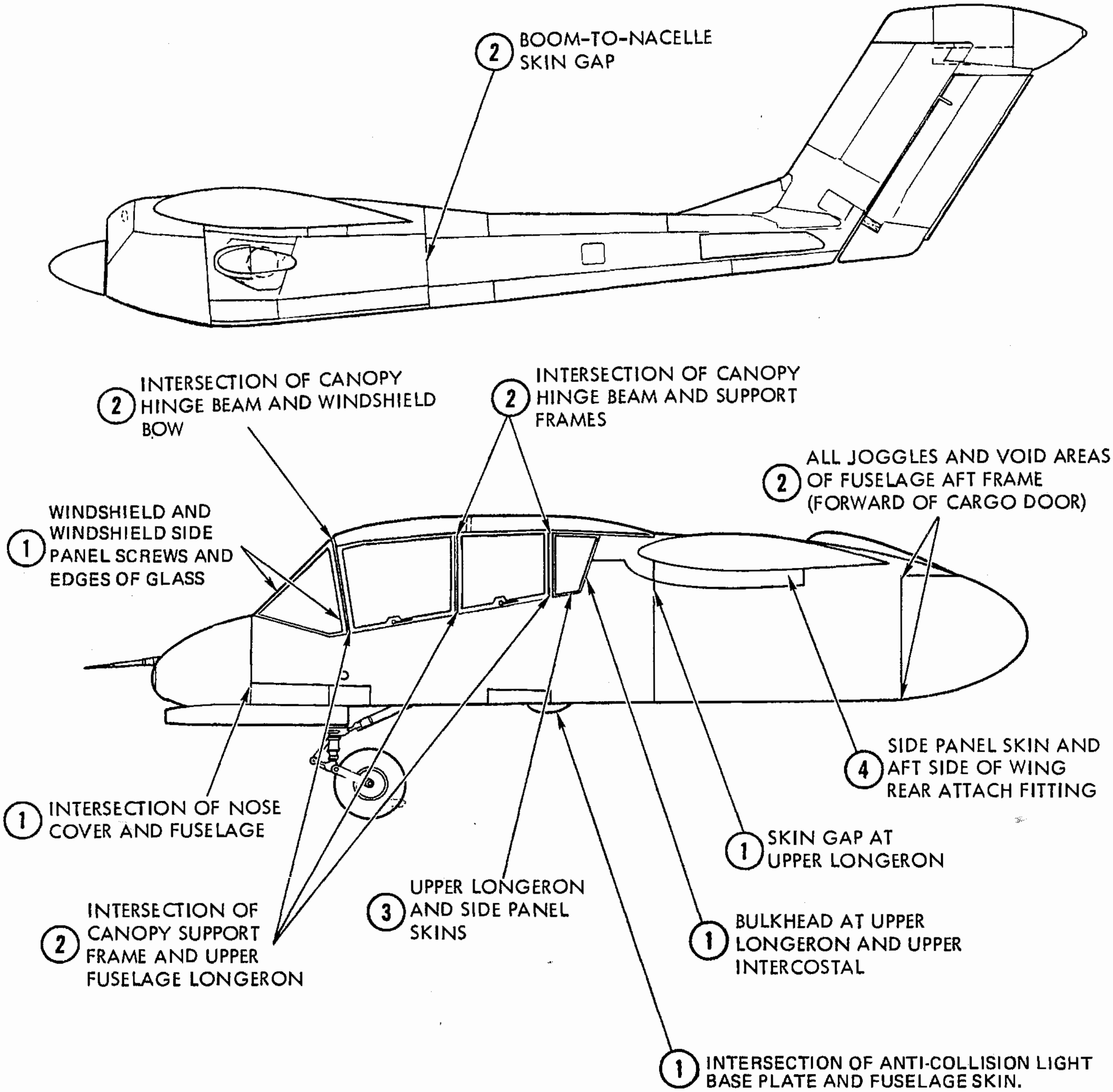
NOTE INFORMATION IS TYPICAL FOR BOTH SIDES EXCEPT WHERE NOTED.

DETAILED SEALING INSTRUCTIONS ARE GIVEN IN THE APPROPRIATE SECTIONS OF THE MAINTENANCE INSTRUCTIONS MANUAL AND STRUCTURAL REPAIR MANUAL.

REFER TO SHEET 1 FOR SEALING OPERATION CODES.

VM-2H-31-57.2

Figure 2-29. Sealing (Sheet 2 of 3)



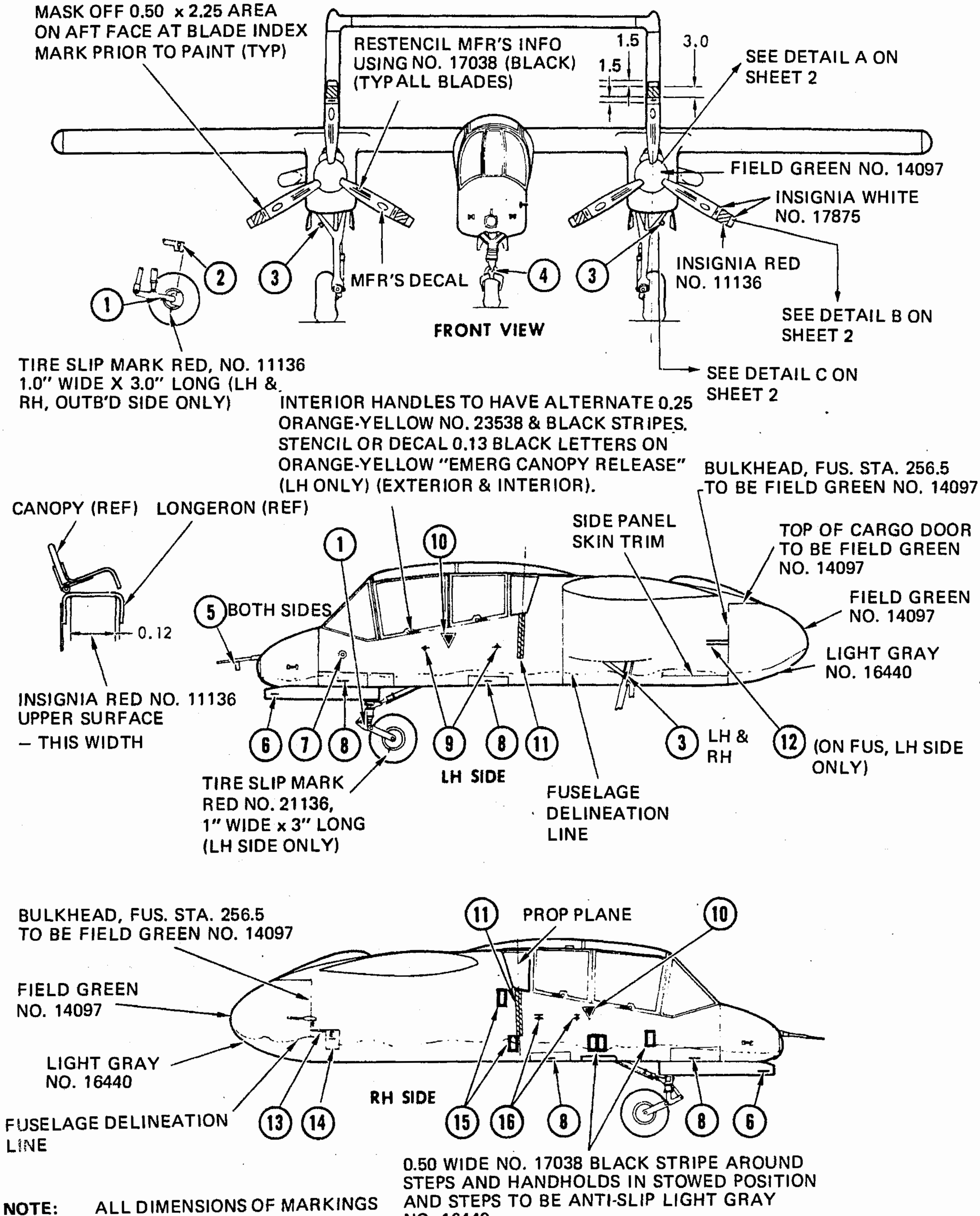
NOTE INFORMATION IS TYPICAL FOR BOTH SIDES EXCEPT WHERE NOTED.

DETAILED SEALING INSTRUCTIONS ARE GIVEN IN THE APPROPRIATE SECTIONS OF THE MAINTENANCE INSTRUCTIONS MANUAL AND STRUCTURAL REPAIR MANUAL.

REFER TO SHEET 1 FOR SEALING OPERATION CODES.

VM-2H-31-57.3A(CP)

Figure 2-29. Sealing (Sheet 3 of 3)



NOTE: ALL DIMENSIONS OF MARKINGS ON SHEETS 1 THROUGH 9 ARE IN INCHES.

VM 2H 31 55 1A

Figure 2-30. Aircraft Markings (Sheet 1 of 10)

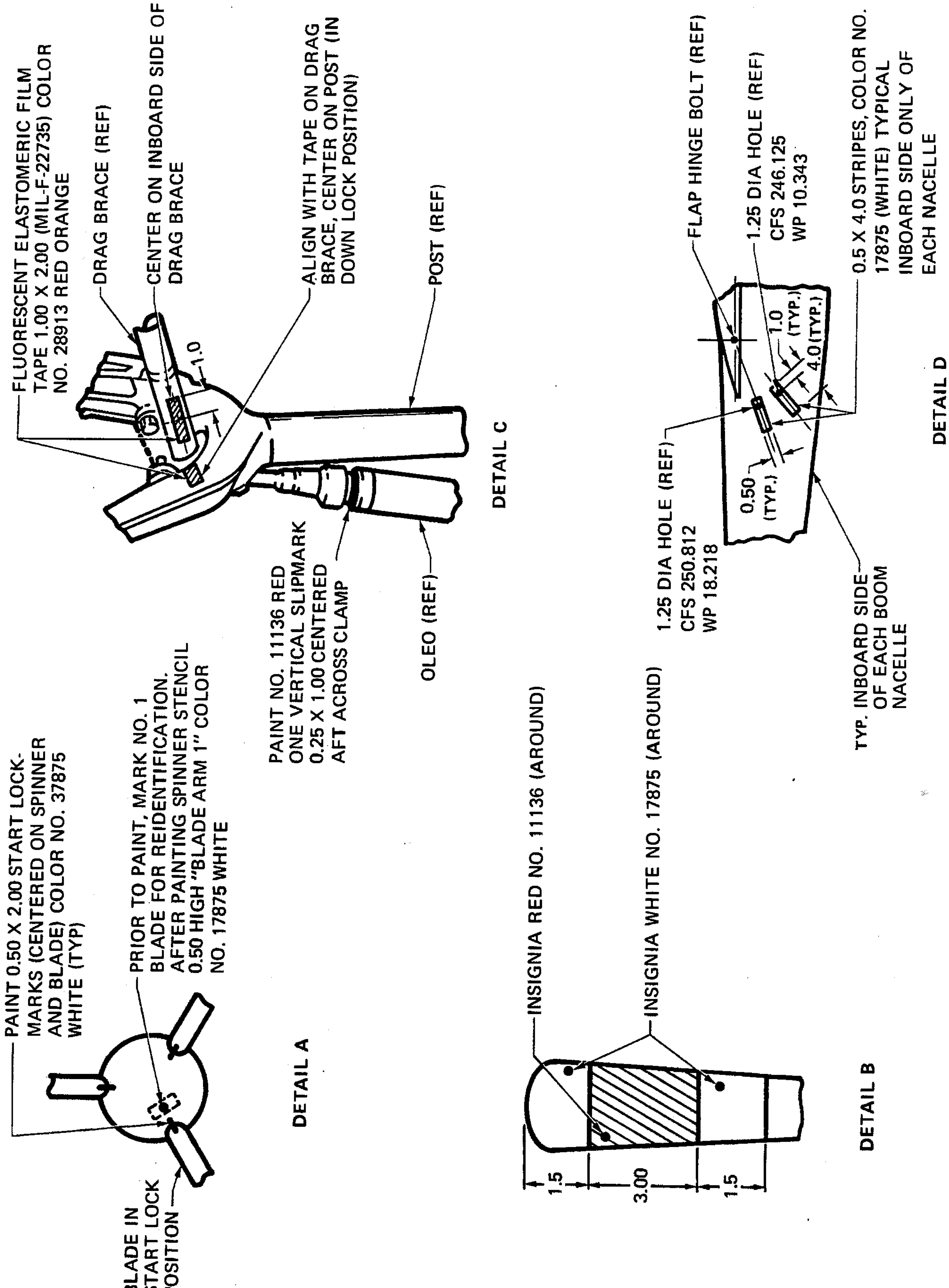


Figure 2-30. Aircraft Markings (Sheet 2 of 10)

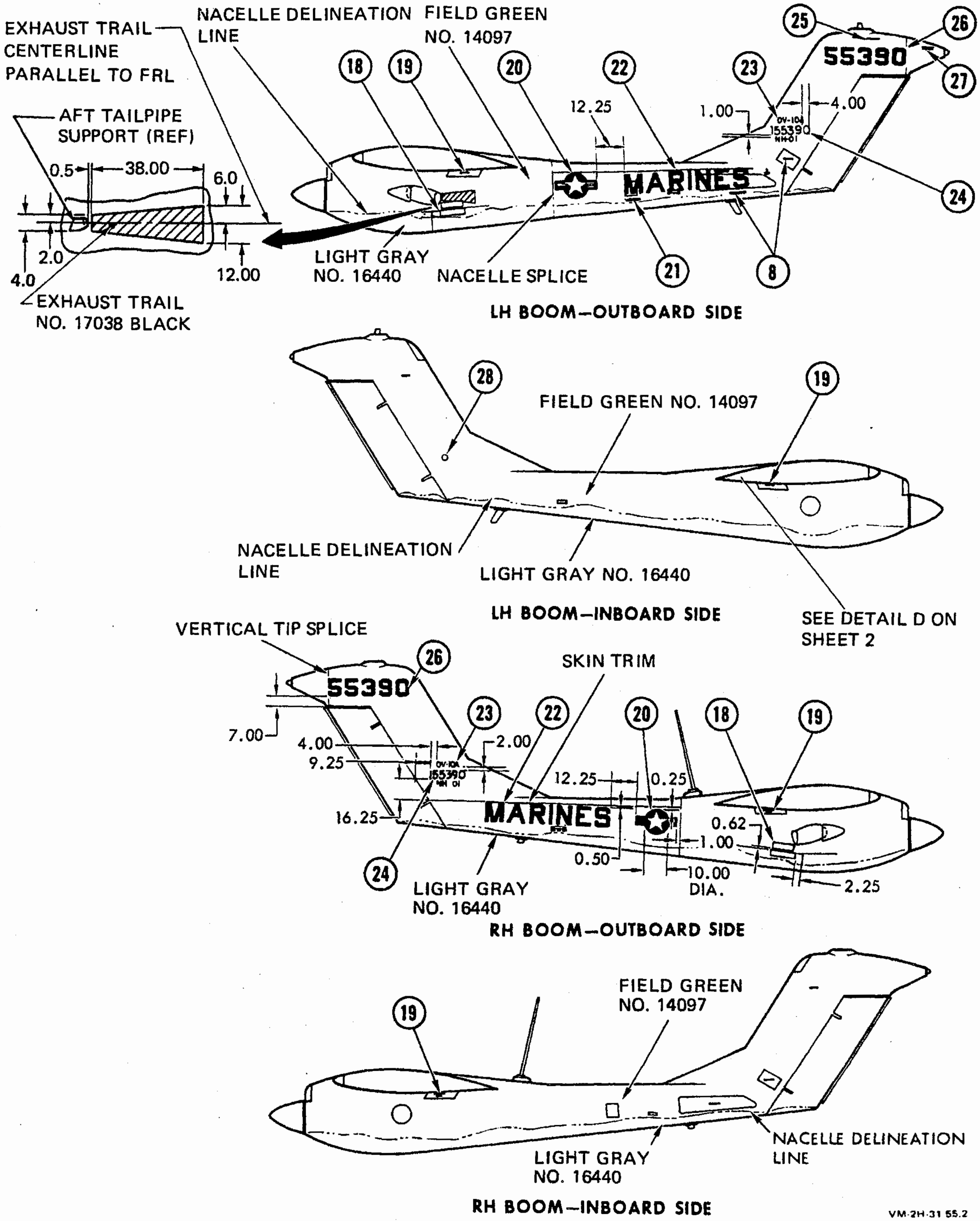


Figure 2-30. Aircraft Markings (Sheet 3 of 10)

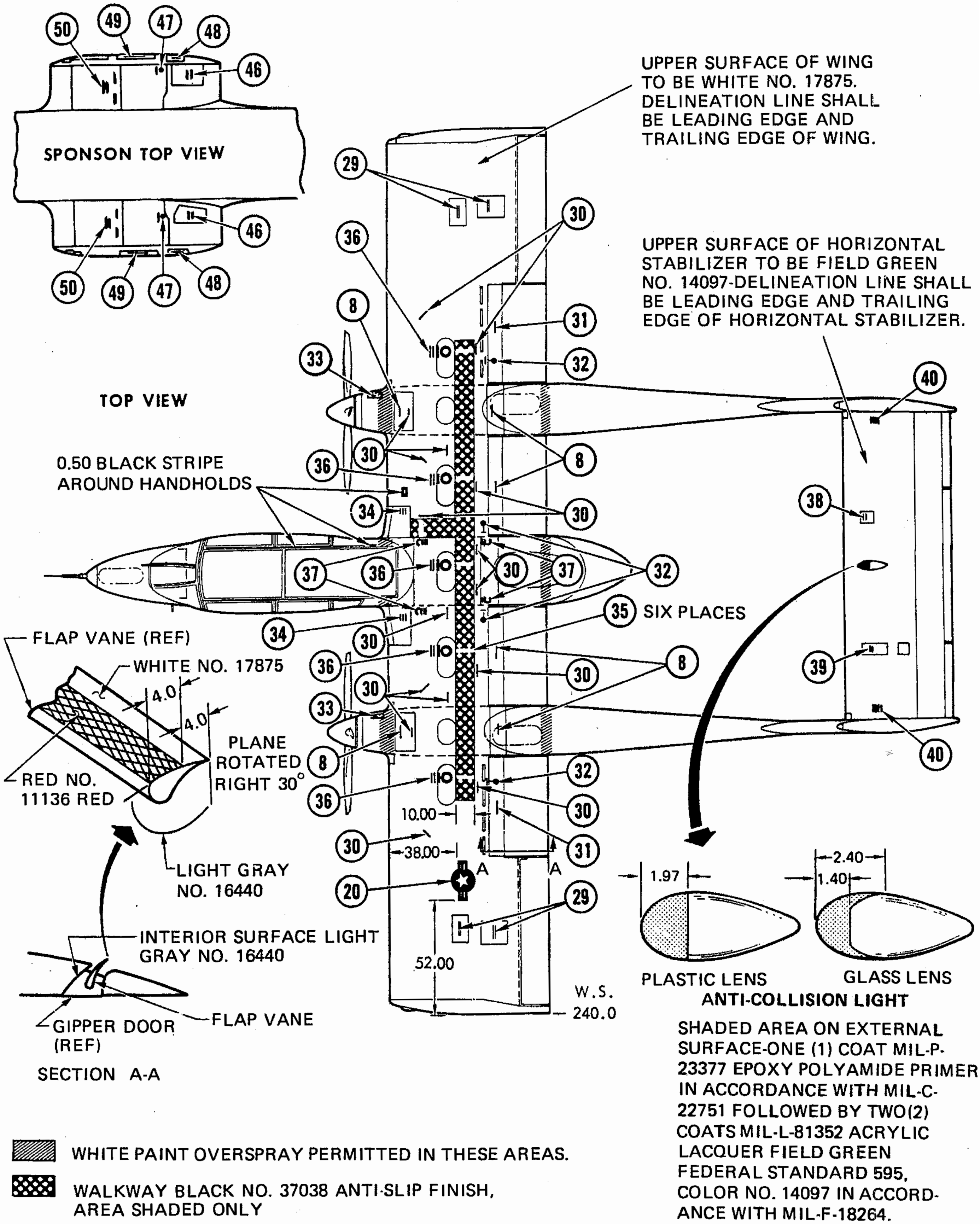


Figure 2-30. Aircraft Markings (Sheet 4 of 10)

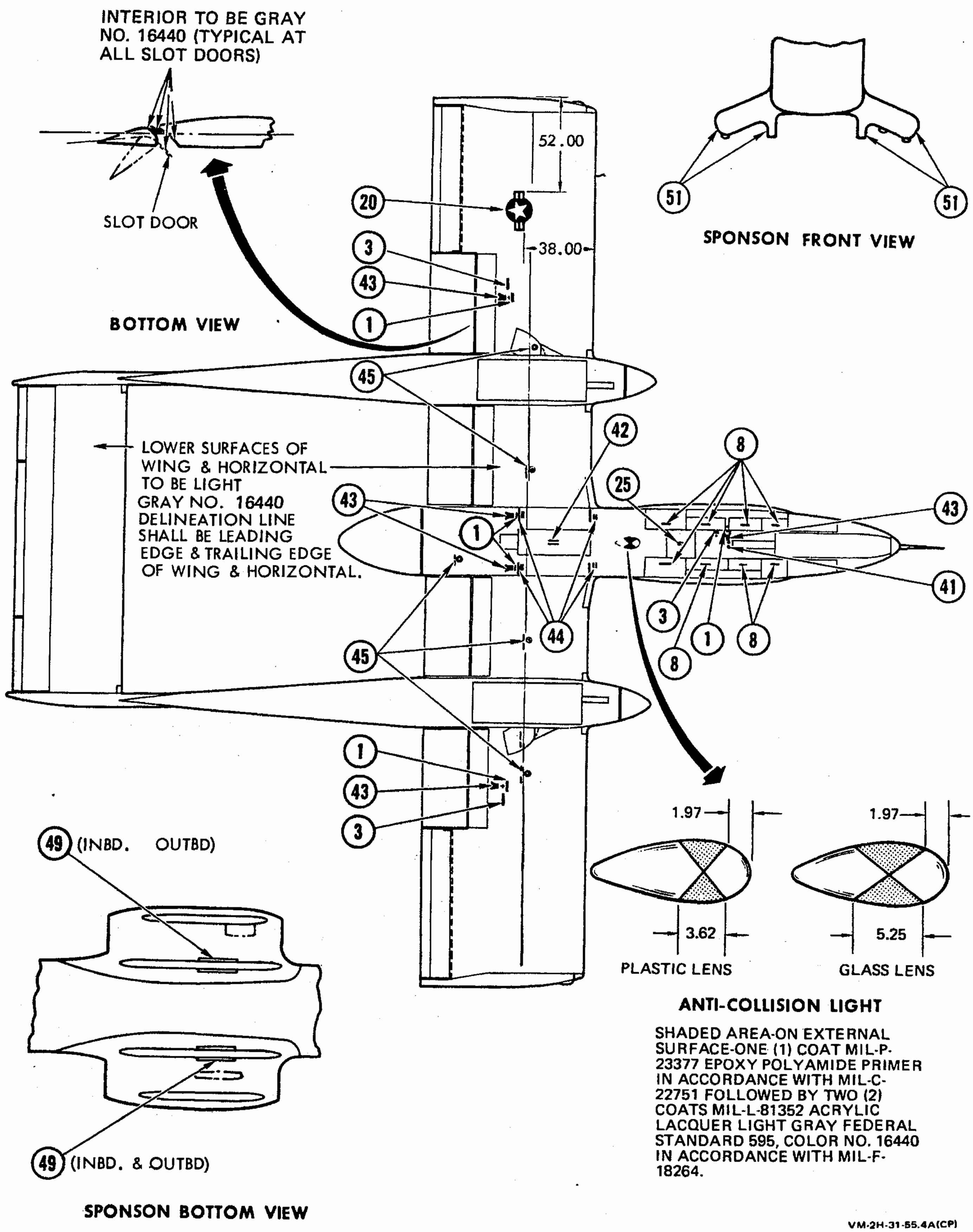


Figure 2-30. Aircraft Markings (Sheet 5 of 10)

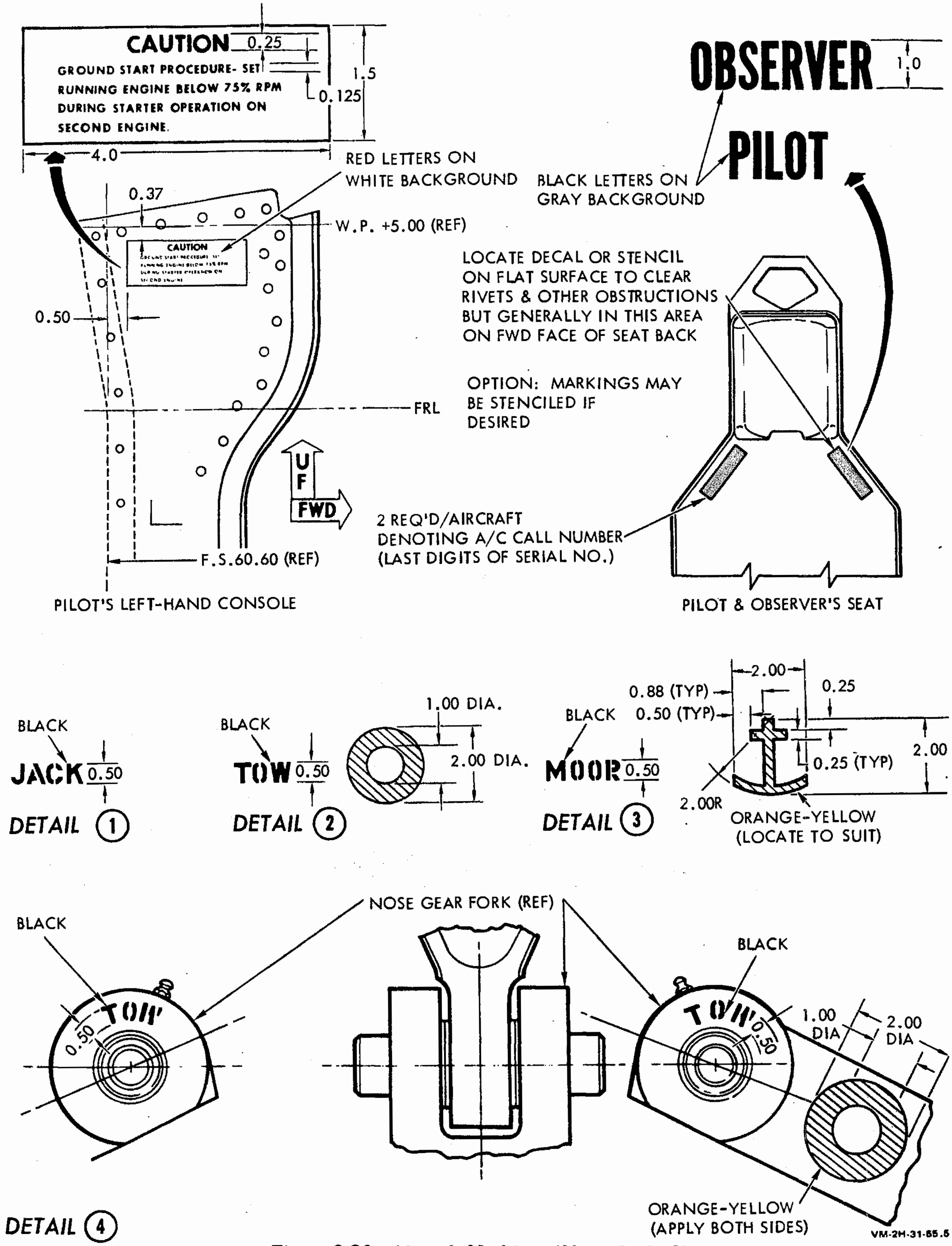


Figure 2-30. Aircraft Markings (Sheet 6 of 10)

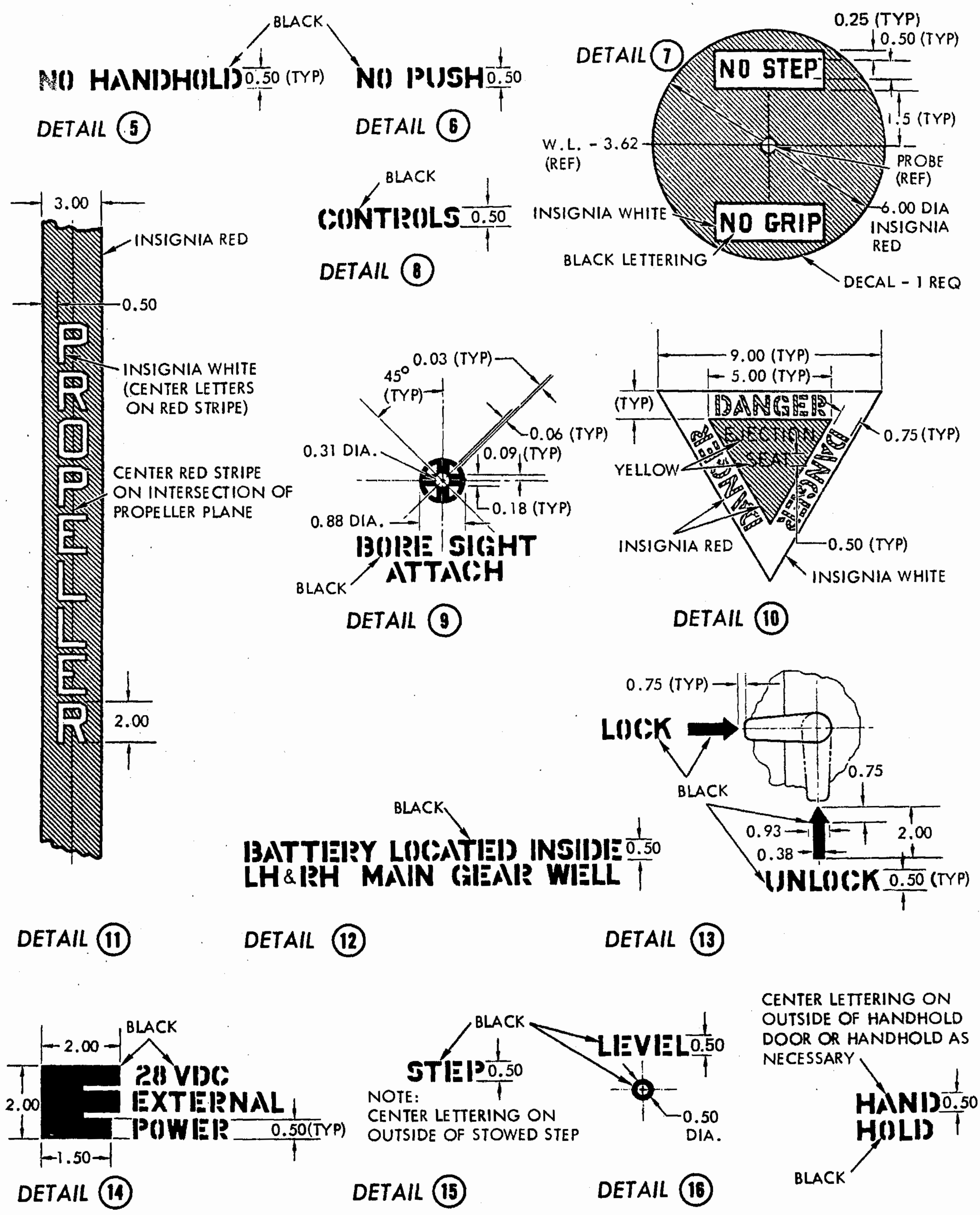


Figure 2-30. Aircraft Markings (Sheet 7 of 10)

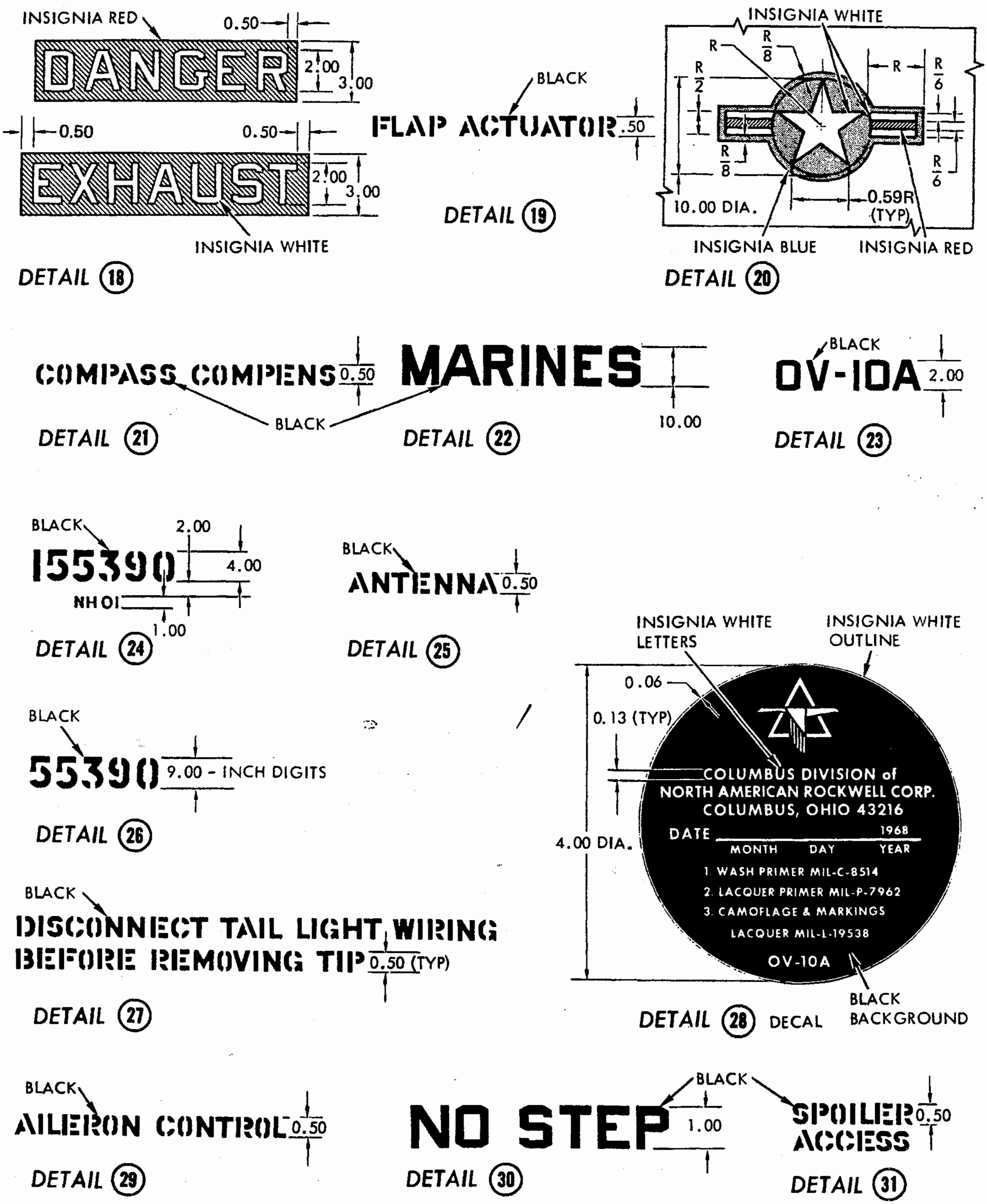


Figure 2-30. Aircraft Markings (Sheet 8 of 10)

VM-2H-31-55.7

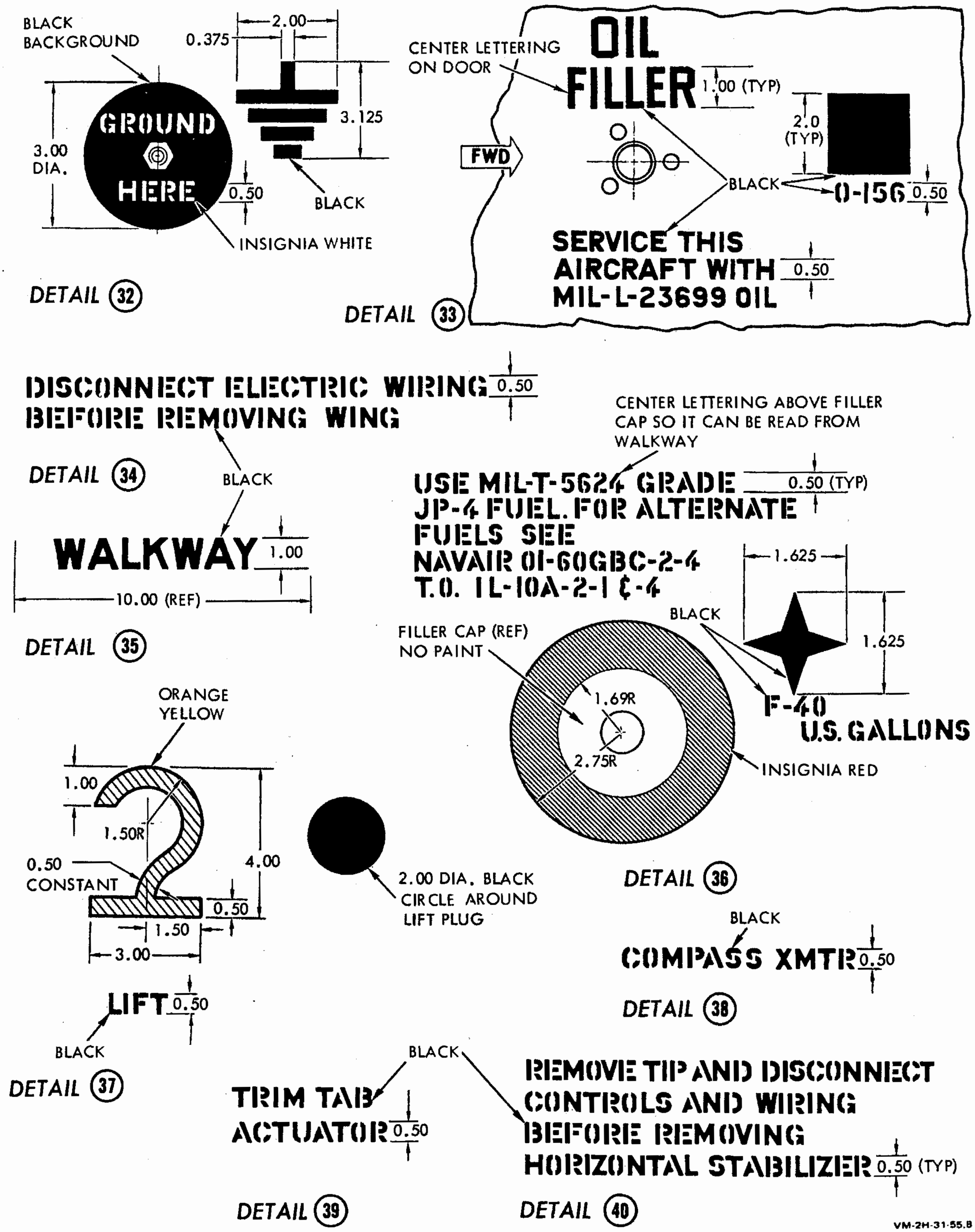


Figure 2-30. Aircraft Markings (Sheet 9 of 10)

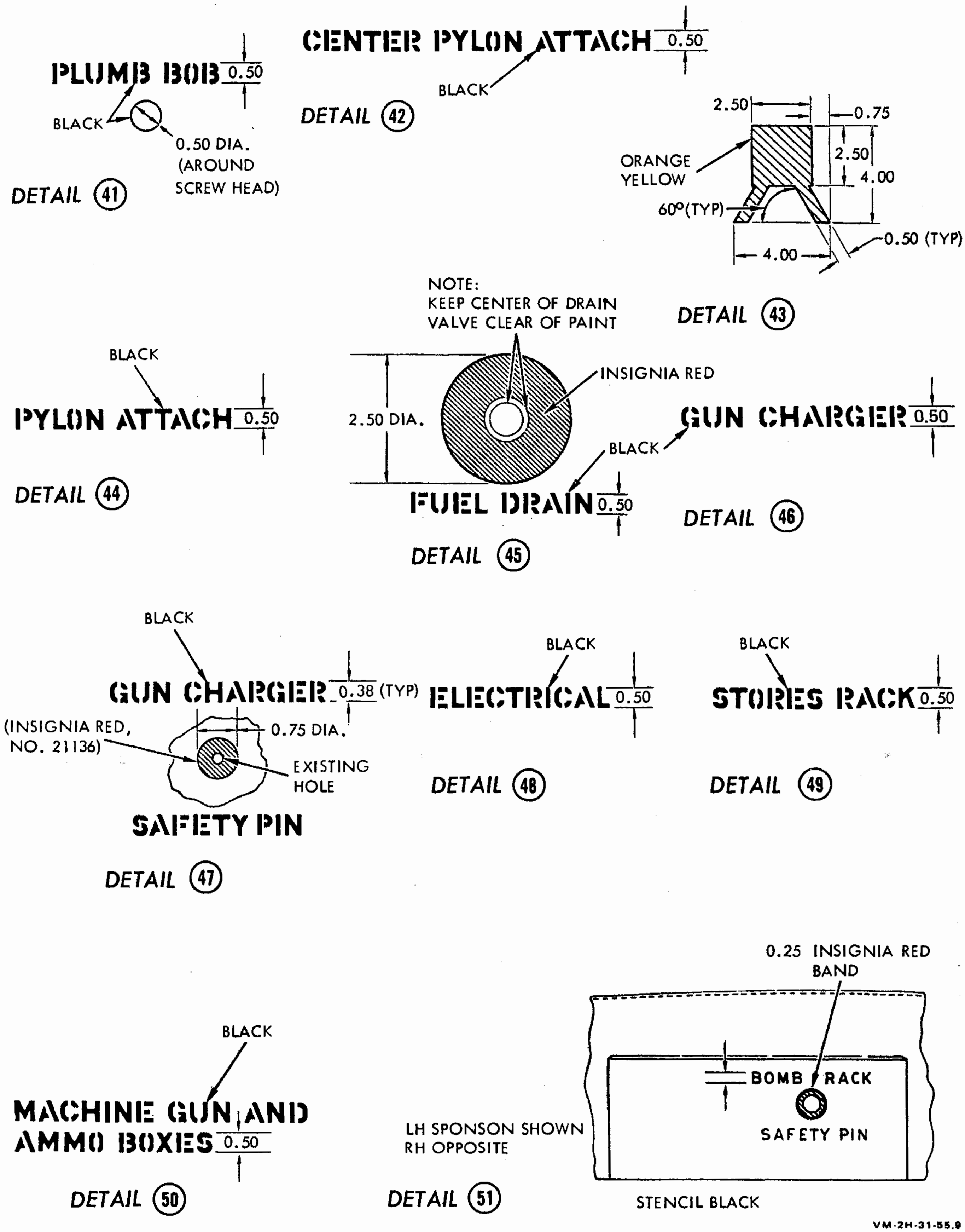


Figure 2-30. Aircraft Markings (Sheet 10 of 10)

SECTION III
INTERMEDIATE MAINTENANCE

2-175. GENERAL.

2-176. Intermediate maintenance for components of the airframe systems is contained in this section. Materials, special tools, and specifications for performing these maintenance procedures are listed as necessary. Repair of components at this level of maintenance generally includes the installation of items contained in provisioned repair kits along with standard supply items.

2-177. AIRCRAFT CONTROL SYSTEM ROD ASSEMBLIES.

2-178. Intermediate maintenance for the majority of the aircraft control system rod assemblies is typical. Refer to paragraph 2-179 through 2-185 for rod-end replacement, and to paragraph 2-186 for bearing replacement. These procedures are applicable to the control rod assemblies listed in table 2-11. See figure 2-31 for types of rod-end assemblies and proceed as follows:

Materials List

Solvent, Naphtha	MIL-N-15178
Adhesive, General-purpose Rubber Base	MIL-A-5092, Type II

2-179. ADJUSTABLE ROD END REPLACEMENT. To replace a typical adjustable rod end, see figure 2-31 and proceed as follows.

2-180. DISASSEMBLY OF ADJUSTABLE ROD END.

1. Loosen nut on threaded rod end and unscrew rod end from rod.

2. Drill out rivets attaching adapter to rod.

3. Use naphtha solvent (MIL-N-15178) to loosen the adhesive and remove plug from adapter.

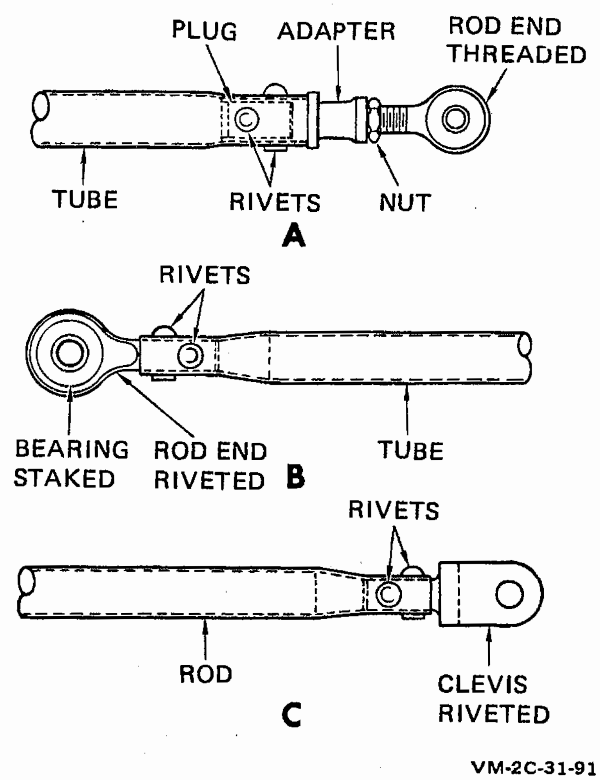


Figure 2-31. Typical Rod Assemblies

2-181. ASSEMBLY OF ADJUSTABLE ROD END.

1. Cement plug in adapter, using adhesive (MIL-A-5092).

2. Rivet adapter to control rod.

3. Install rod end into adapter.

2-182. RIVETED ROD END. To replace a riveted rod end, see figure 2-31 and proceed as follows:

2-183. DISASSEMBLY OF RIVETED ROD END.

1. Drill out rivets and remove rod end from rod.

2. Check and/or replace bearing as necessary. Refer to paragraph 2-185.

Table 2-11. Control Rod Assemblies

ASSEMBLY	NOMENCLATURE	END FITTING AND/OR BEARING	TYPE OF INSTALLATION
300-524029	Directional System	300-524028-3 Rod End MS27261KSP4 Bearing REP4M6FS210 Rod End	Threaded Staked both sides Threaded
300-524038	Turnbuckle, Threaded End	300-524038-3 Terminal MS20201KP4A Bearing	Threaded Staked both sides
300-524064-61	Aft Rudder Pedal Control	AN948-RE4H8 Rod End RE4M6 Rod End	Riveted Threaded
300-524067-1, -21	Aft Rudder Pedal Drive	AN948-RE4 Rod End RE4M6 Rod End	Riveted Threaded
300-524071-1	Aft Rudder Pedal Control Brake	RE4H8-4 Rod End (two required)	Riveted
300-524075	Aft Cockpit Rudder Pedal Control Brake	RE4H8-4 Rod End (two required)	Riveted
300-524110-11	Nose Gear Steering Drive	MS27261KSP4 Bearing (two required)	Staked both sides
300-524122	Rudder Pedal Adjust Actuator	300-524122-3 MS27261KSP4 Bearing	Rod end riveted to rudder pedal adjust screw jack Staked both sides
300-524221	Directional System Rear Spar	247-523421 Clevis 247-523423	Riveted Threaded
300-524501-11	Forward Brake Control	RE4H8-4 Rod End (two required)	Riveted
300-524510-21	Aft Vertical Brake	AN948-RE4H8 279-524213 Rod End (MS27261KSP4A Bearing)	Riveted Threaded Staked both sides
300-520179	Canopy Latch Aft	300-520194 Rod End (BS8ATC21 Bearing) 300-520195 Clevis	Riveted Staked both sides Riveted
300-521018	Lateral Forward Stick Drive	RM4B Bearing-Rod End (two required)	Riveted

Table 2-11. Control Rod Assemblies (Cont)

ASSEMBLY	NOMENCLATURE	END FITTING AND/OR BEARING	TYPE OF INSTALLATION
300-522014	Control—Push-Pull	REP4M6FS210 Rod End RE4H8-4 Rod End	Threaded Riveted
300-522017	Longitudinal Control Aft Drive	AN948-RE4H8 Rod End REP4M6FS210 Rod End	Riveted Threaded
300-522060	Aft Stick Drive	REP4M6FS210 Rod End AN948-RE4H8 Rod End	Threaded Riveted
300-522204	Longitudinal Aft Upper Fuselage	RE4H8-4 Rod End REP4M6FS210 Rod End	Riveted Threaded
300-522260	Longitudinal Trim Spring Support Arm	DW4K2 Bearing MS27261KSP4 Bearing	Staked both sides Staked both sides
300-523010	Lateral Stick Swivel Tube	300-523010-21 Subassembly REP4M6-4 Rod End MS20207DPP4 Bearing	Riveted Threaded Staked both sides
300-523051	Lateral Forward Drive	RM4B Rod End RE4H8-4 Rod End	Threaded Riveted
305-522255	Longitudinal, Aft Fuselage	REP4M6FS210 Rod End RE4H8-4 Rod End	Threaded Riveted
305-523219-11	Trim Spring Drive	MS27261KSP4A Bearing (two required)	Staked both sides
305-523228-21	Aileron Control Geared Tab	305-523237 Clevis 305-526079 Rod End MS27261KSP4A Bearing	Riveted Threaded Staked both sides
305-523258-21	Spoiler Plate, Single and Clevis End	305-523262-7 Rod End MS27261KSP4A Bearing 305-523286 Clevis	Riveted Staked both sides Riveted
305-523264-31	Spoiler Plate, Duel End	305-523347-11 Rod End 305-523263-3 Rod End MS27261KSP4A Bearing (two required)	Riveted Riveted Staked both sides

Table 2-11. Control Rod Assemblies (Cont)

ASSEMBLY	NOMENCLATURE	END FITTING AND/OR BEARING	TYPE OF INSTALLATION
305-523282-81	Aileron Interconnect	RE4M6 Rod End 305-523248 Clevis	Threaded Riveted
305-523287	Spoiler Plate, Duel and Clevis End	305-523263-3 Rod End MS27261KSP4A Bearing (two required) 305-523286 Clevis	Riveted Staked both sides Riveted
305-523306-11	Spring Tab Drive	REP4M6FS210 Rod End 305-523305 Rod	Threaded Threaded
305-523338-21	Spoiler Shifter Drive	RE4H8-4 Rod End AN946RE4M6 Rod End	Riveted Threaded
305-523340	Lateral System Switcher to Overcenter Crank	AN946RE4M6 Rod End RE4H8-4 Rod End	Threaded Riveted
305-523345-11	Link-Spoiler Drive	MS27261KSP4 Bearing (two required)	Staked both sides
305-523353	Lateral-Spoiler Drive	305-523262-11 Rod End AN946RE4M6 Rod End	Riveted Threaded
305-523362-21	Spoiler Shifter Actuator	RE4H8-4 Rod End AN946RE4M6 Rod End	Riveted Threaded

2-184. ASSEMBLY OF RIVETED ROD END.

1. Rivet rod end to rod.

2-185. CLEVIS ROD END REPLACEMENT. To replace a typical clevis rod end, see figure 2-31, detail C and drill out rivets, replace rod end, and install rivets.

2-186. BEARING REPLACEMENT.

2-187. To replace typical antifriction bearings in rod end or bell crank assemblies, refer to Maintenance of Aeronautical Antifriction Bearings (NAVAIR 01-1A-503) technical manual and proceed as follows.

2-188. INSPECTION OF BEARINGS.

1. Absolute causes for bearing rejection:

a. Cracked, flaked, or broken parts.

b. Bent or charred cages or retainers.

c. Dented integral shields which interfere with rotation or permit ingress of contamination.

d. Obvious alterations of original dimensions.

2. Bearings used in surface control quadrants are to be checked to determine that there is not more than 1/16 total wobble measured at a distance of 6 inches from the centerline of the bearing. All antifriction bearings shall operate freely when rotated by hand.

2-189. STAKING BEARINGS.

1. The following requirements shall govern bearings that are to be retained with stakes.

2. Press bed and press ram face shall be parallel to ensure equal pressure on all stake teeth.

3. Depth of stake indentations are prior to finish. Protective treatment such as paint, primer, etc. shall not be included in the depth of the stake impression.

MATERIAL	HEAT TREAT	DEPTH (1) (INCHES)	DEPTH (2) (INCHES)
Aluminum	Any	0.006–0.008	0.011–0.014

(1) For bearings up to and including 0.562-inch diameter.
(2) For bearings 0.563-inch diameter and greater.

4. Multiple punch stake tool is to be used for retention with tools modified to clear buttons or protrusions on housings.

5. Bearings shall be retained in the original package or container until just prior to installation. Hands and tools shall be clean and dry when handling bearings.

6. Housings which require bearings to be restaked, either because of need for rework, or replacement of a defective bearing, are to be staked in previously unstaked material only. The staking tool shall be positioned on the housing so the staking teeth contact the unstaked material between the first stake indentations.

2-190. AIRCRAFT CONTROL SYSTEM BELL CRANK ASSEMBLIES.

2-191. Intermediate maintenance for the majority of the aircraft bell crank assemblies is typical. Refer to paragraph 2-186, table 2-12, and see figure 2-32 for additional information and proceed as follows.

2-192. DISASSEMBLY OF BELL CRANK ASSEMBLIES.

1. Remove the bearing (staked in one place) from the assembly.

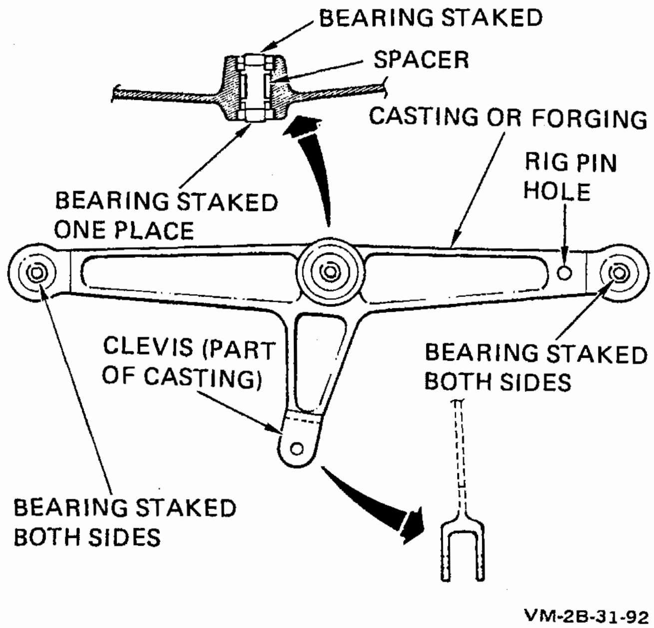


Figure 2-32. Typical Bell Crank Assemblies

CAUTION

During removal and installation of bearings, do not place stress on casting except at point where bearings are removed and installed. Pressure or stress applied at other points may result in cracks or fractures to the casting.

2. Press spacer and other bearing through the casting.

Note

To replace other type bearings in castings, refer to paragraph 2-189.

2-193. ASSEMBLY OF BELL CRANK ASSEMBLIES.

1. Install bearings (2) and spacer in casting. Refer to paragraph 2-186 and see figure 2-32.

2. Check bearings for proper installation.

3. Check casting for damage.

Note

If cracks or damage are suspected, perform a dye-penetrant inspection per MIL-I-6866 and MIL-I-6868.

Table 2-12. Bell Crank Assemblies

ASSEMBLY	NOMENCLATURE	BEARING	SPACER
300-523050-11	Lateral System Drive	MS20201KP4A (two required)	300-523058
300-524066-21	Aft Rudder Pedal Drive Interconnect	MS20200-KP4 (two required)	4S7-5-1.681
300-524070-21, -22	Aft Rudder Pedal Hanger, Lower	MS20200-KP5 (two required)	4S7-8-2.708
300-524078-11	Directional Force, Trim Upper	MS20201KP4A (two required)	4S7-4-1.125
300-524079-11	Directional Force, Trim Lower	MS20201KP4A (two required)	4S7-4-1000
300-524203-21	Directional Control, Aft Left-hand Fuselage	MS20201KP4A (two required) MS27261KSP4 (one required) These bearings required in 300-524203-7 bell crank	4S7-4-1.788
300-524203-31	Directional Control, Aft Left-hand Fuselage	Serrations through center of bell crank (two MS20201KP4A bearings and one MS27261KSP4 bearing required in 300-524203-9 bell crank)	
300-524210	Directional Control Vertical Stabilizer	MS20201KP4A (two required in 300-524210-3 bell crank)	4S7-4-1687
300-524502-1, -2	Rudder Pedal Brake Control	MS20202KP21B (two required)	300-524504
300-524505-11	Aft Brake Outboard	MS27261KSP6A (one required in 300-524505-3 bell crank)	

Table 2-12. Bell Crank Assemblies (Cont)

ASSEMBLY	NOMENCLATURE	BEARING	SPACER
300-524508-21, -22	Aft Lower Brake	MS20201KP4A (two required)	4S7-4-0.562
300-524530-11, -12	Forward Rudder Pedal Hanger	DW5 (two required)	4S7-9-2810
300-524531-21, -22	Forward Brake	MS20201KP4A (two required)	4S7-4-1.112
300-524535-11, -12	Inboard Aft Brake Upper	MS27261KSP4A (one required in 300-524535-3, -4 bell crank)	
300-524536-21, -22	Aft Brake Upper	See assemblies 300-524505-11 and 300-524535-11, -12 for component details.	
305-522202-11	Inboard Upper Fuselage	MS20201KP4A (two required—Staked both sides) MS20201KP5A (two required)	 4S7-7-5846
305-522262	Vertical Left-hand Aft Cable Attach	MS20201KP4A (two required) MS20200KP4 (two required—staked both sides)	4S7-4-2750
305-522263	Vertical Right-hand Aft Cable Attach	MS20201KP4A (two required) MS20200KP4 (two required—staked both sides)	4S7-4-2750
305-523201	Aft Upper Fuselage	MS20201KP5A (two required)	4S7-7-5946
305-523202-11	Inboard Wing Forward Spar	MS20201KP5A (two required) MS20201KP4A (two required in 305-523202-1 forging—staked both sides)	4S7-7-5846

Table 2-12. Bell Crank Assemblies (Cont)

ASSEMBLY	NOMENCLATURE	BEARING	SPACER
305-523207-21	Cable Input, Left-hand	MS20201KP5A (two required) MS20201KP4A (two required in 305-523207-5 bell crank–staked both sides)	4S7-7-2.294
305-523234-21	Cable Input, Right-hand	MS20201KP5A (two required) MS20201KP4A (two required in 305-523234-5 bell crank–staked both sides)	4S7-7-2.294
305-523336-11, -12	Reduced Spoiler	MS20200KP4 (two required)	4S7-5-3032
305-523342-11, -12	Spoiler Drive, Overcenter	MS20200KP4 (two required)	4S6-4-0312
305-523344-11, -12	Delayed Spoiler Drive	MS20200KP4 (two required)	4S6-4-0312
305-523346-11	Interconnect Spoiler Switcher	MS20200KP5 (two required) MS20201KP4A (two required in 305-523346-3 bell crank–staked both sides)	4S7-8-0634
305-523346-12	Interconnect Spoiler Switcher	MS20200KP5 (two required) MS20201KP4A (two required in 305-523346-4 bell crank–staked both sides)	4S7-8-0634
305-523348-11, -12	Spoiler Switcher	DW4K (one required–staked both sides)	

2-194. CANOPY BALANCE BUNGEE. (305-520205).

2-195. Two canopy balance bungees, one installed on the pilot's canopy access door and one installed on the observer's canopy access door, are used to stabilize the doors in the open position. Because of their construction, disassembly, cleaning, inspection, assembly, adjustment, and testing are within the capability of intermediate maintenance.

2-196. DISASSEMBLY. To disassemble the canopy balance bungee, see figure 2-33 and proceed as follows:

1. Hold bungee end cap (2) pointed downward. Cut lockwire and unscrew end cap from housing (9). Pour hydraulic fluid out of end cap.

2. Remove packing (3) from inside of end cap (2). Remove damper (6), packing (5), and compression spring (4) from inside of end cap (2).

3. Remove nut (7) and piston (8) from shaft (16). Remove housing (9) and compression spring (10).

4. Remove packing (11), retainers (12, 13), spacer (14), and compression spring (15) from shaft (16).

5. Cut lockwire and loosen check nut (18). Remove rod end (19), check nut (18), and lock washer (17) from shaft (16).

2-197. CLEANING. To clean the components of the canopy balance bungee, proceed as follows:

Materials List

Solvent, Dry-cleaning	P-D-680, Type II

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

1. Immerse parts in dry-cleaning solvent (P-D-680, Type II).

2. Thoroughly clean all parts, using a stiff-bristled brush.

3. Dry parts with clean compressed air.

2-198. INSPECTION. To inspect the components of the canopy balance bungee, see figure 2-32 and proceed as follows:

Tools and Equipment List

Tester, Spring Resiliency	Type PB4-500, or equivalent (36403)

Materials List

Primer, Zinc chromate	MIL-P-8585 or TT-P-1757

Note

If during inspection, end cap (2), piston (8), housing (9), spacer (14), or shaft (16) is defective, worn, or damaged beyond repair, discard the bungee.

1. Inspect all parts for general condition. Check all threads for damage and all machined surfaces for smoothness. Inspect all parts for cracks, dents, scratches, and worn threads. Spot-paint all scratches with zinc-chromate primer (MIL-P-8585 or TT-P-1757).

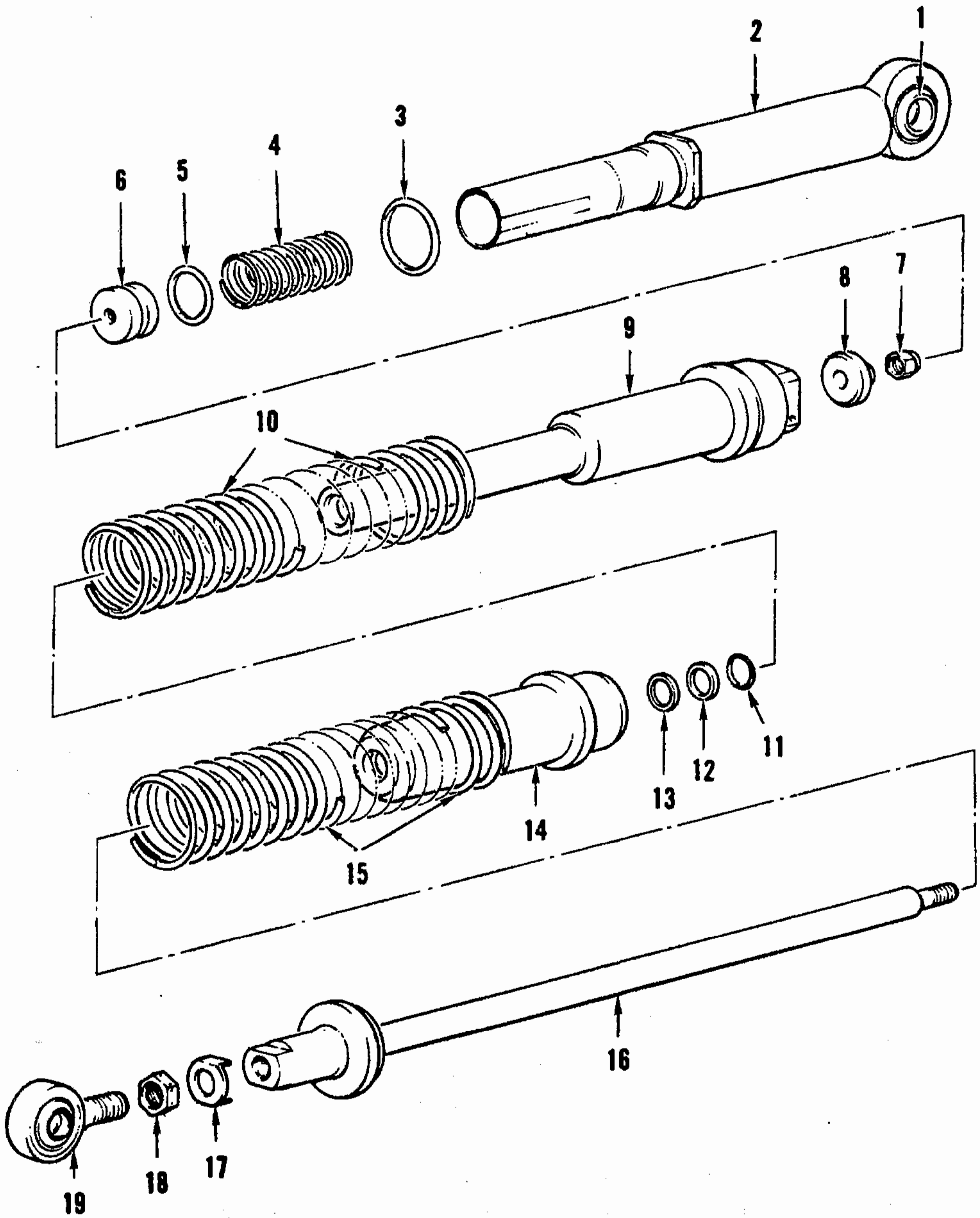
2. Check end cap bearing (1) and rod end bearing (19) for smooth movement during all angles of self-alignment, and to be free of side play.

3. Using a spring resiliency tester (Type PB4-500), compress spring (4) to a solid height of 0.25 inch. Remove tension from spring. Free length must be 1.42 (±0.03) inches.

4. Using a spring resiliency tester (Type PB4-500), compress spring to 0.50 (±0.01) inch length. Tester load must be 2.5 (±0.30) pounds.

5. Using a spring resiliency tester (Type PB4-500), compress each spring (10 and 15) to a solid height of 2.56 (±0.03) inches. Remove tension from spring. Free length must be 7.78 (±0.06) inches.

6. Using a spring resiliency tester (Type PB4-500), compress each spring (10 and 15) to 4.86 (±0.03) inches length. Tester load must be 93 (±0.90) pounds.



1	BEARING	11	PACKING
2	END CAP	12	RETAINER
3	PACKING	13	RETAINER
4	COMPRESSION SPRING	14	SPACER
5	PACKING	15	COMPRESSION SPRING
6	DAMPER	16	SHAFT
7	NUT	17	LOCK WASHER
8	PISTON	18	CHECK NUT
9	HOUSING	19	ROD END
10	COMPRESSION SPRING		

VM-2H-31-59

Figure 2-33. Canopy Balance Bungee

2-199. ASSEMBLY. To assemble the canopy balance bungee, see figure 2-33 and proceed as follows:

Materials List

Fluid, Hydraulic	MIL-H-5606
Fluid, Dow Corning 200, 20 Centistokes	VV-D-1078
Lockwire (0.041-inch diameter steel)	MS20995F41
Packing	MS28775-110
Packing	MS28775-113
Packing	MS28775-212
Pin, Cotter (1/16-inch diameter steel)	MS24665-134
Retainer	MS28782-8
Retainer	MS28774-110
Solvent, Dry-cleaning	P-D-680, Type II

1. Check that all parts are clean before assembling. Coat all internal parts with Dow Corning 200 silicone fluid (VV-D-1078).

2. Install packing (3, MS28775-212) on inside of housing (9). Slip compression spring (15) over outside of spacer (14). Slip compression spring (10) over outside of housing (9).

3. Insert shaft (16) through compression spring (15) and into spacer (14). Slide retainers (13, MS28782-8 and -12, MS28774-110) and packing (MS28775-110) over end of shaft (14) and against inside end of spacer (14).

4. Insert shaft (16) through compression spring (10) and housing (9). Compress compression springs (10, 15) until piston (8) can be slipped over threaded end of shaft and nut (7) can be installed. Tighten nut (7) and safety with cotter pin (MS24665-134).

5. Install packing (5, MS28775-113) on damper (6). Place end cap (2) in vertical position with open end up. Insert compression spring (4) and damper (6) into end cap cylinder. Fill cylinder with hydraulic fluid (MIL-H-5606).

6. Drop housing assembly down onto end cap (2). Tighten end cap (2) against housing (9). Safety end cap (2) with lockwire (MS20995F41).

7. Screw check nut (18) onto rod end (19). Align lock washer (17) with end of shaft (17). Screw rod end into end of shaft. Tighten check nut against lock washer.

2-200. ADJUSTMENT. To adjust the canopy balance bungee, obtain the following listed material, see figure 2-33 and proceed as follows:

Materials List

Lockwire (0.041-inch diameter steel)	MS20995F41

1. Adjust rod end (19) to obtain a dimension of 16.62 inches between center of rod end (19) and center of end cap (2) bearing.

2. Tighten check nut (18) against lock washer (17) and safety with lockwire (MS20995F41).

2-201. TESTING. After bungee rod end (19) has been properly adjusted, check that bungee assembly has a minimum stroke of 4.21 inches.

2-202. COCKPIT LADDER BUNGEE (300-311345).

2-203. Intermediate maintenance for the cockpit ladder bungee consists of disassembly, inspection, and/or replacement of components and assembly.

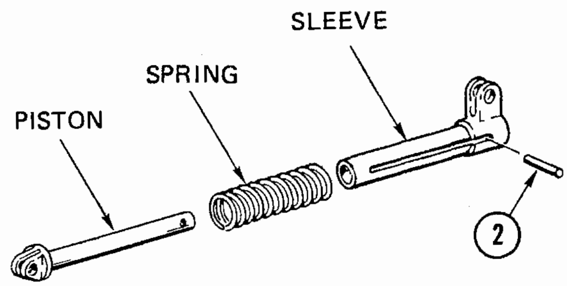
2-204. DISASSEMBLY.

1. Compress bungee far enough to relieve the sleeve pressure from pin.

2. Remove split spring type pin from slotted sleeve fitting.

Note

Place bungee in a position to allow the maximum amount of support for the sleeve end fitting while driving the pin out.



Step 2—Para. 2-204

3. Relieve compression pressure and disassemble the bungee.

4. Examine the sleeve slot and the piston end fitting for elongated, worn, or deformed attach holes. Replace as necessary.

5. Examine the piston spring, and sleeve for corrosion and/or rust pits. Replace as necessary.

2-205. ASSEMBLY.

1. Place spring on sleeve.

2. Insert piston into sleeve. Ensure the piston is turned so as to line up the pin hole with slot in sleeve.

3. Compress spring to align piston hole and sleeve slot.

4. Insert split spring type lockpin.

2-206. COCKPIT STEP BUNGEE (300-311324).

2-207. Intermediate maintenance for the cockpit step bungee consists of disassembly, inspection, and/or replacement, and assembly.

2-208. DISASSEMBLY.

1. Compress bungee enough to allow pin removal.

2. Remove split spring type pin (under spring) from piston.

3. Disassemble bungee.

4. Examine and clean all components.

2-209. ASSEMBLY.

1. Place spring over sleeve.

2. Insert piston into spring and sleeve. (Line up piston pin hole with slot in sleeve.)

3. Insert split spring type pin through sleeve slot into piston.

CHAPTER 3
FLIGHT CONTROL SYSTEMS

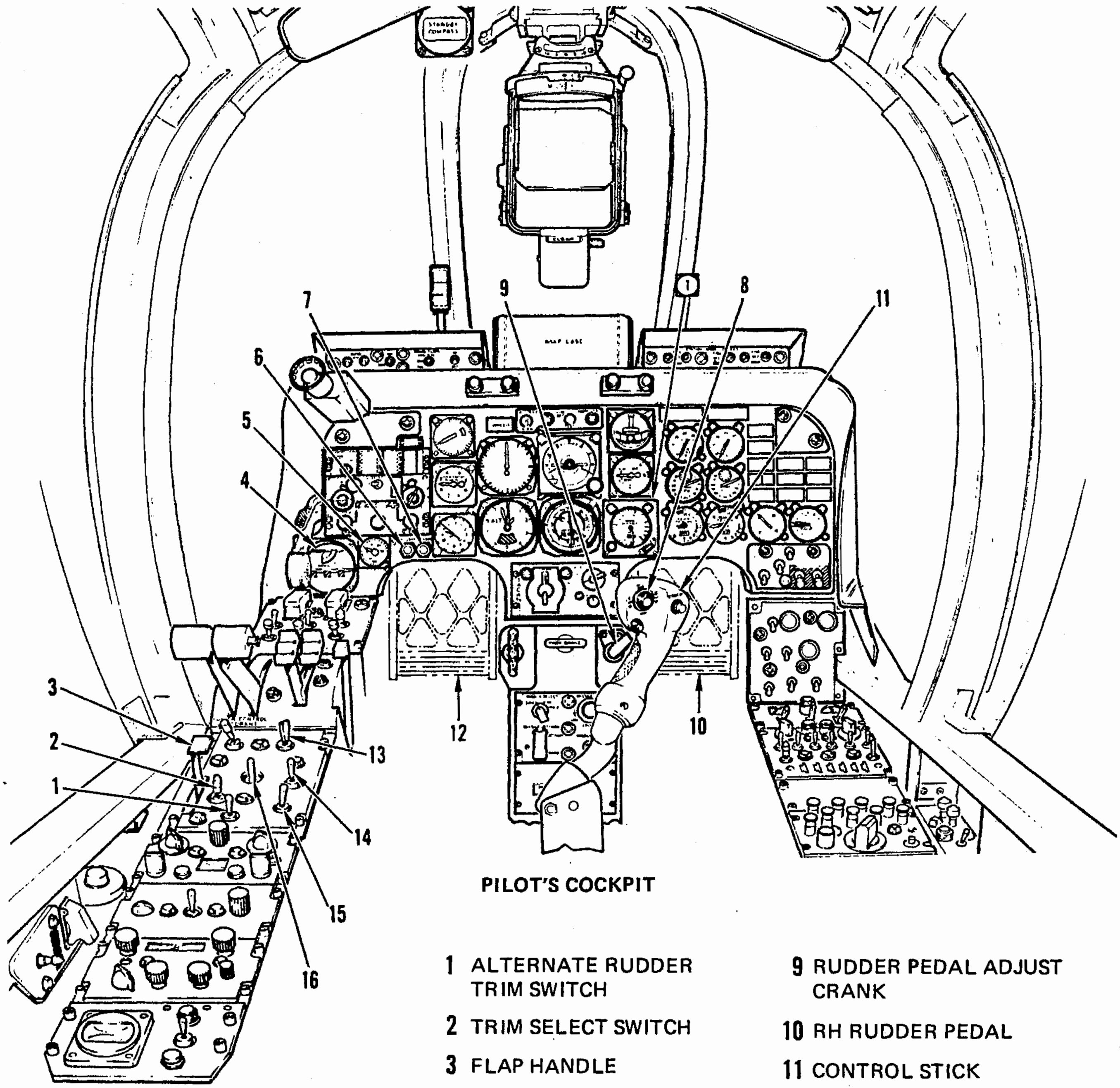
SECTION I
DESCRIPTION AND OPERATION

3-1. GENERAL.

3-2. The flight control system (figures 3-1 and 3-2) provides the means of controlling the aircraft about its three axes. This system is functionally divided into three primary systems, each of which controls the aircraft about one of its three axes, and a wing flap system which provides high-lift capabilities. Table 3-1 provides a brief description of each flight control system and the mode of control utilized. The primary flight control systems feature simplified design minimizing weight and vulnerability. Cockpit control is accomplished by conventional stick and pedals that position control surfaces through reversible, mechanical push rod/cable-type linkage systems. The longitudinal, lateral, and directional trim systems are operated by trimming the no-force stick and rudder pedal position through electrically-operated centering spring assemblies. In this manner, the pilot may position the control surfaces for a desired flight path without having to maintain pressure on the cockpit controls. The wing flap system controls are located on the pilot's left-hand console. This normally hydraulically powered system operates two double-slotted flaps in each wing. An alternate source of power is provided by an electric motor.

Table 3-1. Flight Control Systems and Modes of Control

FUNCTION	COCKPIT CONTROL	CONTROL SURFACES
	LATERAL CONTROL SYSTEM	
Controls the aircraft about its longitudinal axis.	Control stick.	Ailerons. Spoiler plates. Spring tabs, geared tabs.
	LONGITUDINAL CONTROL SYSTEM	
Controls the aircraft about its lateral axis.	Control stick.	Elevator. Spring tabs, geared tabs.
	DIRECTIONAL CONTROL SYSTEM	
Controls the aircraft about its vertical axis.	Rudder pedals.	Rudders.
	WING FLAP SYSTEM	
Provides additional high lift capability.	Flap handle (console).	Wing flaps. Slot (gipper) doors.



1 ALTERNATE RUDDER TRIM SWITCH
2 TRIM SELECT SWITCH
3 FLAP HANDLE
4 FLAP POSITION INDICATOR
5 ELEVATOR TRIM INDICATOR
6 RUDDER TRIM NEUTRAL INDICATOR
7 AILERON TRIM NEUTRAL INDICATOR
8 ELEVATOR AND AILERON TRIM SWITCH
9 RUDDER PEDAL ADJUST CRANK
10 RH RUDDER PEDAL
11 CONTROL STICK
12 LH RUDDER PEDAL
13 NORMAL RUDDER TRIM SWITCH
14 ALTERNATE FLAP SWITCH
15 YAW DAMPER SWITCH
16 ALTERNATE ELEVATOR AND AILERON TRIM SWITCH

[1] RADAR ALTIMETER INDICATOR (AFC 27 INCORPORATED)

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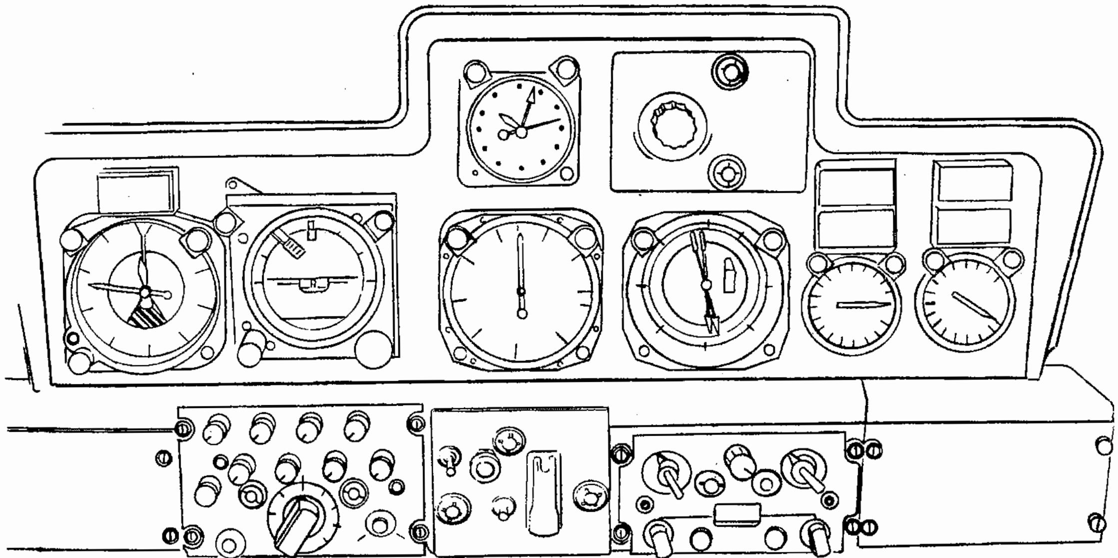
Figure 3-1. Flight Control System Controls and Indicators (Sheet 1 of 2)



30-6E-1

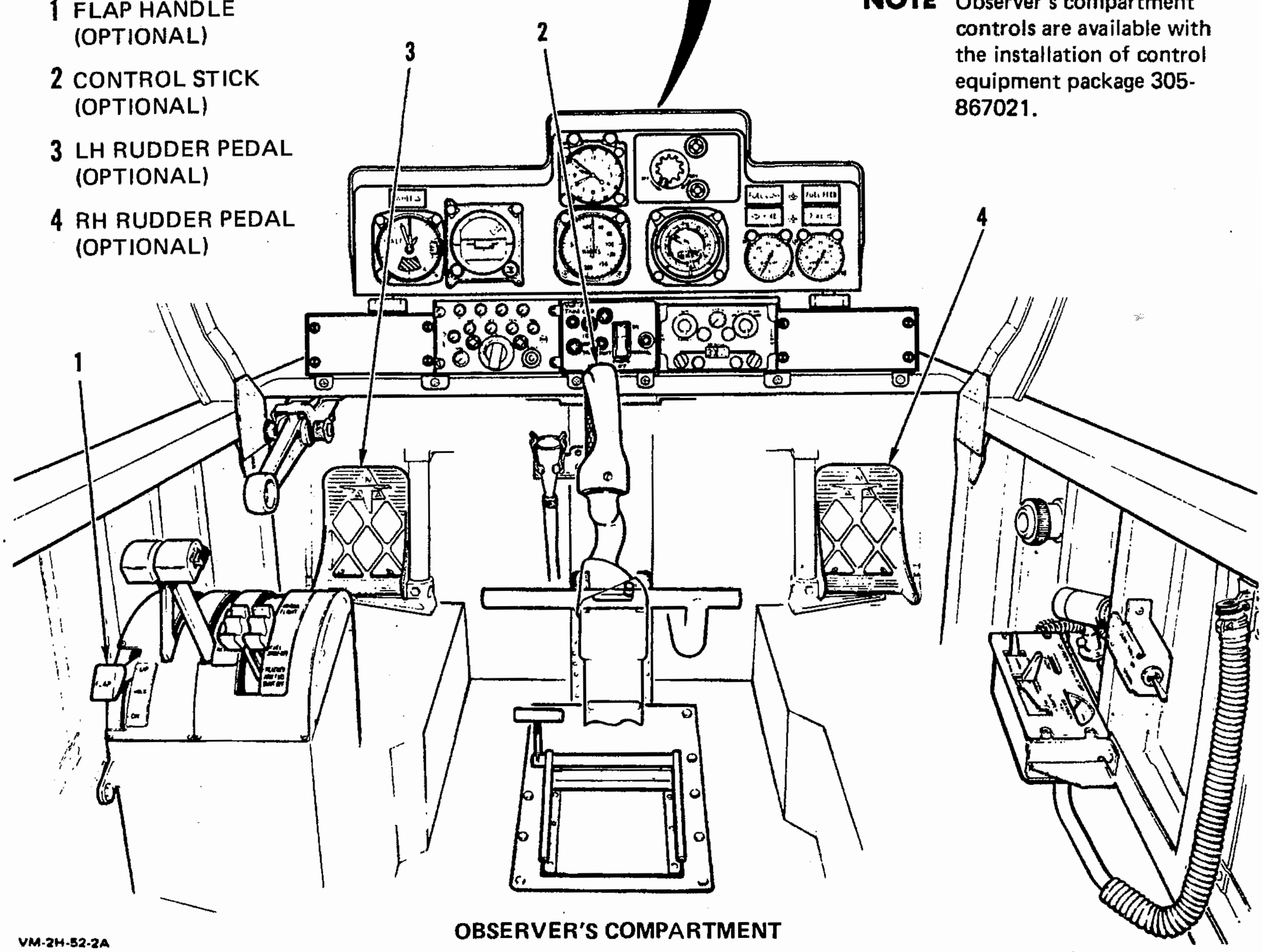
1 FLAP HANDLE (OPTIONAL)

2 CONTROL STICK (OPTIONAL)

3 LH RUDDER PEDAL (OPTIONAL)

4 RH RUDDER PEDAL (OPTIONAL)

NOTE Observer's compartment controls are available with the installation of control equipment package 305-867021.



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OBSERVER'S COMPARTMENT

Figure 3-1. Flight Control System Controls and Indicators (Sheet 2 of 2)

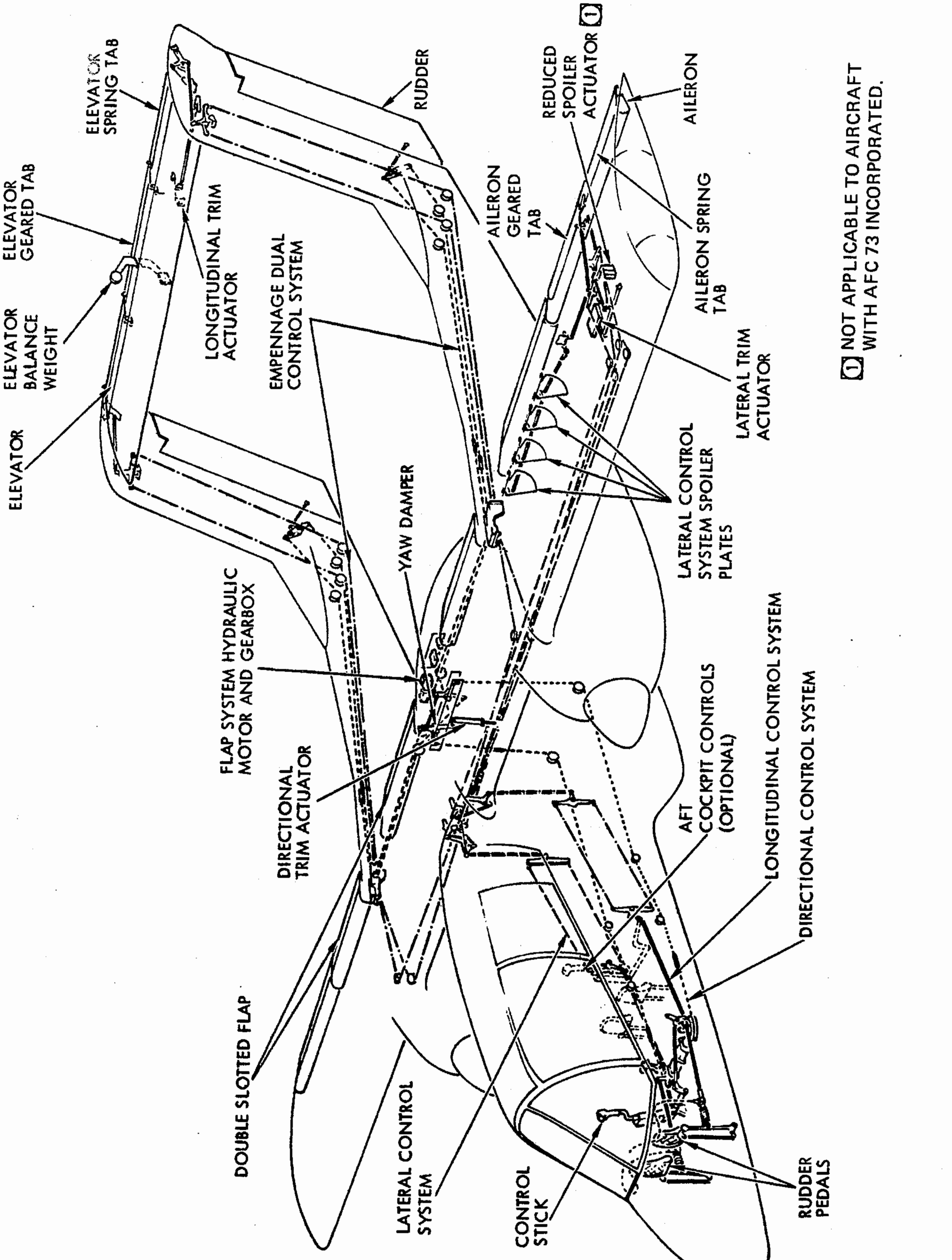


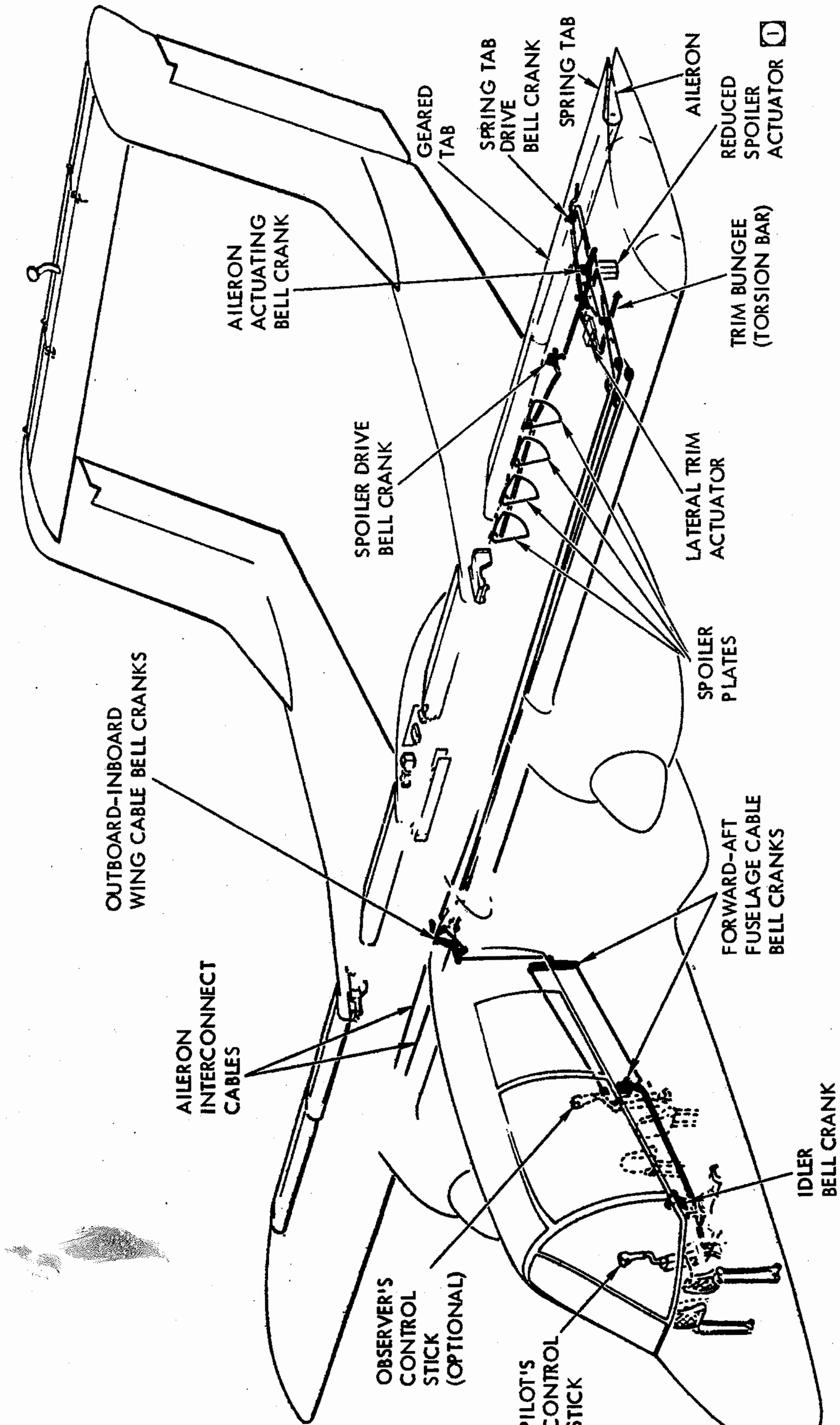
Figure 3-2. Flight Control System Locator

3-3. LATERAL CONTROL SYSTEM.

3-4. The lateral control system (figure 3-3) is a mechanical system which controls the aircraft about its longitudinal axis. Control is accomplished through four wedge-shaped, axially rotating spoiler plates in each wing and in the ailerons which travel in opposite directions to a maximum of 25 degrees up or down. Roll rate is increased by spoiler rotation into the air stream on the "down-going" wing only. Control is accomplished through a conventional control stick in the pilot's cockpit connected by bell cranks, rods, and cables to spring and geared tabs on the trailing edge of each aileron. Control is available to the observer with the installation of a control equipment package (305-867021). When the control stick is moved to the right or left, a spring tab on each aileron moves up or down in proportion to stick travel. These tabs act as aerodynamic boost surfaces, utilizing airflow to position the ailerons. When the tabs travel to maximum deflection, the tab drive linkage contacts stop within the ailerons and continued movement of the pilot's control will physically drive the ailerons. In this manner, the spring tabs may be manually assisted in moving the ailerons if surface loads should exceed the aerodynamic capabilities of the tab system. A spring between the tab linkage and aileron also assists in providing positive force gradients. The ailerons are interconnected by cables and linkage to prevent up float and to assure synchronized action. Four spoiler plates are connected through linkage to each aileron. Normally, these spoilers are enclosed within the wing mold line, producing no effect on control surfaces. When one of the ailerons moves to a trailing edge up (wing down) position, the associated spoiler plates will rotate proportionately upward out of the wing to spoil wing lift. When the ailerons are in faired or trailing edge down (wing up) position, the associated spoilers will remain within the wing mold line. With the ailerons faired, all spoiler plates will be positioned below the wing upper mold line. In this manner, a delay in spoiler actuation is provided that allows unfaired trim of the ailerons.

3-5. SPOILER SYSTEM.

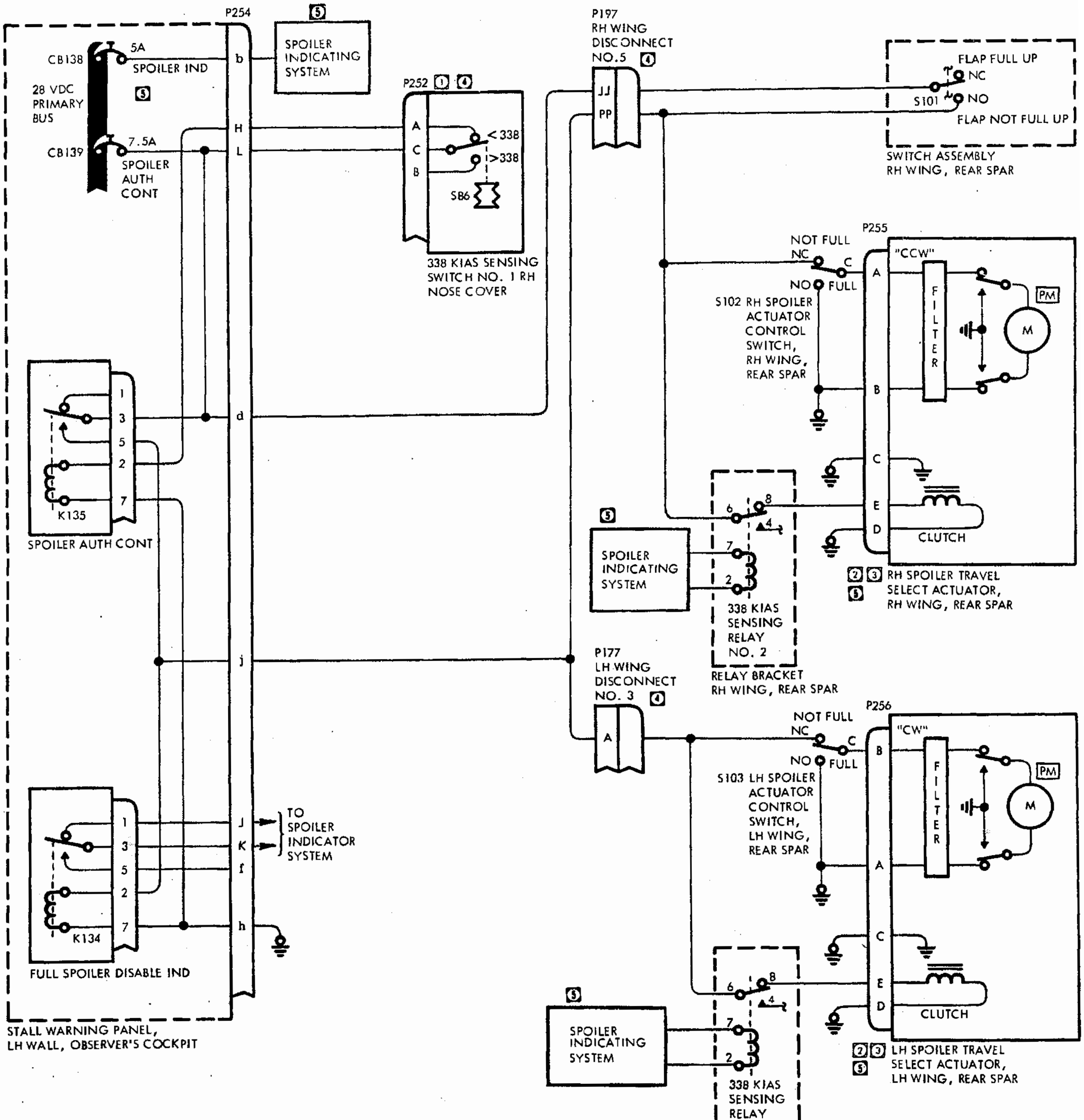
3-6. The spoiler system consists of four rotating spoiler plates located in each end of wing inboard of each aileron. The spoilers are linked to the ailerons and rotate out of the wing when the trailing edge of the respective aileron is deflected upward by stick movement. The spoiler plates remain within the wing mold line when stick movement deflects the trailing edge of the respective aileron downward. To prevent spoiler projection and allow unfaired trim of the ailerons, a delay is incorporated into spoiler actuation. With the ailerons faired, the spoilers are positioned 10 degrees below the wing upper mold line. The spoilers extend perpendicular to the airflow over the wing and as a result do not require operating forces proportional to the aerodynamic loads. At greater than 338 KIAS the spoiler plate projection is reduced to 20 degrees above the wing mold line for full up aileron deflection. The reduced spoiler system consists of an electric spoiler authority system (figure 3-4), an indicating system (figure 3-5), two spoiler authority electromechanical rotary actuators with electromagnetic clutches, two reduced spoiler authority bungees, push-pull rods and bell cranks. At less than 338 KIAS, with electric power on, the electromagnetic clutches are engaged and the rotary actuators in each wing drive the spoiler authority bell cranks to the maximum moment arm position. The spoiler authority bell cranks full position is maintained by the energized clutches and irreversible gear trains to the motors. At greater than 338 KIAS the clutches disengage and the reduced spoiler authority bungees drive the spoiler authority bell cranks to the reduced minimum movement arm positions. The less than 338 KIAS full spoiler authority position is controlled by the No. 1 pressure switch for electric actuation and clutch holding. Either the No. 1 or the No. 2 pressure switch at greater than 338 KIAS disengages the clutch for mechanical bungee return to the reduced spoiler position. A flap not full up control switch will provide full spoiler authority in the event the No. 1 less than



1 NOT APPLICABLE ON AIRCRAFT WITH AFC 73 INCORPORATED.

VM-2H-52-4B

Figure 3-3. Lateral Control System Unit Locator



RELAY BRACKET, LH WING, REAR SPAR

1 DISCONNECTED AND STOWED ON AIRCRAFT 155390 THROUGH 155496 HAVING IAFC 19 INCORPORATED

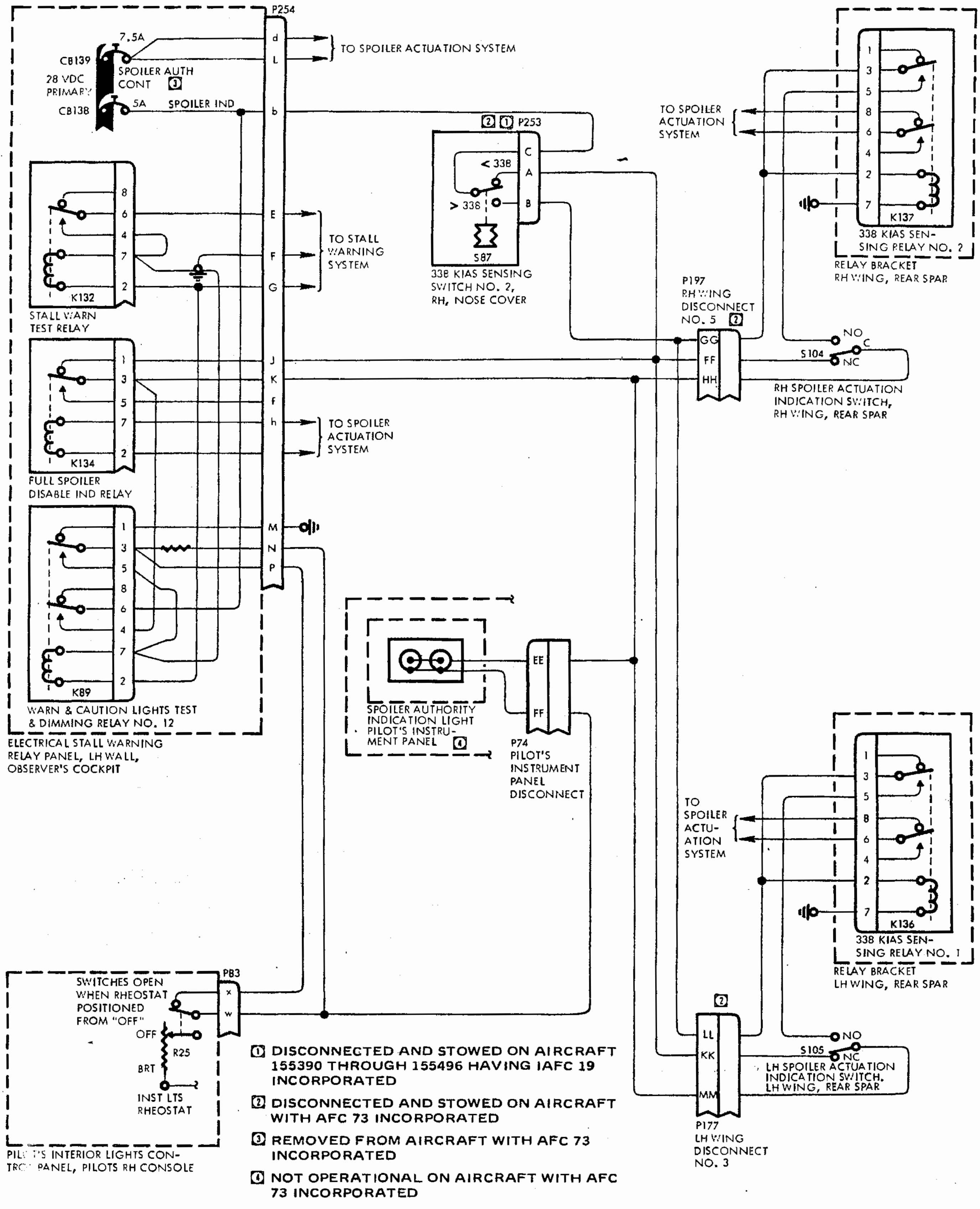
2 AIRCRAFT 153390 THROUGH 155496 NOT HAVING IAFC 19 INCORPORATED

3 AIRCRAFT 155497 AND SUBSEQUENT

4 DISCONNECTED AND STOWED ON AIRCRAFT WITH AFC 73 INCORPORATED

5 REMOVED FROM AIRCRAFT WITH AFC 73 INCORPORATED

Figure 3-4. Spoiler System Actuation Schematic Diagram



1 DISCONNECTED AND STOWED ON AIRCRAFT 155390 THROUGH 155496 HAVING IAFC 19 INCORPORATED

2 DISCONNECTED AND STOWED ON AIRCRAFT WITH AFC 73 INCORPORATED

3 REMOVED FROM AIRCRAFT WITH AFC 73 INCORPORATED

4 NOT OPERATIONAL ON AIRCRAFT WITH AFC 73 INCORPORATED

Figure 3-5. Spoiler Indication System Schematic Diagram

338 KIAS pressure switch malfunctions. The cockpit spoiler authority warning light will be on for malfunctions of improper spoiler authority at less than 338 KIAS and improper spoiler authority at greater than 338 KIAS.

Note

On aircraft having AFC No. 19 incorporated, the reduced spoiler system and spoiler authority warning light are temporarily deactivated. Spoilers function at full authority and warning light illuminates during warning lights test only.

Note

On aircraft having AFC 73 incorporated, spoilers function at full authority. Electrical power supply to the spoiler shift system has been terminated, lights do not function, and several components have been removed from the aircraft.

3-7. LATERAL CONTROL TRIM SYSTEM.

3-8. The lateral control system incorporates an electromechanical trim system (figure 3-7) that will provide up to 6 pounds of trim when desired. The trim system is a spring-type system connected to the left-hand aileron spring tab linkage. Trim power is provided by an electromechanical actuator controlled from the pilot's cockpit. The bungee is a low-force gradient torsion bar. A TRIM SELECT switch, located on the pilot's left-hand console, provides NORM or ALT selections for normal or alternate trim control. Normal control is exercised through a trim switch on the pilot's stick grip. This section has two lateral system trim positions, RWD (right wing down) and LWD (left wing down) and two longitudinal system trim positions, NU (nose up) and ND (nose down). An alternate trim control system (ALTERNATE ELEV & AIL TRIM) is located on the pilot's left-hand console. In the event of a malfunction in the normal control electrical system, this switch may be utilized for trim control by positioning the TRIM SELECT switch to ALT. Take-off trim indication is provided by an advisory light (AILERON) on the pilot's instrument panel. This light is illuminated through switches in the trim actuator when aileron trim is set at neutral.

3-9. AILERON TRIM TAB AIRFLOW BARRIER. Airflow barrier for the aileron trim tabs (figure 3-6) is provided by the use of 10-ounce cotton duck

Table 3-2. Airflow Barrier Material Dimensions

AILERON TRIM TAB			
305-160020-11 SPRING TAB		305-160020-1 GEARED TAB	
NOMENCLATURE	DIMENSIONS (INCHES)	NOMENCLATURE	DIMENSIONS (INCHES)
Cotton Duck		Cotton Duck	
305-160020-15 (outboard)	2.25 x 20.50	305-160020-10 (outboard)	2.25 x 15.88
305-160020-13 (inboard)	2.25 x 20.65	305-160020-17 (inboard)	2.25 x 15.81
Nylon Tape Hook		Nylon Tape Hook	
305-160020-25 (outboard)	0.50 x 20.50	305-160020-29 (outboard)	0.50 x 15.88
305-160020-23 (inboard)	0.50 x 20.65	305-160020-27 (inboard)	0.50 x 15.81
Aileron Nylon Tape Pile		Aileron Nylon Tape Pile	
305-160301-5	0.50 x 34.00	305-160301-7	0.50 x 43.00

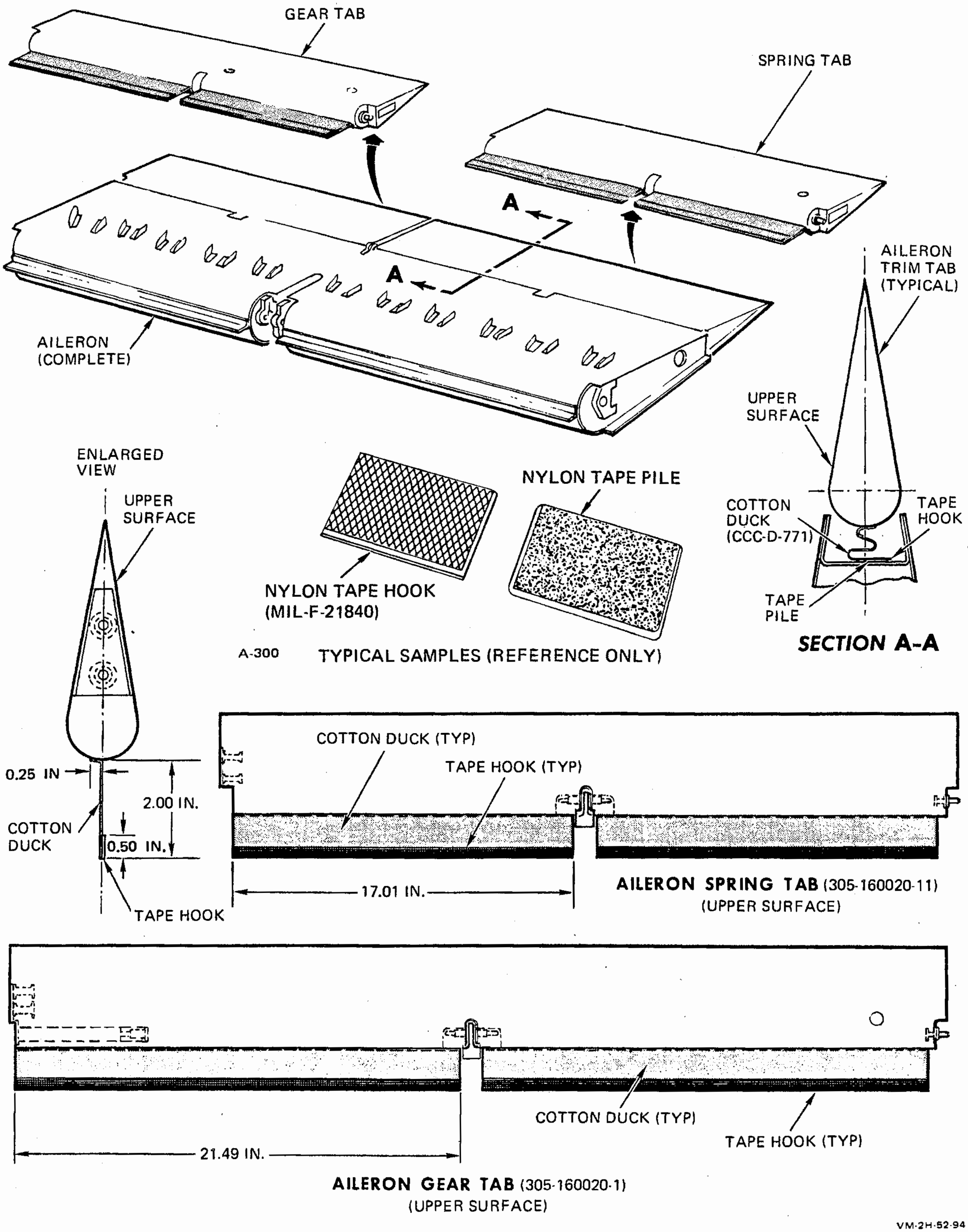


Figure 3-6. Aileron Trim Tab Airflow Barrier Attachment Spoiler System Actuation Schematic Diagram

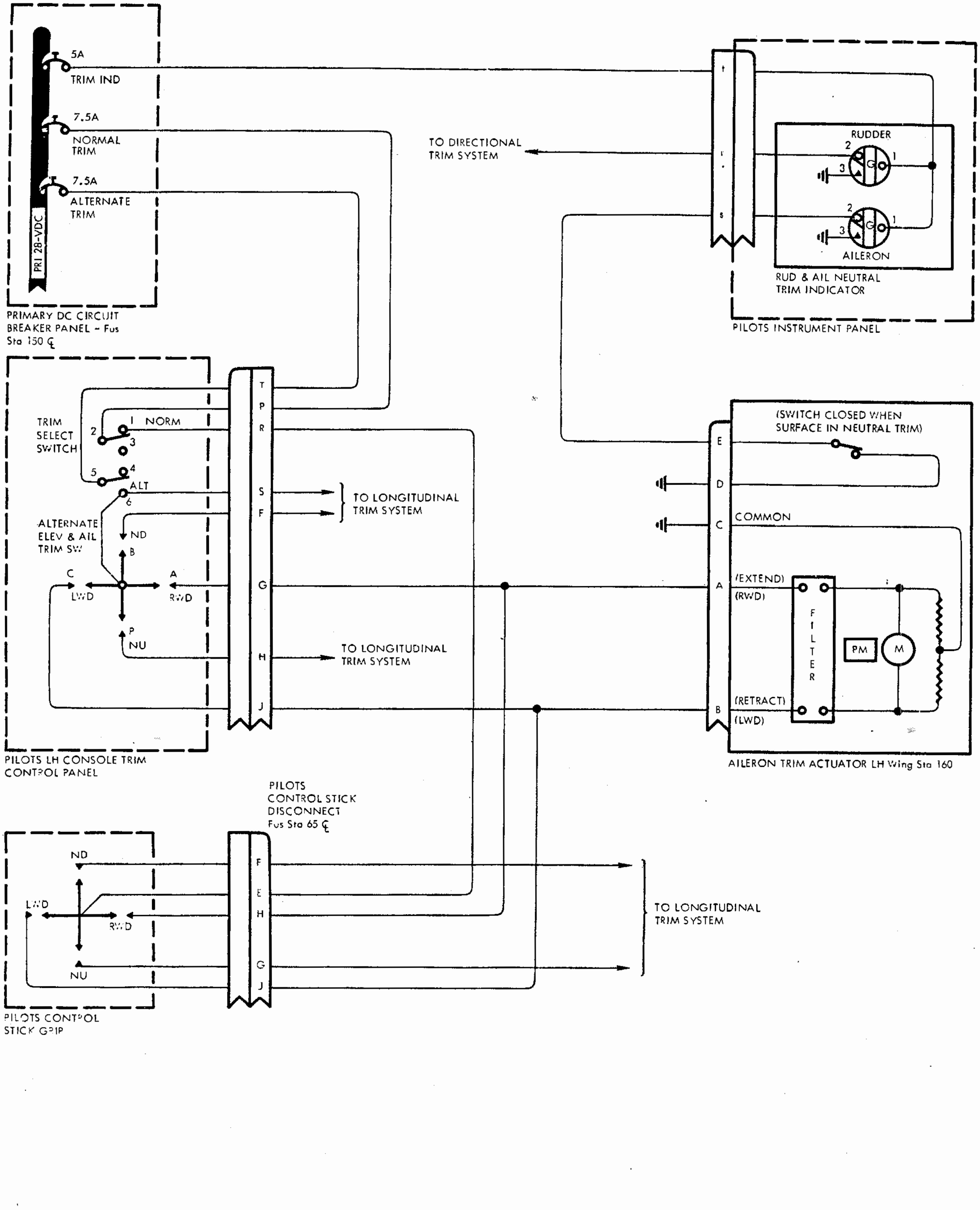


Figure 3-7. Lateral Trim System Electrical Schematic

(Type IV, CCC-D-741) and nylon hook tape (Type II, MIL-F-21840). The cotton duck is bonded to the leading edge centerline of the trim tabs using EC1357. The other end of the cotton duck is bonded to the nylon tape hook. The nylon tape pile is bonded to the aileron spars. Refer to table 3-2 for dimensions of cotton duck and hook tape. See figure 3-6 for attaching details.

Note

The solvent for EC1357 is methyl-ethyl-ketone (TT-M-261) or acetone (O-A-51C).

3-10. LONGITUDINAL CONTROL SYSTEM.

3-11. The longitudinal control system (figure 3-8) is a mechanical system which controls the aircraft about its lateral axis. Control is accomplished through a tab-boosted elevator on the horizontal stabilizer. Control is exercised through a conventional control stick in the pilot's cockpit connected by bell cranks, rods, and cables to two spring tabs in the trailing edge of the elevator. Optional control is available to the observer with the installation of a control equipment package (305-867021). When the control stick is moved forward or aft, the elevator spring tabs (outboard) are mechanically-positioned up or down proportionate to stick travel. These tabs act as aerodynamic boost surfaces utilizing airflow to position the elevator. When the tabs travel to maximum deflection, the drive linkage contacts stop on the elevator and continued movement of the control stick will physically drive the elevator. In this manner, the spring tabs may be manually assisted in moving the elevator if surface loads should exceed the aerodynamic capabilities of the tab system. The longitudinal system includes two geared tabs on the elevator trailing edge (inboard) that also act as aerodynamic boost surfaces. The geared tabs are linked to the horizontal stabilizer, automatically deflecting elevator travel. Balance weights are installed at each end of the elevator, and counterweights are installed at the chordwise centerline of the upper and lower portions of the elevator leading edge. A viscous damper is installed in the system to reduce longitudinal oscillations.

3-12. LONGITUDINAL CONTROL TRIM SYSTEM.

3-13. The longitudinal control system includes an electromechanical trim system (figure 3-10) that will provide nose up or nose down trim. The trim system is a bungee-type system connected to the left-hand elevator drive linkage. Trim power is provided by an electromechanical actuator controlled from the pilot's cockpit. The bungee is a low-force gradient torsion bar with a maximum trim authority of 33 pounds nose down and 30 pounds nose up. A TRIM SELECT switch on the pilot's left-hand console provides NORM or ALT selections for normal or alternate trim control. Normal control is exercised through a trim switch on the pilot's stick grip. This switch has two longitudinal system trim positions, NU (nose up) and ND (nose down), and two lateral system trim positions, LWD (left wing down) and RWD (right wing down). An alternate trim control switch (ALTERNATE ELEV & AIL TRIM) is located on the pilot's left-hand console. In the event of a malfunction in the normal control electrical system, this switch may be utilized for trim control by positioning the TRIM SELECT switch to ALT. Continuous indication of trim position is provided by an indicator on the pilot's instrument panel. This indicator receives and reflects electrical trim position signals from the trim position transmitter located in the horizontal stabilizer. The trim position transmitter is connected to the elevator trim linkage and electrically signals the position of the linkage to the indicator.

Note

With actuator, P/N R5219M1 (81039), installed in aircraft and a properly rigged and adjusted longitudinal control system, the elevator trim indicator will indicate approximately one minor graduation less than full NU after maximum NU trim is obtained using trim switch.

3-14. ELEVATOR TRIM TAB AIRFLOW BARRIER. Airflow barrier for the elevator trim tabs is provided by the use of 10-ounce cotton duck (Type IV, CCC-D-741) and nylon hook tape (Type II, MIL-F-21840). See figure 3-9. The dimensions of

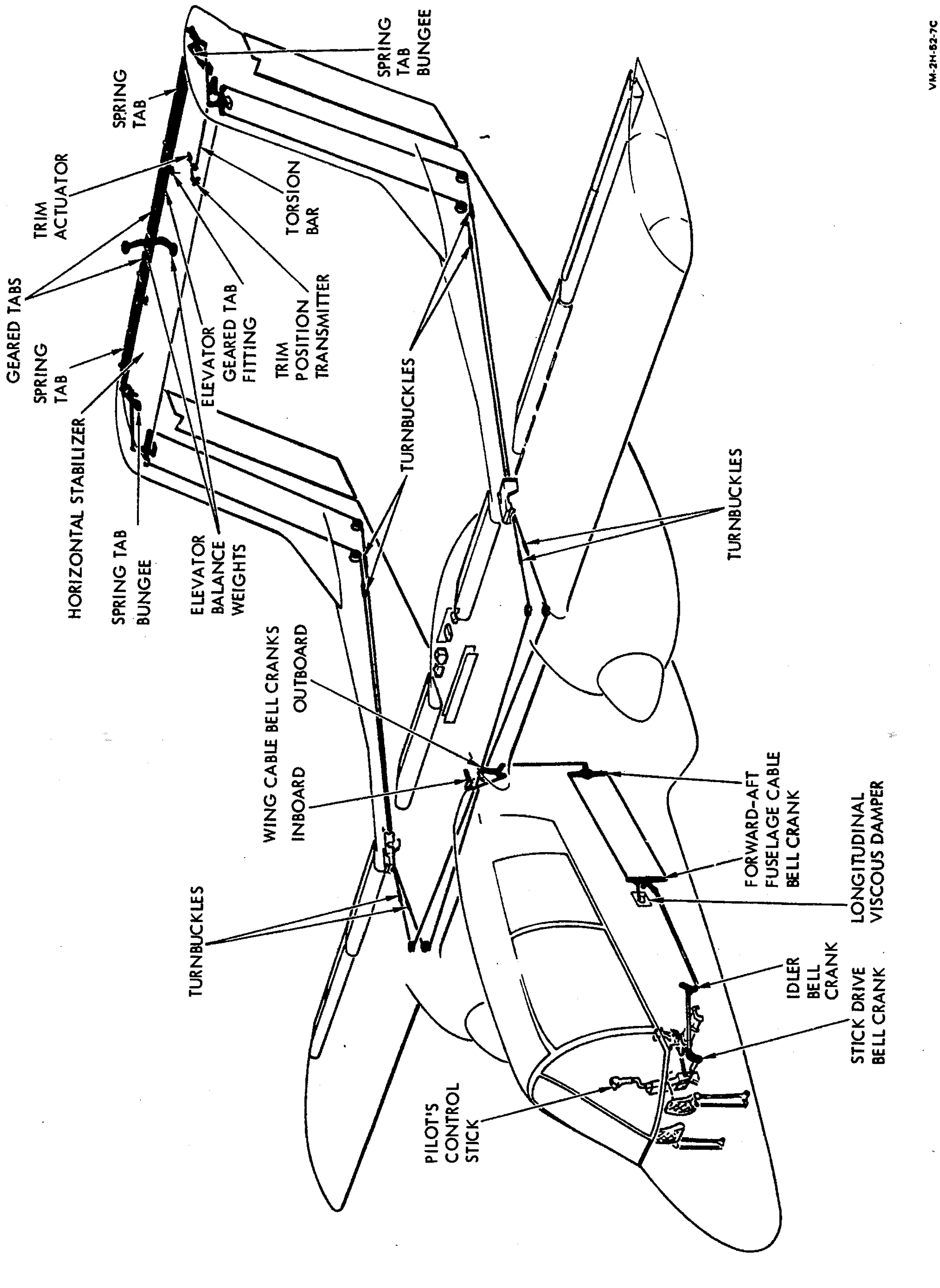


Figure 3-8. Longitudinal Control System Unit Locator

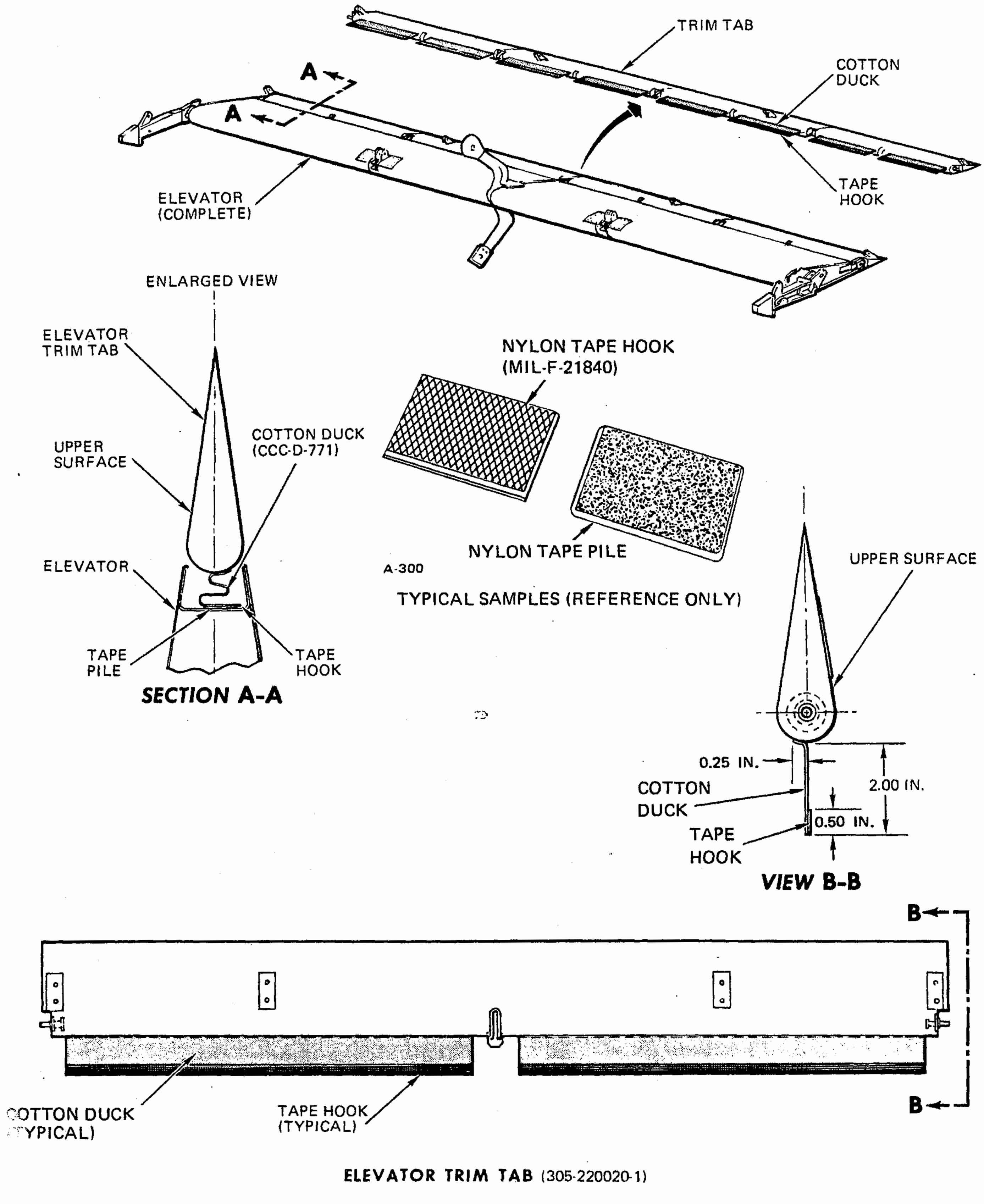


Figure 3-9. Elevator Trim Tab Airflow Barrier Attachment

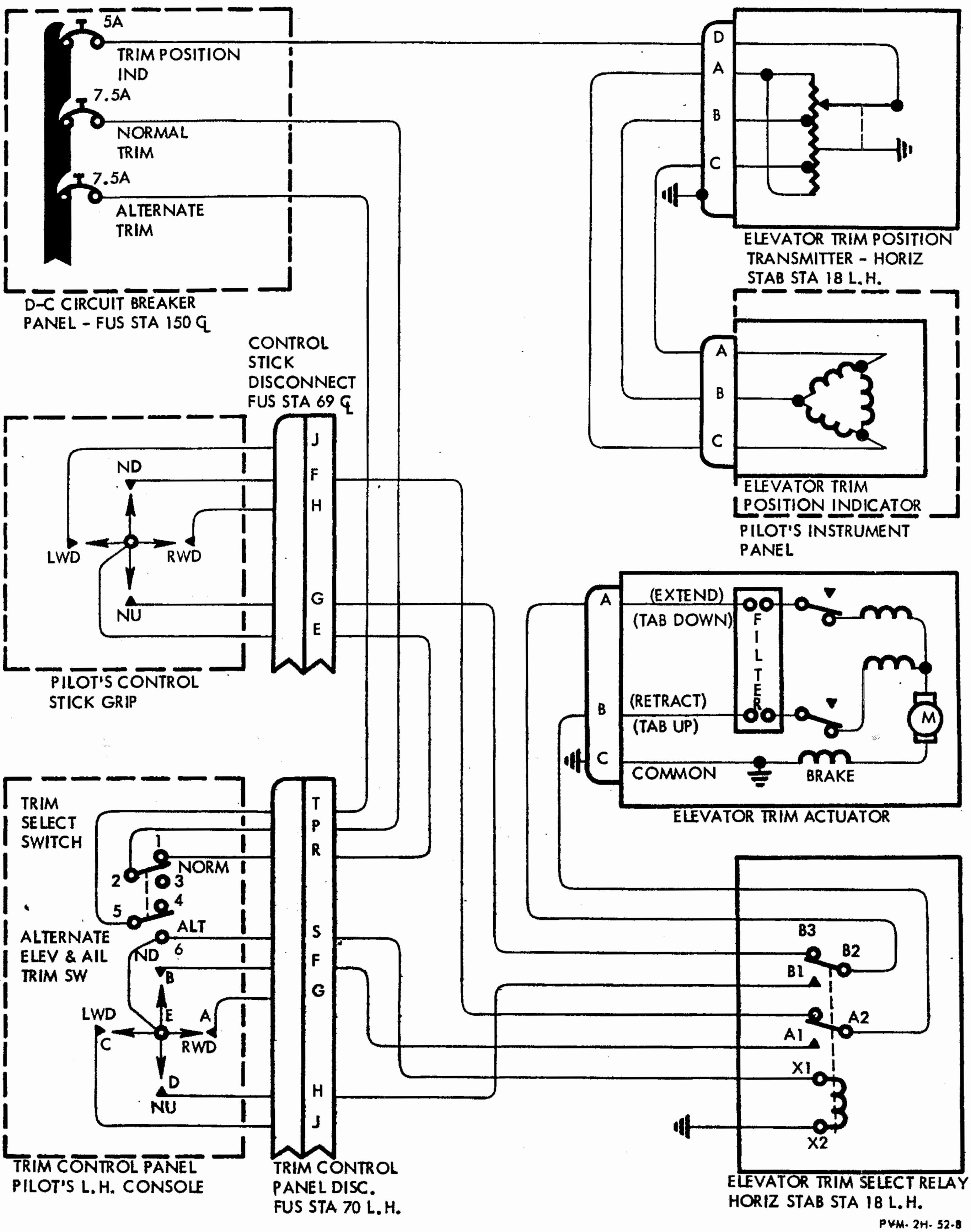


Figure 3-10. Longitudinal Trim System Electrical Schematic

the cotton duck (305-220020-9) are 2.12 x 19.31 inches, the nylon tape hook (305-220020-13) 0.50 x 19.31 inches. The cotton duck is bonded to the nylon tape hook and to the leading edge of the elevator trim tab (as shown in figure 3-9) using EC1357. The nylon tape pile (305-220102-15) is 0.50 x 83.62 inches and is bonded to the elevator rear spar (305-220147-3) using EC1357.

Note

The solvent for EC1357 is methyl-ethyl-ketone (TT-M-261) or acetone (O-A-51C).

3-15. DIRECTIONAL CONTROL SYSTEM.

3-16. The directional control system (figure 3-11) is a mechanical system that controls the aircraft about its vertical axis. Control is accomplished through rudders in the right- and left-hand vertical stabilizers that travel to a maximum of 25 degrees right or left. Crew member control is exercised through two conventional pedals in the pilot's cockpit connected by bell cranks, rods, and cables to the rudders. The left-hand pedal moves both rudders to a trailing edge left position, and the right-hand pedal moves both rudders to a trailing edge right position. The two rudder pedals are also connected to the wheel brake system master cylinders and serve as combination brake and rudder pedals. Refer to Chapter 5. Control is available to the observer's compartment with the installation of control equipment package (305-867021). Forward and aft adjustment of the rudder pedals may be accomplished through a PEDAL ADJUST crank on the pilot's center pedestal. This crank, through flexible shafts, drives two screw jacks in the linkage system adjacent to the pedals, providing a 9-inch range of adjustment.

3-17. DIRECTIONAL CONTROL TRIM SYSTEM.

3-18. The directional control system includes an electromechanical trim system (figures 3-12 and 3-13). Directional trim is accomplished through an electromechanical actuator and bungee connected to the control cables in the cargo bay. Actuator control is accomplished from the pilot's cockpit by switches on the left-hand console. A TRIM SELECT switch provides NORM or ALT selections for normal or alternate trim control. Normal control is accomplished by the NORM RUD TRIM switch and alternate control is accomplished by the ALT RUD TRIM switch. Both switches are located on the pilot's left-hand console and both provide NR (nose right) and NL (nose left) selection. In the event of a malfunction in the normal control electrical system, the ALT RUD TRIM switch may be utilized by positioning the TRIM SELECT switch to ALT. Take-off trim indication is provided by an advisory light (RUDDER) on the pilot's instrument panel. This light is illuminated through switches in the trim actuator when rudder trim is set at neutral.

3-19. YAW DAMPER SYSTEM.

3-20. DESCRIPTION. The yaw damper amplifier and gyro are located in the upper cargo bay at fuselage station 256. See figure 3-13. It is housed in a sealed container which includes the rate gyro and a balancing potentiometer. The amplifier receives the output signal from the rate gyro through a rate washout gyro. The amplifier produces a polarity sensitive d-c current which is proportional to the aircraft yaw rate and amplifies it to a level sufficient to actuate the clutches of the servo actuator. The actuator output is a bidirectional torque proportional to the differential current in the two clutch coils. It receives signal currents of only a few milliamperes from the amplifier and converts them into a proportional mechanical force to make corrective rudder movements. The actuator consists of a continuously running d-c motor which drives a pair of magnetic clutches. The actuator output shaft torque is transmitted and amplified through a gearbox incorporated within the actuator housing. The gearbox output is connected to the hub of a bell crank in the directional control system. The gearbox contains an adjustable slip clutch preset to slip at 800 inch-pounds of rudder torque.

3-21. OPERATION. The yaw damper system utilizes a rate gyro to sense the rate of directional oscillation of the aircraft. The signal from the gyro is fed to the gyro amplifier and amplified to a sufficient level to control the servo unit. The servo unit contains two magnetic clutches; the output from

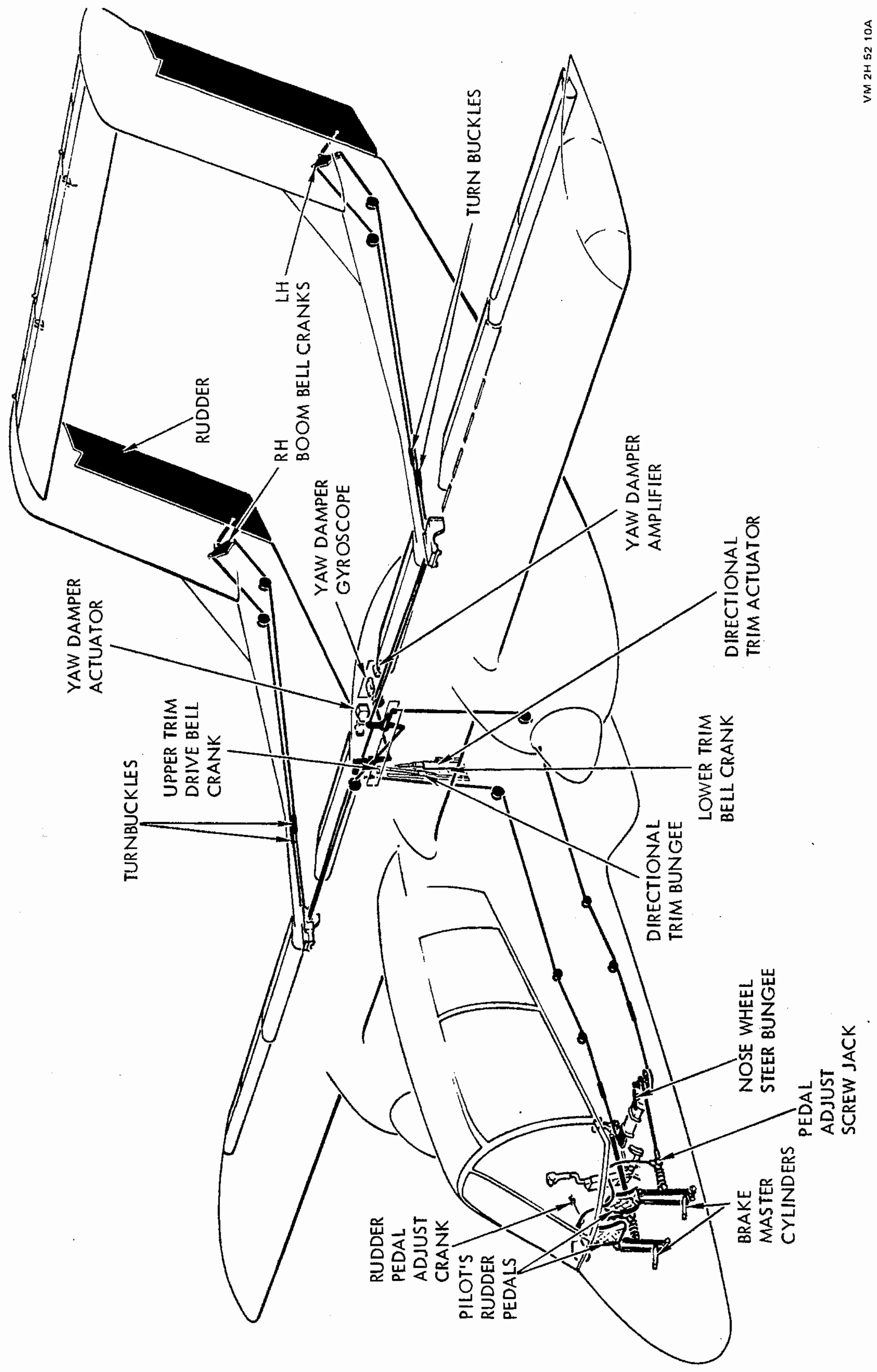


Figure 3-11. Directional Control System Unit Locator

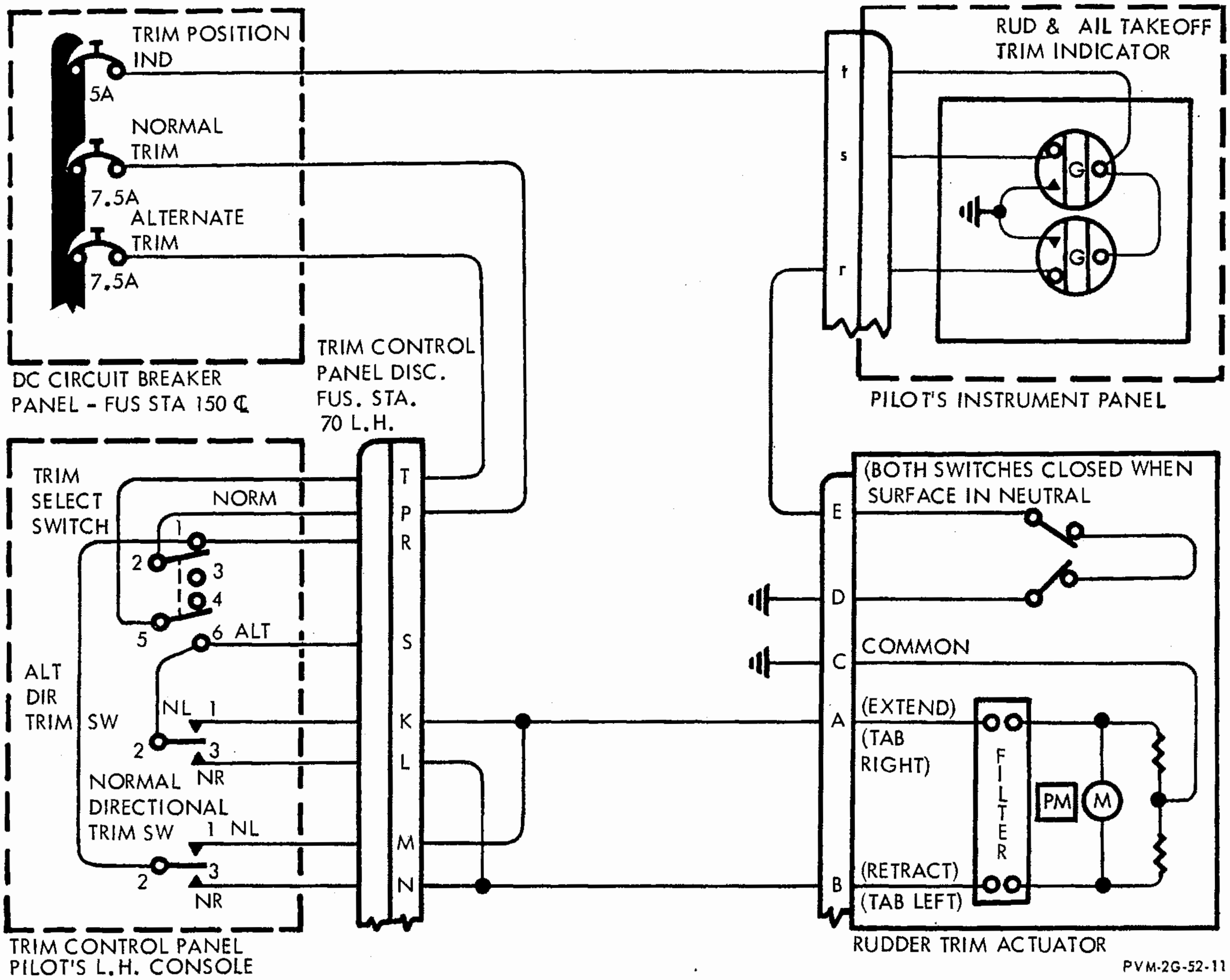


Figure 3-12. Directional Trim System Electrical Schematic

the amplifier is used to actuate one or the other of these clutches. With the clutch engaged, the torque output from the servo unit is transmitted to the right-hand rudder control bell crank through a splined shaft. The rudders are repositioned by moving the bell crank to correct for directional oscillation of the aircraft. The amount of correction is in proportion to the amount of oscillation and is felt at the rudder pedals. As the change of oscillation decreases, the correction action also decreases. A YAW DAMPER switch is provided to break the signal from the amplifier to the servo unit if no damping action is required. The circuit is also de-energized when the aircraft is on the ground, by routing the electrical wiring from the YAW DAMPER switch to the amplifier through the ground safety relay. There is a test position on the YAW DAMPER switch which permits testing the yaw damper system. With the yaw damper fuse in, the servomotor will run continuously as long as electrical power is provided to the No. 1 MONITORED BUS, regardless of the position of the YAW DAMPER switch. However, with switch in the OFF position, the signal from the amplifier to servo unit is broken and the clutch will not be engaged. In the event of a jammed servo or clutching mechanism, the system can be overridden by the pilot by exerting a 100-pound pressure (approximately) on the rudder pedals until the YAW DAMPER switch can be turned to OFF.

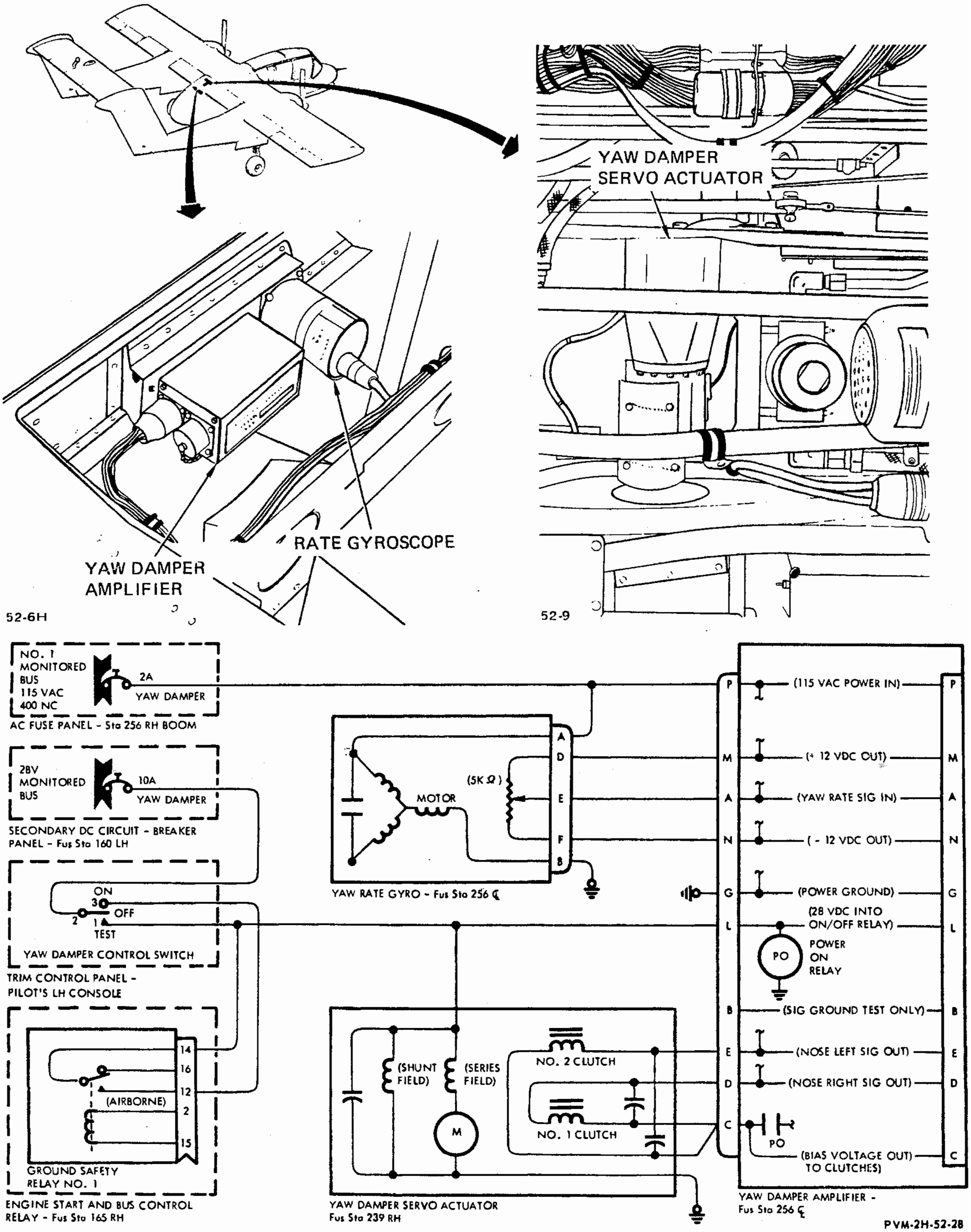


Figure 3-13. Yaw Damper System Unit Locator and Electrical Schematic

3-22. WING FLAP SYSTEM.

3-23. **The wing flap system (figure 3-14)** is a hydraulically powered system that provides high-lift capabilities to the aircraft when desired. Both normal and alternate control are exercised electrically from the pilot's cockpit. High-lift capability is provided through four double-slotted wing flap sections; one inboard of each aileron, and one inboard of each boom. The double-slotted flap arrangement utilizes a slot (gipper) door, located forward of the associated flap. Slot doors are connected by linkage to the adjacent flaps to open as the flaps extend and close as the flaps are raised. The wing flaps may be lowered any amount to a maximum of 40 degrees for high-lift performance, and/or raised to a faired (full up) position. The flaps are positioned by linear screw jacks driven through shafts by a centrally located, hydraulically powered motor gearbox. This gearbox incorporates a hydraulic motor and brake for normal operation and an electromechanical drive capability for emergency operation. Normal flap control is exercised electrically from the pilot's cockpit through a four-position FLAPS handle on the left-hand console. Optional control is available to the observer's compartment with the installation of control equipment package (305-867021). The FLAPS handle is marked UP, HOLD, T/O, and DOWN for control position indication. Placing the handle in the UP or DOWN position electrically controls the hydraulic system to provide hydraulic power to the motor gearbox to move the flaps in the desired direction. When flaps reach full travel in the selected direction, a position switch (one for flaps up and one for flaps down) automatically breaks electrical power to the hydraulic system. Refer to Section IV for hydraulic system operation. Placing the handle in the T/O position will position the flaps at 20 ($\pm$5) degrees. Electrical power to the hydraulic system is broken also when the flap handle is placed in the HOLD position. This stops the flaps in whatever position they had reached at the time selection was made; in this way, the pilot may choose any amount of flaps between full up and full down. If a malfunction should occur in the normal control electrical system, a FLAPS—ALT CONT switch is provided on the pilot's left-hand console which may be positioned at UP-HOLD-DOWN to give a corresponding flap movement. See **figure 3-24. Electrical power is routed to the flap-**alternate control relay panel in the cargo bay by positioning the switches on the electrical trim control panel which energize the electrical alternate flap motor. A switch assembly opens the circuitry when full up or down positions are reached. Continuous indication of flap position is provided by an indicator on the pilot's instrument panel to reflect the extent of retraction or extension. Flap position is electrically signaled to the indicator by a position transmitter located in the left boom and connected to the flap linkage.

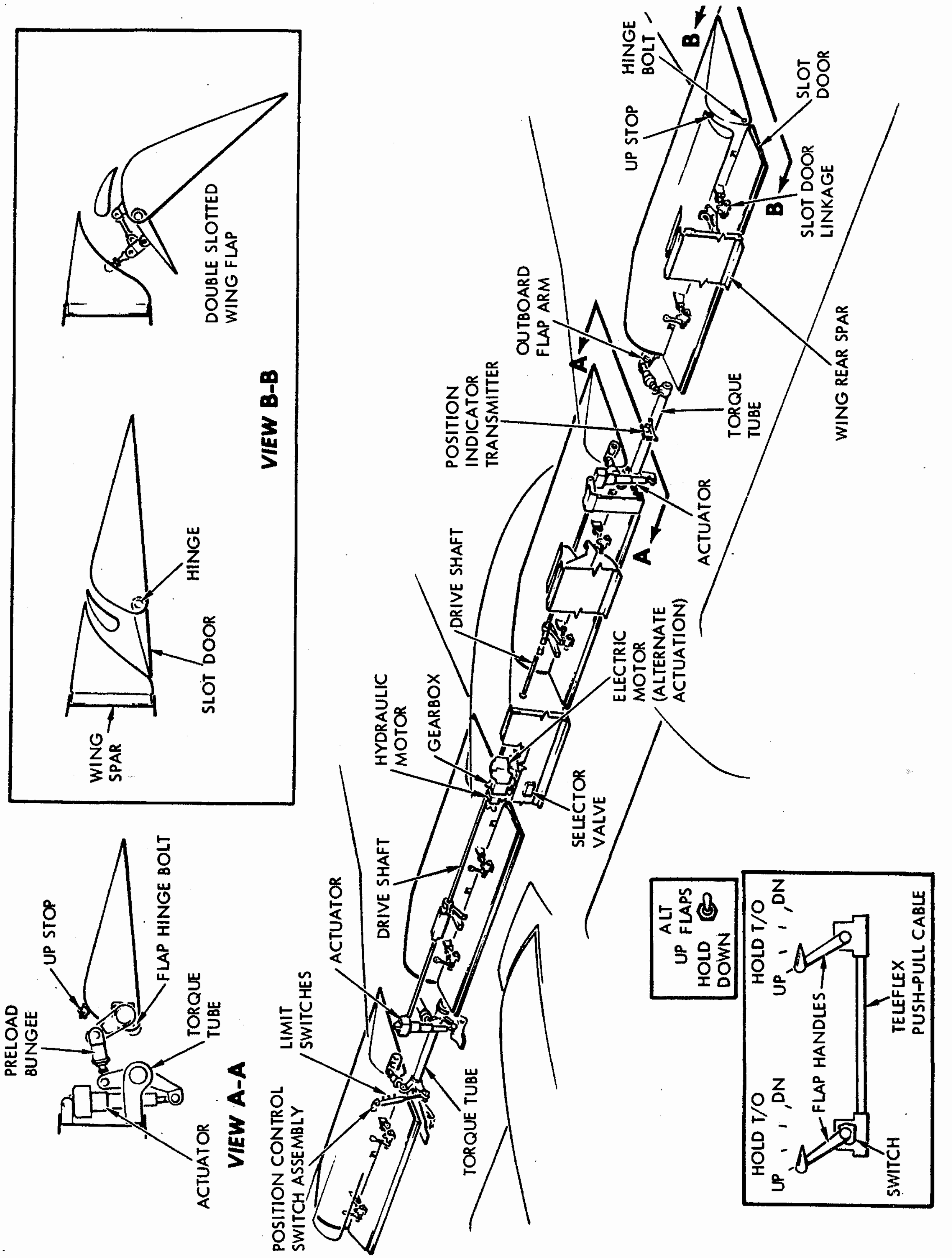


Figure 3-14. Wing Flap System Unit Locator

SECTION II
ORGANIZATIONAL MAINTENANCE

3-24. GENERAL.

3-25. This section provides maintenance procedures for the flight control systems at organizational level maintenance.

3-26. LATERAL CONTROL SYSTEM.

3-27. Organizational maintenance for the lateral control system includes operational checkout procedures, system troubleshooting, rigging, adjusting, and component removal and installation. These procedures provide all instructions necessary to maintain this portion of the flight control systems within the limits of organizational-level tools and facilities. Each procedure will include lists of tools and materials, and illustrations to clarify instructions and accomplish the component location.

3-28. OPERATIONAL CHECK.

3-29. The following procedure provides the instructions necessary to accomplish a general verification of lateral control system operations. This procedure is performed when operational checkout does not warrant a detailed verification of operating forces, travel limitations, etc. To perform an operational checkout of the lateral control system, see figures 3-1 and 3-2 and proceed as follows:

1. Select NORM trim and trim full LWD with stick switch, noting that stick moves freely to left.

2. Move stick full right and note the following:

a. Left-hand aileron moves full down.

b. Left-hand aileron spring and geared tab move full up.

c. Right-hand aileron moves full up and right-hand spring and geared tabs move full down.

d. Right-hand spoiler plates rotate full up.

3. Trim full RWD with stick trim switch, noting that stick moves freely to right.

4. Move stick to full left and note the following:

a. Right-hand aileron moves full down.

b. Right-hand aileron spring and geared tabs move full up.

c. Left-hand aileron moves full up and left-hand spring and geared tabs move full down.

d. Left-hand spoiler plates rotate full up.

5. Select ALTERNATE trim on pilot's left-hand console and trim first LWD and then RWD with console switch, noting stick moves left then right.

6. Return console switch to NORM and trim stick to neutral, noting the following:

a. Aileron trim indicator light comes on.

b. Left- and right-hand ailerons and tabs faired (streamlined) with wing.

7. Move stick left one-third, release, right one-third and release, noting that stick returns to neutral each time.

3-30. TROUBLESHOOTING.

3-31. To troubleshoot the lateral control system, refer to Wiring Data Manual (NAVAIR 01-60GCB-2-7) for wiring diagrams and to table 3-3 for instructions.

Tools and Equipment List

Power Unit, Mobile	NC-8A (or equivalent)
Multimeter	AN/PSM-4 (or equivalent)
Tester, Air Data	VPT-10F-11072

Note

Whenever electrical power is required to isolate and correct a trouble, use a mobile power unit (NC-8A, or equivalent) when available.

3-32. SERVICING.

3-33. No servicing of the lateral control system is required. All bearings are lubricant-sealed bearings and do not require lubrication.

3-34. PILOT'S STICK GRIP REMOVAL AND INSTALLATION.

3-35. To remove and install the pilot's stick grip assembly, proceed as follows:

3-36. REMOVING STICK GRIP ASSEMBLY.

Tools and Equipment List

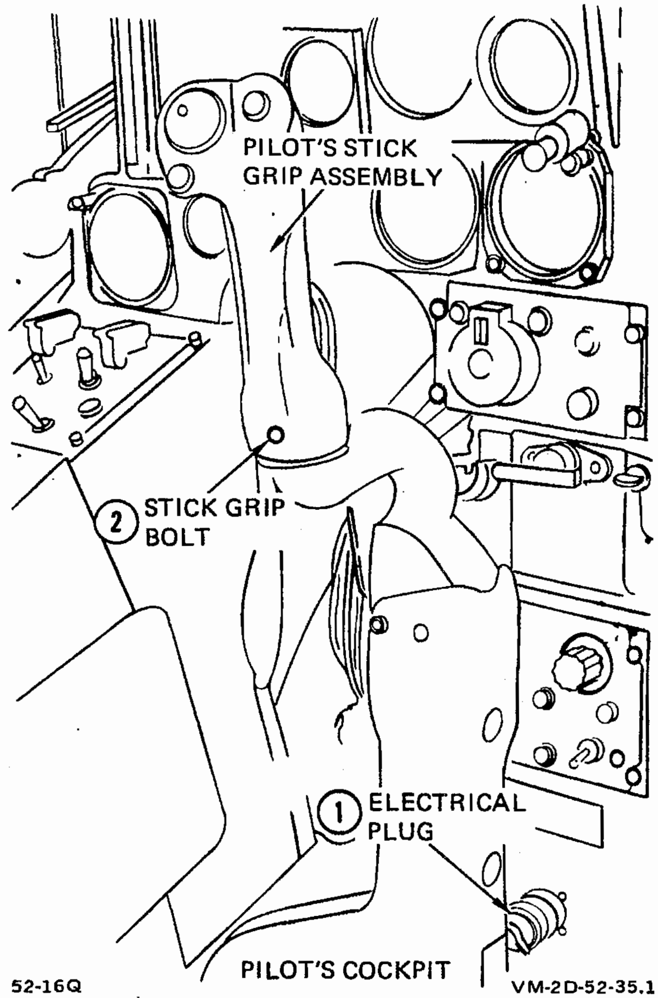
Tool, Pin, Plug Removal	MS24256R20

Materials List

Lockwire (0.032-inch diameter steel)	MS20995F32

1. Disconnect electrical crimp-pin type plug at base of pilot's center pedestal.

2. Remove attaching bolt from stick grip assembly.



Steps 1 and 2—Para. 3-36

3. Using plug pin removal tool (MS24256R20), remove pins E through T from crimp-type pin plug.

4. Disconnect wiring clamp on forward side of control stick rear floor.

Note

To aid in installation, thread a length of lockwire (MS20995F32) through the control stick column when removing wiring to stick grip buttons and switches.

Table 3-3. Troubleshooting Lateral Control System

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: CONTROL STICK WILL NOT MOVE.		
1. Foreign object restricting system operation.	See figure 3-3. Inspect all cables, bell cranks, and drive rods in system for interference from foreign objects.	Remove all foreign objects. Replace any damaged components. Refer to paragraph 3-62 and rerig control system, or continue troubleshooting.
2. Rig pin installed in bell crank.	See figure 3-3. Inspect all bell cranks in system for rig pin installation.	Remove rig pin.
TROUBLE: CONTROL STICK MOVES BUT AILERONS DO NOT FOLLOW.		
1. System component broken, disconnected, or removed.	See figure 3-16. Inspect all cables, bell cranks, and drive rods for condition and proper installation.	Replace any damaged components. Install any components that have been removed. Connect any component that has been disconnected.
TROUBLE: CONTROL STICK BINDS MOMENTARILY DURING STICK TRAVEL.		
1. Foreign object restricting system operation.	See figure 3-16. Inspect all cables, bell cranks, and drive rods in system for interference from foreign objects.	Remove all foreign object. Replace any damaged components. Refer to paragraph 3-62 and rerig control system.
TROUBLE: EXCESSIVE CONTROL STICK FRICTION THROUGH FULL STICK TRAVEL.		
1. System component misaligned, rubbing or chafing airframe, or foreign object.	See figure 3-16. Inspect all cables, bell cranks, and drive tods in system for clearance and ease of operation. Check for interference from foreign objects.	Remove any foreign objects. Replace any damaged components. Refer to paragraph 3-62 and rerig control system or continue troubleshooting.
2. Excessive control cable tension.	Refer to paragraph 3-62 for proper cable tension.	Refer to paragraph 3-62 and adjust cables to proper tension or continue troubleshooting.
3. Foreign object in aerodynamic seal between aileron and wing.	Disconnect aileron drive rods and check ailerons for freedom of movement.	Refer to paragraph 3-38 and remove applicable aileron and foreign object. Replace any damaged components. Refer to paragraph 3-38 to replace aileron and connect drive rods.

Table 3-3. Troubleshooting Lateral Control System (Cont)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: AILERON WILL NOT MOVE THROUGH FULL TRAVEL.		
1. Lateral drive bell crank and/or aileron travel stop bolts improperly adjusted.	Refer to paragraph 3-62 and check adjustment or lateral drive bell crank and aileron travel stop bolts.	Refer to paragraph 3-62 and adjust lateral drive bell crank and/or aileron stop bolts or continue troubleshooting.
2. Foreign object restricting control system operation.	See figure 3-3. Inspect all cables, bell cranks, and drive rods for interference from foreign objects.	Remove foreign objects. Replace any damaged component. Refer to paragraph 3-62 and rerig control system or continue troubleshooting.
3. Improperly rigged control system.	Refer to paragraph 3-62 and check control system rigging.	Refer to paragraph 3-62 and rerig control system.
TROUBLE: SPRING TABS WILL NOT MOVE THROUGH FULL TRAVEL.		
1. Foreign object in aerodynamic seal between spring tab and aileron trailing edge.	Disconnect tab drive rods and check spring tabs for freedom of movement.	Refer to paragraph 3-42. Remove spring tab and foreign objects. Install tab and drive rod, or continue troubleshooting.
2. Spring tab drive bell crank travel stop bolts improperly adjusted.	Refer to paragraph 3-62 for proper stop bolt adjustment.	Refer to paragraph 3-62 and adjust spring tab drive bell crank troud stop bolts.
TROUBLE: AILERONS WILL NOT RETURN TO NEUTRAL POSITION.		
1. Foreign object restricting system operation.	See figure 3-16. Inspect all cables, bell cranks, and drive rods in control system for interference form foreign objects.	Remove foreign object. Replace any damaged component. Refer to paragraph 3-62 and rerig control system or continue troubleshooting.
2. Foreign object in aerodynamic seal between aileron and trailing edge of wing.	Disconnect aileron drive rods and check ailerons for freedom or movement.	Refer to paragraph 3-38. Remove aileron and foreign object. Install aileron and drive rod, or continue troubleshooting.
TROUBLE: LATERAL TRIM CANNOT BE OBTAINED IN NORMAL POSITION.		
1. TRIM NORM CONT circuit breaker CB46 disengaged.	Check that TRIM NORM CONT circuit breaker CB46 is engaged.	Engage TRIM NORM CONT circuit breaker CB46 or continue troubleshooting.
2. Pilot's trim select switch S10 defective in	Using a multimeter (AN/PSM-4), check for continuity between test points CCA and CCB.	Replace trim select switch S10 or continue troubleshooting.

Table 3-3. Troubleshooting Lateral Control System (Cont)

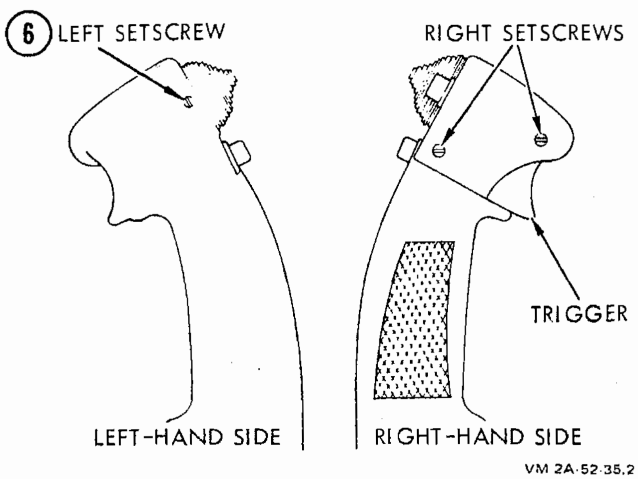
PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: LATERAL TRIM CANNOT BE OBTAINED IN NORMAL POSITION (Cont)		
3. Defective trim switch S92.	Have helper place trim switch S92 in LWD position. Using a multimeter (AN/PSM-4), check for continuity between test points CCC and CCD.	Replace trim switch S92 or continue troubleshooting.
4. Defective lateral trim actuator.	Turn electrical system ON. Have helper place trim switch S92 in LWD position. Check actuator for operation. Turn electrical system OFF.	Refer to paragraph 3-58 and replace trim actuator.
TROUBLE: LATERAL TRIM CANNOT BE OBTAINED IN ALTERNATE POSITION.		
1. TRIM ALT CONT circuit breaker CB47 disengaged.	Check that TRIM ALT CONT circuit breaker CB47 is engaged.	Engage TRIM ALT CONT circuit breaker CB47 or or continue troubleshooting.
2. Pilot's trim select switch S10 defective in ALTERNATE position.	Using a multimeter (AN/PSM-4), check for continuity between test points CCE and CCF.	Replace trim select switch S10 or continue troubleshooting.
3. Defective ALTERNATE trim switch S9.	Have helper place trim select switch S10 in ALTERNATE trim position and ALTERNATE trim switch S9 in LWD position. Check continuity between test points CCE and CCF.	Replace ALTERNATE trim switch S9, or continue troubleshooting.
4. Defective lateral trim actuator.	Turn electrical system ON. Have helper place ALTERNATE trim switch S9 in LWD position. Check actuator for operation. Turn electrical system OFF.	Refer to paragraph 3-58 and replace trim actuator.
TROUBLE: REDUCED SPOILER ACTUATOR(S) WILL NOT OPERATE WITH FLAPS FULL UP.		
1. SPOILER AUTH CON CONT circuit breaker CB139 is disengaged.	Check that SPOILER AUTH CONT circuit breaker CB139 is engaged.	Engage SPOILER AUTH CONT circuit breaker CB139 or continue troubleshooting.
2. 338 KIAS SENSING SW NO. 1 S86, defective.	Using a multimeter (AN/PSM-4), check for continuity between test points CCDA and CCDB.	Replace SENSING SW NO. 1 S86 or continue troubleshooting.
3. SPOILER AUTH CONT relay K135 defective.	Using a multimeter (AN/PSM-4), check for 28 volts dc between test point CCDC and ground.	Replace SPOILER AUTH CONT relay K135 or continue troubleshooting.
4. 338 KIAS SENSING RELAY NO. 1, K136 defective.	Connect air data tester (VPT-10F-11072) to pitot tube. Increase airspeed to above 344 KIAS. Using a multimeter (AN/PSM-4), check for 28 volts dc between test point CCDD and ground.	Replace 338 KIAS SENSING RELAY NO. 2, K137 or continue troubleshooting.
5. 338 KIAS SENSING RELAY NO. 2, K137, defective.	Same procedure as trouble 4. Check for 28 volts dc between test point CCDE and ground.	Replace 338 KIAS SENSING RELAY NO. 2, K137 or continue troubleshooting.
6. Defective reduced spoiler actuator(s).	Turn electrical system ON and observe spoiler actuator rotation to full spoiler position.	Refer to paragraph 3-46 and replace actuator(s).

Table 3-3. Troubleshooting Lateral Control System (Cont)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: REDUCED SPOILER ACTUATOR(S) WILL NOT OPERATE WITH FLAPS NOT FULL UP.		
1. Refer to previous trouble and repeat probable cause No. 1.	Refer to previous trouble and repeat isolation procedure No. 1.	Refer to previous trouble and repeat remedy No. 1.
2. Flap full up/not full up switch S101 defective.	Using a multimeter (AN/PSM-4), check for continuity between test points CCDF and CCDG.	Replace flap switch S101 or continue troubleshooting.
3. Refer to previous trouble and repeat probable cause No. 4, No. 5, and No. 6.	Refer to previous trouble and repeat isolation procedure No. 4, No. 5, and No. 6.	Refer to previous trouble and repeat remedy No. 4, No. 5, and No. 6.

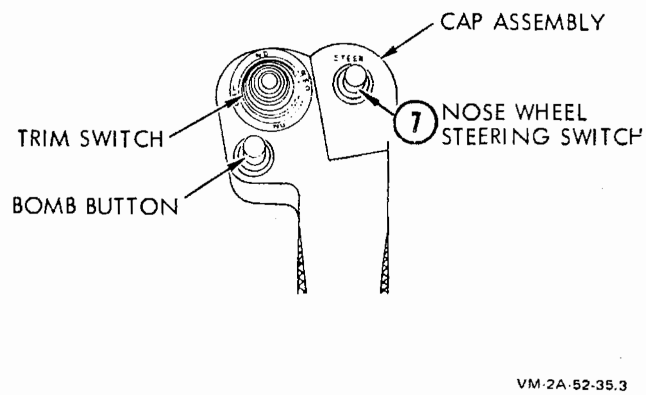
5. Pull stick grip assembly up and push wire bundle through hole in stick grip bell crank; remove stick grip assembly.

6. Remove sealing compound covering the three setscrews on cap assembly. Remove setscrews and cap assembly.



Step 6—Para. 3-36

7. Unsolder wires at nose wheel steer button, bomb button, trim switch, and trigger switch. Remove both buttons and both switches.



Step 7—Para. 3-36

3-37. INSTALLING STICK GRIP ASSEMBLY.

Tools and Equipment List

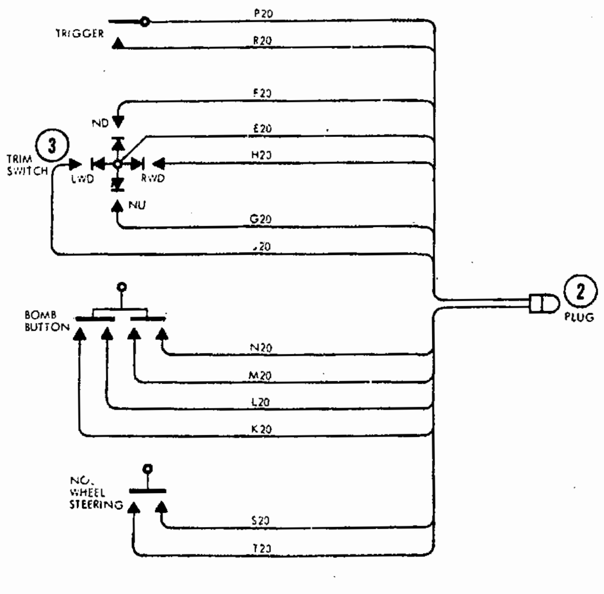
Tool, Pin, Plug Insertion	MS24256A20
Multimeter	AN/PSM-4C (or equivalent)

Materials List

Lockwire (0.032-inch diameter steel)	MS20995F32

1. Attach a length of lockwire (MS20995F32) to stick grip wire bundle. Thread lockwire through stick grip bell crank and pull wire bundle through.

2. Using insertion tool (MS24256A20), insert pins from letter-designated wires into correspondingly lettered holes in crimp-type plug.



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Steps 2 and 3—Para. 3-37

3. Using a multimeter (AN/PSM-4C), perform a continuity check of the four switches in the stick grip assembly.

4. Install electrical connector at base of center pedestal and clamp near bottom of forward side of control stick.

5. Refer to paragraph 3-28 and perform an operational check of the lateral control system.

3-38. AILERON REMOVAL AND INSTALLATION.

3-39. To remove and install an aileron, see figure 3-3, and proceed as follows:

3-40. REMOVING AILERON.

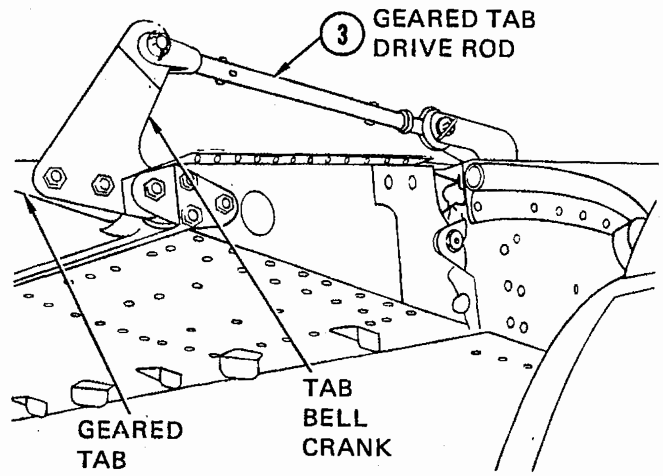
Tools and Equipment List

Platform, Aircraft Maintenance	Type B-1 (or equivalent)

1. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1), for location, and remove access panels numbered 97, 98, 116, and 117 (AILERON ATTACHMENT).

2. Place flaps in full down position.

3. Remove geared tab drive rod at tab bell crank.



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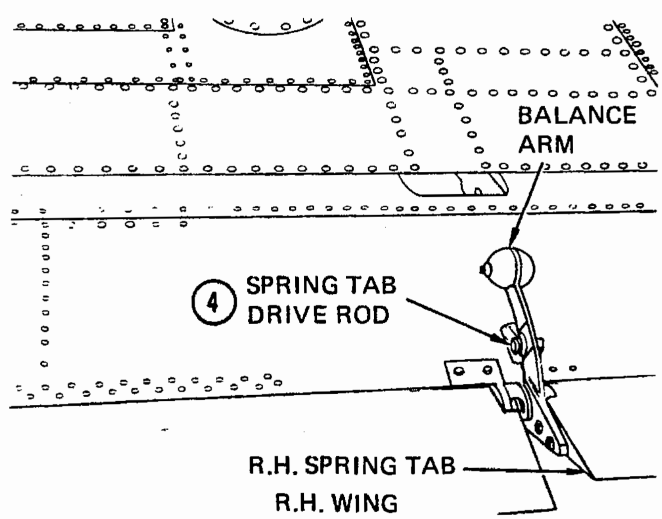
Step 3—Para. 3-40

4. Remove spring tab drive rod attaching hardware from balance-weight arm.



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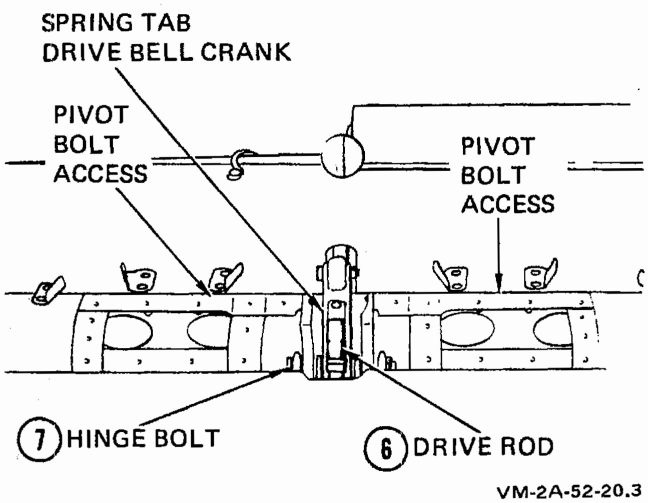
Step 4—Para. 3-40

5. Move the aileron to full trailing edge up position and remove cotter pin and bolt from aileron drive rod at leading edge of spanwise centerline.

6. Move aileron to full trailing edge down position, and disconnect spring tab drive bell crank drive rod from drive bell crank.



Steps 6 and 7—Para. 3-40

7. Remove hinge bolt from center hinge.

Note

In the following step, mechanical fingers must be used to remove the aileron outboard hinge bolt through the wing tip.

8. With a crewman supporting aileron, remove cotter pin at outboard end of aileron hinge and, using a socket and extension, remove the hinge bolt through the wing tip access hole.

Note

On aircraft having IAFC 33 and AFC 33 incorporated, the inboard and outboard hinge bolt nuts are safetied with a cotter pin to a clip mounted on the support fittings. The cotter pins are inserted through the clip and then through the bolt and nut so as to keep the bolt from turning during operation of the ailerons. The clips are mounted on the inboard side of the outboard support fittings and on the outboard side of the inboard support fittings.

9. Remove inboard hinge bolt cotter pin, nut, and bolt.

10. Move aileron aft slightly and remove retaining bolts in aileron well holding inboard and outboard bonding jumpers to aileron structure.

3-41. INSTALLING AILERON.

Tools and Equipment List

Stand, Aircraft Maintenance	Type B-1 (or equivalent)

Materials List

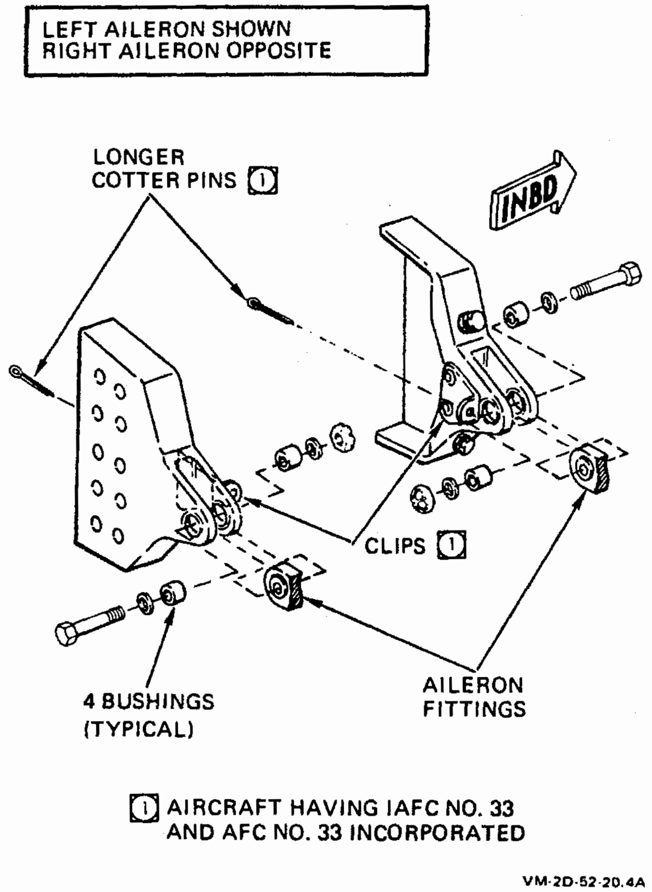
Pin, Cotter (Aircraft having IAFCS 33 and AFC 33 incorporated)	MS24665-155
Pin, Cotter (1/16-inch diameter steel)	MS24665-134

Note

If the aileron trim tabs require replacement, ensure the airflow barrier nylon hook tape is disconnected from aileron spars prior to removal of trim tab, and reconnected upon installation.

1. Have helper hold aileron and attach inboard and outboard bonding jumpers to aileron.

2. Position aileron on hinges and install outboard hinge bolt through wing tip access hole. Tighten hinge bolt nut and safety with cotter pin (MS24665-155).



Steps 2 and 3—Para. 3-41

3. Install inboard hinge bolt. Tighten nut and safety with cotter pin (MS24665-155).

4. Install center hinge bolt. Tighten nut and safety with cotter pin (MS24665-134).

5. Move aileron to trailing edge up position. Install aileron drive rod. Tighten bolt and safety with cotter pin (MS24665-134).

6. Install geared tab drive rod. Tighten bolt and safety with cotter pin (MS24665-134).

7. Refer to paragraph 3-62 for instructions to rig and adjust the aileron and tabs.

8. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1), for location, and install access panels numbered 97, 98, 116, and 117 (AILERON ATTACHMENT).

3-42. AILERON GEARED AND/OR SPRING TAB REMOVAL AND INSTALLATION.

3-43. To remove and install an aileron geared and/or spring tab, see figure 3-3 and proceed as follows:

3-44. REMOVING GEARED AND/OR SPRING TAB(S).

Note

The geared tab (inboard) must be removed before the spring tab (outboard) can be removed.

Tools and Equipment List

Platform, Aircraft Maintenance	Type B-1 (or equivalent)

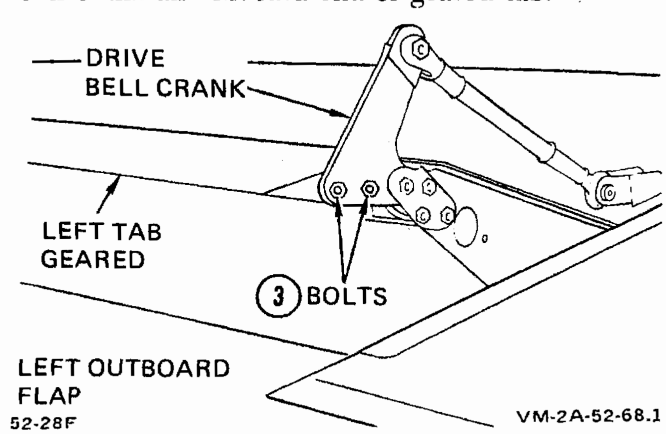
1. Position wing flaps to full DOWN position. Have helper move spring tab down to expose both ends of geared tab.

Note

On the left aileron, both bonding jumpers are attached to the upper trailing edge surface of the aileron. On the right aileron, both bonding jumpers are attached to the lower trailing edge surface of the aileron.

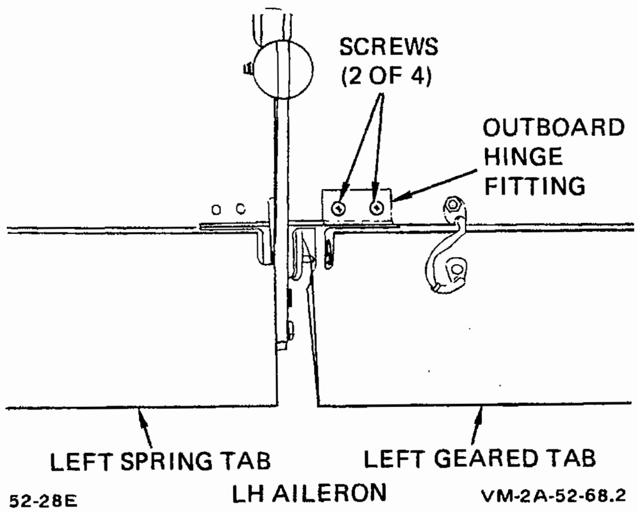
2. Remove bolt from inboard aileron bonding jumper.

3. Remove two bolts from geared tab drive bell crank and inboard end of geared tab.



Step 3—Para. 3-44

4. Remove four Torq-Set screws (two on upper trailing edge surface and two on lower surface) from outboard geared tab hinge fitting.



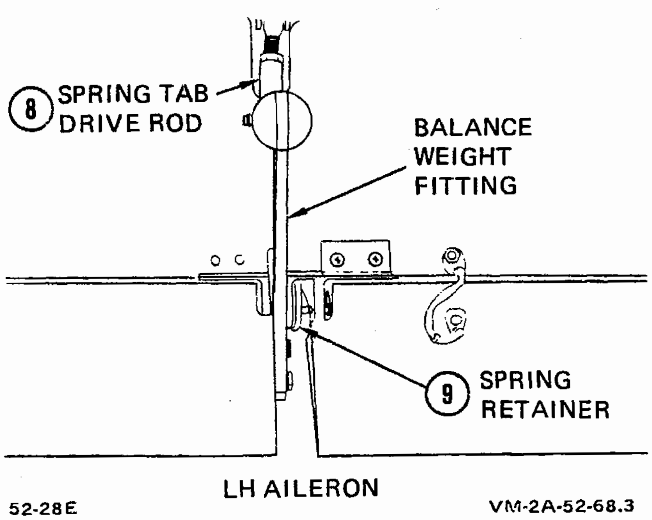
Step 4—Para. 3-44

5. Have helper hold geared tab. Remove two Torq-Set screws (one on upper surface of aileron trailing edge, and one on lower surface) from center hinge fitting.

6. Pull tab to rear to remove.

7. Remove bolt from outboard aileron bonding jumper.

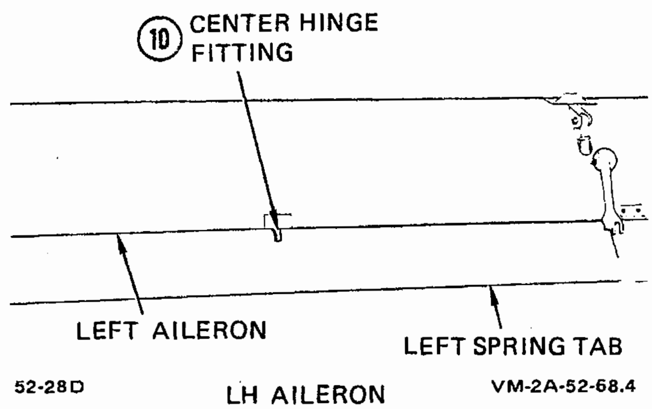
8. Remove spring tab drive rod from balance weight fitting.



Steps 8 and 9—Para. 3-44

9. Locate spring tab spring retainer at inboard end of spring tab and remove from trailing edge of aileron. Remove spring assembly.

10. Have helper hold spring tab. Remove two Torq-Set screws (one on upper surface of trailing edge and one on lower surface) from center hinge fitting.



Step 10—Para. 3-44

11. Move aileron inboard and aft to remove.

3-45. INSTALLING GEARED AND/OR SPRING TAB(S).

Tools and Equipment List

Platform, Aircraft Maintenance,	Type B-1 (or equivalent)
Wrench, Torque (0 to 200 inch-pounds)	GGG-W-686 Type 1, No. 6 (or equivalent)

Materials List

Pins, Cotter (1/16-inch diameter steel)	MS24665-134

1. Slide spring tab hinge pin into outboard spring tab hinge fitting.

2. Align seal halves on leading edge of tab and trailing edge of aileron. Apply forward pressure and align holes in center hinge fitting with holes in upper surface of trailing edge. Install Torq-Set screws and, using a torque wrench (GGG-W-686 Type 1, No. 6), tighten 25 to 35 inch-pounds.

3. Install spring tab spring retainer at inboard end of spring tab. Bolt retainer to trailing edge of aileron.

4. Align center and outboard hinge fittings with mounting holes in trailing edge of aileron. Align seal halves on leading edge of tab and trailing edge of aileron. Apply forward pressure and align holes. Install Torq-Set screws in upper and lower surfaces of trailing edge, using a torque wrench (GGG-W-686 Type 1, No. 6), tighten 25 to 35 inch-pounds.

5. Clean bolt threads with primer [MIL-S-22473, Grade N (green)]. Apply sealing compound [MIL-S-22473, Grade AV (red)] to bolt threads. Align holes in geared tab drive bell crank with holes in inboard end of tab and install bolts. Torque 25 to 35 inch-pounds.

6. Install bonding jumpers from outboard end of each tab to trailing edge of aileron. Torque attach bolts 25 to 35 inch-pounds. Raise wing flaps to full up position.

7. Refer to paragraph 3-62 and check travel of both spring and geared tabs. Adjust, if necessary, according to instructions. Refer to paragraph 3-11 and perform an operational check of the lateral control system.

3-46. REDUCED SPOILER ACTUATOR REMOVAL AND INSTALLATION (AIRCRAFT BUNO 155497 THROUGH 155503 AND AIRCRAFT HAVING AFC 19 INCORPORATED). (REMOVED FROM AIRCRAFT WITH AFC 73 INCORPORATED).

3-47. To remove and install the reduced spoiler actuator, proceed as follows:

3-48. REMOVING REDUCED SPOILER ACTUATOR.

Tools and Equipment List

Platform, Aircraft Maintenance	Type B-1 (or equivalent)

Materials List

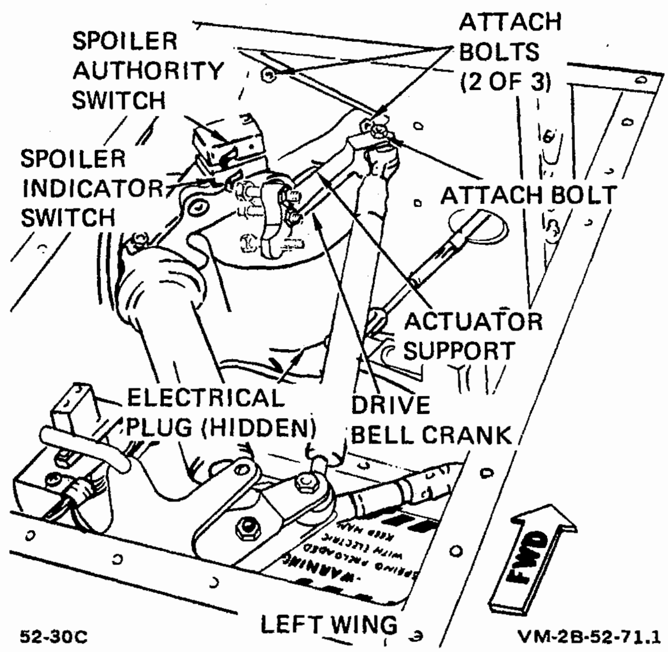
Lockwire (0.032-inch diameter steel)	MS20995F32

1. Place maintenance platform (Type B-1, or equivalent) near trailing edge of aileron at applicable end of wing.

2. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for location and remove access panel number 96 and/or 118 (CONTROLS, LATERAL).

3. Refer to paragraph 3-50 for instructions and remove reduced spoiler bungee.

4. Remove attach bolt, nut, and washer and disconnect actuator drive rod from actuator drive bell crank. Tie aside drive rod with lockwire (MS20995F32).



Steps 4 through 6—Para. 3-48

5. Remove reduced spoiler authority switch and reduced spoiler indicator switch from actuator support.

6. Disconnect electrical plug from base of actuator. Remove three attach bolts securing actuator support to wing bulkhead. Remove actuator and support from aircraft.

7. Remove Torq-Set screw and two bolts from support and remove actuator. If necessary, remove cotter pin, nut, washer, and bolt and remove actuator drive bell crank from actuator.

3-49. INSTALLING REDUCED SPOILER ACTUATOR.

Tools and Equipment List

Wrench, Torque (0-200 inch-pounds)	GGG-W-686, No. 6 (or equivalent)

Materials List

Pins, Cotter (1/16-inch diameter steel)	MS24665-134
Lockwire (0.032-inch diameter steel)	MS20995F32

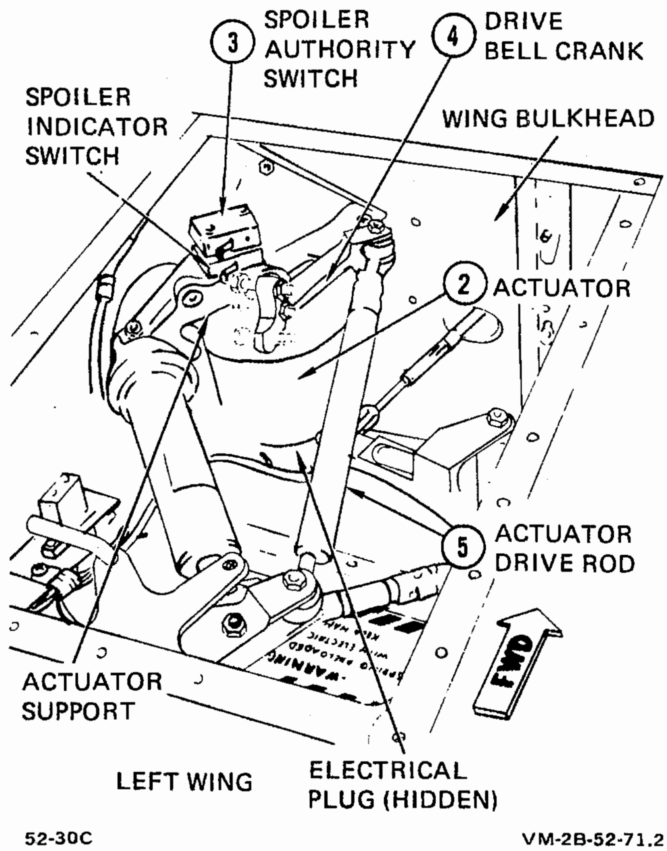
1. Install reduced spoiler actuator on actuator support, using Torq-Set screw and two bolts. Using a torque wrench (GGG-W-686, No. 6, or equivalent), tighten Torq-Set screw and both bolts 70 to 90 inch-pounds.

2. Install actuator and support on wing bulkhead. Using a torque wrench (GGG-W-686, No. 6, or equivalent), tighten attach bolts 70 to 90 inch-pounds.

3. Install reduced spoiler authority and reduced spoiler indicator switches on top of actuator support. Connect electrical plug to base of actuator.

4. If removed, install actuator drive bell crank on actuator drive shaft. Insert bolt and install washer and nut. Using a torque wrench (GGG-W-686, No. 6, or equivalent), tighten nut 50 to 70 inch-pounds. Safety nut with cotter pin (MS24665-134).

5. Connect actuator drive rod to actuator drive bell crank with bolt. Install washer and nut. Using a torque wrench (GGG-W-686, No. 6, or equivalent), tighten nut 30 to 40 inch-pounds. Safety nut with cotter pin (MS24665-134).



Steps 2 through 5—Para. 3-49

6. Refer to paragraph 3-50 and install reduced spoiler bungee. Refer to paragraph 3-62 and check adjustment of switch actuating bolts on actuator drive bell crank. Refer to paragraph 3-28 and perform an operational check of the lateral control system.

7. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for location and install access panel number 96 and/or 118 (CONTROLS, LATERAL).

3-50. REDUCED SPOILER BUNGEE (305-523376) REMOVAL AND INSTALLATION (AIRCRAFT BUNO 155497 THROUGH 155503 AND AIRCRAFT HAVING AFC 19 INCORPORATED). (REMOVED FROM AIRCRAFT WITH AFC 73 INCORPORATED).

3-51. To remove and install the reduced spoiler bungee, proceed as follows:

Tools and Equipment List

Platform, Aircraft Maintenance	Type B-1 (or equivalent)
Bundle, Rig Pin	T3382

Note

On aircraft having AFC No. 19 incorporated, the reduced spoiler system is deactivated. The reduced spoiler actuators, shifter rods, and bell cranks are removed. Rod assembly (H331886) is installed in place of the LH and RH reduced spoiler damping bungees.

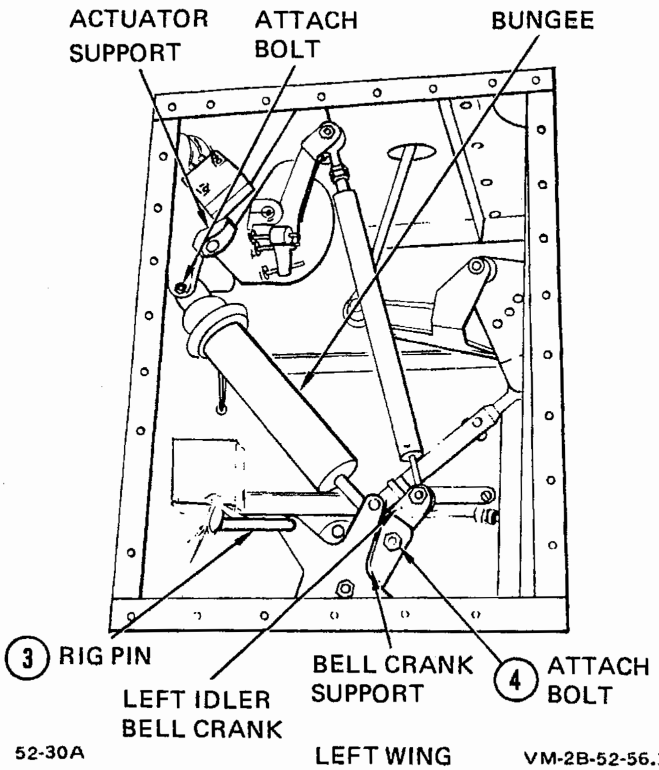
On aircraft having AFC 73 incorporated, the reduced spoiler system function has been removed. The reduced spoiler actuators, shifter rods, and bell cranks are removed. Rod assembly (15C1059-1) is installed in place of the LH and RH spoiler damping bungees.

3-52. REMOVING REDUCED SPOILER BUNGEE.

1. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for location and remove access panels numbered 96 and 118 (CONTROLS, LATERAL).

2. Place maintenance platform (Type B-1) near aileron of applicable wing.

3. Insert rig pin (-7, rig pin bundle T3382) through outboard rig pin hole in left idler bell crank support and into left idler bell crank.



Steps 3 and 4—Para. 3-52

3-53. INSTALLING REDUCED SPOILER BUNGEE.

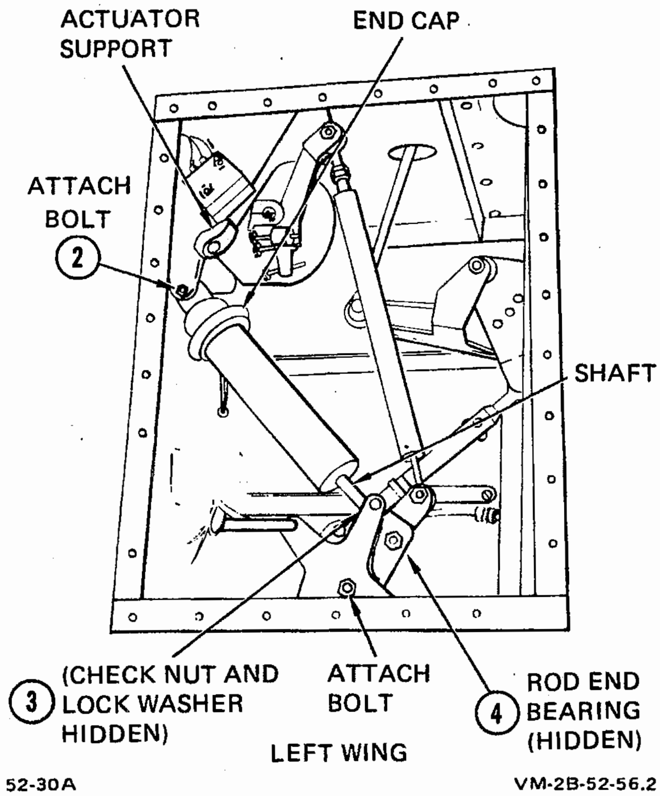
4. Remove bungee attach bolt from idler bell crank and from actuator support. Remove bungee from aircraft. Do not remove rig pin from idler bell crank.

Materials List

Lockwire (0.032-inch diameter steel)	MS20995F32
Pins, Cotter (1/16-inch diameter steel)	MS24665-134

1. Check that rig pin (-7, rig pin bundle T3382), is installed through outboard rig pin hole in left idler bell crank support and into left idler bell crank.

2. Align end cap bolt hole with mounting hole in actuator support. Install attach bolt, washer, and nut. Safety nut with cotter pin (MS24665-134).



Steps 2 through 4—Para. 3-53

3. If installed, remove lockwire from check nut and lock washer. Loosen check nut and slide back washer off of bungee shaft.

4. Adjust rod end bearing until attach bolt can be easily installed through idler bell crank and rod end bearing. Install washer and nut on attach bolt. Tighten attach bolt and safety nut with cotter pin (MS24665-134).

5. Slide back washer onto bungee shaft. Tighten check nut against lock washer and safety both together with lockwire (MS20995F32).

6. Remove rig pin from bell crank support and idler bell crank. Refer to paragraph 3-28 and perform an operational check of the lateral control system.

7. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for location and install access panels numbered 96 and 118 (CONTROLS, LATERAL).

3-54. SPOILER PLATE REMOVAL AND INSTALLATION.

3-55. To remove and install a spoiler plate, see figure 3-3 and proceed as follows:

3-56. REMOVING SPOILER PLATE(S).

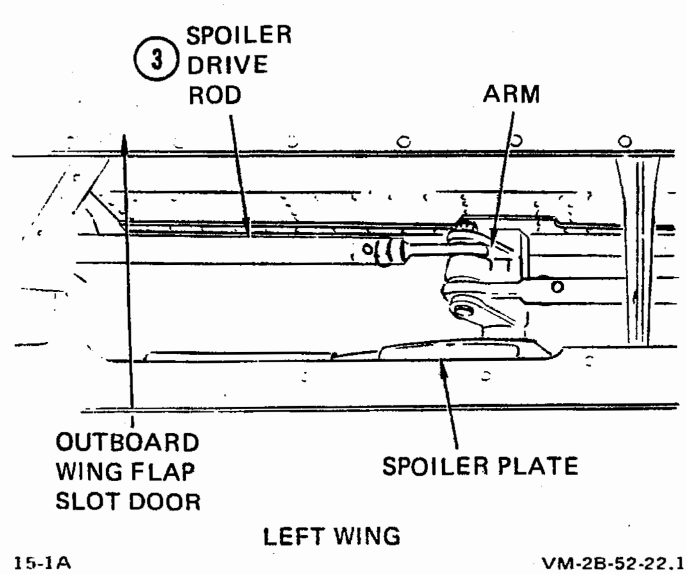
Tools and Equipment List

Platform, Aircraft Maintenance	Type B-1 (or equivalent)

1. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for location, and remove access panels numbered 16 and 18 (SPOILER ATTACH), 17 (CONTROLS, SPOILER), 60 and 62 (SPOILER ATTACH), 61 (CONTROLS, SPOILER), 99 and 115 (CONTROLS, SPOILER, FLAP). Keep attaching hardware with respective panel.

2. Lower wing flaps to full DOWN position, neutralize stick, and move maintenance platform (Type B-1, or equivalent) into position.

3. Disconnect spoiler drive rod from spoiler plate arm by removing cotter pin, nut, and bolt.

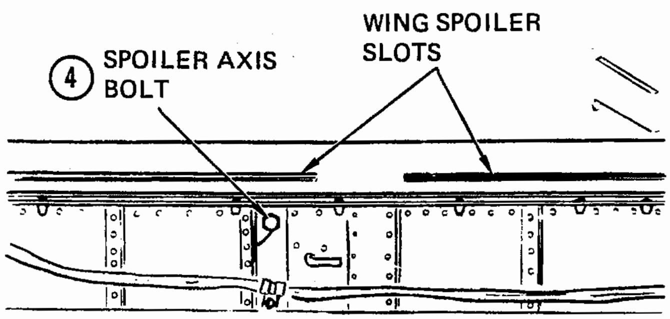


Step 3—Para. 3-56

Note

The spoiler axis bolt is attached on forward end by a self-locking winged nut. It will be necessary to have a helper retrieve the spoiler and winged nut from the wing flap well.

4. Remove safety wire and spoiler axis bolt.



Step 4—Para. 3-56

3-57. INSTALLING SPOILER PLATE(S).

Tools and Equipment List

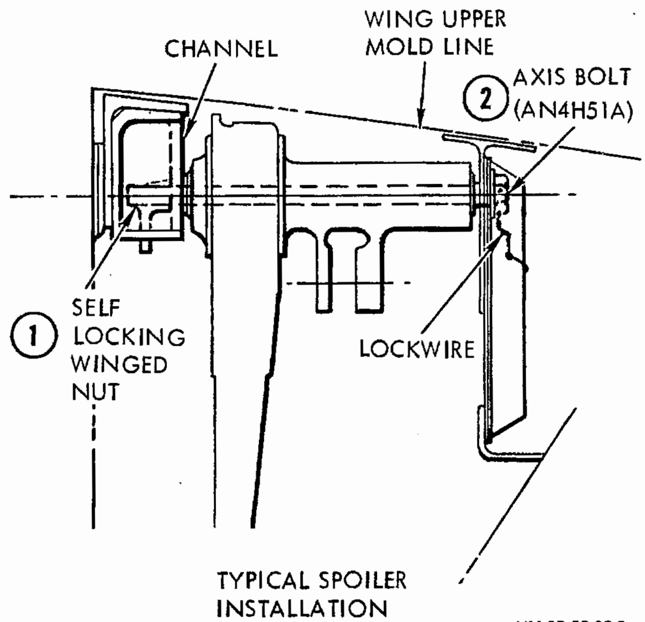
Platform, Aircraft Maintenance	Type B-1 (or equivalent)
Wrench, Torque (0-200 inch-pounds)	GGG-W-686, Type 1, Size No. 6 (or equivalent)

Materials List

Pins, Cotter (1/16-inch diameter steel)	MS24665-134
Lockwire (0.041-inch diameter steel)	MS20995F41

1. Using mechanical fingers, have helper position self-locking winged nut in channel.

2. Have helper hold spoiler plate up in spoiler well. Insert axis bolt through wing trailing edge bulkhead, spoiler bearing, and into channel at top forward corner of spoiler well. Tighten bolt and using a torque wrench (GGG-W-686, size No. 6 or equivalent), torque bolt 30 to 40 inch-pounds. Safety head of bolt to wing bulkhead with lockwire (MS20995F41).



Steps 1 and 2—Para. 3-57

3. Install spoiler drive rod with attach bolt. Tighten nut and safety with cotter pin (MS24665-134).

4. Perform an operational check of the lateral control (paragraph 3-28) and wing flap systems (paragraph 3-139). Return flaps to full DOWN position.

5. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for location, and install access panels numbered 16 and 18 (spoiler attach), 17 (CONTROLS, SPOILER), 60 and 62 (SPOILER ATTACH), 61 (CONTROLS, SPOILER), 99 and 115 (CONTROLS, SPOILER, FLAP).

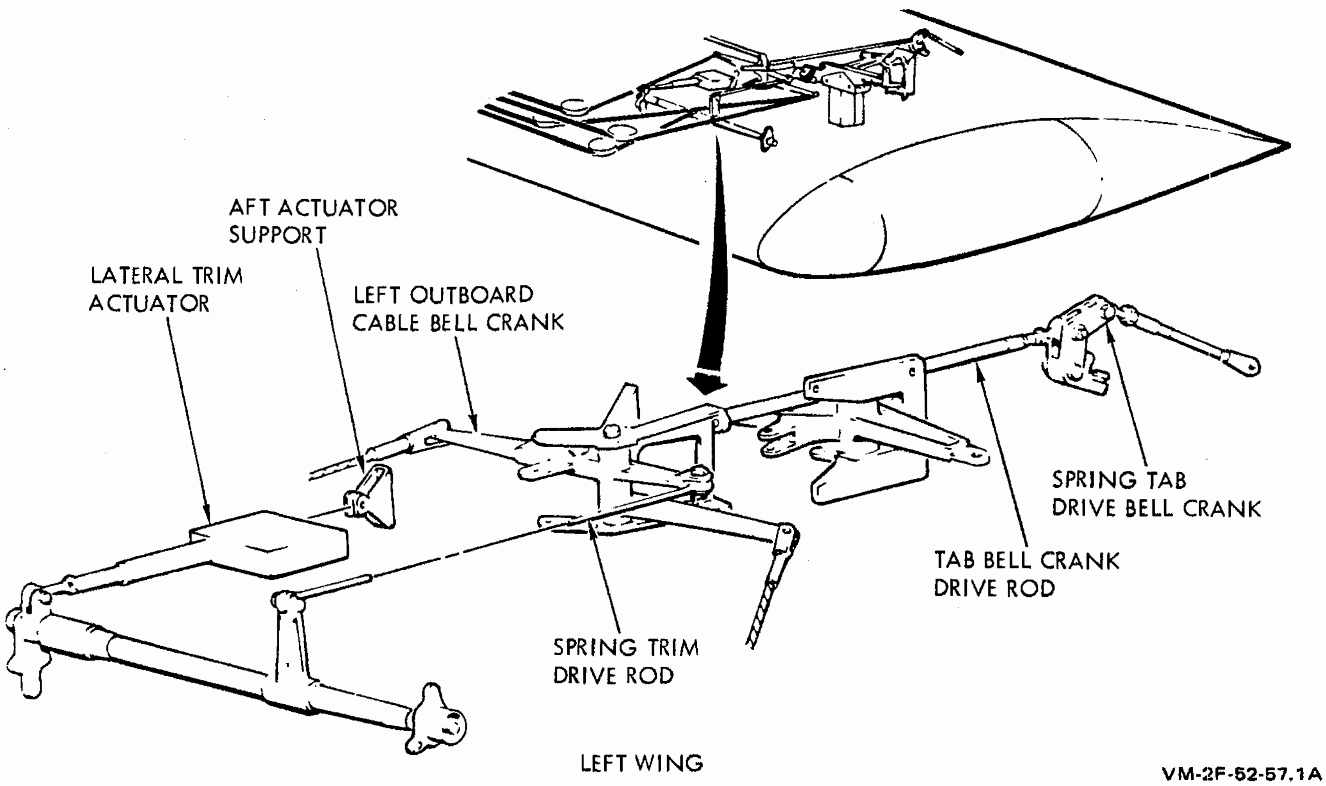


Figure 3-15. Lateral Trim Actuator

3-58. LATERAL TRIM ACTUATOR REMOVAL AND INSTALLATION.

3-59. To remove and install the lateral trim actuator, see figure 3-15 and proceed as follows:

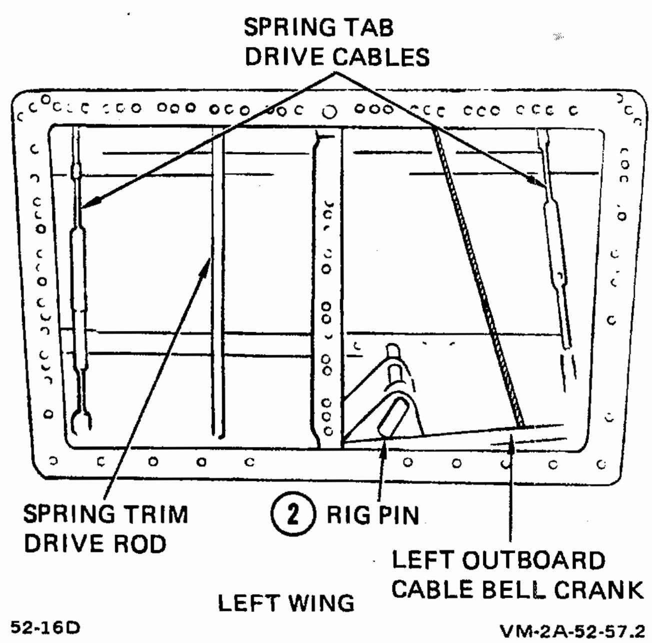
3-60. REMOVING LATERAL TRIM ACTUATOR.

Tools and Equipment List

Bundle, Rig Pin	T3382

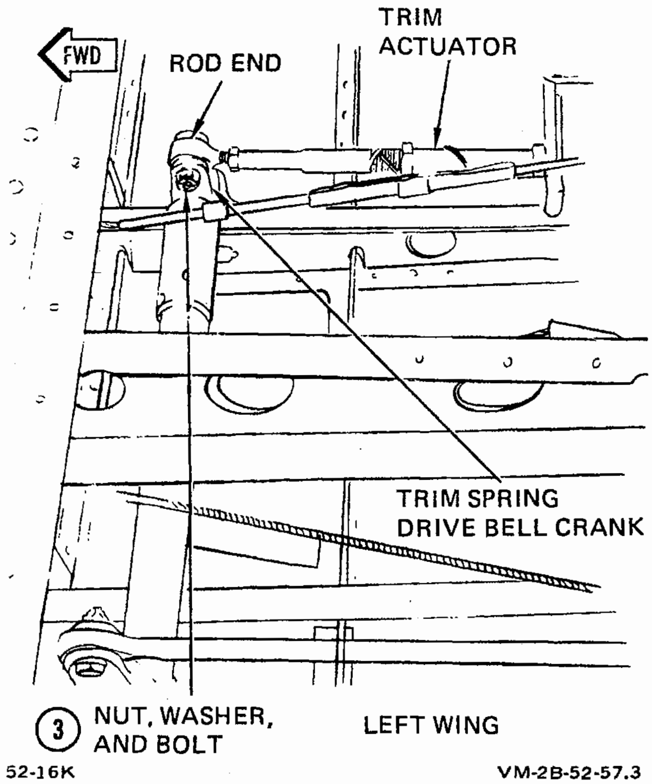
1. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for location, and remove access panel numbered 119 (CONTROLS, LATERAL).

2. Install rig pin (-7, rig pin bundle, T3382) through left outboard cable bell crank support and into left outboard cable bell crank.



Step 2—Para. 3-60

3. Remove nut, washer, and bolt from actuator rod end and disconnect rod end from trim spring drive bell crank.



Step 3—Para. 3-60

4. See figure 3-15. Disconnect electrical plug from aft end of actuator. Remove nut, washer, and bolt from aft actuator support. Remove actuator from aircraft.

3-61. INSTALLING LATERAL TRIM ACTUATOR.

Tools and Equipment List

Power Unit, Mobile	NC-8A (or equivalent)

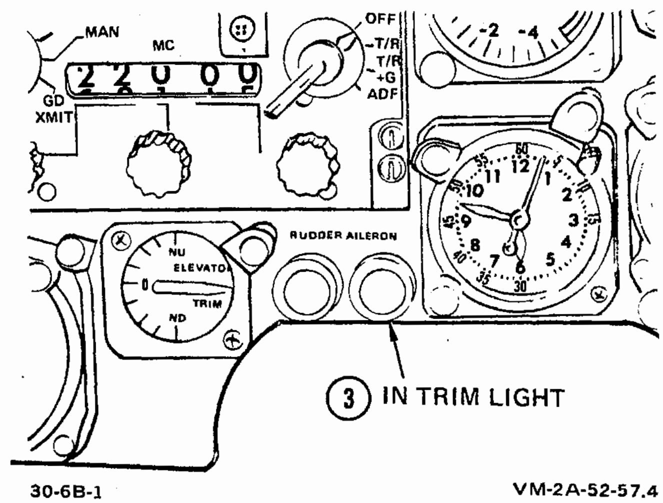
Materials List

Pins, Cotter (1/16-inch diameter steel)	MS24665-134
Lockwire (0.032-inch diameter steel)	MS20995F32

1. Refer to figure 3-15, and align actuator attach fitting with aft actuator support and install with bolt, washer, and nut. Tighten nut and safety with cotter pin (MS24665-134).

2. Connect electrical plug to aft end of actuator.

3. If available, connect mobile power unit (NC-8A, or equivalent) to aircraft. Turn aircraft electrical system ON. Have helper in cockpit electrically operate trim actuator to IN trim position, as indicated by aileron trim light.



Step 3—Para. 3-61

4. If necessary, loosen jamnut and adjust actuator rod end to fit trim spring drive bellcrank. Connect rod end to bellcrank with bolt, washer, and nut. Tighten jamnut against actuator rod. Tighten attach bolt nut and safety with cotter pin (MS24665-134). Remove rig pin from cable bell crank.

5. Refer to paragraph 3-28 and perform an operational check of the lateral control system.

6. Install access panel numbered 119 (CONTROLS, LATERAL) on wing.

3-62. RIGGING AND ADJUSTING THE LATERAL CONTROL SYSTEM.

3-63. To rig and adjust the lateral control system, see figure 3-16 and proceed as follows:

Tools and Equipment List

Platform, Aircraft Maintenance	Type B-1 (or equivalent, two required)
Bundle, Rig Pin	T3382
Fixture, Aileron Rigging	T3392 (two required)
Gage, Force, Push/Pull (0-100 pounds)	S131 (or equivalent)
Tensiometer, Cable	T-5-8002-105-00 (or equivalent)
Tester, Air Data	VPT-10F-11072
Multimeter	AN/PSM-4C (or equivalent)
Power Unit, Mobile	NC-8A (or equivalent)

Materials List

Pins, Cotter (1/16-inch diameter steel)	MS24665-134
Lockwire (0.032-inch diameter steel)	MS20995F32
Clips, Turnbuckle, Locking (0.028-inch diameter steel)	MS21256-2

Note

Where indicated, adjustments to cables and drive rods must be made so that related rig pins can be installed in the respective rig pin holes without binding. Rig pins must never be installed under pressure.

In the following procedure, rig pins must be installed and removed in the order given.

Diameters and lengths of pins are indicated by dash numbers (-7, for example) stamped on arm of each pin.

Cable tension values given are for 21.1°C (70°)F. For any other ambient temperature, see figure 3-17 for correct tension values.

1. Before beginning to rig the system, refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for location, and remove the access panels listed in table 3-4.

Note

On aircraft having IAFC No. 19 or AFC No. 73 incorporated, rod assembly (H331886) or (15C1059-1) is installed in place of the reduced spoiler bungee and must be disconnected from the reduced spoiler idler bell crank prior to rigging the system.

Table 3-4. Lateral Control System Access Panels

PANEL NUMBER	DESCRIPTION	PANEL NUMBER	DESCRIPTION
16	SPOILER, ATTACH	96	CONTROLS, LATERAL
17	CONTROLS, SPOILER	97	AILERON ATTACHMENT
18	SPOILER, ATTACH	98	AILERON ATTACHMENT
23	CONTROLS, AILERON	99	CONTROLS, SPOILER, FLAP
55	CONTROLS, AILERON	115	CONTROLS, SPOILER, FLAP
60	SPOILER, ATTACH	116	AILERON ATTACHMENT
61	CONTROLS, SPOILER	117	AILERON ATTACHMENT
62	SPOILER, ATTACH	118	CONTROLS, LATERAL
87	ELECTRICAL, CONTROLS	119	CONTROLS, LATERAL
95	CONTROLS, LATERAL		

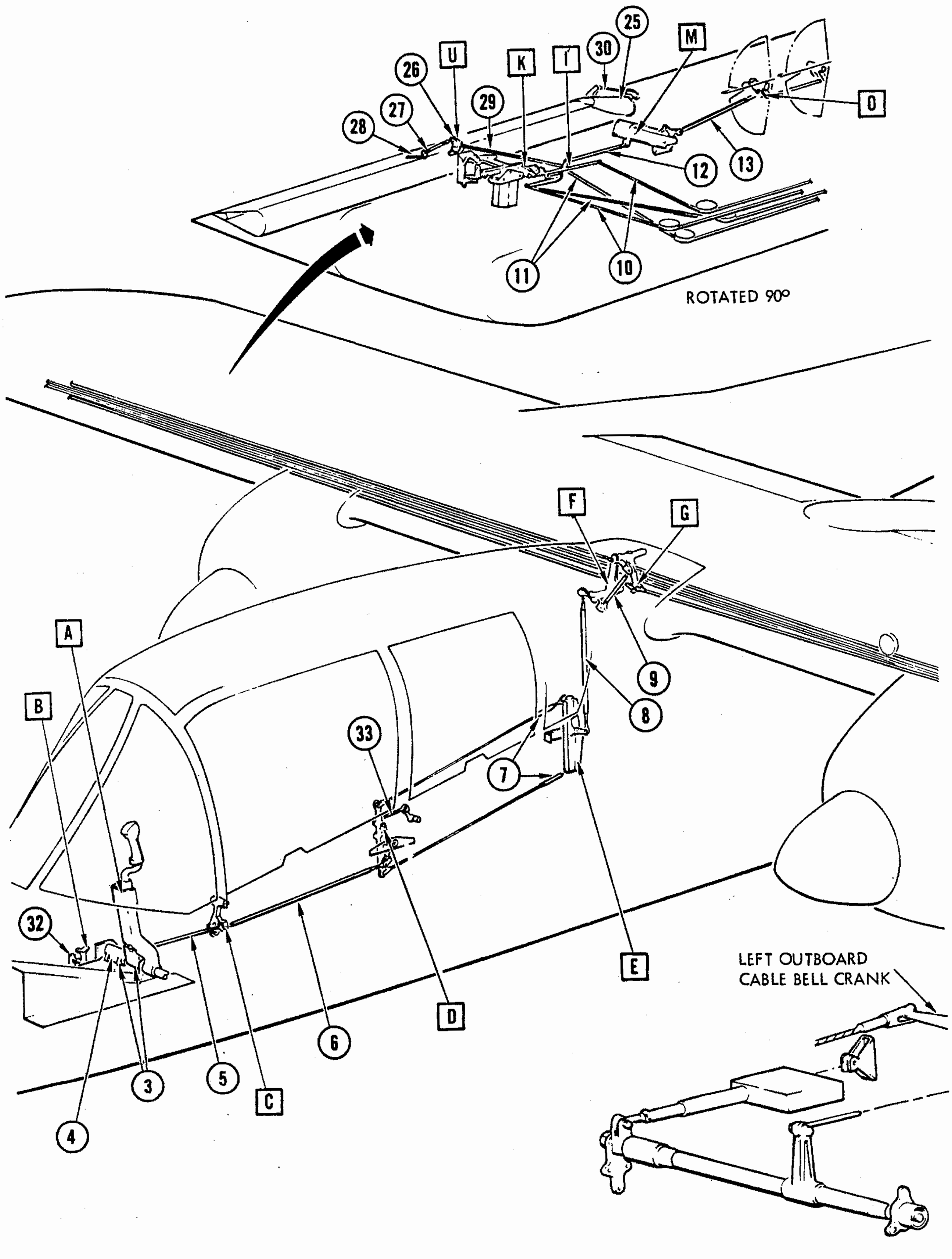


Figure 3-16. Rigging and Adjusting Lateral Control System (Sheet 1 of 2)

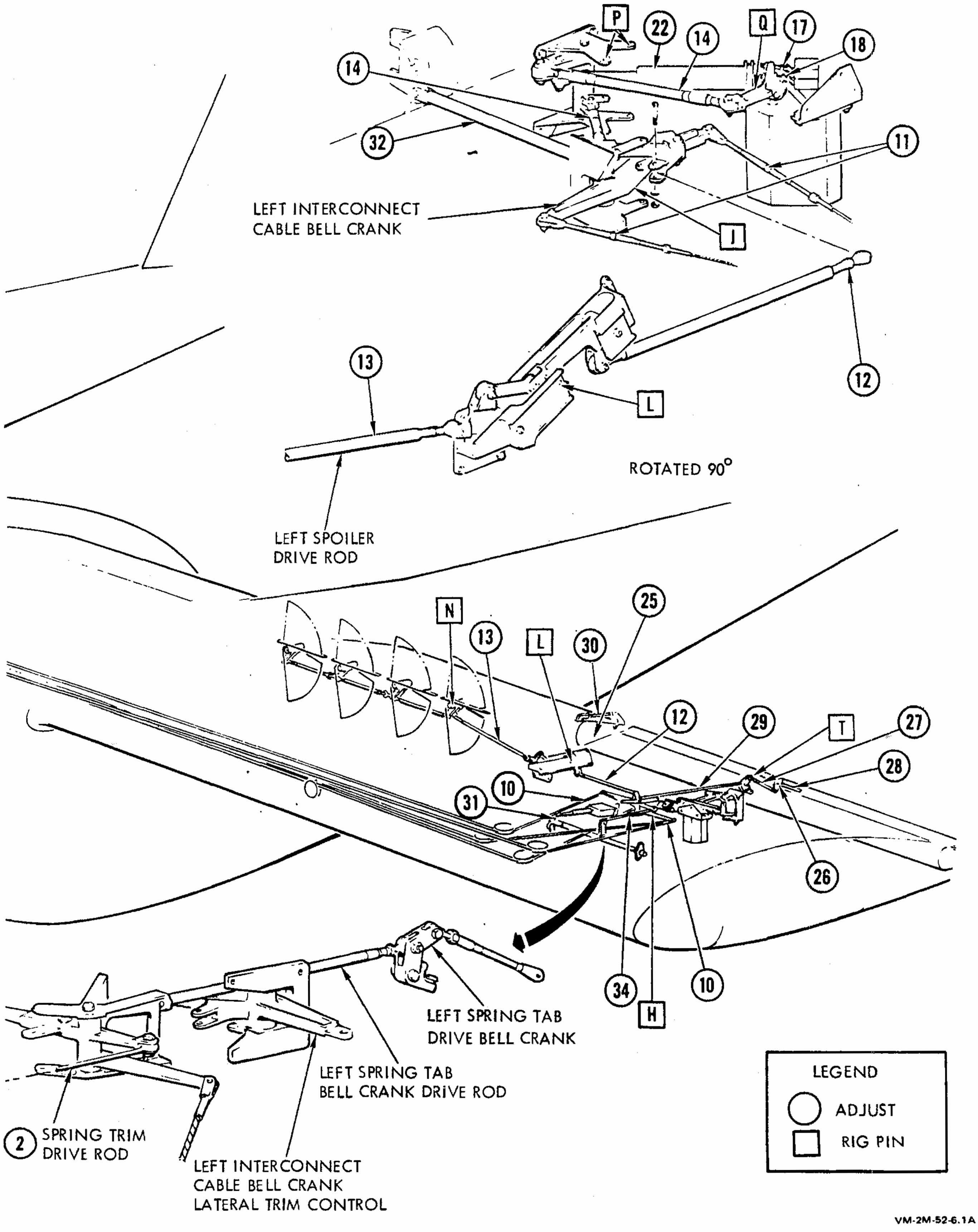
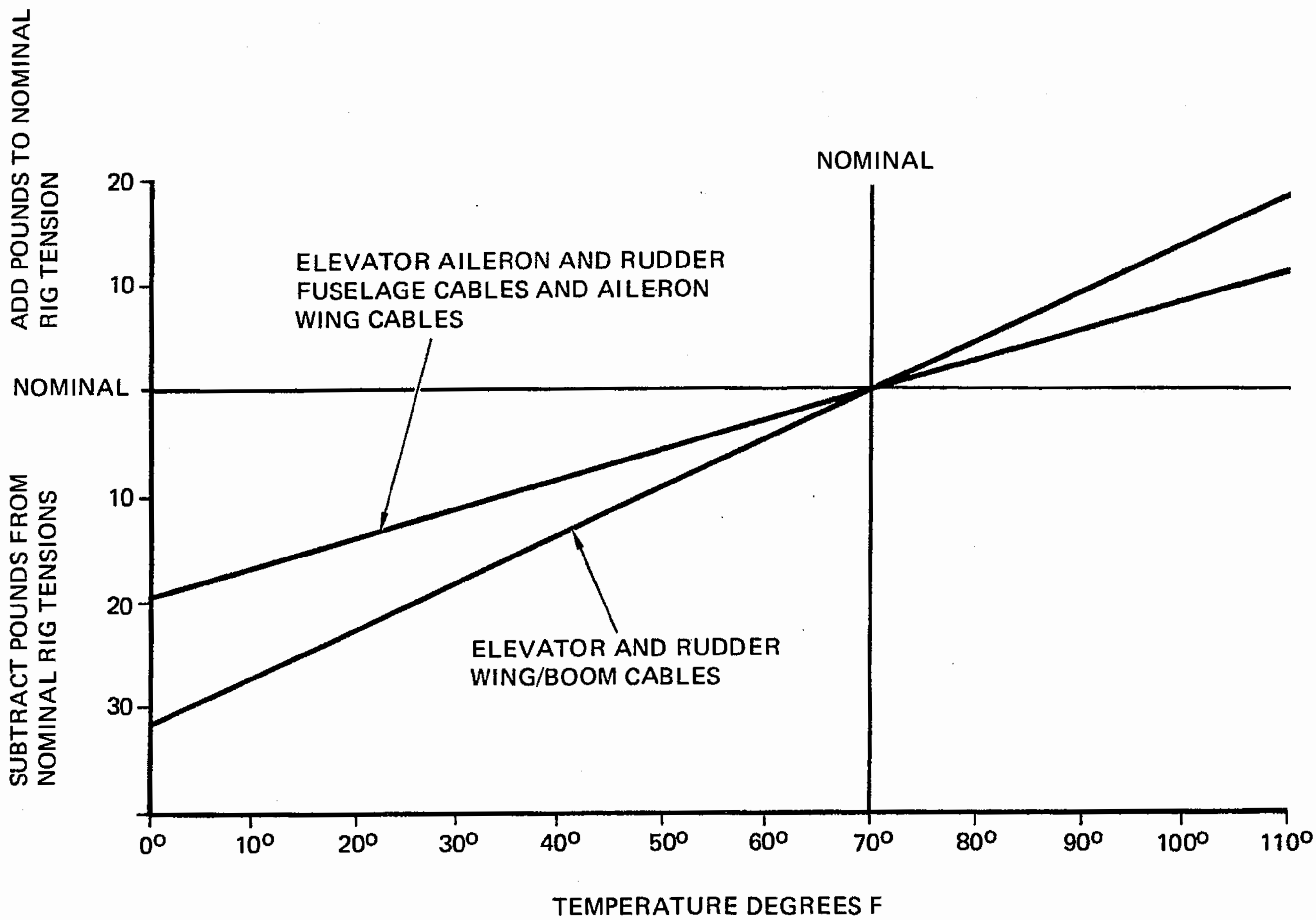


Figure 3-16. Rigging and Adjusting Lateral Control System (Sheet 2 of 2)



NOTE

ALL SPECIFIED FLIGHT CONTROL SYSTEM CABLE RIG TENSIONS ARE NOMINAL FOR AN AMBIENT TEMPERATURE CONDITION OF 70°F. AS THE AMBIENT TEMPERATURE CHANGES AND THE AIRCRAFT STRUCTURE AND SYSTEMS STABILIZE AT THE DIFFERENT TEMPERATURE THE CABLE TENSION WILL CHANGE. AS THE TEMPERATURE INCREASES THE TENSION WILL INCREASE AND CONVERSELY A DECREASE IN TEMPERATURE WILL DECREASE CABLE TENSION.

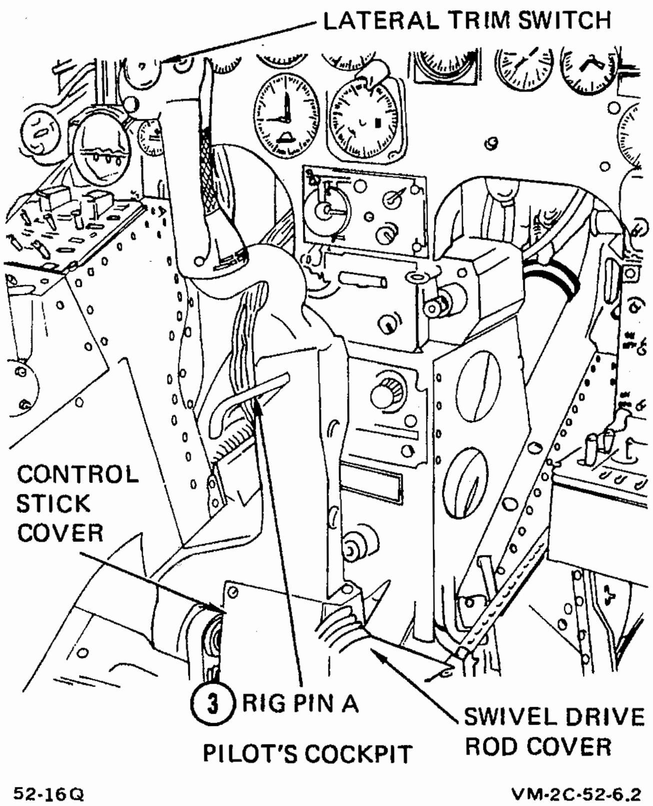
THE ABOVE CHART PRESENTS THE INCREMENT OF CABLE TENSION IN POUNDS THAT SHOULD BE ADDED OR SUBTRACTED FROM THE NOMINAL SPECIFIED TENSIONS WHEN FLIGHT CONTROL SYSTEMS ARE RIGGED AT AMBIENT TEMPERATURE CONDITIONS OTHER THAN 70°F.

OV-10CP-00-1

Figure 3-17. OV-10A Flight Control System Tension vs Temperature Conversion Chart

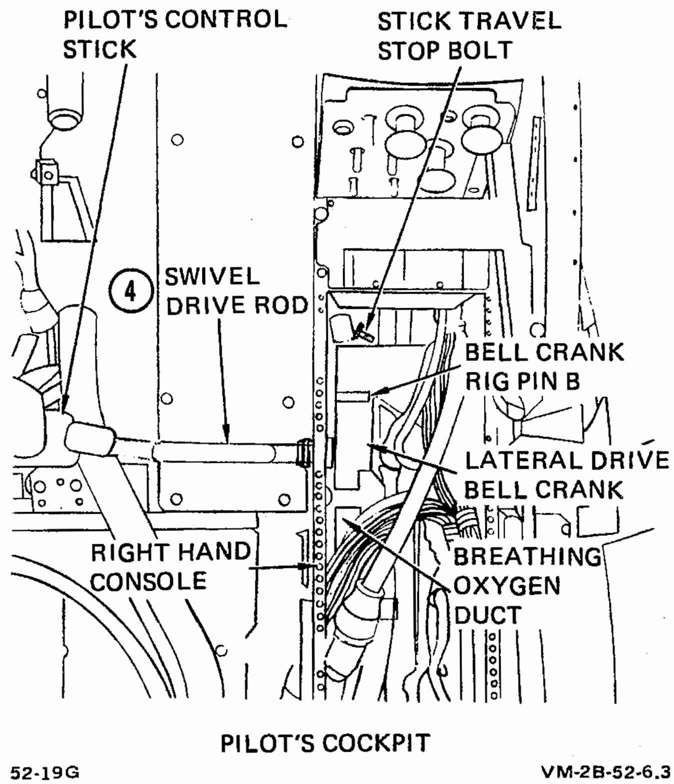
2. See figure 3-16 and disconnect spring trim drive rod from left outboard cable bell crank. Disconnect spring tab bell crank drive rods at both ailerons. Disconnect left and right spoiler drive rods. Disconnect reduced spoiler drive rods from reduced spoiler bell cranks. Disconnect reduced spoiler bungees and reduced spoiler actuator drive rods from the reduced spoiler idler bell cranks.

3. Install rig pin A (-5) in pilot's control stick. Remove control stick cover from base of stick. Remove lateral drive bell crank swivel drive rod cover from floor.



Step 3—Para. 3-63

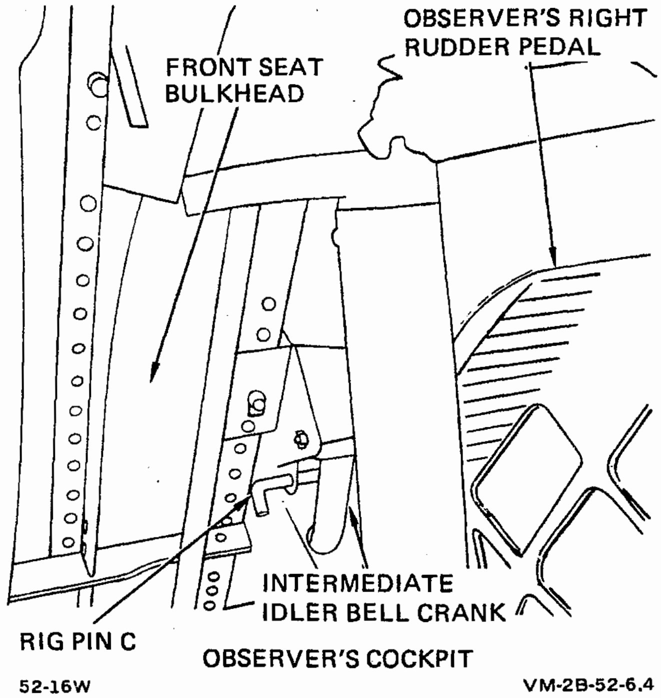
4. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5). Remove pilot's transponder set control panel [C-6280 (A)/APX] and Juliet-28 control



Step 4—Para. 3-63

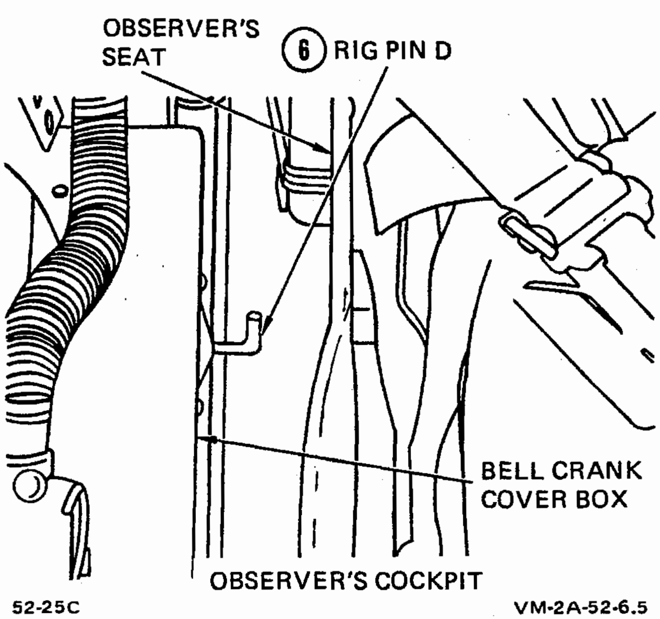
panel (C-7213/ARC) or close-out panel, whichever is installed. Remove also, pilot's interphone control panel (C-3942/AIC-18). Locate lateral drive bell crank under breathing oxygen duct. Adjust swivel drive rod rod end bearing until rig pin B (-5) can be easily installed in lateral drive bell crank. Tighten jamnut against rod end and safety with lockwire (MS20995F32). Safety attach bolt with cotter pin (MS24665-134). Remove rig pin B.

5. Locate intermediate idler bell crank forward of observer's right rudder pedal. Adjust idler bell crank drive rod at lateral drive bell crank until rig pin C (-5) can be inserted into intermediate idler bell crank. Tighten jamnut against rod end and safety attach bolt with cotter pin (MS24665-134). Remove rig pin A.



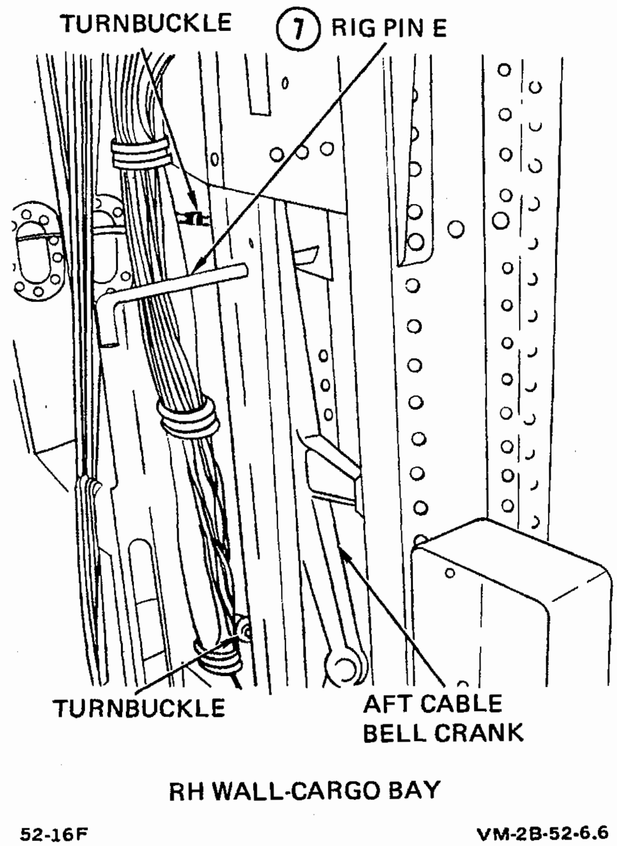
Step 5—Para. 3-63

6. Locate forward cable bell crank cover box to right of observer's seat. Bell crank rig pin hole is on side of box. Adjust seat to full UP position. Remove top panel from box. Adjust bell crank drive rod until rig pin D (-9) can be inserted into forward cable bell crank. Tighten drive rod jamnut against rod end and safety attach bolt with cotter pin (MS24665-134). Remove rig pin C.



Step 6—Para. 3-63

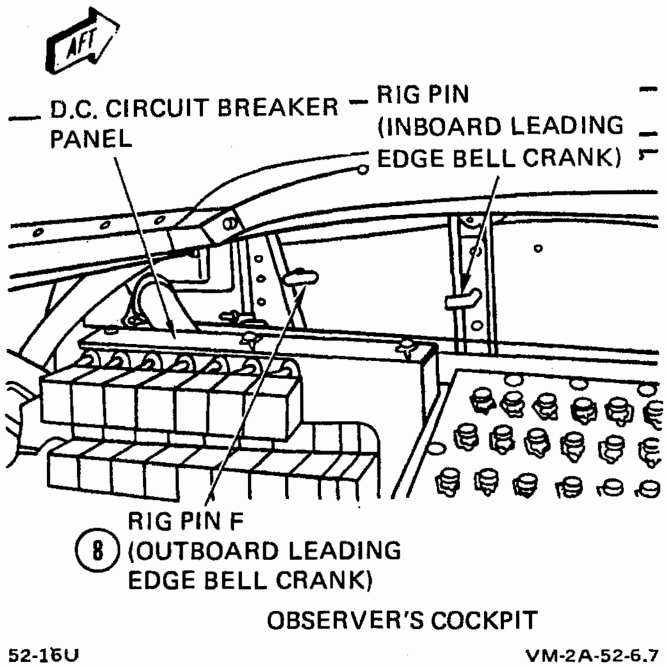
7. Remove right forward wall panel in cargo bay to gain access to aft cable bell crank. Using a tensiometer (T-5-8002-105-00), adjust each cable (1/8-inch diameter) to 66 (±5) pounds until rig pin E (-5) can be installed in aft bell crank. Safety turnbuckles with locking clips (MS21256-2). Remove rig pin D.



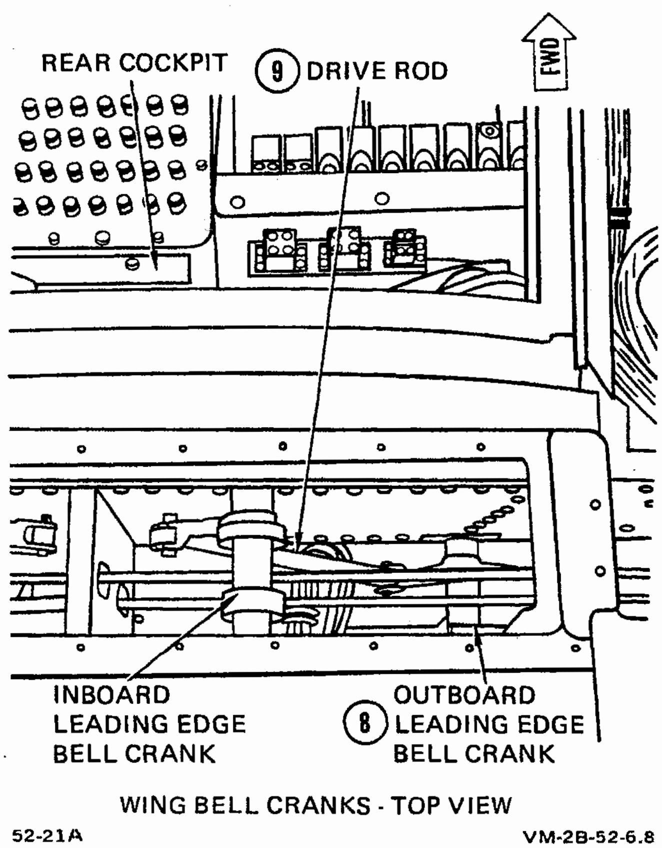
Step 7—Para. 3-63

8. Locate two rig pin holes in wing bulkhead, aft of d-c circuit-breaker panel, at rear of observer's compartment. Adjust outboard leading edge bell crank drive rod, attached to aft cable bell crank, until rig pin F (-13) can be inserted into outboard leading edge bell crank. Tighten jamnut against rod end and safety attach bolt with cotter pin (MS24665-134). Remove rig pin E.

9. Adjust inboard leading edge bell crank drive rod until rig pin G (-13) can be installed in inboard leading edge bell crank. Tighten jamnut against rod end and safety attach bolt with cotter pin (MS24665-134). Remove rig pin F.

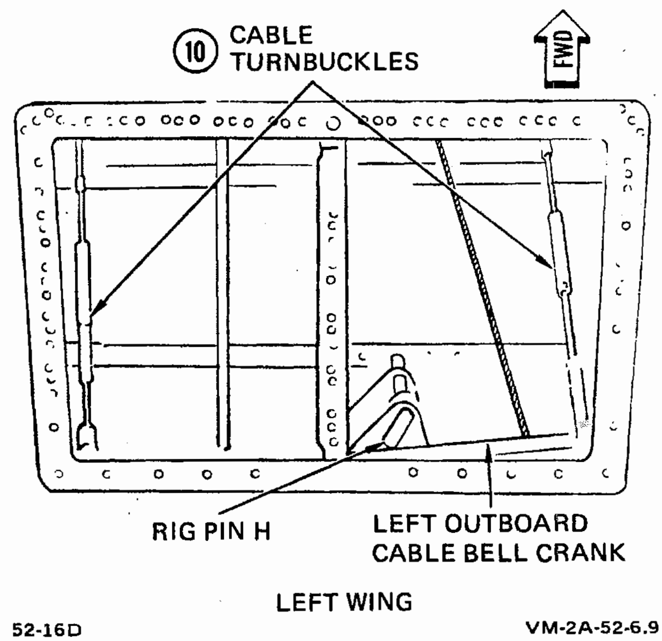


Step 8—Para. 3-63



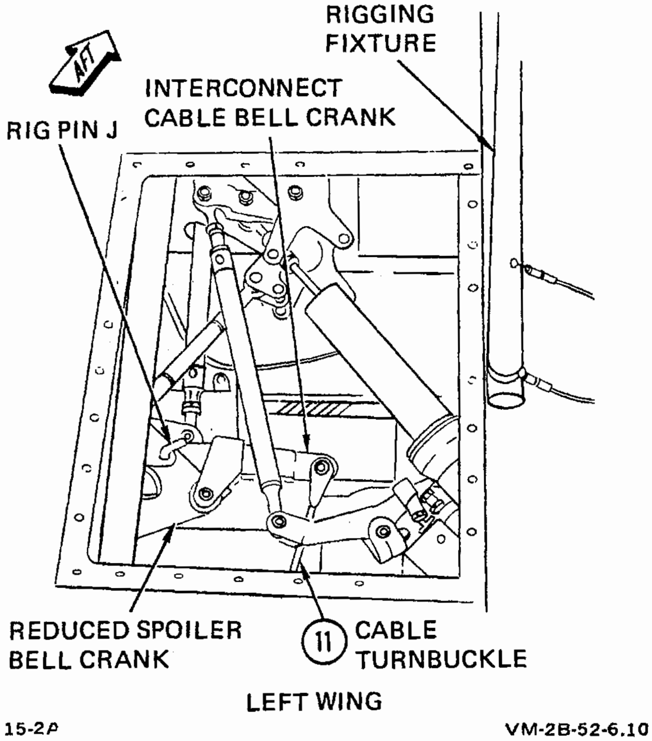
Step 9—Para. 3-63

10. Locate left and right outboard cable bell cranks and cable turnbuckles at both bell cranks. Using a tensiometer (T-5-8002-105-00), with aid of helper, simultaneously adjust all four cables (1/8-inch diameter) to 50 (±5) pounds until rig pin H (-5) can be installed in left outboard cable bell crank, and rig pin I (-5) can be installed in right outboard cable bell crank. Check fit of rig pin G. Rig pin G must not be under pressure. If rig pin G does not fit freely, readjust all four turnbuckles again until rig pins G, H, and I all fit freely and are not binding. Once properly adjusted, safety all four cable turnbuckles with locking clips (MS21256-2).

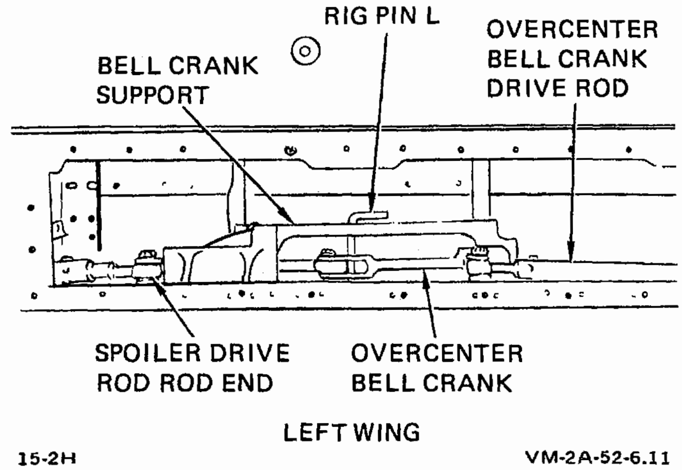


Step 10—Para. 3-63

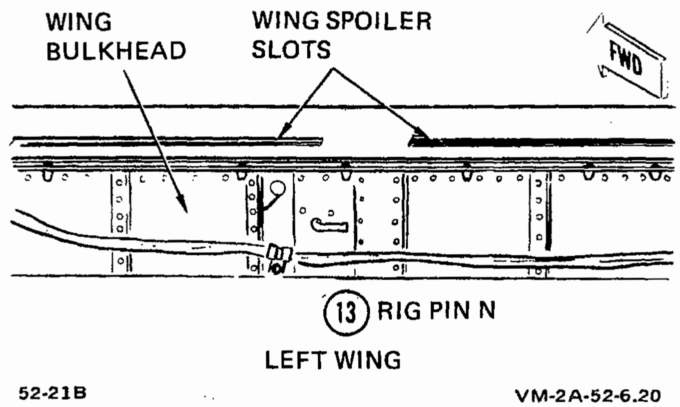
11. Using a tensiometer (T-5-8002-105-00), adjust aileron interconnect cables (⅛-inch diameter) at turnbuckles forward of left interconnect bell crank to 50 (±5) pounds until rig pin J (-7) and rig pin K (-7) can both be easily inserted through left and right aileron interconnect cable and reduced spoiler bell cranks. Safety both cable turnbuckles with locking clips (MS21256-2). Remove rig pin G.



Step 11—Para. 3-63



Steps 12 and 13—Para. 3-63

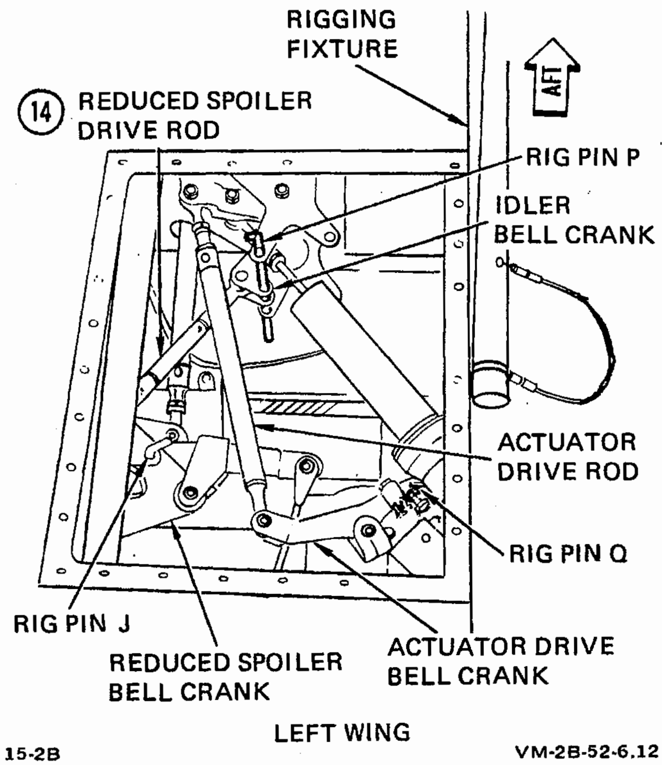


Step 13—Para. 3-63

12. Remove left overcenter bell crank drive rod at left reduced spoiler bell crank. Adjust drive rod rod end bearing until rig pin L (-5) can be easily inserted through overcenter bell crank support and into left overcenter bell crank. Tighten jamnut against rod end and safety attach bolt with cotter pin (MS 24665-134). Adjust right overcenter bell crank drive rod in same manner. Install rig pin M (-5) in right overcenter bell crank. Tighten jamnut against rod end and safety attach bolt with cotter pin (MS 24665-134).

13. Adjust left spoiler drive rod rod end bearing until rig pin N (-9) can be inserted through wing trailing edge spar and into left outboard spoiler plate. Tighten jamnut against rod end and safety attach bolt with cotter pin (MS24665-134). Adjust right spoiler drive rod rod end bearing in same manner until rig pin O (-9) can be inserted in right outboard spoiler plate. Tighten jamnut against rod end and safety attach bolt with cotter pin (MS24665-134). Remove rig pins L, M, N, and O.

14. Install rig pin P (-7) through left idler support inboard rig pin hole and into left reduced spoiler idler bell crank, and rig pin Q (-3) in left reduced spoiler actuator drive bell crank. Adjust and install left reduced spoiler drive rod on reduced spoiler bell crank. Tighten jamnut against rod end and safety attach bolt with cotter pin (MS24665-134). Adjust and install left reduced spoiler actuator drive rod rod end bearing to fit left reduced spoiler idler bell crank. Tighten jamnut against rod end and safety attach bolt with cotter pin (MS24665-134).



Step 14—Para. 3-63

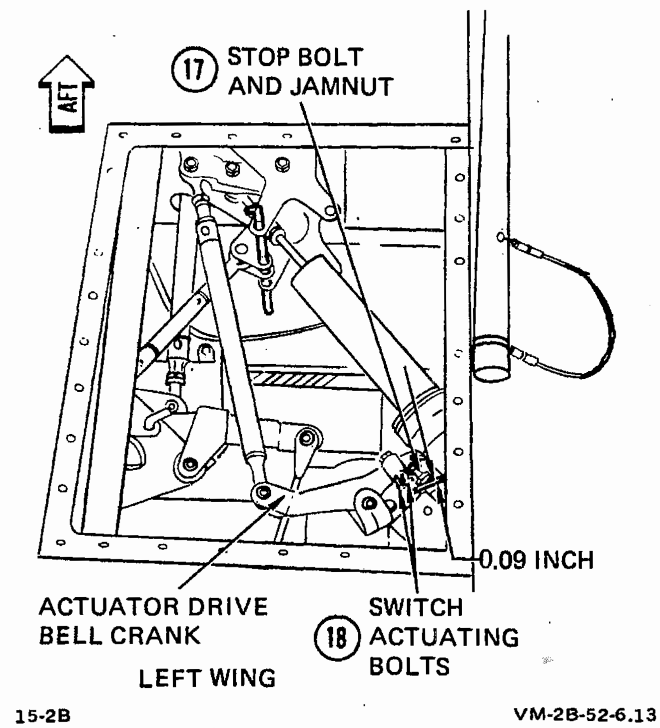
Note

Perform the procedure in step 15 on aircraft not having either ECP No. 179 (reduced spoiler—lateral control system) or AFC No. 73 incorporated. These aircraft will have a rod assembly (E.O. H331886-3) installed in place of the reduced spoiler bungee (305-523330), a component of ECP No. 179.

15. Adjust rod assembly (E.O. H331886-3) or (15C1059-1) rod end to fit idler bell crank. Tighten jamnut against rod end. Safety attach bolt with cotter pin (MS24665-134).

16. Install rig pin R (-7) through right idler support inboard rig pin hole and into right reduced spoiler idler bell crank and rig pin S (-3) in right reduced spoiler actuator drive bell crank. Adjust and install right reduced spoiler drive rod on reduced spoiler bell crank. Tighten jamnut against rod end and safety attach bolt with cotter pin (MS24665-134). Adjust and install left reduced spoiler actuator drive rod rod end bearing to fit left reduced spoiler idler bell crank. Tighten jamnut against rod end and safety attach bolt with cotter pin (MS24665-134).

17. Locate and adjust left actuator drive bell crank stop bolt (figure 3-7) to provide a clearance of 0.09 inch between head of stop bolt and contact surface on actuator support.



Steps 17 and 18—Para. 3-63

18. Attach leads of multimeter (AN/PSM-4C) between common (COM) and normally open (NO) terminals of left reduced spoiler authority switch (upper). Adjust switch arm actuating bolt until switch closes. Tighten jamnut against bell crank. Attach leads of multimeter between common (COM) and normally open (NO) terminals of left reduced spoiler indicator switch (lower). Adjust lower switch actuating bolt until switch closes. Adjust (extend) lower switch actuating bolt an additional one half to three quarters of a turn. Tighten jamnut against bell crank. Safety actuator bell crank stop bolt jamnut and jamnut on switch actuating bolts together with lockwire (MS20995F32).

19. Repeat step 17 to adjust right actuator bell crank stop bolt. Repeat step 18 to adjust right reduced spoiler authority and reduced spoiler indicator switches.

20. Remove rig pin J (-7) from left interconnect and reduced spoiler bell cranks and rig pin K (-7) from right reduced spoiler and interconnect bell cranks. Remove rig pin Q (-3) from left actuator drive bell crank and rig pin S (-3) from right actuator drive bell crank. Remove rig pin P (-7) from left idler bell crank support inboard rig pin hole and bell crank. Remove rig pin R (-7) from right idler bell crank support inboard rig pin hole and bell crank.

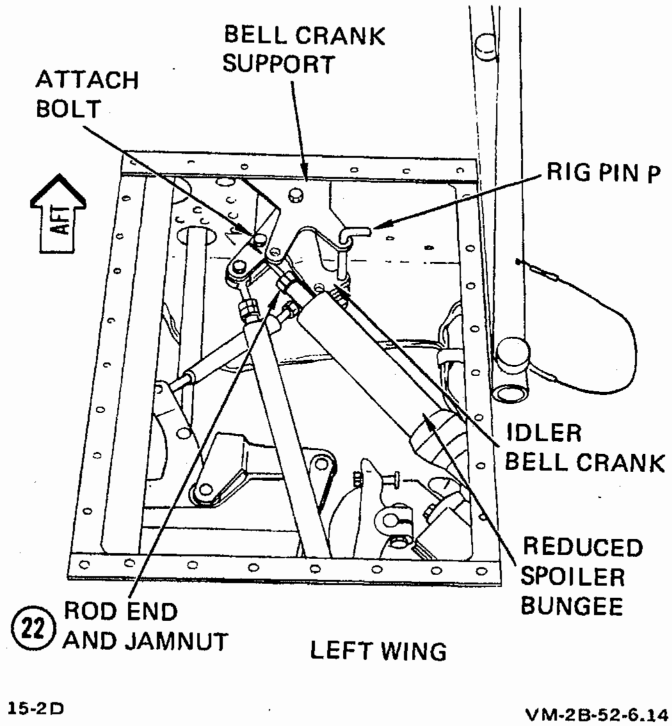
WARNING

The reduced spoiler system is spring-loaded when the aircraft electrical system is turned ON. Before turning electrical system ON or OFF, ensure that no personnel are working in reduced spoiler actuator areas, that areas are free of loose equipment, and that rig pins are removed from bell cranks in both ends of wing.

21. If available, connect mobile power unit (NC-8A or equivalent) to aircraft. Turn electrical system ON. Locate circuit-breaker panel on left side of observer's compartment and pull out SPOILER AUTH CONT circuit breaker. Turn electrical system OFF.

22. Insert rig pin P (-7) through outboard rig pin hole in left idler bell crank support and into left idler bell crank. Adjust rod end and install left reduced spoiler bungee. Tighten jamnut against rod end and safety with lockwire (MS20995F32). Safety attach bolt with cotter pin (MS24665-134).

23. Insert rig pin R (-7) through outboard rig pin hole in right idler bell crank support and into right idler bell crank. Adjust rod end and install right reduced spoiler bungee. Tighten jamnut against rod end and safety with lockwire (MS20995F32). Safety attach bolt with cotter pin (MS24665-134).

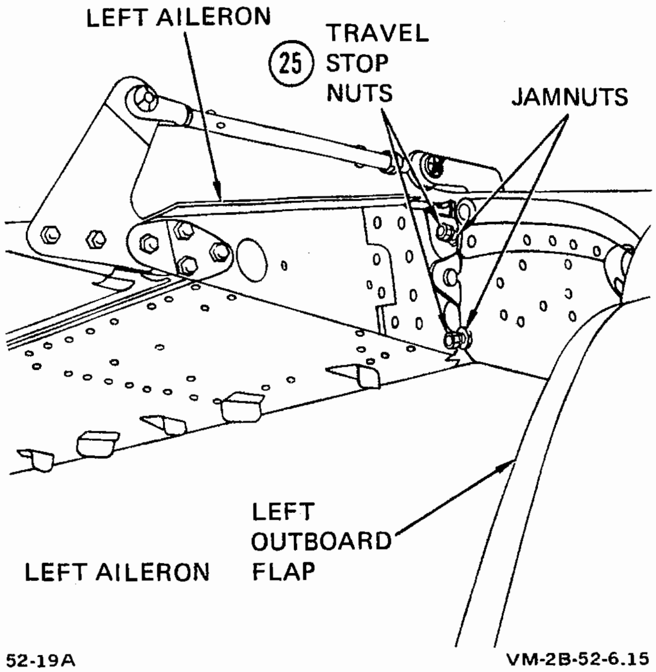


Step 22—Para. 3-63

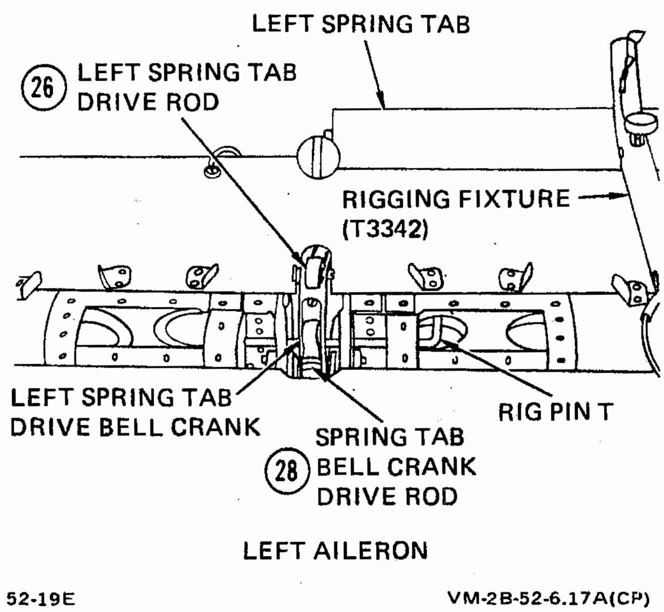
24. Locate two rigging fixture mounting points on each aileron and single rig fixture mounting point on wing forward of each aileron. Install aileron rigging fixtures (T3392) on both ailerons.

25. If available, connect mobile power unit (NC-8A) to aircraft. Turn aircraft electrical system ON. Lower flaps to full DOWN position. Turn electrical system OFF. Locate travel stop bolts at inboard end of each aileron. Adjust left aileron stop bolts to limit aileron travel to 25 (+0.5/−0) degrees trailing edge up and trailing edge down. Tighten jamnuts and safety with lockwire (MS20995F32). Adjust right aileron stop bolts in same manner. Tighten jamnuts and safety with lockwire (MS20995F32).

26. Adjust left spring tab drive rod to position spring tab trailing edge at 0(±1/4) degree. Tighten jamnut against rod end and safety attach bolt with cotter pin (MS24665-134). Adjust right tab drive rod in same manner. Tighten jamnut and safety attach bolt with cotter pin (MS24665-134).

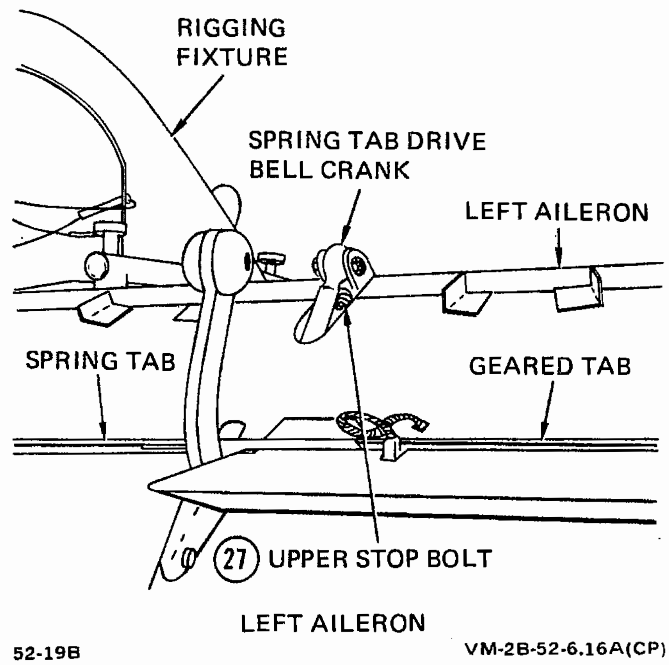


Step 25—Para. 3-63



Steps 26 and 28—Para. 3-63

27. Locate spring tab travel stop bolts on left and right spring tab drive bell cranks. Adjust bolts to limit spring tab travel to 20 (±1/2) degrees trailing edge up and down. Tighten jamnuts and safety with lockwire (MS20995F32). Adjust and safety right spring tab travel stop bolts in same manner. Safety stop bolt jamnuts with lockwire (MS20995F32).

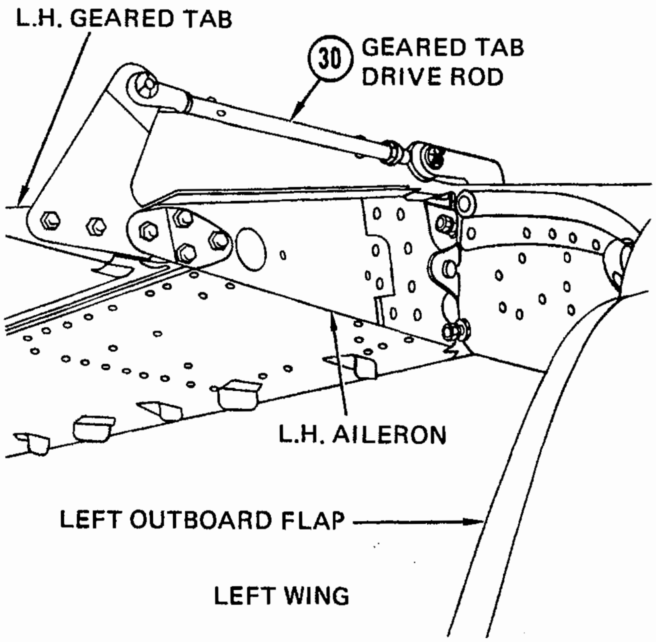


Step 27—Para. 3-63

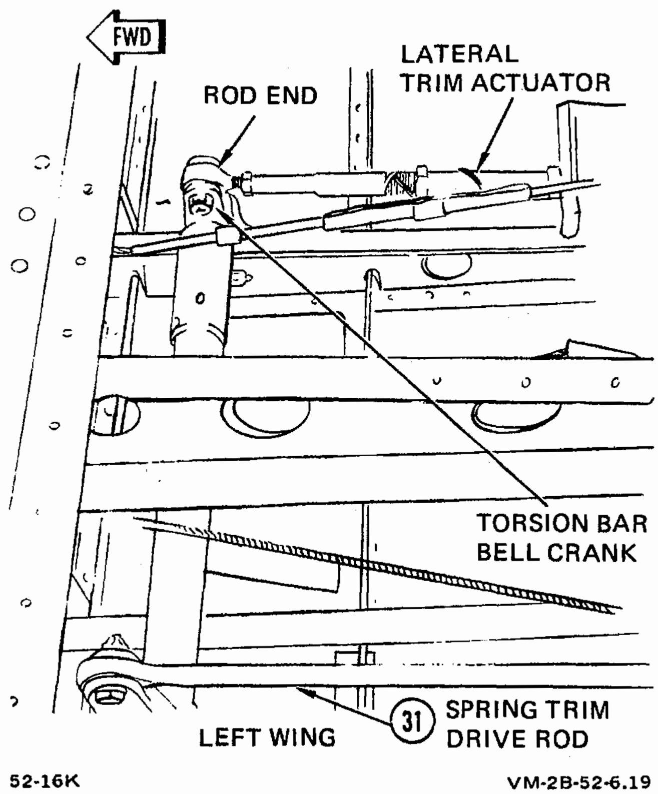
28. Install rig pin T (-9) in left spring tab drive bell crank. Adjust spring tab bell crank drive rod to position aileron at 0 (±1/4) degree. Tighten jamnut against rod end and safety attach bolt with cotter pin (MS24665-134). Install rig pin U (-9) in right spring tab drive bell crank and adjust in same manner. Tighten jamnut and safety attach bolt with cotter pin (MS24665-134).

29. Adjust left aileron drive rod at left interconnect bell crank to position aileron at 0 (±1/4) degree. Rig pin T (-9) must fit freely as drive rod is adjusted. Tighten jamnut against rod end and safety attach bolt with cotter pin (MS24665-134). Adjust right aileron drive rod in same manner. Rig pin U (-9) must fit freely as drive rod is adjusted. Tighten jamnut against rod end and safety attach bolt with cotter pin (MS24665-134).

30. Adjust left and right geared tab drive rods to position geared tab trailing edges at 0 (±1/4) degree, in line with spring tab trailing edges. Tighten jamnuts against rod ends and safety attach bolts with cotter pins (MS24665-134).



Step 30—Para. 3-63



Step 31—Para. 3-63

31. If available, connect mobile power unit (NC-8A or equivalent) to aircraft. Turn aircraft electrical system ON. Electrically operate lateral trim actuator to "in trim" position, as indicated when cockpit trim light comes on. Connect spring trim drive rod to outboard cable bell crank. Safety attach bolt with cotter pin (MS24665-134). Adjust trim actuator drive rod rod end bearing until attach bolt fits freely through rod end and bell crank. Connect rod end to bell crank. Tighten jamnut against rod end bearing. Tighten attach bolt-nut and safety with cotter pin (MS24665-134).

32. Attach a force gage (S131) to pilot's stick 0.50 inches below trigger. Locate stick travel stop bolts on lateral drive bell crank support (refer to step 2). Have helper apply a lateral force of 30 (± 2) pounds to the right until another helper indicates the ailerons and spring tabs are against the travel stops. Adjust aft stop bolt to contact bell crank. Tighten jamnut against bell crank and safety with lockwire (MS20995F32). Have helper apply a lateral force of 30 (±2) pounds to the left. Adjust forward stop bolt to contact lateral drive bell crank in same manner. Tighten jamnut against bell crank and safety with lockwire (MS20995F32).

33. Locate circuit-breaker panel on left side of observer's compartment and engage SPOILER AUTH CONT circuit breaker. Remove all rig pins from system and perform an aileron and tab travel check as follows:

Note

If necessary, readjust aileron stops for full spoiler travel within tolerances.

COMPONENT	STICK FULL LEFT (DEGREES)	
LH Aileron	25 (+0.5/−0)	Up
LH Spring Tab	20 (±0.5)	Down
LH Geared Tab	25 (±0.5)	Down
LH Spoilers		
Power ON	82 (±6)	Up
Power OFF	20 (±4)	Up
RH Aileron	25 (+0.5/−0)	Down
RH Spring Tab	20 (±0.5)	Up
RH Geared Tab	25 (±0.5)	Up
RH Spoilers	Below wing mold line	

COMPONENT	STICK FULL RIGHT (DEGREES)	
LH Aileron	25 (+0.5/−0)	Down
LH Spring Tab	20 (±0.5)	Up
LH Geared Tab	25 (±0.5)	Up
LH Spoilers	Below wing mold line	
RH Aileron	25 (+0.5/−0)	Up
RH Spring Tab	20 (±0.5)	Down
RH Geared Tab	25 (±0.5)	Down
RH Spoilers		
Power ON	82 (±6)	Up
Power OFF	20 (±4)	Up

34. Using a spring scale (S131), complete a system friction check as follows:

a. Remove forward side panel from pilot's left console. Refer to paragraph 3-63, step 7, and install rig pin (-5) into longitudinal drive bell crank.

b. Refer to step 11 and install rig pin J (-7) through left and right aileron interconnect and reduced spoiler bell cranks.

c. Refer to step 12 and install rig pins L (-5) and M (-5) through left and right overcenter bell cranks and supports.

d. Attach a spring scale (S131) to the pilot's stick grip 0.05 inch below trigger.

Note

While performing the following step, it will be necessary to have a helper indicate when the left aileron spring tab is in the following positions: -18°, -15°, -10°, -5°, 0°, 5°, 10°, 15°, and 18°.

e. Pull on spring scale (S131) and slowly cycle stick from full left to full right and back to full left. Have a helper record scale readings for the following aileron spring tab positions: -18°, -15°, -10°, -5°, 0°, 5°, 10°, 15°, and 18°. The difference between the recorded forces must not exceed 5 pounds. Do not remove scale from stick.

f. Remove rig pins from left and right aileron interconnect bell cranks and left and right spoiler overcenter bell cranks. Refer to step 27 and install rig pins T (-9) and U (-9) in left and right spring tab drive bell cranks.

Note

While performing the following step, it will be necessary to have a helper indicate when the left aileron is in the following positions: -23°, -20°, -15°, -10°, -5°, 0°, 5°, 10°, 15°, 20°, and 23°.

g. Pull on spring scale (S131) and slowly cycle stick from full left to full right and back to full left. Have a helper record scale readings for the following aileron positions: -23°, -20°, -15°, -10°, -5°, 0°, 5°, 10°, 15°, 20°, and 23°. The difference between the recorded forces must not exceed 10 pounds.

h. Remove spring scale from stick grip.

35. Turn electrical system ON. Remove rigging fixtures from wing and ailerons. Using a force gage (S131), apply a left lateral force until a helper indicates the left aileron is at the full trailing edge up, the left spoilers at the full position [82 (± 6) degrees], and the left aileron spring tab is full

trailing edge down within 1/16 to 1/32 inch of stop bolts. The force required must be 22 (+ 3) pounds. Check right stick force in same manner. Force again must be 22 (+ 3) pounds.

36. Ensure that flaps are full UP. Have helper in cockpit to energize electrical system and helper on right wing to monitor operation of rotary actuator. Have helper turn aircraft electrical system ON, and note operation of actuators. Both actuators must rotate to the full authority position in 4 to 5 seconds. The spoiler authority indicator light in the cockpit will be illuminated while the actuators are rotating, and will go out when the actuators reach the full authority position.

37. Attach an air data tester (VPT-10F-11072) to pitot tube. Increase pitot pressure until cockpit airspeed indicator reads above 344 KIAS. At 338 (±6) KIAS, the reduced spoiler actuators will be deenergized and the system will operate to the reduced spoiler authority position. [If lateral stick pressure is applied, the tip of each spoiler plate will rotate upward and out of wing 20 (±4) degrees, or to a "reduced" position.]

Note

In the following step, do not keep the flaps lowered for more than 2 to 3 seconds, as this condition will damage the reduced spoiler actuator motors.

38. With the cockpit airspeed indicator reading above 344 KIAS, partially lower flaps and check that both actuators are running. Check also that neither actuator bell crank moves and that the spoilers do not move from the reduced position. Immediately raise flaps to full UP position after these conditions are checked.

39. Reduce pitot pressure on air data tester. Do not decrease pressure below 320 KIAS reading on cockpit airspeed indicator. At 320 minimum KIAS, the reduced spoiler actuators will rotate to the full authority position in 4 to 5 seconds. During this time, the spoiler authority indicator light will be illuminated. The cockpit indicator will go out when the actuators reach the full authority position. [If lateral stick pressure is applied, the tip of each spoiler will rotate upward and out of the wing 82 (±6) degrees, or to a "full" position.]

40. Ensure that all bolts are tightened and are safetied with cotter pins. Ensure that all jamnuts are tightened and safetied with lockwires where necessary. Ensure that all cables have proper tension and all turnbuckles are safetied with locking clips. Ensure that all access areas are clean and free of tools and materials.

41. Refer to paragraph 3-28 and perform an operational check of the lateral control system.

42. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for location, and install access panels listed in table 3-4.

3-64. LONGITUDINAL CONTROL SYSTEM.

3-65. Organizational maintenance for the longitudinal control systems includes operational check procedures, system trouble shooting, rigging, adjusting, and component removal and installation. These procedures provide all the instructions necessary to maintain the longitudinal control systems within the limits of organizational level tools and facilities. Each procedure will include, as required, lists of tools and materials, and illustrations to clarify instructions and accomplish component location.

3-66. OPERATIONAL CHECK.

3-67. The following procedure provides the instructions necessary to accomplish a general verification of proper longitudinal control systems operation. This procedure is performed when operational check does not warrant a detailed verification of operating forces, travel limitations, etc. To perform an operational check of the longitudinal control systems, see figures 3-1 and 3-8 and proceed as follows:

1. Select NORM trim on pilot's left-hand console and trim full ND with pilot's stick switch, noting the following:

a. Stick moves forward freely.

b. ND shows on elevator trim indicator.

2. Move stick full back, noting the following:

a. Elevator is full up.

b. Spring tabs and geared tabs are full down.

3. Trim full NU with stick switch, noting the following:

a. Stick moves aft freely.

b. NU shows on elevator trim indicator.

4. Move stick full forward, noting the following:

a. Elevator is full down.

b. Spring and geared tabs are full up.

5. Select ALTERNATE trim on pilot's left-hand console and trim first ND then NU with console switch, noting stick moves forward then aft.

Note

With actuator, P/N R5219M1 (81039), installed in aircraft and a properly rigged and adjusted longitudinal control system, the elevator trim indicator will indicate approximately one minor graduation less than full NU after maximum NU trim is obtained using trim switch.

3-68. TROUBLESHOOTING.

3-69. To troubleshoot the longitudinal control system, refer to Wiring Data Manual (NAVAIR 01-60GCB-2-7) for wiring diagrams, and to table 3-5 for instructions.

Table 3-5. Troubleshooting Longitudinal Control System

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: CONTROL STICK DOES NOT MOVE.		
1. Foreign object interfering with control system operation.	See figure 3-8. Check all bell cranks, drive rods, and cables in system for interference from foreign objects.	Remove foreign objects. Replace any damaged component Refer to paragraph 3-90 and check rigging.
2. Rig pin installed in system bell crank.	See figure 3-8. Check all bell cranks for rig pin installation.	Remove rig pin.
TROUBLE: CONTROL STICK MOVES BUT ELEVATOR DOES NOT FOLLOW.		
1. Control system components aft of stick disconnected, broken, or removed.	See figure 3-8. Check all components in system in proper installation. Inspect all components for breakage.	Connect all components that have been disconnected. Install any components that have been removed. Replace any parts that have been broken. Refer to paragraph 3-90 and rerig system.
TROUBLE: CONTROL STICK BINDS MOMENTARILY DURING STICK TRAVEL.		
1. Foreign object restricting system operation.	See figure 3-8. Inspect all cables, bell cranks, and drive rods for interference from foreign objects.	Remove objects and replace components if damaged. Refer to paragraph 3-90 and rerig system.

Table 3-5. Troubleshooting Longitudinal Control System (Cont)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: CONTROL STICK BINDS MOMENTARILY DURING STICK TRAVEL. (Cont)		
2. Defective elevator spring tab bungee.	Remove both spring tab drive, bell crank, drive rods, and individually check each bungee for binding during operation.	Refer to paragraph 3-78 and replace defective bungee. Refer to paragraph 3-90 for proper bungee length.
TROUBLE: EXCESSIVE CONTROL STICK FRICTION THROUGH FULL STICK TRAVEL.		
1. System component misaligned, rubbing, or chafing airframe or foreign object.	See figure 3-8. Inspect system components for proper clearance and ease of operation. Check for interference from foreign objects.	Remove or adjust cause of chafing or rubbing. Replace damaged components. Remove foreign objects if present.
2. Excessive control cable tension.	Refer to paragraph 3-90 for proper cable tension.	Refer to paragraph 3-90 and adjust cables to proper tension.
3. Defective elevator spring tab bungee.	Remove both spring tab drive, bell crank, drive rods and individually check each bungee for excessive friction during operation.	Refer to paragraph 3-78 and replace defective bungee. Refer to paragraph 3-90 for proper bungee length.
4. Chafing or rubbing between stabilizer shroud and leading edge of elevator.	Inspect shroud and elevator leading edge for evidence of rubbing or chafing.	Refer to paragraph 3-82 for instructions to set proper clearance between shroud and elevator. Replace any damaged components.
5. Foreign object lodged between stabilizer shroud and leading edge of elevator.	Inspect clearance between shroud and elevator for obstructions.	Remove any obstruction and replace any damaged components.
6. Foreign object in aerodynamics seal between spring and/or geared tabs and trailing edge of elevator.	Remove spring and geared tab drive rods. Remove spring and geared tabs and check seal area for foreign objects restricting ease of operation.	Remove foreign objects. Replace any damaged components. Install tab drive rods.
TROUBLE: ELEVATOR WILL NOT MOVE THROUGH FULL TRAVEL.		
1. Longitudinal drive, bell crank and/or elevator for travel stop bolts im-	Refer to paragraph 3-90 for proper stop bolts adjustment.	Refer to paragraph 3-90 and adjust stop bolts.
2. Foreign object restricting system operation.	See figure 3-8. Inspect all cables, bell cranks and drive rods in system for interference from foreign objects.	Remove any foreign objects. Replace damaged components. Refer to paragraph 3-90 and check system rigging.

Table 3-5. Troubleshooting Longitudinal Control System (Cont)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: ELEVATOR WILL NOT MOVE THROUGH FULL TRAVEL. (Cont)		
3. Improperly rigged control system.	Refer to paragraph 3-90 and check rigging of control system.	Refer to paragraph 3-90 and rerig system.
TROUBLE: SPRING TABS WILL NOT MOVE THROUGH FULL TRAVEL.		
1. Travel stop bolts improperly adjusted.	Refer to paragraph 3-90 and check stop bolt adjustment.	Refer to paragraph 3-90 and properly adjust stop bolts.
2. Foreign object in aerodynamic seal between spring tab and elevator trailing edge.	Disconnect tab drive rods. Check tabs for freedom of movement.	Remove applicable spring tab. Remove foreign object. Install tab and drive rods.
TROUBLE: ELEVATOR WILL NOT RETURN TO NEUTRAL POSITION.		
1. Foreign object restricting system operation.	See figure 3-8. Inspect all cables, bell cranks, and drive rods for interference from foreign objects.	Remove foreign object and replace components if damaged. Refer to paragraph 3-90 and rerig system.
2. Foreign object between stabilizer shroud and leading edge of eleva-	Inspect clearance between shroud and elevator for obstruction.	Remove any obstruction and replace any damaged component.
3. Improper elevation spring tab bungee length.	Refer to Rigging and Adjusting and check length of both elevation spring tab bungees.	Refer to paragraph 3-90 and adjust bungees to proper length as required.
4. Defective spring tab bungee.	Remove drives, bell crank, drive rods and check freedom of operation of each operation of each bungee. Check for excessive internal friction.	Refer to paragraph 3-78. Replace bungee. Refer to paragraph 3-90 to adjust bungees.
TROUBLE: LONGITUDINAL TRIM CANNOT BE OBTAINED IN NORMAL POSITION.		
1. TRIM NORM CONT circuit breaker CB46 disengaged.	Check that TRIM NORMAL CONT circuit breaker CB46 is engaged.	Engage circuit breaker CB46 or continue troubleshooting.
2. Pilot's trim select switch S10 defective in NOTMAL position.	Using a multimeter (AN/PSM-4), check for continuity between test points CCA and CCB.	Replace trim select switch S10 or continue troubleshooting.
3. Pilot's trim switch S92 defective.	Have helper place switch S92 in NU position. Using a multimeter (AN/PSM-4), check for continuity between test points CCG and CCH.	Replace trim switch S92 or continue troubleshooting.
4. ELEVATOR TRIM SELECT RELAY, K80, defective	Using a multimeter (AN/PSM-4), check for 28 volts dc between test point CCN and ground.	Replace ELEVATOR TRIM SELECT RELAY, K80 or continue troubleshooting.
5. Defective elevator trim actuator.	Turn electrical system ON. Have helper place trim switch S92 in NU position. Turn electrical system OFF.	Refer to paragraph 3-86 and replace trim actuator.

Table 3-5. Troubleshooting Longitudinal Control System (Cont)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: LONGITUDINAL TRIM CANNOT BE OBTAINED IN ALTERNATE POSITION.		
1. TRIM ALT CONT circuit breaker CB47 disengaged.	Check that TRIM ALT CONT circuit breaker CB47 is engaged.	Engage TRIM ALT CONT circuit breaker CB47 or continue troubleshooting.
2. Pilot's trim select switch S10 defective in ALTERNATE position.	Using a multimeter (AN/PSM-4), check for continuity between test points CCE and CCJ.	Replace trim select switch S10 or continue troubleshooting.
3. Pilot's ALTERNATE trim switch S9 defective.	Have helper place ALTERNATE trim switch S9 in NU position. Using a multimeter (AN/PSM-4), check for continuity between test points CCE and CCK.	Replace trim switch S9 or continue troubleshooting.
4. Refer to previous trouble and repeat steps 4 and 5.	Refer to previous trouble and repeat steps 4 and 5.	Refer to previous trouble and repeat steps 4 and 5.

Tools and Equipment List

Power Unit, Mobile	NC-8A (or equivalent)
Multimeter	AN/PSM-4 (or equivalent)

Note

Whenever electrical power is required to isolate and correct a trouble, use a mobile power unit (NC-8A or equivalent) when available.

3-70. SERVICING.

3-71. Since all of the bearings of the longitudinal control system are sealed and prelubricated, no servicing is required.

3-72. PILOT'S STICK GRIP REMOVAL AND INSTALLATION.

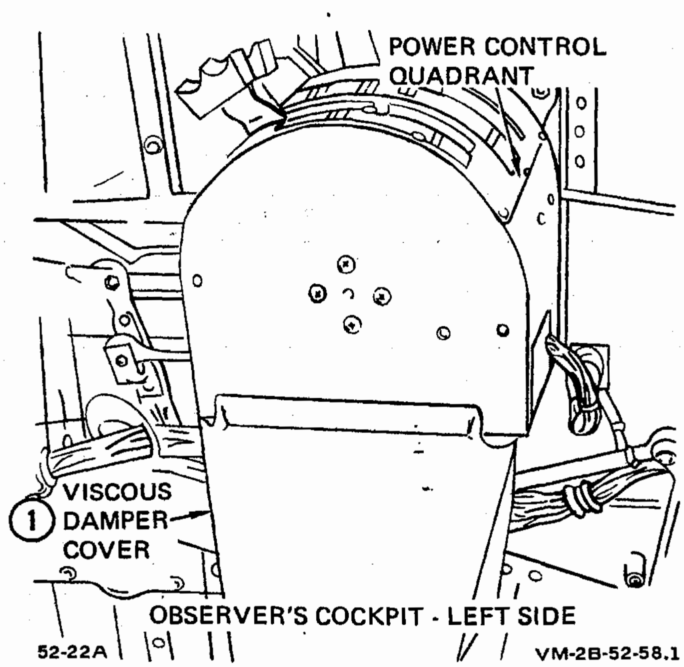
3-73. Refer to paragraph 3-34 for information and instructions to remove and install the pilot's stick grip.

3-74. LONGITUDINAL VISCOUS DAMPER REMOVAL AND INSTALLATION.

3-75. To remove and install the longitudinal viscous damper, refer to figure 3-8 for location, and proceed as follows:

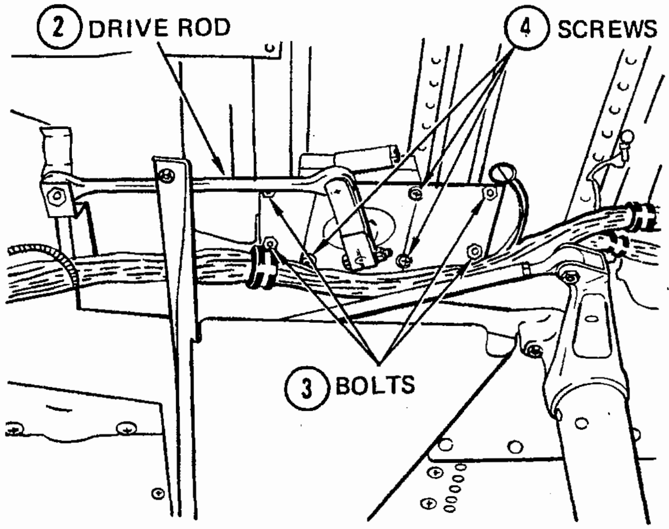
3-76. REMOVING LONGITUDINAL VISCOUS DAMPER.

1. Locate and remove viscous cover damper below the power control quadrant in the observer's cockpit.



Step 1—Para. 3-76

2. Disconnect viscous damper drive rod by removing cotter pin, nut, washer, and Torq-Set screw from damper arm.



Steps 2 through 4—Para. 3-76

3. Locate and remove four bolts holding damper mounting bracket to structure.

4. Cut lockwire and remove four Torq-Set screws securing damper to mounting bracket. Slip damper arm through mounting bracket hole and remove damper.

3-77. INSTALLING LONGITUDINAL VISCOUS DAMPER.

Tools and Equipment List

Wrench, Torque (0-200 inch-pounds)	GGG-W-686 Type 1, No. 6 (or equivalent)
Pins, Cotter (1/16-inch diameter steel)	MS26445-134
Lockwire (0.032-inch diameter steel)	MS20995F32

1. Slip damper arm through mounting bracket hole, align damper with mounting bracket, and secure with four Torq-Set screws. Tighten screws and safety with lockwire (MS20995F32).

2. Align mounting bracket and damper on structure and secure with mounting bolts. Using a torque wrench (GGG-W-686, No. 6), tighten bolts 25 to 35 inch-pounds.

3. Connect drive rod to damper arm and secure with Torq-Set screw, washer, and nut. Tighten nut and safety with cotter pin (MS24665-134).

4. Install cover below power control quadrant.

3-78. ELEVATOR SPRING TAB BUNGEE REMOVAL AND INSTALLATION.

3-79. To remove and install the elevator spring tab bungee, proceed as follows:

3-80. REMOVING ELEVATOR SPRING TAB BUNGEE.

Tools and Equipment List

Platform, Aircraft Maintenance	Type B-1 (or equivalent, as required)
Bundle, Rig Pin	T3382

Note

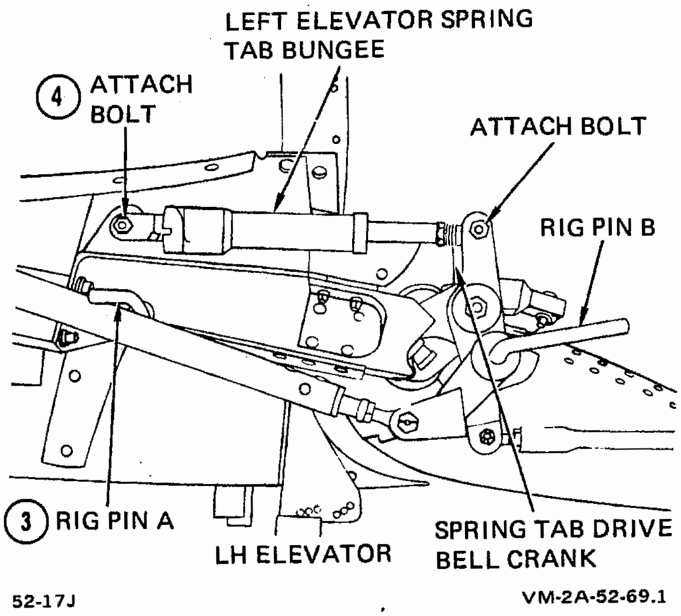
In the following procedure, rig pins must be removed and installed in the order given.

Diameters and lengths of rig pins are indicated by dash numbers (-7, for example) stamped on the arm of each pin.

1. Place aircraft maintenance platform (Type B-1) at outboard side of applicable vertical stabilizer.

2. Refer to paragraph 2-130 for instructions, and remove the intermediate and aft tip sections from either or both vertical stabilizers, whichever is applicable.

3. Insert rig pin A (-5, rig pin bundle T3382) through elevator balance weight arm and into end of horizontal stabilizer. Insert rig pin B (-9) through spring tab drive bell crank and into elevator.



Steps 3 and 4—Para. 3-78

4. Remove cotter pins, nuts, washers, and attach bolts from each end of bungee. Remove bungee from aircraft.

3-81. INSTALLING ELEVATOR SPRING TAB BUNGEE.

Tools and Equipment List

Platform, Aircraft Maintenance	Type B-1 (or equivalent, as required)
Bundle, Rig Pin	T3382

Materials List

Pins, Cotter (1/16-inch diameter steel)	MS24665-134
Lockwire (0.032-inch diameter steel)	MS20995F32

1. Align bungee body end fitting with balance weight arm. Install attach bolt, washer, and nut. Tighten nut and safety with cotter pin (MS24665-134). If necessary, adjust bungee piston rod to align with mounting hole in spring tab drive bell crank. Install attach bolt, washer, and nut. Tighten nut and safety with cotter pin (MS24665-134). Tighten jamnut against rod end and safety to lock washer with lockwire (MS20995F32).

2. Refer to paragraph 3-66 and perform an operational check of longitudinal control system.

3. Remove rig pins A and B. Refer to paragraph 2-130 and replace intermediate and aft tip sections.

3-82. ELEVATOR REMOVAL AND INSTALLATION.

3-83. To remove and install the elevator, refer to figure 3-8 and proceed as follows:

3-84. REMOVING ELEVATOR.

Tools and Equipment List

Platform, Aircraft Maintenance	Type B-1 (or equivalent, two required)

1. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for location, and remove access panels numbered 104 and 107 (ELEVATOR, ATTACH).

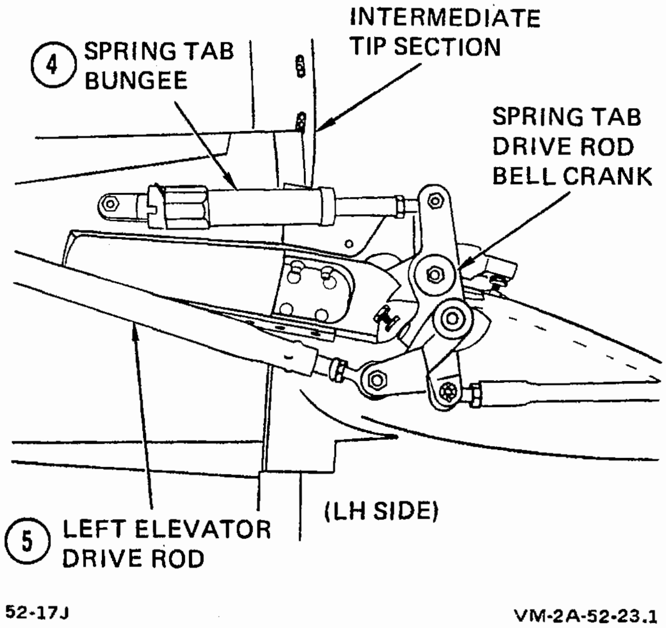
2. Place maintenance platform (Type B-1) at outside of each vertical stabilizer.

3. Refer to paragraph 2-130, and remove the intermediate and aft sections of both tip assemblies.

Note

Since the balance weights will rotate the elevator leading edge downward, a helper should be present to assist in holding the trailing edge.

4. Disconnect left and right spring tab bungees from spring tab drive rod bell cranks by removing cotter pin, nut, washer, and bolt from each bungee rod end and bell crank.



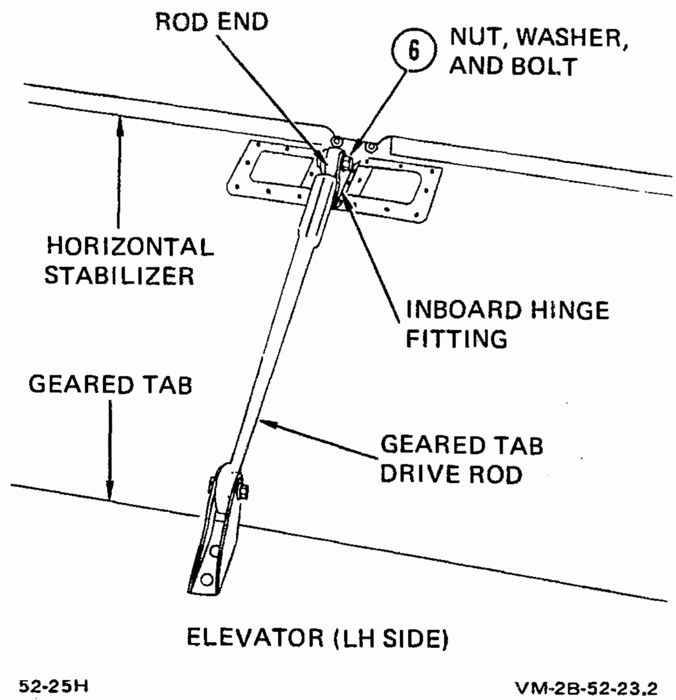
Steps 4 and 5—Para. 3-84

5. Disconnect left and right elevator drive rods from spring tab drive rod bell cranks by removing cotter pin, nut, washer, and bolt from each drive rod and bell crank.

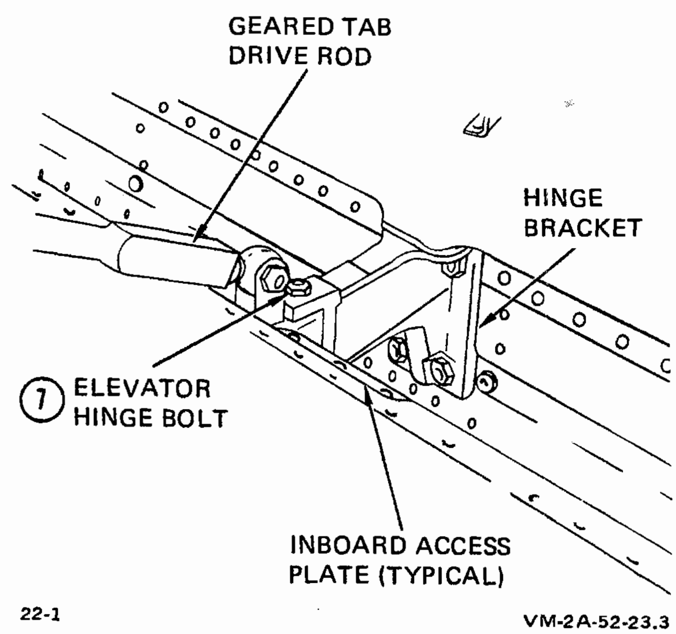
6. Locate left and right geared tab drive rods on top of elevator, outboard of centerline balance weight. Disconnect drive rods from inboard hinge fittings by removing cotter pin, nut, washer, and bolt from each drive rod rod end bearing and fitting.

7. Locate and remove cotter pin, nut, washer, and hinge bolt from each inboard hinge bracket.

8. Locate and remove bonding jumpers near outboard ends of stabilizer, on upper surface, forward of stabilizer trailing edge.

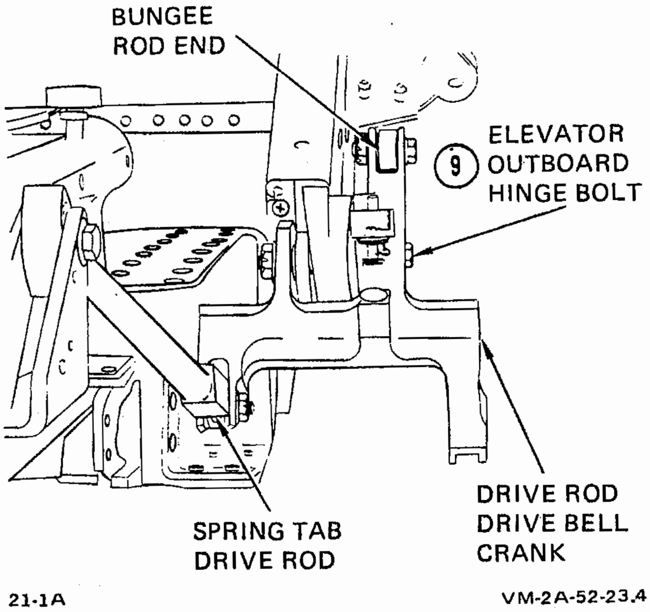


Step 6—Para. 3-84



Step 7—Para. 3-84

9. Have helper support trailing edge of elevator. Remove cotter pin, nut, washer, and outboard hinge bolt from each spring tab drive rod drive bell crank, and outboard hinge bracket.



Step 9—Para. 3-82

10. Pull elevator aft, and remove from aircraft.

3-85. INSTALLING ELEVATOR.

Tools and Equipment List

Platform, Aircraft Maintenance	Type B-1 (or equivalent, two required)
Bundle, Rig Pin	T3382

Materials List

Pins, Cotter (1/16-inch diameter steel)	MS24665-134
Lockwire (0.032-inch diameter steel)	MS20995F32
Compound, Sealing	MIL-S-8002
Washers, Flat	AN-961-10S (as required)
Spacers, Screw and Bolt	NAS43DD3-12 (as required)
Naphtha	TT-N-95

Note

If the elevator trim tabs require replacement, ensure the airflow barrier nylon hook tape is disconnected from elevator rear spar prior to removal of trim tab reconnected upon installation.

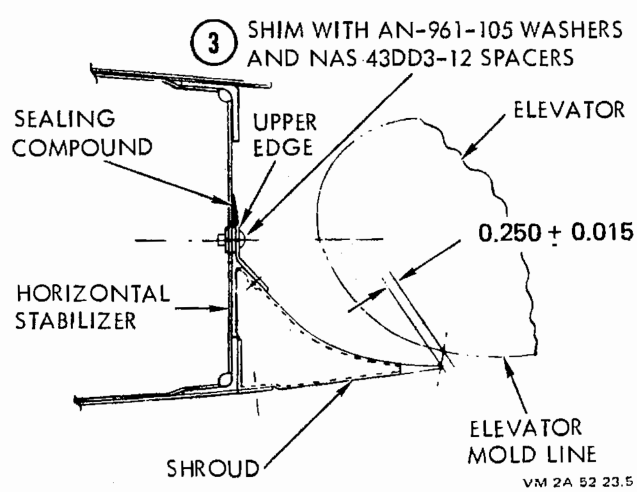
CAUTION

Refer to Structural Repair Manual (NAVAIR 01-60GCB-3) and ensure elevator assembly is balanced prior to installation.

1. Have two helpers align inboard and outboard elevator hinge fittings with hinge brackets on trailing edge of horizontal stabilizer. Install both inboard hinge bolts. Using a torque wrench (GGG-W-686, No. 6), tighten hinge bolts 5 to 25 inch-pounds. Safety head of bolt to elevator hinge fitting with lockwire (MS20995F32).

2. Install each outboard hinge bolt with respective washer and nut. Tighten nut and safety with cotter pin (MS24665-134).

3. Insert rig pin (-9) through left balance weight arm and into end of stabilizer. Check clearance between stabilizer shroud and elevator mold line along length of shroud. Clearance must be 0.250 ($\pm$ 0.015) inch. If necessary, scrape away old sealing compound and shim under Torq-Set screws with washers (AN-961-10S) and spacers (NAS43DD3-12) to obtain clearance. Remove rig pin.



Step 3—Para. 3-85

4. After adjusting shroud, clean upper edge of shroud with naphtha (TT-N-95). Apply sealing compound (MIL-S-8802) along edge.

5. Using bolt, washer, and nut, connect geared tab drive rods to inboard hinge fittings on trailing edge of stabilizer. Tighten nuts and safety with cotter pin (MS24665-134).

6. Using bolt, washer, and nut, connect both elevator drive rods to both spring tab drive rod drive bell cranks. Tighten each nut and safety with cotter pin (MS24665-134).

7. Using bolt, nut, and washer, connect both spring tab bungees to both spring tab drive rod drive bell cranks. Tighten each nut and safety with cotter pin (MS24665-134).

8. Refer to paragraph 3-90 and rig the elevator.

9. Refer to paragraph 2-130 and install the intermediate and aft sections of both tip assemblies.

10. Refer to paragraph 3-66 and perform an operational check of the longitudinal system.

11. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for locations, and install access panels numbered 104 and 107 (ELEVATOR, ATTACH).

3-86. LONGITUDINAL TRIM ACTUATOR REMOVAL AND INSTALLATION.

3-87. To remove and install the longitudinal trim actuators, refer to figure 3-18 and proceed as follows:

3-88. REMOVING LONGITUDINAL TRIM ACTUATOR.

Tools and Equipment List

Platform, Aircraft Maintenance	Type B-1 (or equivalent, one required)
Bundle, Rig Pin	T3382

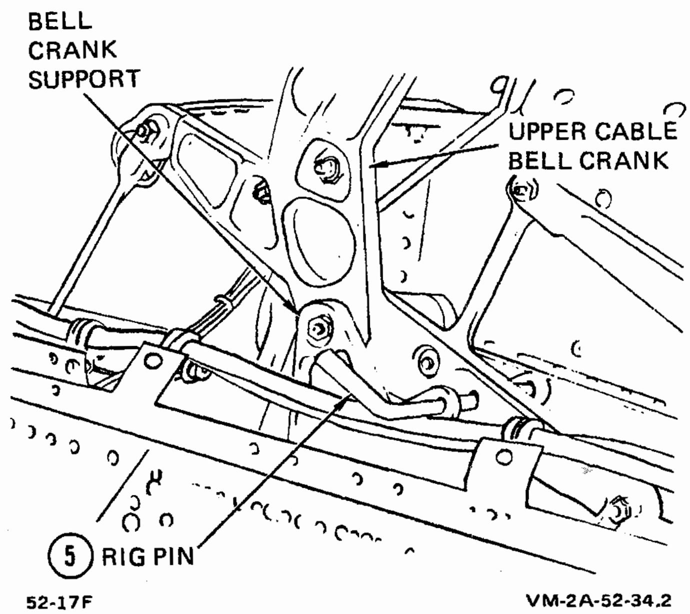
1. Position maintenance platform (Type B-1) at outside of left vertical stabilizer.

2. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for location and remove access panels numbered 108 (CONTROLS, ELEVATOR) and 110 (TRIM ACTUATOR, LONGITUDINAL).

3. Place pilot's control stick in neutral position.

4. 4. Refer to paragraph 2-130 and remove left intermediate tip section.

5. Have helper electrically position actuator until rig pin holes in left upper vertical stabilizer cable bell crank and bell crank support are aligned. Insert rig pin (-9 rig pin bundle T3382) through bell crank and support.



Step 5—Para. 3-88

6. Refer to figure 3-18. Disconnect electrical plug from actuator and remove bolt from rear support and torque arm. Remove actuator through forward access hole.

3-89. INSTALLING LONGITUDINAL TRIM ACTUATOR.

Tools and Equipment List

Platform, Aircraft Maintenance	Type B-1 (or equivalent, one required)
Bundle, Rig Pin	T3382

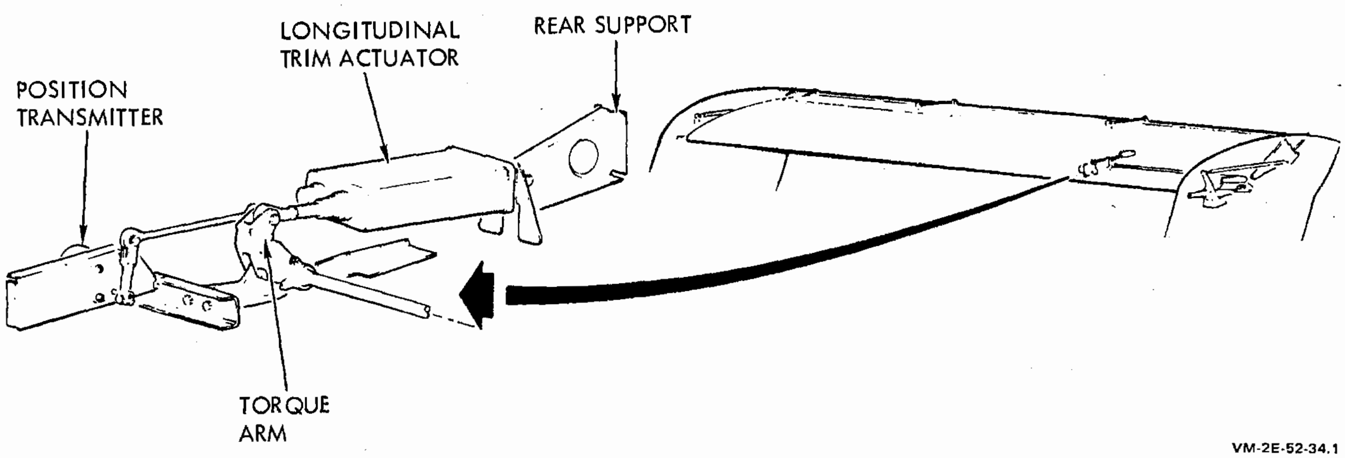
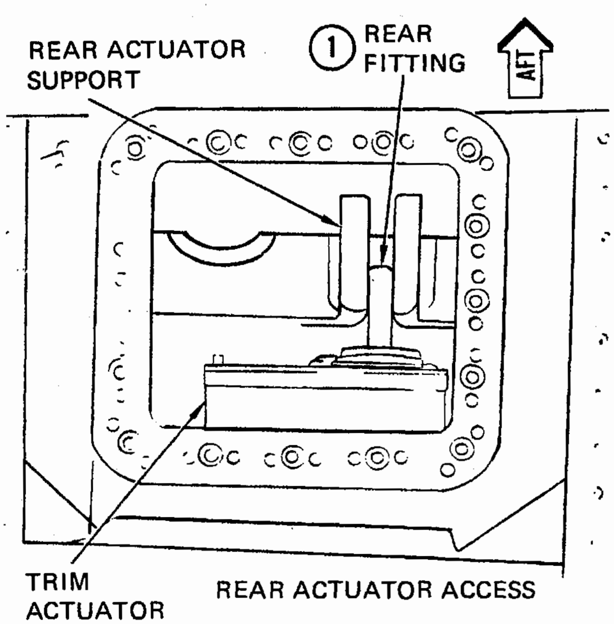


Figure 3-18. Longitudinal Trim Actuator

Materials List

Lockwire (0.032-inch diameter steel)	MS20995F32
Pins, Cotter (1/16-inch diameter steel)	MS24665-134

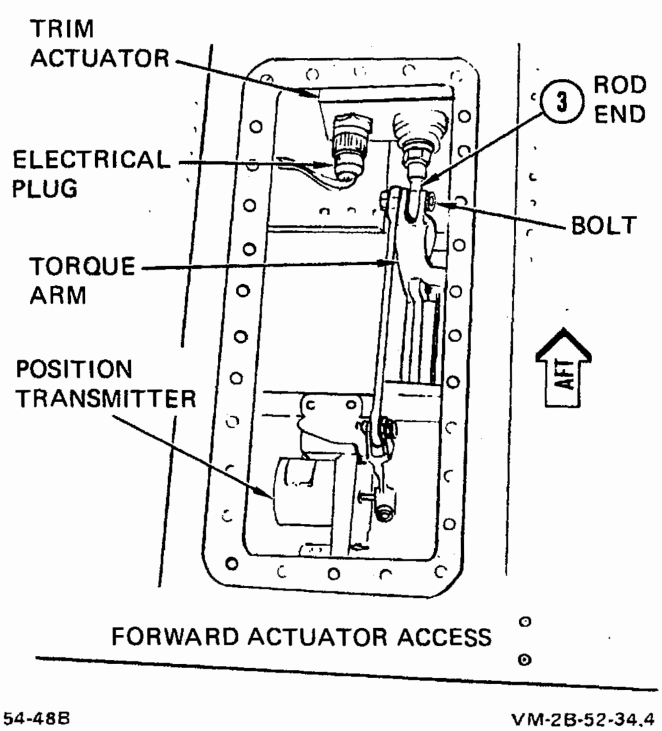
1. Slip actuator through forward access hole and align rear fitting with rear actuator support. Install bolt, washer, and nut. Tighten nut and safety with cotter pin (MS24665-134).



Step 1—Para. 3-89

2. Connect electrical plug and have helper retract and then extend actuator arm to 1.580 inches from full retract.

3. If necessary, adjust actuator rod end until bolt can be easily installed through torque arm. Tighten bolt and safety with cotter pin (MS24665-134). Tighten jamnut and safety with lockwire (MS20995F32).



Step 3—Para. 3-89

4. Remove rig pin from cable bell crank. Refer to paragraph 2-130 and install left intermediate tip section.

5. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for location and install access panels numbered 108 (CONTROLS, ELEVATOR) and 110 (TRIM ACTUATOR, LONGITUDINAL).

3-90. RIGGING AND ADJUSTING THE LONGITUDINAL CONTROL SYSTEM.

3-91. To rig and adjust the longitudinal control system, see figure 3-19 and proceed as follows:

Tools and Equipment List

Fixture, Elevator Rigging	T3391 (two required)
Gage, Force, Push/Pull (0-100 pounds)	S131 (or equivalent)
Platform, Aircraft Maintenance	Type B-1 (two required)
Power Unit, Electrical Mobile	NC-8A (or equivalent)
Bundle, Rig Pin	T3382
Tensiometer, Cable	T5-8002-105-00 (or equivalent)

Materials List

Pins, Cotter (1/16-inch diameter steel)	MS24665-134
Lockwire (0.032-inch diameter steel)	MS20995F32
Clips, Turnbuckle Locking (0.028-inch diameter steel)	MS21256-2

Note

Where indicated, adjustments to cables and drive rods must be made so that related rig pins can be installed in the respective rig pin holes without binding. Rig pins must never be installed under pressure.

Diameters and lengths of rig pins are indicated by dash numbers (-7, for example) stamped on the arm of each pin.

Cable tension values given are for 70°F. For any other ambient temperature, see figure 3-17 for correct tension values.

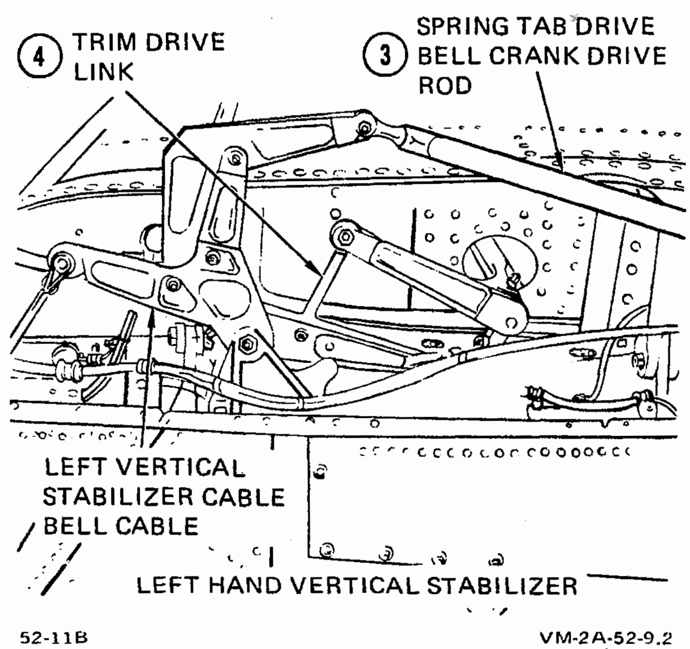
CAUTION

Ensure actuator is trimmed to neutral position before proceeding with following steps. After setting at neutral, disconnect actuator as shown (25, figure 3-19). This will remove all spring load from trim link and reduce possibility of injury.

1. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for location, and remove access panels listed in table 3-6.

2. Place aircraft maintenance platform (Type B-1, or equivalent) at outboard side of each vertical stabilizer. Refer to paragraph 2-130 and remove left and right intermediate and aft sections of each tip assembly.

3. Locate and disconnect both spring tab drive bell crank drive rods from both vertical stabilizer upper cable bell cranks.



Steps 3 and 4—Para. 3-91

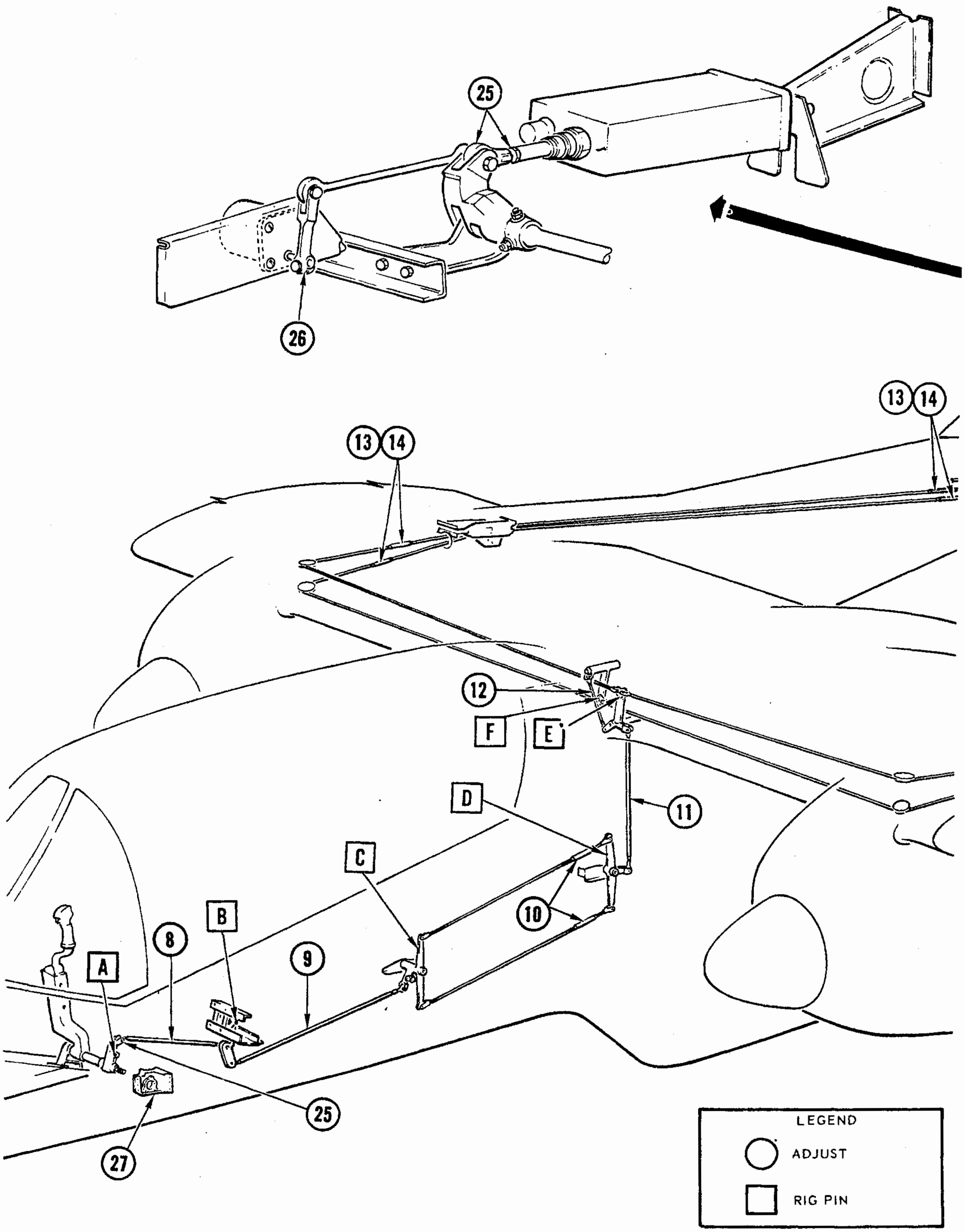
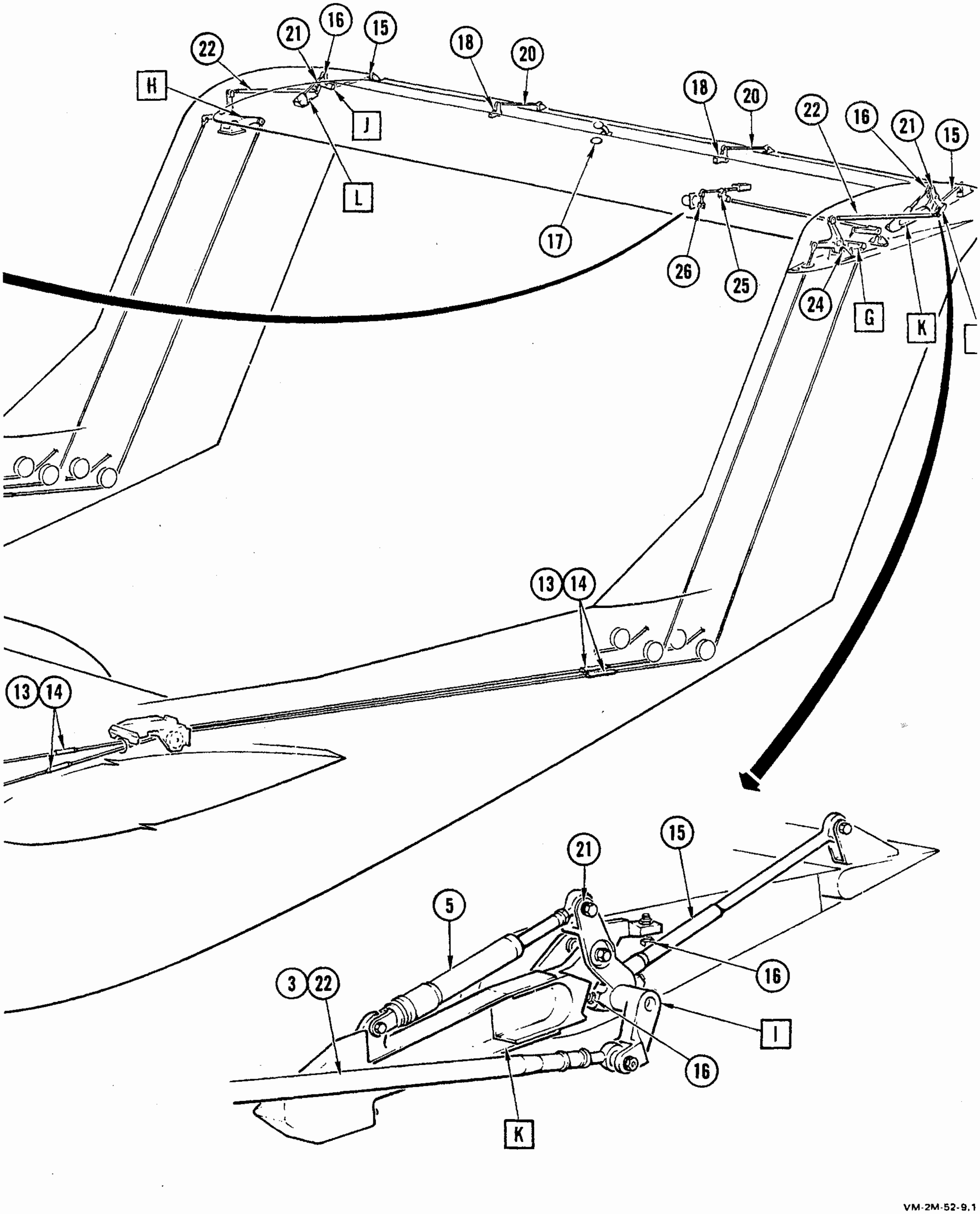


Figure 3-19. Rigging and Adjusting Longitudinal Control System (Sheet 1 of 2)

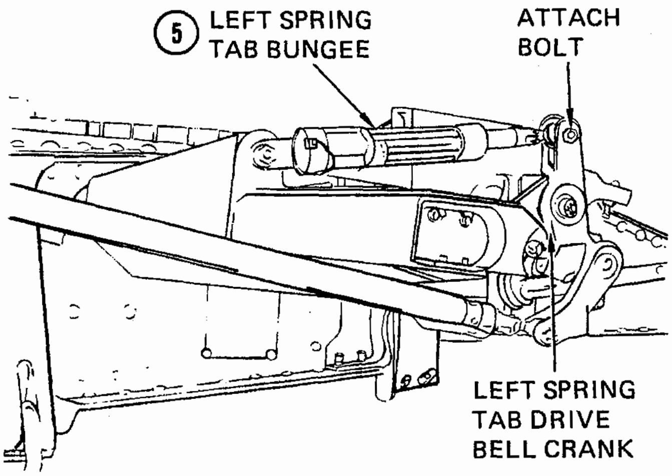


VM-2M-52-9.1

Figure 3-19. Rigging and Adjusting Longitudinal Control System (Sheet 2 of 2)

4. Locate and remove spring tab trim drive link from left vertical stabilizer cable bell crank.

5. Locate and disconnect both spring tab bungees from spring tab drive bell cranks.



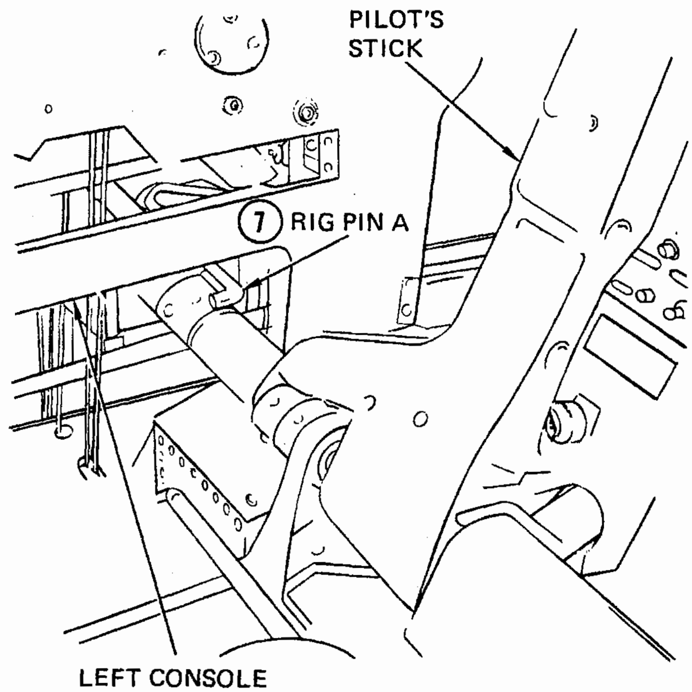
HORIZONTAL STABILIZER - LEFT HAND VIEW

21-3E VM-2A-52-9.3

Step 5—Para. 3-91

6. Remove forward side panel from pilot's left console. Locate stick travel stop bolts on left outboard stick support. Loosen jamnuts and screw in bolts.

7. Locate longitudinal drive bell crank outboard of pilot's stick. Insert rig pin A (-5) through bell crank and into outboard support.



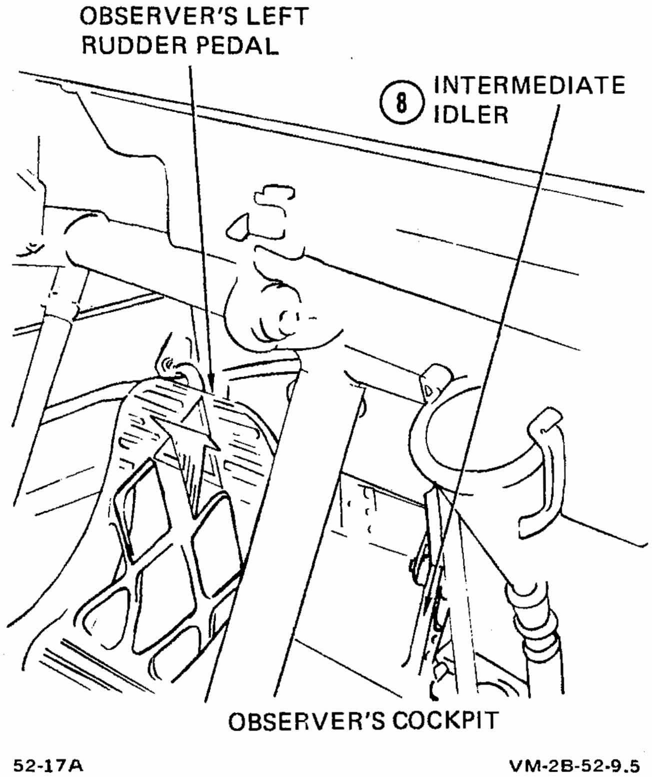
52-17B VM-2B-52-9.4

Step 7—Para. 3-91

8. Locate intermediate idler forward of observer's left rudder pedal. Adjust drive rod aft of longitudinal drive bell crank until rig pin B (-5) can be inserted into intermediate idler. Once properly adjusted, tighten jamnut against rod end and safety attach bolt with cotter pin (MS24665-134). Remove rig pin A.

Table 3-6. Longitudinal Control System Access Panels

PANEL NUMBER	DESCRIPTION	PANEL NUMBER	DESCRIPTION
80	Controls, Fuel Shut-off Valve L.H.	107	Elevator, Attach
87	Electrical, Controls	110	Trim, Actuator Longitudinal
93	Controls, Fuel Shut-off Valve R.H.	131	Controls
104	Elevator, Attach	149	Controls

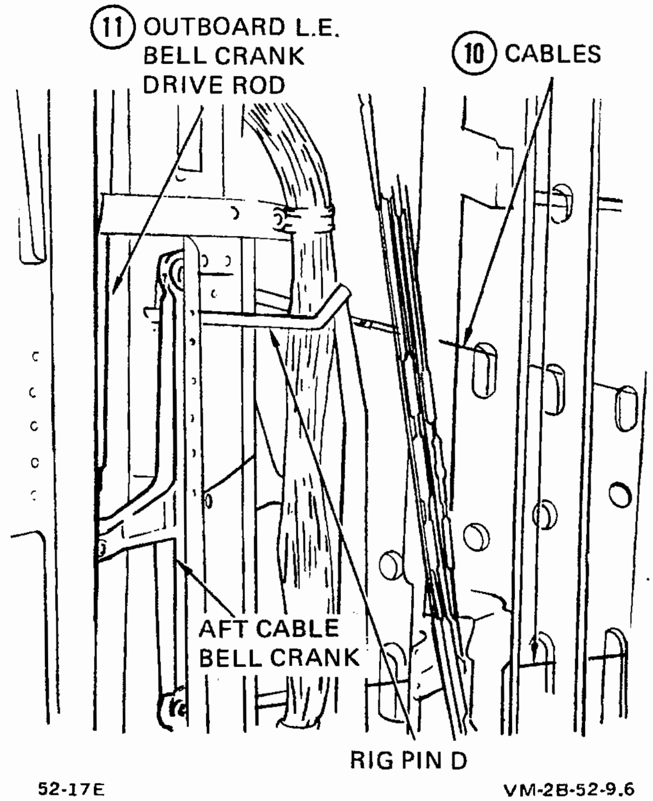


Step 8—Para. 3-91

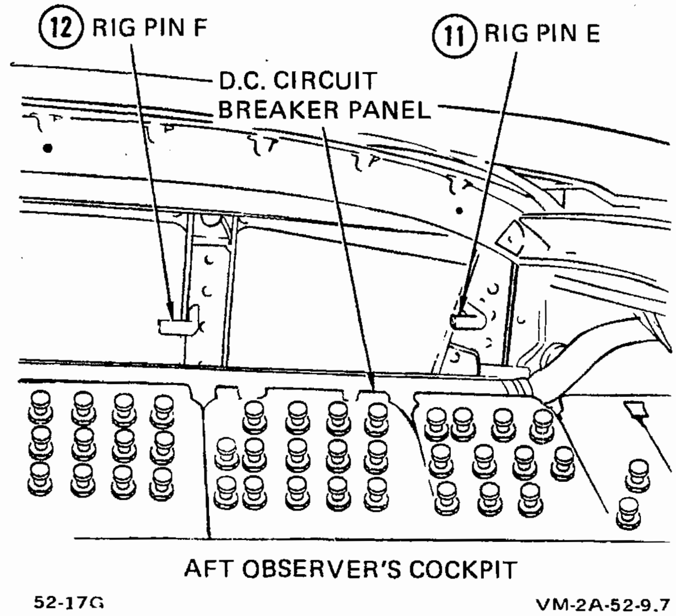
9. Raise observer's seat to full UP position. Locate forward cable bell crank rig pin hole on panel, 6 inches above the floor on left side of observer's seat. Remove armor plate panel under observer's left rudder pedal. Adjust drive rod aft of idler until rig pin C (-9) can be inserted into forward cable bell crank. Once properly adjusted, tighten jamnut against rod end. Safety attach bolt with cotter pin (MS24665-134). Reinstall armor plate panel. Remove rig pin B.

10. Remove left forward wall panel in cargo bay to gain access to aft cable bell crank. Using a tensiometer (T-5-8002-105-00), alternately adjust cables (1/8-inch diameter) to 90 (±5) pounds until rig pin D (-5) can be inserted into aft cable bell crank. Check that no more than three threads show outside of turnbuckle barrels before safetying with locking clips (MS21256-2). If threads show, readjust cables, maintain cable tension, and safety. Remove rig pin C.

11. With rig pin D installed, adjust leading edge outboard bell crank drive rod until rig pin E (-13) can be installed in leading edge outboard bell crank. Tighten jamnut against rod end and safety attach bolt with cotter pin (MS24665-134). Remove rig pin D.



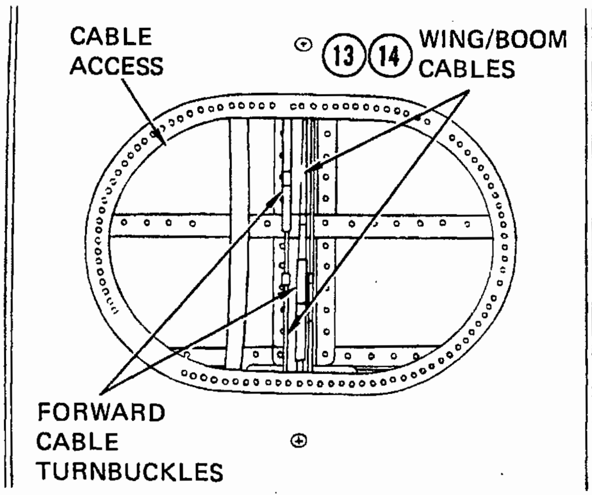
Steps 10 and 11—Para. 3-91



Steps 11 and 12—Para. 3-91

12. Adjust leading edge inboard bell crank drive rod until rig pin F (-13) can be installed in inboard leading edge bell crank. Tighten drive rod jamnut and safety attach bolt with cotter pin (MS24665-134). Remove rig pin E.

13. Using a tensiometer (T-5-8002-105-00, or equivalent) adjust two left wing/boom cables (1/8-inch diameter) to 80 (± 6) pounds until rig pin G (-7) can be inserted into left vertical stabilizer upper cable bell crank. Adjust right wing/boom cables (1/8-inch diameter) in same manner until rig pin H (-7) can be inserted into right vertical stabilizer upper cable bell crank.



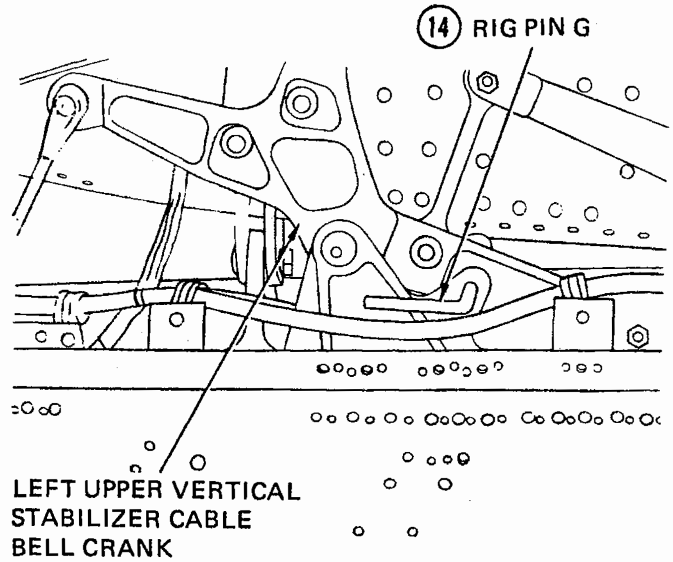
NACELLE ACCESS (TYPICAL)

52-17C VM-2A-52-9.8

Steps 13 and 14—Para. 3-91

14. Ensure that rig pins G (-7) and H (-7) can both be installed in the respective cable bell cranks. Rig pins must fit easily without excessive friction. If necessary, the forward and aft wing/boom cable turnbuckles must again be adjusted. Check cable ends for threads showing and cables for proper tension. Safety all eight turnbuckles with locking clips (MS21256-2).

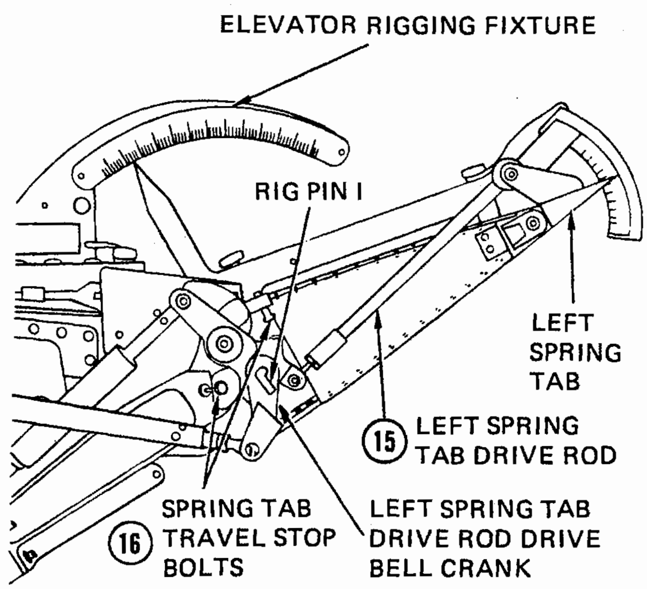
15. Locate two mounting points at outboard ends of stabilizer and elevator and install rig fixtures (T3391). Insert rig pin I (-9) through left spring tab drive rod bell crank and into elevator. Insert rig



LEFT HAND VERTICAL STABILIZER

21-3D VM-2A-52-9.9

Step 14—Para. 3-91



LEFT HAND ELEVATOR

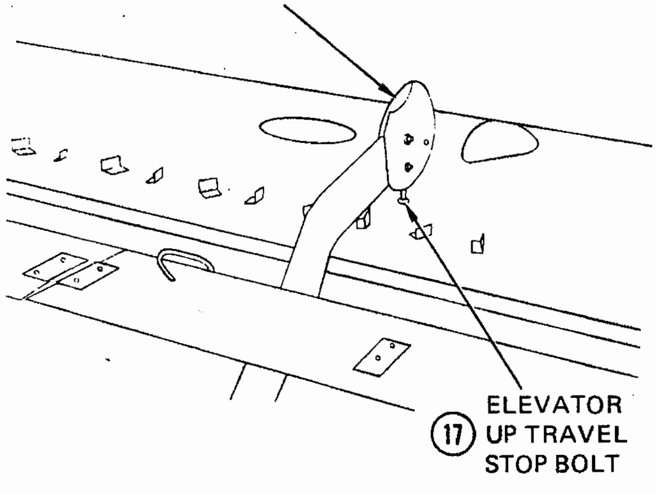
52-24 VM-2B-52-9.10

Steps 15 and 16—Para. 3-91

pin J (-9) through right bell crank and into elevator. Remove, adjust, and reinstall left and right spring tab drive rods until trailing edge of both spring tabs are set at 0 (±1/4) degree. After adjusting, install drive rods on tab drive bell cranks. Tighten jamnuts against rod ends and safety attach bolts with cotter pins (MS24665-134).

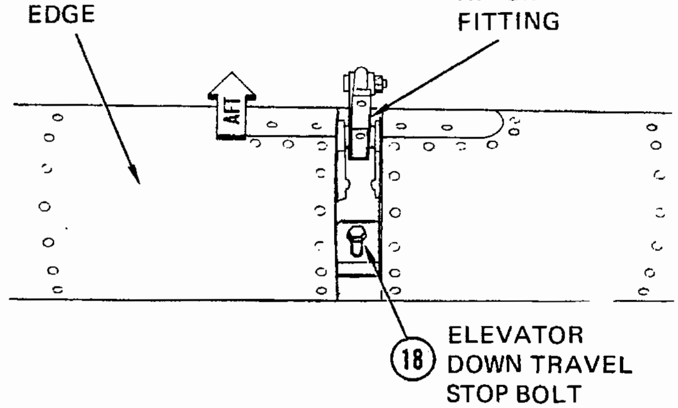
16. Remove rig pins I and J from left and right spring tab drive rod bell cranks. Locate tab travel stop bolts on both outboard counterweights and adjust to limit spring tab travel to 28 (±1/2) degree trailing edge down and 20 (±1/2) degrees trailing edge up. Once adjusted, tighten jamnuts on stop bolts and safety with lockwire (MS20995F32).

17. Locate elevator up travel stop on stabilizer, forward of elevator balance weight. Adjust until contact with balance weight position elevator trailing edge at 35 (±1/2) degrees trailing edge up. Tighten jamnut and safety with lockwire (MS20995F32).



Step 17—Para. 3-91

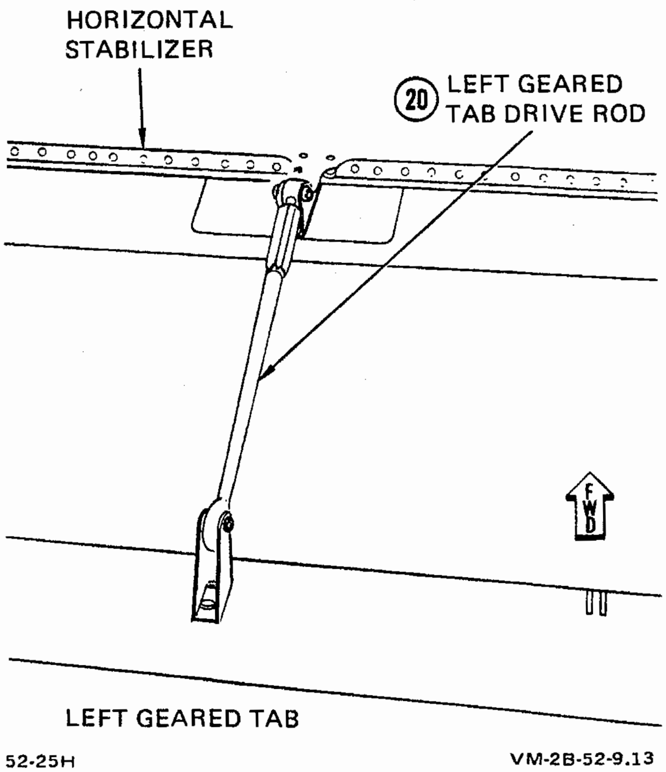
18. Locate elevator down travel stop bolts on underside of elevator at each inboard hinge fitting. Adjust to limit elevator down travel to 25 (±1/2) degrees trailing edge down. Tighten jamnut and safety with lockwire (MS20995F32).



Step 18—Para. 3-91

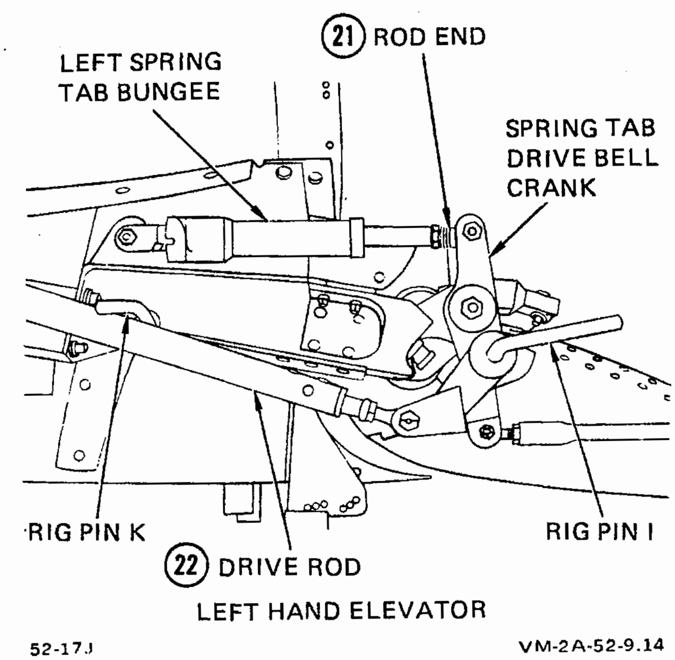
19. Position elevator at full trailing edge up (35 degrees) against travel up stop bolt. Geared tab position must be 29 degrees trailing edge down. Position elevator at full trailing edge down (25 degrees) against travel down stop rubber bumpers. Geared tab position must be 15 degrees 45 minutes trailing edge up.

20. Insert rig pins I (-9) and J (-9) through left and right spring tab drive rod bell cranks and into each end of elevator. Install rig pins K (-5) and L (-5) through elevator balance arms and into stabilizer ends. Check that elevator position is 10 degrees 41 minutes. Adjust left and right geared tab drive rods to position tab trailing edges at 5 degrees trailing edge up. Tighten jamnuts and safety with lockwire (MS20995F32). Remove rig pins K and L and position elevator at 0 degrees. (At this point, the trailing edge of either spring tab may be used to read elevator position.) Geared tab position must be 3 degrees trailing edge down.



Step 20—Para. 3-91

21. Adjust rod end on both spring tab bungees until they can be installed on spring tab drive bell cranks. Tighten jamnuts and safety with lockwire (MS20995F32). Secure attach bolt with cotter pins (MS24665-134).



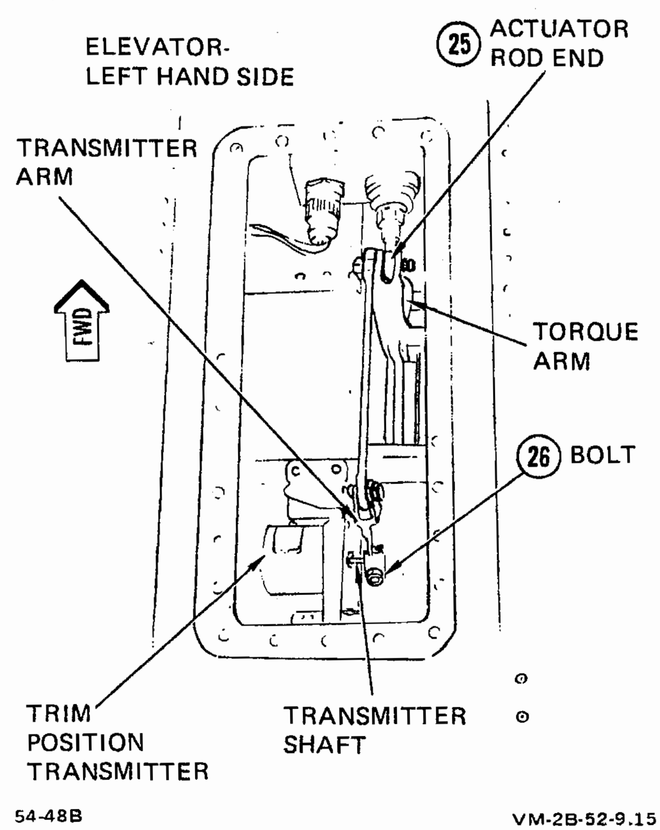
Steps 21 and 22—Para. 3-91

22. Adjust left and right spring tab drive bell crank drive rods until they can be mounted on cable bell cranks. Tighten jamnut and safety attach bolt with cotter pin (MS24665-134). Remove all rig pins.

23. Cycle pilot's stick in all directions. Note any binding or excessive friction. Ensure that elevator moves freely.

24. Insert rig pin G (-7) through left vertical stabilizer upper cable bell crank and support. Connect spring tab trim drive link to cable bell crank. Safety attach bolt with cotter pin (MS24665-134). Remove rig pin C.

25. If available, connect mobile power unit (NC-8A or equivalent) to aircraft. Turn aircraft electrical system ON. Have helper electrically position actuator 1.58 inches from full retract. Adjust actuator rod end until attach bolt can be inserted through torque arm and rod end. Tighten jamnut against rod end and safety jamnut with lockwire (MS20995F32). Safety attach bolt with cotter pin (MS24665-134). Remove rig pin G.



Steps 25 and 26—Para. 3-91

26. Have helper electrically extend actuator 1.645 inches from full retract. Loosen bolt on transmitter arm at transmitter shaft. Locate elevator trim indicator on lower left side of pilot's instrument panel and turn transmitter shaft until indicator reads 0 degrees. Once adjusted, tighten bolt on arm and safety with cotter pin (MS24665-134). Turn aircraft electrical system OFF.

27. Locate stick stop bolts on left outboard stick support. Attach push/pull gage (S131) to pilot's stick 1/2 inch below trigger switch. Turn aircraft electrical system ON. Electrically position elevator to "in trim" position as indicated by trim light in cockpit. Have helper pull aft on stick with a force of 60 (± 5) pounds. While helper maintains force, adjust aft stop bolt on stick support to contact longitudinal drive bell crank. Tighten stop bolt jamnut and safety with lockwire (MS20995F32). As helper applies forward force of 75 (± 5) pounds, adjust forward stop bolt in same manner. Tighten jamnut and safety with lockwire (MS20995F32).

28. Remove rig fixtures from stabilizer and elevator. With elevator in neutral trim position, pull aft on stick with force gage until helper indicates elevator is at full trailing edge up position and right spring tab bell crank is 1/16 to 1/32 inch from down stop. Force required must be 42 (±4) pounds.

29. With elevator in neutral trim position, push stick forward with force gage until helper indicates elevator is at full trailing edge down position and right spring tab bell crank is 1/16 to 1/32 inch from up stop. Force required must be 55 (±5) pounds.

30. Turn electrical system ON. Place elevator trim selector switch in NORMAL position. Trim to full ND (nose down) position. Check that stick moves smoothly and freely full forward and full aft. Trim to full NU (nose up) and repeat check. Place elevator trim selector switch in ALTERNATE position and check that stick will move forward when ND is selected and aft when NU is selected.

31. Ensure that all bolts and turnbuckles involved in this procedure are tightened and properly safetied. Refer to paragraph 3-66 and perform an operational check of the longitudinal control system.

32. Refer to and install all access panels listed in table 3-6.

3-92. DIRECTIONAL CONTROL SYSTEM.

3-93. Organizational maintenance for the directional control systems includes operational checkout procedures, system troubleshooting, rigging, adjusting, and component removal and installation. These procedures provide all the instructions necessary to maintain the directional control systems within the limits of organizational-level tools and facilities. Each procedure will include, as required, lists of tools and materials, and illustrations to clarify instructions and accomplish component location.

3-94. OPERATIONAL CHECK.

3-95. The following procedure provides the instructions necessary to accomplish a general verification of proper directional control system operation. This procedure is performed when operational checkout does not warrant a detailed verification of operating forces, travel limitations, etc. To perform an operational check of the directional control system, proceed as follows:

3-96. CHECKING PRIMARY CONTROLS.

1. Depress the right rudder pedal and observe the vertical stabilizers. Both rudders should deflect to the right proportionate to pedal travel.

2. Depress the left rudder pedal and observe the vertical stabilizers. Both rudders should deflect to the left proportionate to pedal travel.

3. During rudder pedal operation, check rudder pedals for looseness. Visually check arm tube (300-524014-5) and Jo-bolts (eight each) at upper and lower attaching fittings for looseness and elongation of holes.

4. If Jo-bolts are loose, remove rudder pedal assembly and refer to paragraph 3-300 for intermediate maintenance instructions.

3-97. CHECKING TRIM SYSTEM.

1. Apply electrical power to aircraft in accordance with General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

2. Place TRIM SELECT switch to NORM on the pilot's left-hand console.

3. Operate NORMAL RUDDER TRIM switch on pilot's left-hand console and observe RUDDER advisory light on pilot's instrument panel. The light should come on when the rudder is in neutral trim and go out when RN or NR is selected to trim the rudders either direction from neutral. Trim position vs. rudder is dependent upon friction.

4. Check trim operation again as described in step 3, using the ALT RUD TRIM switch on the pilot's left-hand console.

3-98. GROUND CHECKING YAW DAMPER SYSTEM.

1. Apply electrical power to aircraft. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

2. Position yaw damper switch to ON. No rudder deflections should be noted.

3. With the aircraft on the landing gear, position yaw damper switch to TEST (hold). Rotate aircraft a few degrees nose left; trailing edge of rudder should move to the right. Rotate aircraft a few degrees nose right; trailing edge of rudder should move to the left.

4. Position yaw damper switch from OFF to TEST. Observe that the rudder displacement resulting from the engagement transient is less than 0.25 degree.

3-99. TROUBLESHOOTING.

3-100. To troubleshoot the directional control system, refer to Wiring Data Manual (NAVAIR 01-60GCB-2-7) for wiring diagrams, and to table 3-7 for instructions.

Table 3-7. Troubleshooting Directional Control System

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: CONTROL STICK WILL NOT MOVE.		
1. Foreign object restricting system operation.	See figure 3-11. Inspect all cables, bell cranks, and drive rods in system for interference from foreign objects.	Remove all foreign objects. Replace any damaged components. Refer to paragraph 3-135 and rerig control system or continue troubleshooting.
2. Rig pin installed in bell crank.	See figure 3-11. Inspect all bell cranks in system for rig pin installation.	Remove rig pin.
TROUBLE: CONTROL STICK MOVES BUT RUDDERS DO NOT FOLLOW.		
1. System component broken, disconnected or removed.	See figure 3-11. Inspect all cables, bell cranks, and drive rods for breakage and proper installation.	Replace any damaged components. Install any components that have bee removed. Connect any component that has been disconnected.

Table 3-7. Troubleshooting Directional Control System (Cont)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: CONTROL STICK BINDS MOMENTARILY DURING STICK TRAVEL.		
1. Foreign object restricting system operation.	See figure 3-11. Inspect all cables, bell cranks, and drive rods in system for interference from foreign objects.	Remove all foreign objects. Replace any damaged components. Rerig control system in accordance with paragraph 3-135.
TROUBLE: EXCESSIVE CONTROL STICK FRICTION THROUGH FULL STICK TRAVEL.		
1. System component misaligned, rubbing or chafing airframe or foreign object.	See figure 3-11. Inspect all cables, bell cranks, and drive rods in system for clearance and ease of operation. Check for interference from foreign objects.	Remove any foreign objects. Replace any damaged components. Refer to paragraph 3-135 and rerig control system or continue troubleshooting.
2. Excessive control cable tension.	Refer to paragraph 3-135 for proper cable tension.	Refer to paragraph 3-135 and adjust cables to proper tension or continue troubleshooting.
TROUBLE: RUDDERS WILL NOT MOVE THROUGH FULL TRAVEL.		
1. Directional cable sector and/or rudder stop bolts improperly adjusted.	Refer to paragraph 3-135 for proper stop bolt adjustment.	Refer to paragraph 3-135 and adjust stop bolts or continue troubleshooting.
2. Foreign object restricting system operation.	See figure 3-11. Inspect all cables, bell cranks, and drive rods for interference from foreign objects.	Remove foreign object. Replace any damaged components. Refer to paragraph 3-135 and rerig control system, or continue troubleshooting.
3. Inproperly rigged control system.	Refer to paragraph 3-135 and check system rigging.	Refer to paragraph 3-135 and rerig system.
TROUBLE: DIRECTIONAL TRIM CANNOT BE OBTAINED IN NORMAL POSITION.		
1. TRIM NORM CONT circuit breaker CB46 disengaged.	Check that TRIM NORM CONT circuit breaker is engaged.	Engage TRIM NORM CONT circuit breaker or continue troubleshooting.
2. Pilot's trim select switch S10 defective in NORMAL position.	Using multimeter (AN/PSM-4), check for continuity between test points CCA and CCB.	Replace trim select switch or continue troubleshooting.
3. Pilot's NORMAL directional trim switch S12 defective.	Have helper place NORMAL trim switch in NL position. Using a multimeter (AN/PSM-4), check for continuity between test points CCA and CCL.	Replace NORMAL directional trim switch or continue troubleshooting.

Table 3-7. Troubleshooting Directional Control System (Cont)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: DIRECTIONAL TRIM CANNOT BE OBTAINED IN NORMAL POSITION. (Cont)		
4. Defective directional trim actuator.	Turn electrical system ON. Have helper place NORMAL trim switch in NL position. Turn electrical system OFF.	Refer to paragraph 3-107 and replace trim actuator.
TROUBLE: DIRECTIONAL TRIM CANNOT BE OBTAINED IN ALTERNATE POSITION.		
1. TRIM ALT CONT circuit breaker CB47 disengaged.	Check that TRIM ALT CONT circuit breaker is engaged.	Engage TRIM ALT CONT circuit breaker or continue troubleshooting.
2. Pilot's trim select switch S10 defective in ALTERNATE position.	Using a multimeter (AN/PSM-4), check for continuity between test points CCE and CCJ.	Replace trim select switch or continue troubleshooting.
3. Pilot's ALTERNATE directional trim switch S12 defective.	Have helper place ALTERNATE trim switch in NL position. Using a multimeter (AN/PSM-4), check for continuity between test points CCE and CCM.	Replace trim switch or continue troubleshooting.
4. Defective directional trim actuator.	Turn electrical system ON. Have helper place ALTERNATE trim switch in NL position. Turn electrical system OFF.	Refer to paragraph 3-107 and replace trim actuator.
TROUBLE: YAW DAMPER SYSTEM INOPERATIVE.		
1. YAW DAMPER circuit breaker CB112 disengaged.	Check that YAW DAMPER circuit breaker is engaged.	Engage YAW DAMPER circuit breaker or continue troubleshooting.
2. Yaw damper control switch S68 defective.	Place yaw damper control switch in ON position. Using a multimeter (AN/PSM-4), check for continuity between test points CCCA and CCCB.	Replace yaw damper control switch or continue troubleshooting.
3. Yaw rate gyro defective.	Turn electrical system ON. Have helper shake nose of aircraft to left and right. Check for varying d-c voltage on yaw damper amplifier between test points CCCC and CCCD. Turn electrical system OFF.	Refer to paragraph 3-115 and replace yaw rate gyro or continue troubleshooting.
4. Yaw damper amplifier defective.	Turn electrical system ON. Have helper shake nose of aircraft to left and right. Using a multimeter (AN/PSM-4), check for varying d-c voltage between test points CCCE and CCCF and CCCG and CCCF. Turn electrical system OFF.	Refer to paragraph 3-119 and replace yaw damper amplifier, or continue troubleshooting.
5. Yaw damper acturtor receptacle ground defective.	Using a multimeter (AN/PSM-4), check for continuity between test point CCCF and ground.	Repair or replace receptacle ground wire or continue troubleshooting.
6. Defective wiring.	Turn electrical system ON. Using a multimeter (AN/PSM-4), check for 28 volts dc between test point CCCH and ground. Turn electrical system OFF.	Repair of replace wiring or continue troubleshooting.

Table 3-7. Troubleshooting Directional Control System (Cont)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: YAW DAMPER SYSTEM INOPERATIVE. (Cont)		
7. Yaw damper actuator defective.	Turn electrical system ON. Have helper shake nose of aircraft from left to right. Check for actuator operation. NOTE If all previous probable cause have been eliminated and the yaw damper system is still inoperative, proceed as follows:	Refer to paragraph 3-123 and replace yaw damper actuator.
8. GRD & AIR SAFETY circuit breaker CB41 disengaged.	Check that GRD & AIR SAFETY circuit breaker is engaged.	Engage GRD & AIR SAFETY circuit breaker or continue troubleshooting.
9. GRD SAFETY RELAY No. 1, K35, defective.	Pull No. 1 MSL FIRE CB16, No. 2 MSL FIRE CB17, and NOSE STEER CB24, circuit breakers. Attach jumper between test points CGE and CGF. Turn electrical system ON. Have helper shake aircraft from nose left to right. Turn electrical system OFF. Remove jumper from terminal strip No. 63. Engage the following circuit breakers: MSL FIRE No. 1, MSL FIRE No. 2, and NOSE STEER.	Replace GRD SAFETY RELAY No. 1 or continue troubleshooting.
10. Ground safety switch S74 defective.	Disconnect ground safety switch arm from link. Have helper manually close switch. Using a multimeter (AN/PSM-4), check for continuity between test points CGC and CGD. Connect switch arm and link.	Replace ground safety switch.

Tools and Equipment List

Power Unit, Mobile	NC-8A (or equivalent)
Multimeter	AN/PSM-4 (or equivalent)

Note

Whenever electrical power is required to isolate and correct a trouble, use a mobile power unit (NC-8A or equivalent) when available.

3-101. SERVICING.

3-102. Servicing required for the directional control system consists of greasing the rudder pedals. Refer to Calendar Maintenance Requirements Cards (NAVAIR 01-60GCB-6-4).

3-103. RUDDER PEDAL ADJUST SCREW JACK REMOVAL AND INSTALLATION.

3-104. To remove and install the rudder pedal adjust screw jack, see figure 3-20 and proceed as follows:

3-105. REMOVING RUDDER PEDAL ADJUST SCREW-JACK ASSEMBLY.

Note

The following procedures are typical for the right and left rudder pedal adjust screw-jack assembly.

It will be necessary to hold the nuts on the forward side of the pedestal.

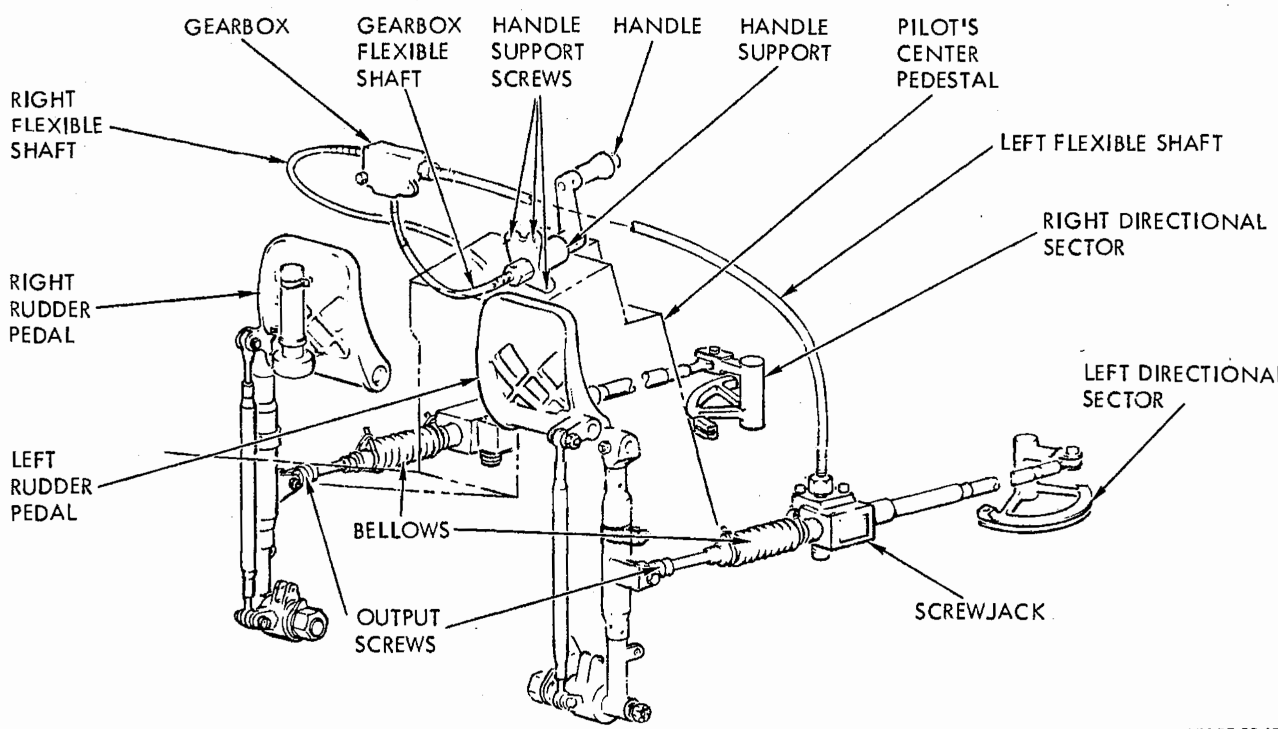


Figure 3-20. Rudder Pedal Adjust Screw Jack

1. Remove the three screws holding the handle support to the pilot's center pedestal.

2. Cut the lockwire and disconnect gearbox flexible shaft from handle support.

3. Remove instrument panel shroud. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

4. Cut lockwire and disconnect flexible shaft.

5. Remove attaching bolts from gearbox and remove gearbox assembly.

6. Remove retaining clamps from flexible shaft.

7. Remove scuff guards from console side panels near rudder pedals.

8. Cut lockwire and disconnect flexible shaft from the respective screw jacks.

9. Remove bolt attaching output screw to pilot's rudder pedal.

10. Remove console closeout side panels in pilot's compartment to gain access to directional control system input sector.

11. Remove bolt retaining input sectors to the rudder pedal adjust tube.

12. Remove screw-jack assembly.

3-106. INSTALLING RUDDER PEDAL ADJUST SCREW-JACK ASSEMBLY.

Materials List

Lockwire (0.041-inch diameter steel)	MS20995F41
Pins, Cotter (1/16-inch diameter steel)	MS24665-134

1. Install rig pin through rudder pedal arm and cable sector.

2. Position screw-jack assembly in aircraft with tube assembly at sector as shown in figure 3-20.

3. Install bolt through sector and rudder pedal adjust screw-jack tube rod end. Safety with cotter pin (MS24665-134).

4. Manually turn screw jack to align hole in pedal arm with forward screw-jack rod end and install bolt. Safety with cotter pin (MS24665-134).

5. Install gearbox, using two screws.

6. Connect flexible shaft from gearbox to screw jack. Safety shaft nuts with lockwire (MS20995F41).

7. Install handle and handle support on pilot's center pedestal.

8. Install flexible shaft between handle and gearbox. Safety with lockwire (MS20995F41).

9. Install instrument panel shroud. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5) and remove rig pins from sector and rudder pedal.

10. Install console closeout panels.

11. Check for free operation of rudder pedals and screw-jack assembly.

3-107. DIRECTIONAL TRIM ACTUATOR REMOVAL AND INSTALLATION.

3-108. To remove and install the directional trim actuator, proceed as follows:

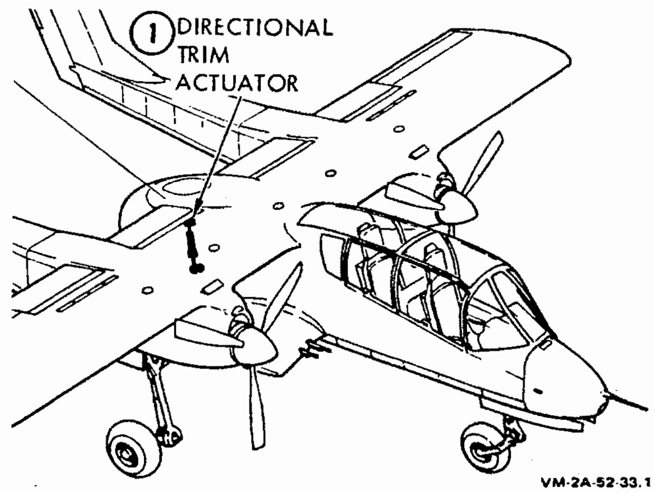
Tools and Equipment List

Bundle, Rig Pin	T3382

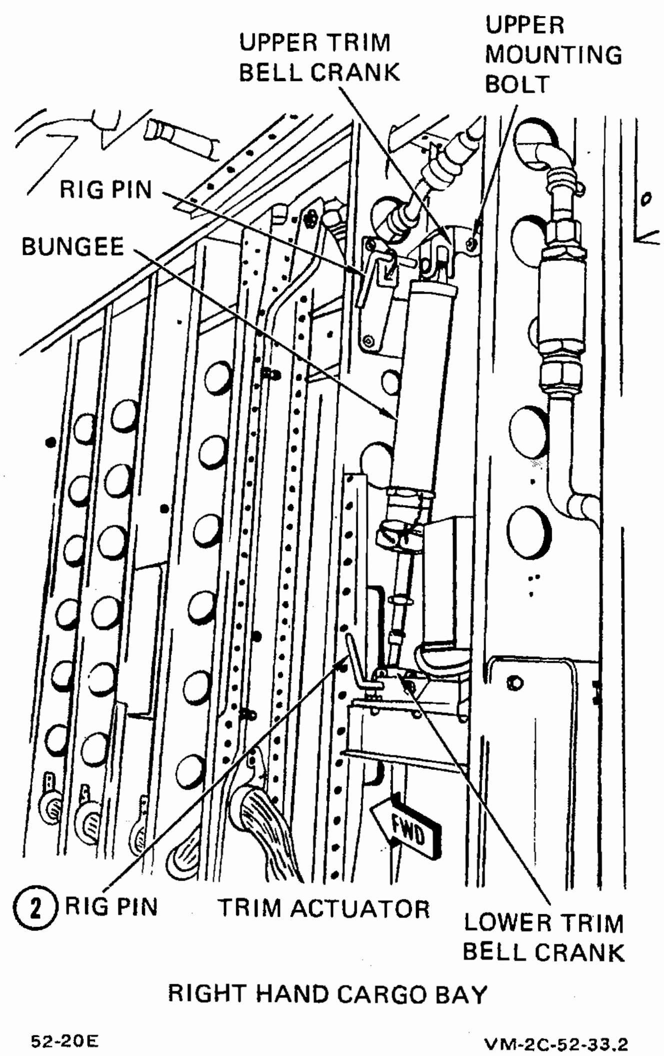
3-109. REMOVING DIRECTIONAL TRIM ACTUATOR.

1. Remove right rear wall panel in cargo bay to gain access to directional trim actuator.

2. Have helper electrically position actuator until rig pins (-7, rig pin bundle T3382) can be installed in upper and lower trim bell cranks.

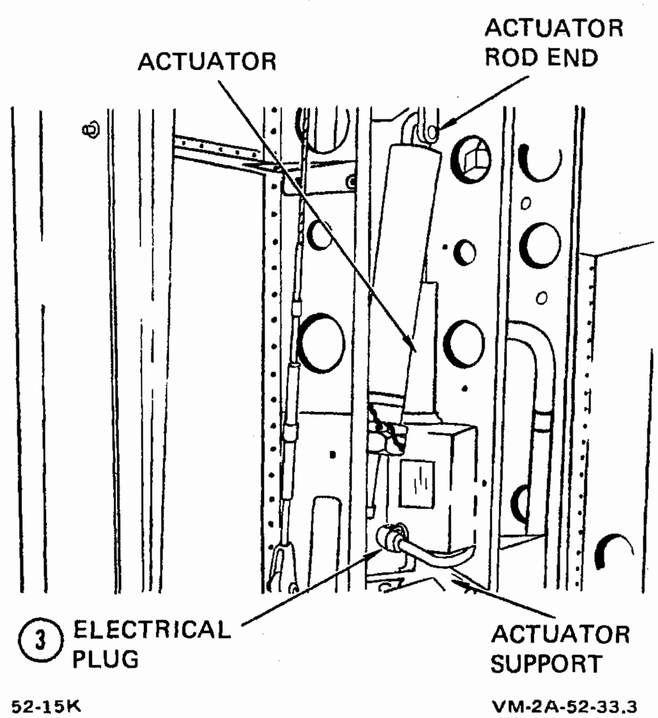


Step 1—Para. 3-109



Step 2—Para. 3-109

3. Disconnect electrical plug. Remove bolts from actuator support and actuator rod end, and remove actuator.



Step 3—Para. 3-109

3-110. INSTALLING DIRECTIONAL TRIM ACTUATOR.

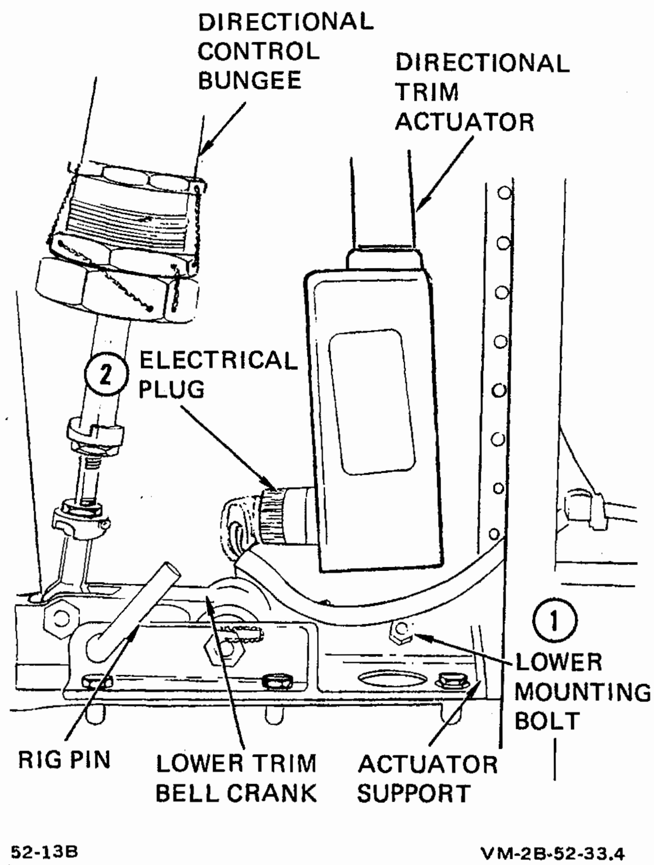
Tools and Equipment List

Bundle, Rig Pin	**T3382**
Wrench, Torque (0-200 inch-pounds)	**GGG-W-686, No. 6 (or equivalent)**

Materials List

Lockwire (0.032-inch diameter nickel-copper)	MS20995NC32
Lockwire (0.032-inch diameter steel)	MS20995F32
Pins, Cotter (1/16-inch diameter steel)	MS24665-134

1. Position actuator on lower support and install lower mounting bolt. Using a torque wrench (GGG-W-686, No. 6), torque bolt 70 to 90 inch-pounds. Safety head of bolt to support with lockwire (MS20995F32).



Steps 1 and 2—Para. 3-110

Note

If AYC 315 is incorporated, remove clamp at upper rod end and slide back boot to adjust rod end.

2. With rig pins (-7) in upper and lower bell cranks and supports, connect electrical plug and have helper in cockpit electrically position actuator to "in trim" position. Adjust upper rod end until bolt can be easily installed through upper trim bell crank. Tighten jamnut against actuator rod and safety with lockwire (MS20995F32). Install washer and nut. Tighten nut and safety with cotter pin (MS24665-134).

Note

If AYC 315 is incorporated, install boot over shoulder on rod end with clamp and safety with lockwire (MS20995NC32).

3. Remove rig pins from bell cranks and perform an operational check of directional control system.

4. Install right rear wall panel in cargo bay.

3-111. DIRECTIONAL FORCE TRIM BUNGEE REMOVAL AND INSTALLATION.

3-112. To remove and install the directional force trim bungee, proceed as follows:

3-113. REMOVING DIRECTIONAL FORCE TRIM BUNGEE.

Tools and Equipment List

Bundle, Rig Pin	T3382
Power Unit, Electrical, Mobile	NC-8A (or equivalent)

1. Remove right rear wall panel in cargo bay to locate directional force trim bungee and actuator.

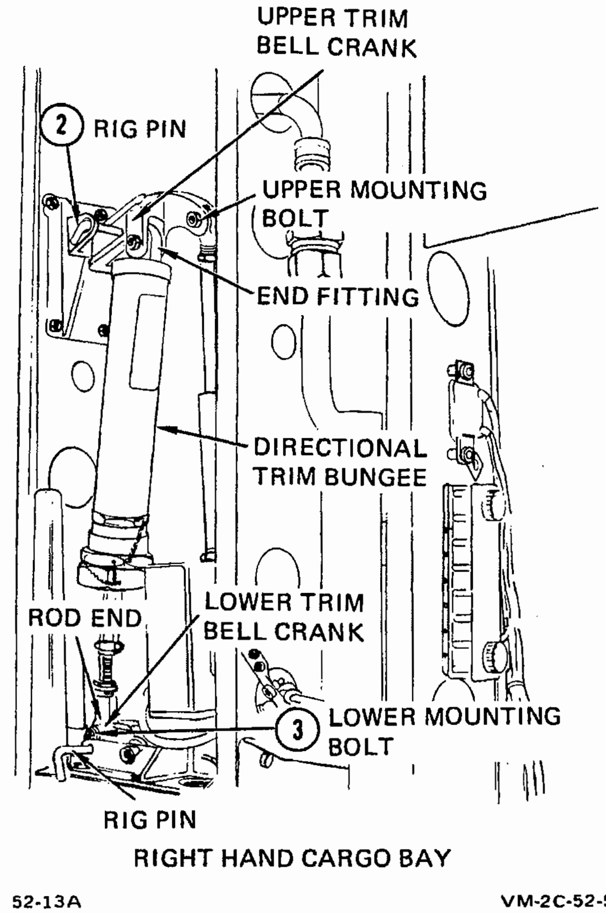
2. If available, connect mobile power unit (NC-8A, or equivalent) to aircraft. Turn aircraft electrical system ON. Have helper electrically position directional trim actuator until rig pins (-7, rig pin bundle, T3382) can be installed in upper and lower directional trim bell cranks. Turn electrical system OFF.

3. Remove nut, washer, and lower mounting bolt from lower trim bell crank and bungee rod end. Remove nut, washer, and upper mounting bolt from upper trim bell crank and bungee end fitting. Remove bungee from aircraft.

3-114. INSTALLING DIRECTIONAL FORCE TRIM BUNGEE.

Tools and Equipment List

Bundle, Rig Pin	T3382



Steps 2 and 3—Para. 3-113

Materials List

Pins, Cotter (1/16-inch diameter steel)	**MS24665-134**
Lockwire (0.032-inch diameter steel)	**MS20995F32**

1. Align end fitting with upper trim bell crank. Install upper mounting bolt, washer, and nut. Tighten nut and safety with cotter pin (MS24665-134).

2. If necessary, cut lockwire on bungee rod end jamnut. Adjust rod end to align with lower trim bell crank. Install lower mounting bolt, washer, and nut. Tighten nut and safety with cotter pin (MS24665-134). Tighten jamnut and safety to lock ring with lockwire (MS20995F32).

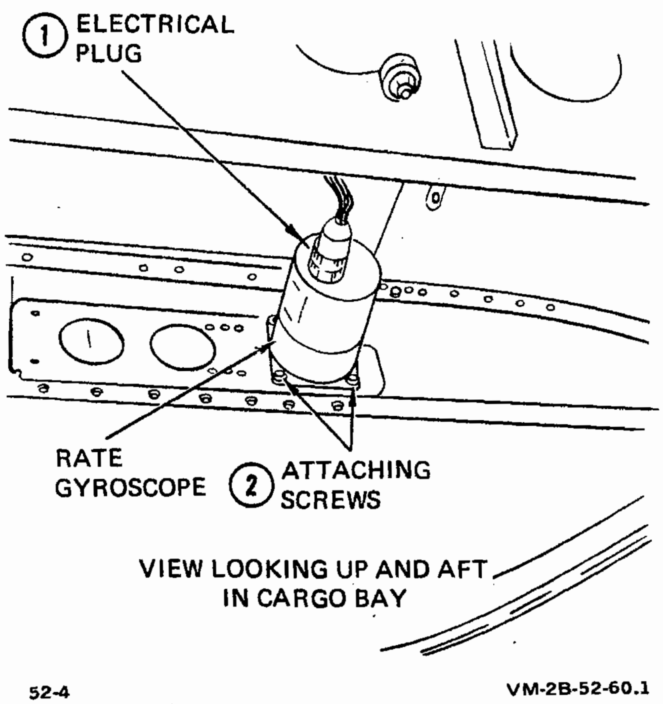
3. Remove rig pins from upper and lower trim bell cranks. Refer to paragraph 3-94 and perform an operational check of the directional control system.

3-115. YAW DAMPER RATE GYROSCOPE REMOVAL AND INSTALLATION.

3-116. To remove and install the yaw damper rate gyroscope, see figure 3-11 and proceed as follows:

3-117. REMOVING RATE GYROSCOPE.

1. Disconnect electrical plug on forward end of rate gyroscope on upper bulkhead at fuselage station 256.50.



Steps 1 and 2—Para. 3-117

2. Remove four AN515 Phillips screws holding rate gyroscope to mounting bracket.

3-118. INSTALLING RATE GYROSCOPE.

1. Insert positioning pin in positioning hole as shown in figure 3-21.

2. Install the rate gyroscope on mounting bracket as shown with four attaching screws.

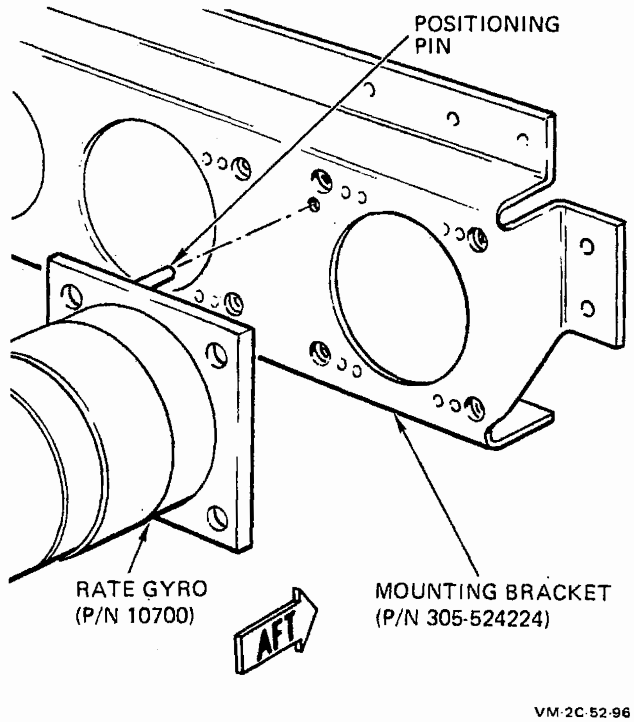


Figure 3-21. Rate Gyro Positioning Pin Alignment

3. Install electrical plug.

4. Perform operational check of the directional control system. Refer to paragraph 3-94.

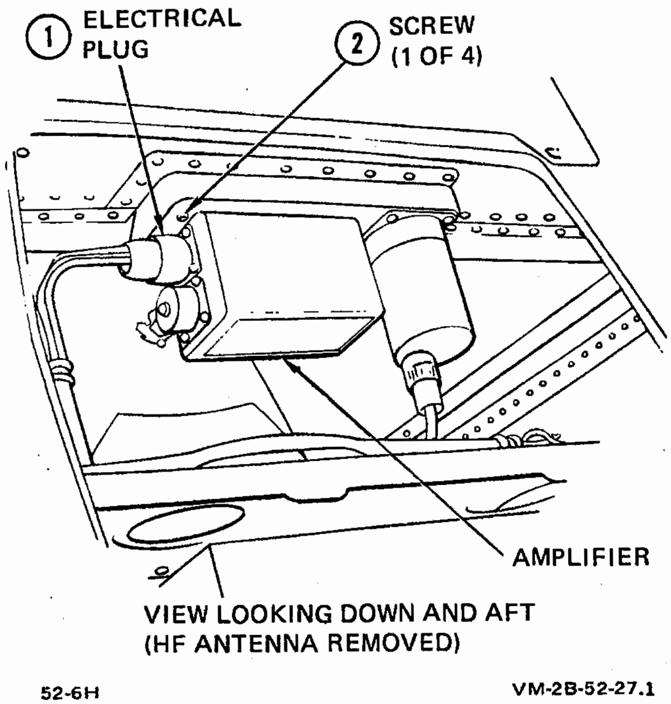
3-119. YAW DAMPER AMPLIFIER REMOVAL AND INSTALLATION.

3-120. To remove and install the yaw damper amplifier, see figure 3-11 and proceed as follows:

3-121. REMOVING YAW DAMPER AMPLIFIER.

1. Locate amplifier on upper cargo bay bulkhead at fuselage station 256.50. Disconnect electrical plug from left side of amplifier.

2. Remove four AN515 Phillips screws holding amplifier to mounting bracket.



Steps 1 and 2—Para. 3-121

3-122. INSTALLING YAW DAMPER AMPLIFIER.

1. Position the amplifier on the mounting bracket and install four attaching screws.

2. Install Bendix plug-in aft receptacle.

3. Install protective cover on test connector.

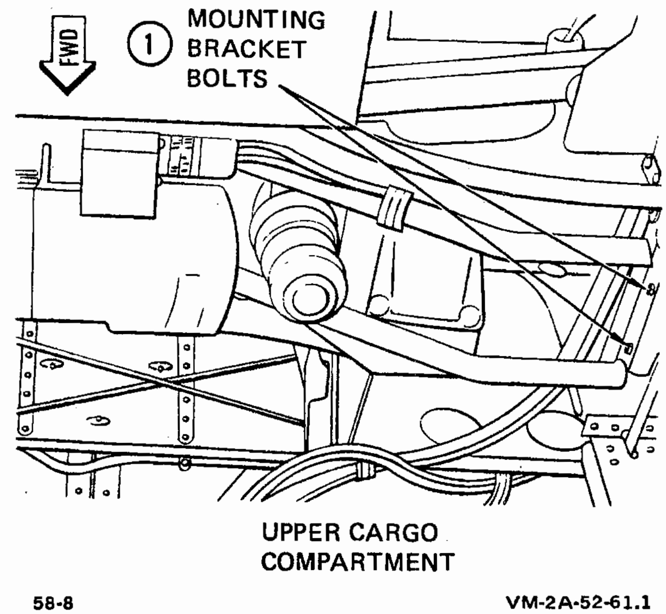
4. Perform operational check of the directional control system. Refer to paragraph 3-94.

3-123. YAW DAMPER SERVO ACTUATOR REMOVAL AND INSTALLATION.

3-124. To remove and install the yaw damper servo actuator, see figure 3-11 and proceed as follows:

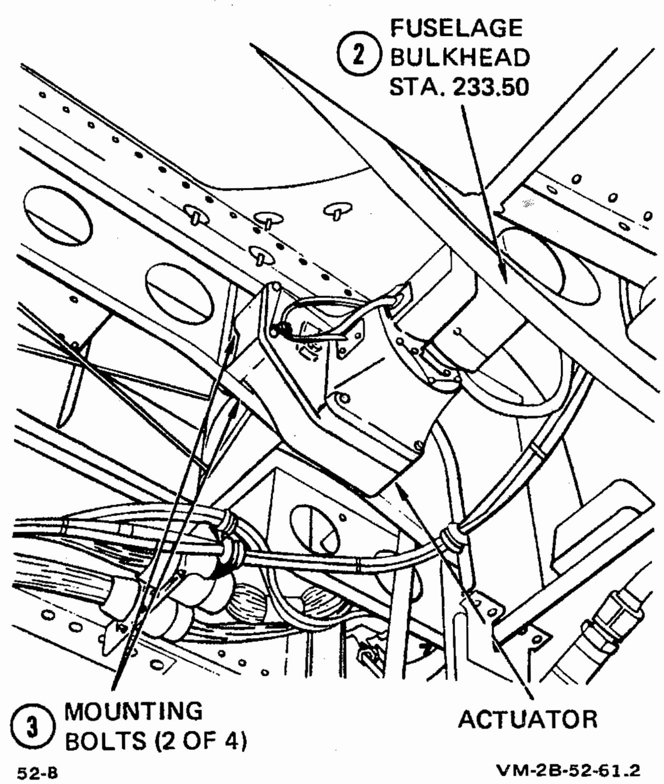
3-125. REMOVING YAW DAMPER SERVO ACTUATOR.

1. Remove two mounting bracket bolts from hydraulic power equipment package rack and swing down.



Step 1—Para. 3-125

2. Disconnect actuator electrical plug from receptacle located on upper fuselage bulkhead at fuselage station 233.50.



Steps 2 and 4—Para. 3-125

3. Remove four NAS1104 mounting bolts attaching actuator to bulkhead.

4. Slide actuator aft and remove from aircraft.

3-126. INSTALLING YAW DAMPER SERVO ACTUATOR.

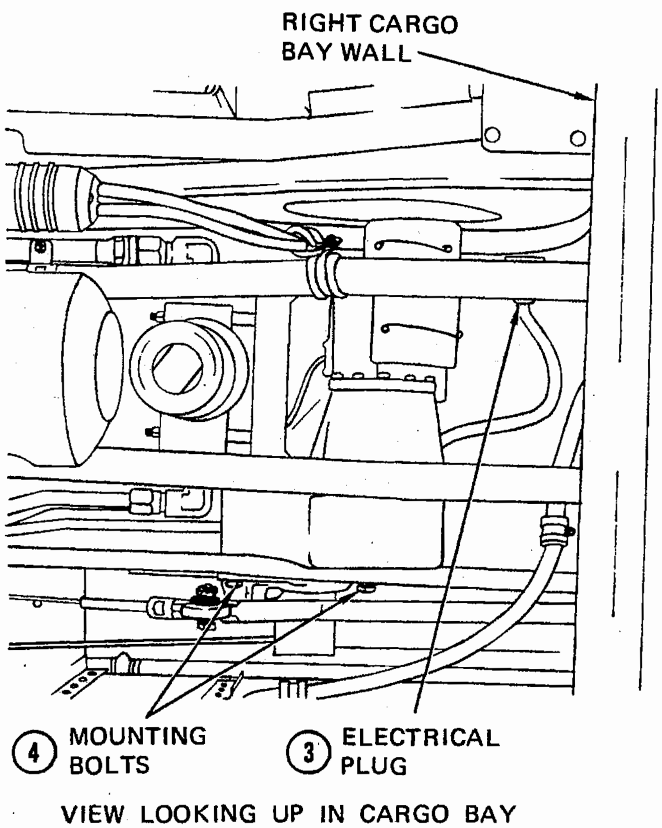
Tools and Equipment List

Wrench, Torque (0-200 inch-pounds)	GGG-W-686, No. 6 (or equivalent)

1. Slide the actuator splined shaft into the right fuselage cable bell crank.

2. Install four mounting bolts. Using a torque wrench (GGG-W-686, No. 6), torque mounting bolts 70 to 90 inch-pounds.

3. Connect electrical plug to receptacle located on upper fuselage bulkhead at fuselage station 233.50.



Steps 3 and 4—Para. 3-126

4. Move hydraulic equipment power unit back to the horizontal position and install mounting bracket bolts.

5. Perform operational check of the directional control system. Refer to paragraph 3-94.

3-127. RUDDER REMOVAL AND INSTALLATION.

3-128. To remove and install rudder(s), see figure 3-11 and proceed as follows:

3-129. REMOVING RUDDER(S).

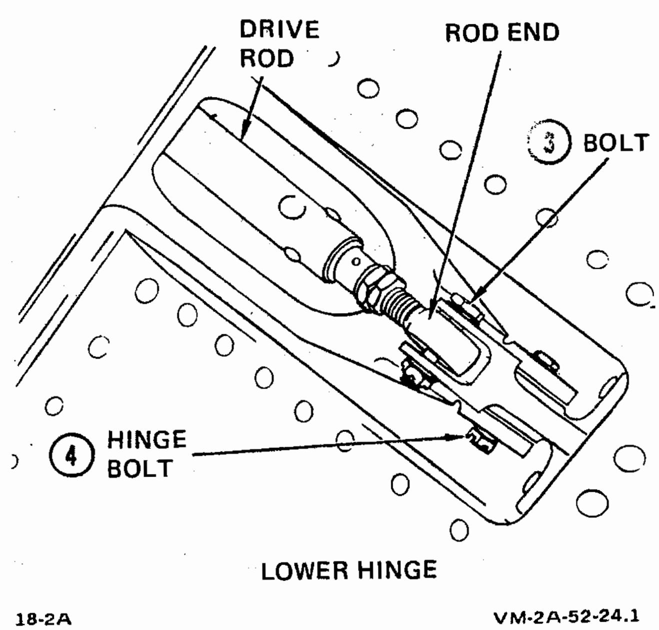
Tools and Equipment List

Wrench, Torque (0-200 inch-pounds)	GGG-W-686, No. 6 (or equivalent)
Platform, Aircraft Maintenance	Type B-1

1. Position maintenance platform on outboard side of the vertical stabilizer.

2. Locate bonding jumper at lower hinge. Position rudder against stop and remove jumper from rudder.

3. Remove bolt from drive rod rod end at lower hinge.



Steps 3 and 4—Para. 3-129

4. Remove hinge bolt from lower hinge fitting.

5. Remove hinge bolt from upper hinge fitting.

3-130. INSTALLING RUDDER(S).

Tools and Equipment List

Wrench, Torque (0-200 inch-pounds)	GGG-W-686, No. 6 (or equivalent)
Platform, Aircraft Maintenance	Type B-1

Materials List

Pins, Cotter (1/16-inch diameter steel)	MS24665-134
Pins, Cotter (5/64-inch diameter steel)	MS24665-210

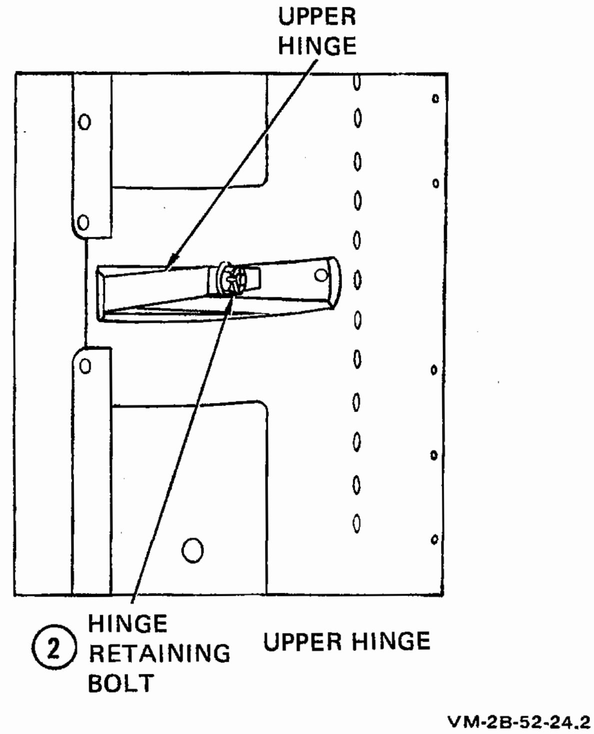
Note

Prior to installing rudder, inspect rudder support fittings bushing holes for a maximum diameter of 0.3835 inches and inspect rudder support bushings for looseness. If bushing holes exceed the maximum diameter of 0.3835 or if bushings show evidence of looseness, replace the bushing in accordance with Structural Repair Manual (NAVAIR 01-60GCB-3).

1. Have two helpers position and align rudder hinges with upper and lower hinge fittings on trailing edge of vertical stabilizer.

2. Install hinge bolt through upper rudder hinge and upper hinge fitting. Using a torque wrench (GGG-W-686, No. 6), torque nut 5 to 25 inch-pounds. Safety nut with cotter pin (MS24665-134).

3. Install hinge bolt through lower rudder hinge and lower hinge fitting. Install washer and nut. Torque to 30 to 40 inch-pounds and safety with cotter pin (MS24665-210). Check installed rudder for vertical loose play. Loose play shall not exceed .003 inches maximum axial play of bushing (MS28913).



Step 2—Para. 3-130

4. Install attach bolt through rudder drive rod rod end and lower rudder hinge. Install washer and nut. Tighten nut and safety with cotter pin (MS24665-134).

5. Install bonding jumper on rudder at lower hinge.

6. Refer to paragraph 3-135 and adjust rudder travel and stops.

7. Refer to paragraph 3-94 and perform an operational check of the directional control system.

3-131. RUDDER TRIM TAB ADJUSTMENT.

3-132. The rudders are equipped with ground adjustable trim tabs. The tabs (figure 3-22) are located at the upper trailing edge of each rudder. The tabs aerodynamically balance the rudder to keep directional trim changes to a minimum. To adjust the rudder trim tabs, obtain the following listed equipment and materials and proceed as follows:

Tools and Equipment List

Platform Aircraft Maintenance	Type B-1 (or equivalent)

Materials List

Bar Stock, Aluminum Alloy	2024-T4
Rod, Aluminum Alloy (1/2-inch diameter) or	2024-T4
Tubing, Aluminum Alloy (1/2-inch diameter, 0.049-inch wall thickness)	2024-T4
Rivet, Aluminum Alloy	MS20470DD6-20

Note

It will be necessary to manufacture a trim tab adjustment tool before adjusting a tab(s). Obtain the materials listed and see figure 3-22 for fabrication dimensions.

In the following steps, all tab adjust measurements are to be made with reference to the rudder trailing edge strip(s). See figure 3-22.

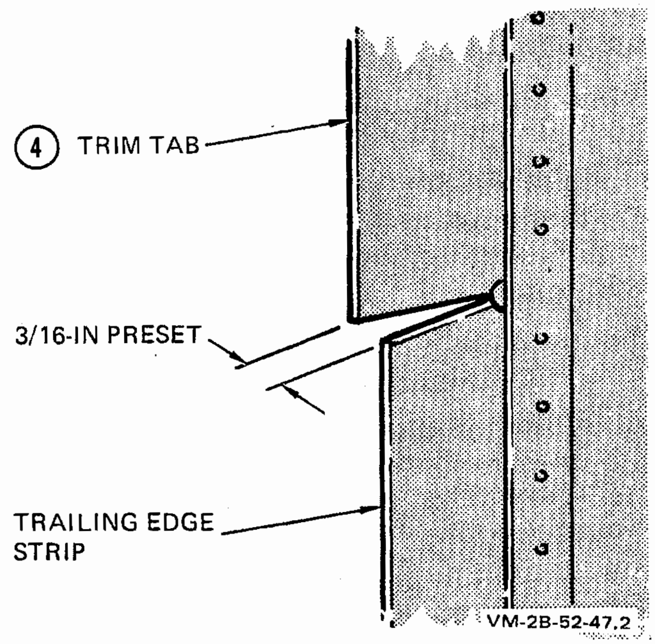
If, after flight testing, tab adjustment is necessary, both tabs must be adjusted in the same direction to the same dimension.

3-133. GROUND ADJUSTMENT.

1. If only one rudder is being replaced, bend trim tab in same direction and to same dimension as the opposite rudder installed on the aircraft.

2. Have pilot flight test aircraft (paragraph 3-134). If tab adjustment is required, see figure 3-22 for instructions.

3. If both rudders have been replaced, bend each tab on each replacement rudder to the same dimension as the tabs on the rudders that have been removed. If this is not possible, preset each tab 3/16 inch to the left (correction for aircraft yaw to the left).



Step 3—Para. 3-133

4. Have pilot flight test aircraft (paragraph 134). If tab adjustment is required, see figure 3-22 for instructions.

3-134. FLIGHT TEST.

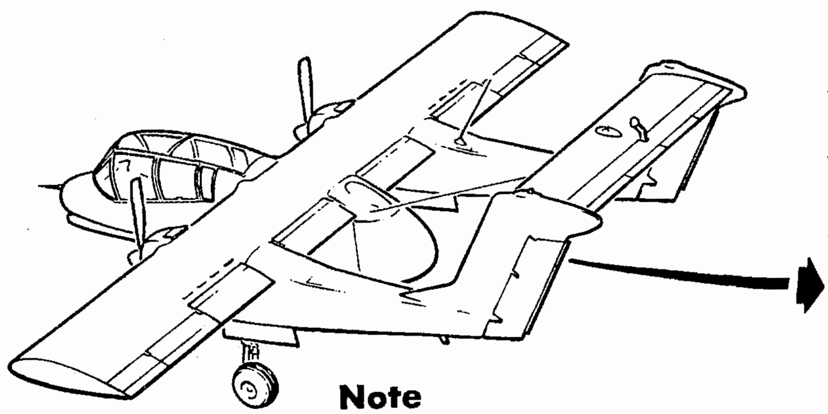
1. Have a pilot fly and trim the aircraft for straight and level flight at 190 KIAS, at altitude between 5000 and 10,000 feet.

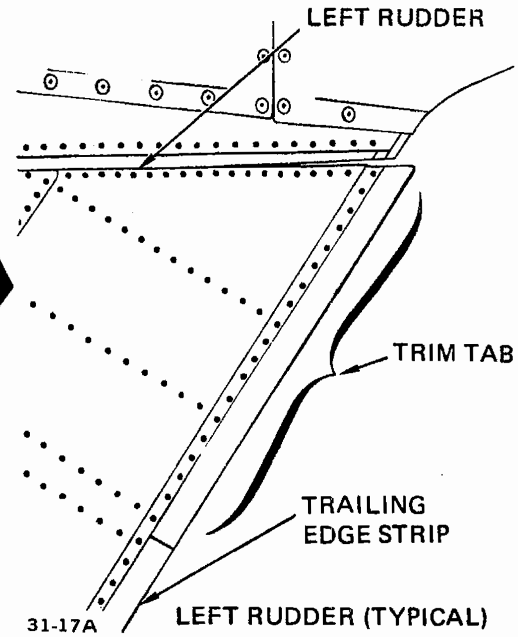
2. Have pilot place aircraft in neutral directional trim and note position of ball in turn and slip indicator.

3. See figure 3-22 for instructions and adjust tabs as required.

3-135. RIGGING AND ADJUSTING THE DIRECTIONAL CONTROL SYSTEM.

3-136. To rig and adjust the directional control system, see figure 3-23 and proceed as follows:





Note

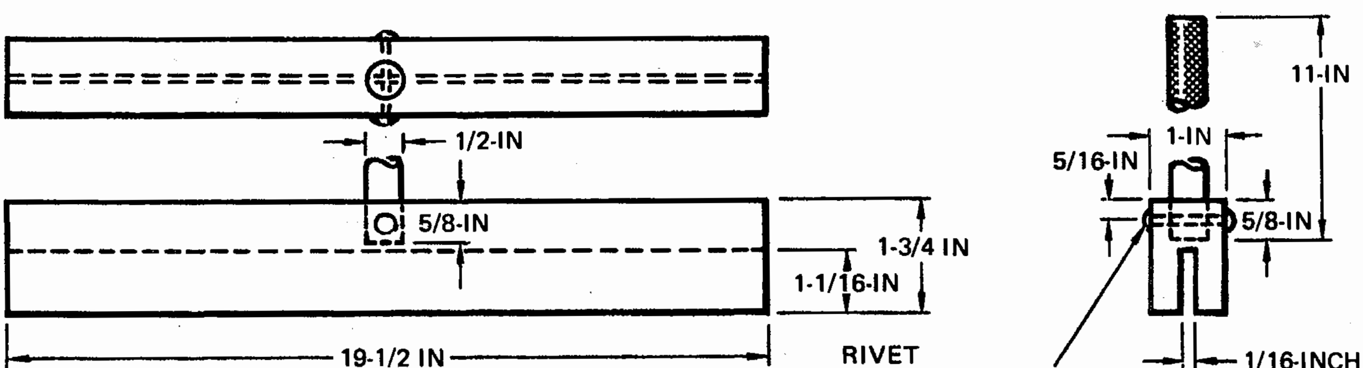
Left yaw indications shown in table below — right yaw opposite.

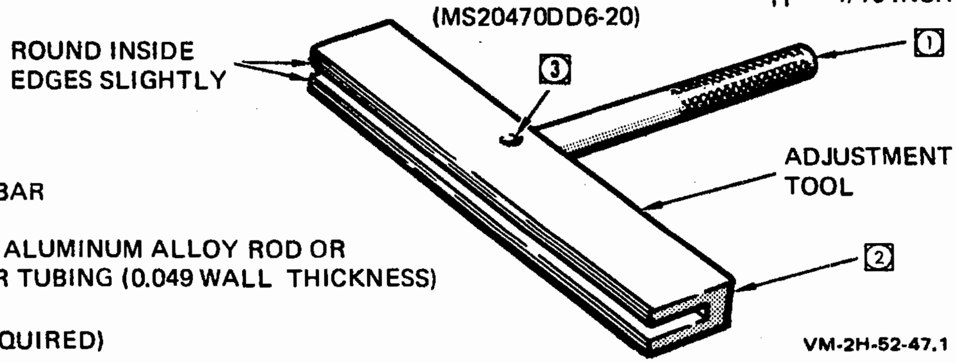
Trim tab adjustment value is in addition to the 3/16 inch preset in tab.

When adjusting tabs, all measurements are to be made with reference to the rudder trailing edge strip.

TURN AND SLIP INDICATOR	ADJUST TRIM TABS
	0
1/16-INCH	1/8-INCH LEFT

TURN AND SLIP INDICATOR	ADJUST TRIM TABS
3/32-INCH	1/4-INCH LEFT
1/8-INCH	3/8-INCH LEFT





MATERIALS

1 2024-T4 ALUMINUM ALLOY BAR

2 2024-T4 1/2-INCH DIAMETER ALUMINUM ALLOY ROD OR 2024-T42 1/2-INCH DIAMETER TUBING (0.049 WALL THICKNESS)

3 MS20470DD6-20 RIVET (1 REQUIRED)

Figure 3-22. Rudder Trim Tab Adjustment

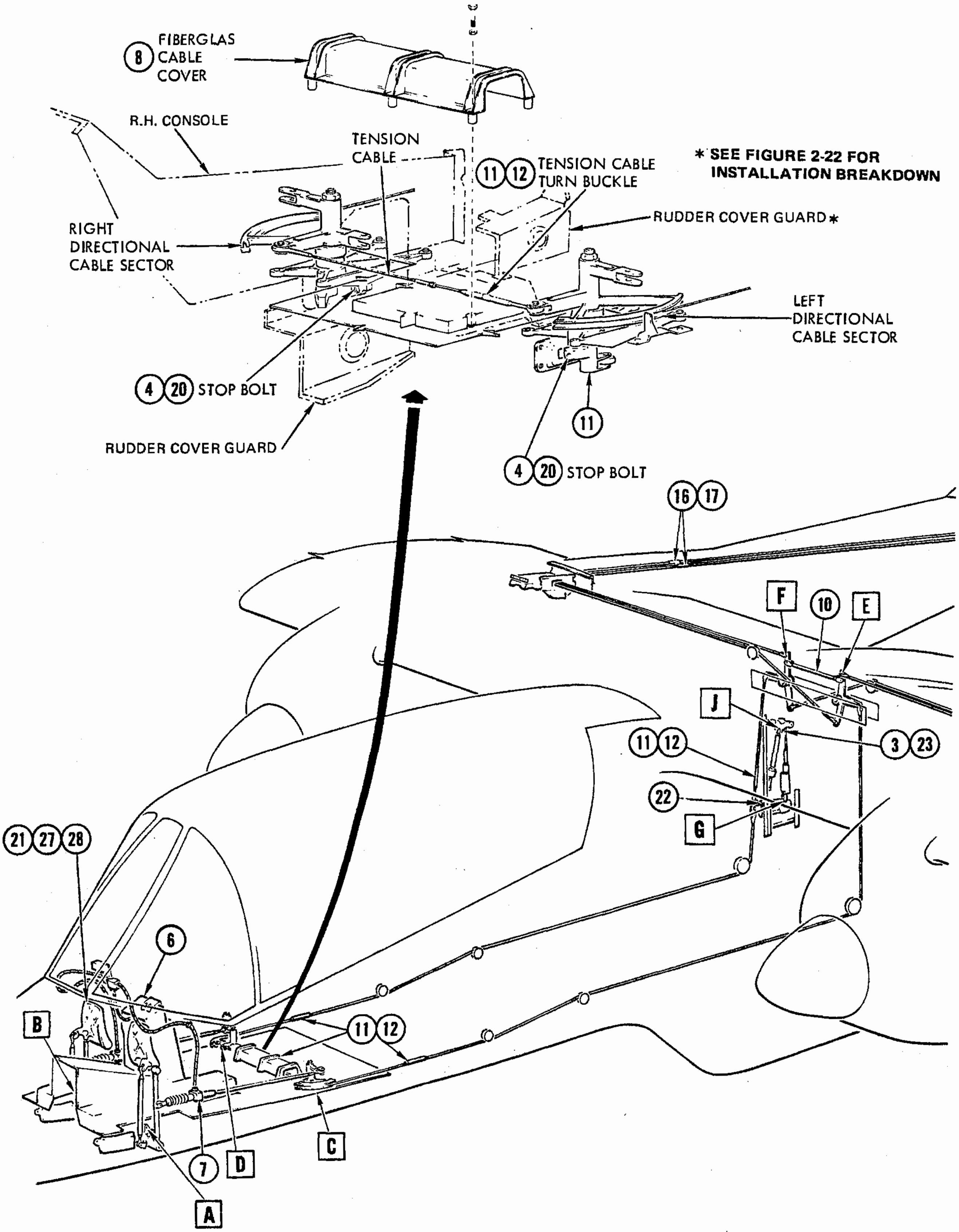


Figure 3-23. Rigging and Adjusting Directional Control System (Sheet 1 of 2)

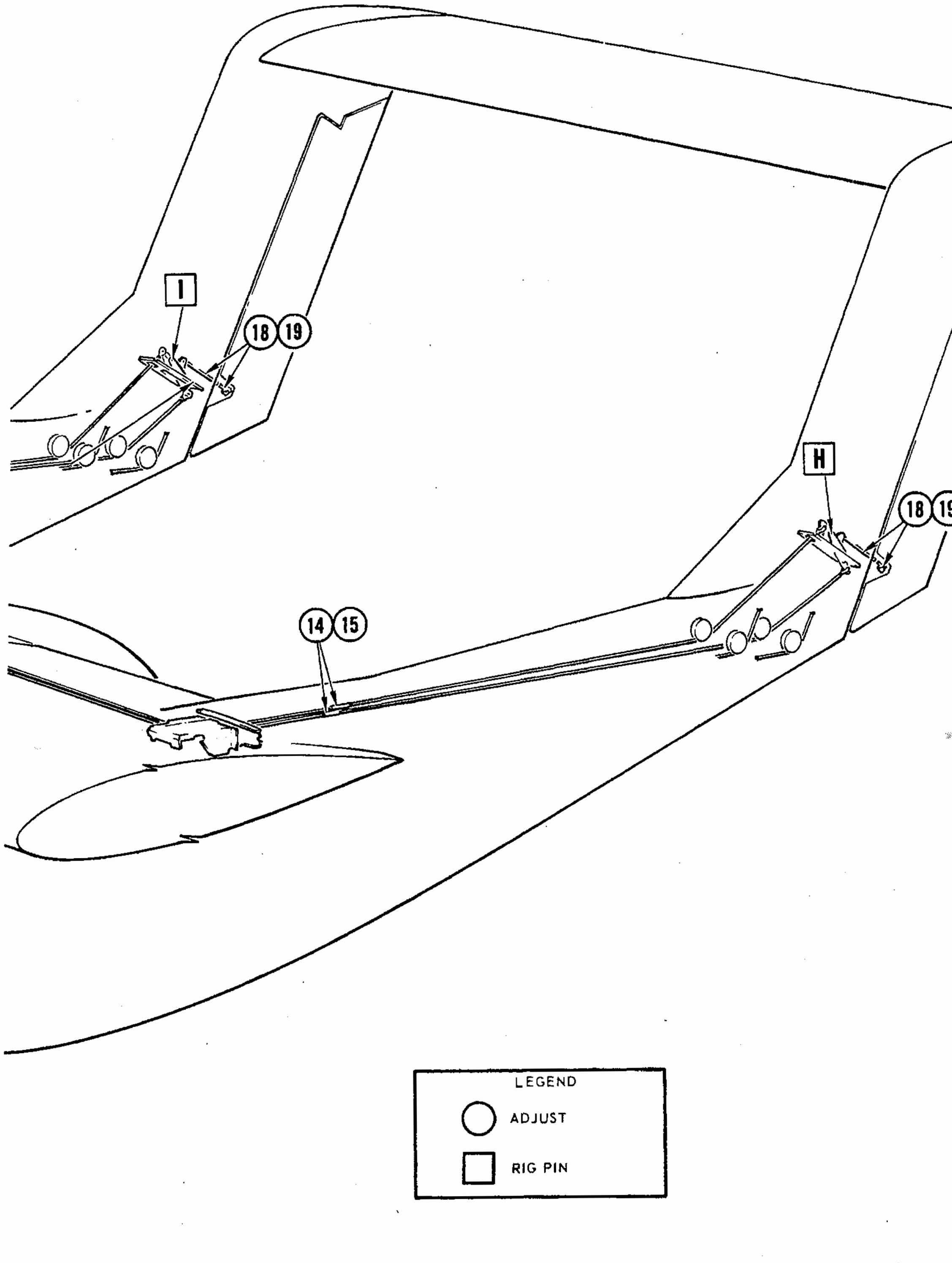


Figure 3-23. Rigging and Adjusting Directional Control System (Sheet 2 of 2)

Tools and Equipment List

Platform, Aircraft Maintenance	Type B-1 (or equivalent, two required)
Power Unit, Electrical Mobile	NC-8A (or equivalent)
Fixture, Rudder Rigging	T3393 (two required)
Bundle, Rig Pin	T3382
Gage, Force, Push/Pull (0-100 pounds)	S131 (or equivalent) (or equivalent)
Tensiometer, Cable	T-5-8002-105-00 (or equivalent)
Wrench, Torque (0-200 inch-pounds)	GGG-W-686,No.6 (or equivalent)

Materials List

Clips, Locking, Turnbuckle (0.028-inch diameter steel)	MS21256-2
Lockwire (0.032-inch diameter steel)	MS20995F32
Pins, Cotter (1/16-inch diamter steel)	MS24665-134

Note

In the following procedure, rig pins must be installed and removed in the order given.

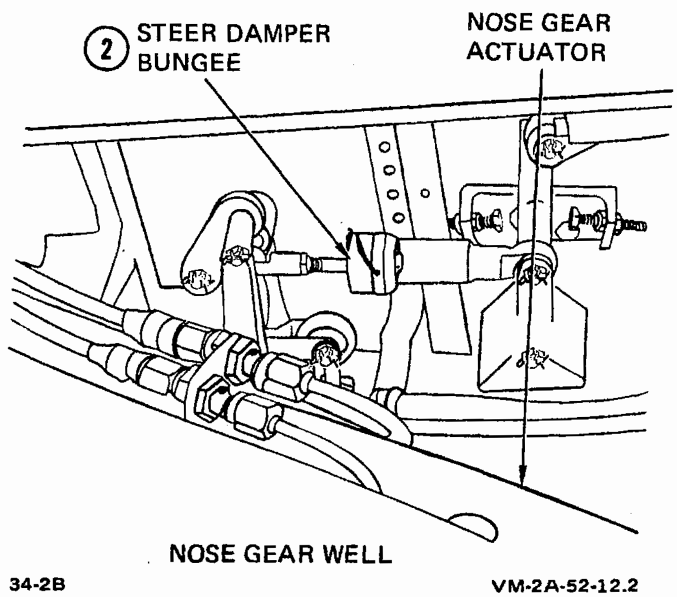
Where indicated, adjustments to cables and drive rods must be made so that related rig pins can be installed in the respective rig pin holes without binding. Rig pins must never be installed under pressure.

Diameters and lengths of pins to be used in this procedure, are indicated by dash numbers (-7 for example) stamped on the arm of each pin in rig bundle T3382.

Cable tension values given are for 70°F. For any other ambient temperature, see figure 3-17 for correct tension values.

1. Before beginning to rig the system, refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for location, and remove the access panels listed in table 3-8.

2. Disconnect steer damper bungee, located at aft end of nose wheel well, above nose gear actuator.

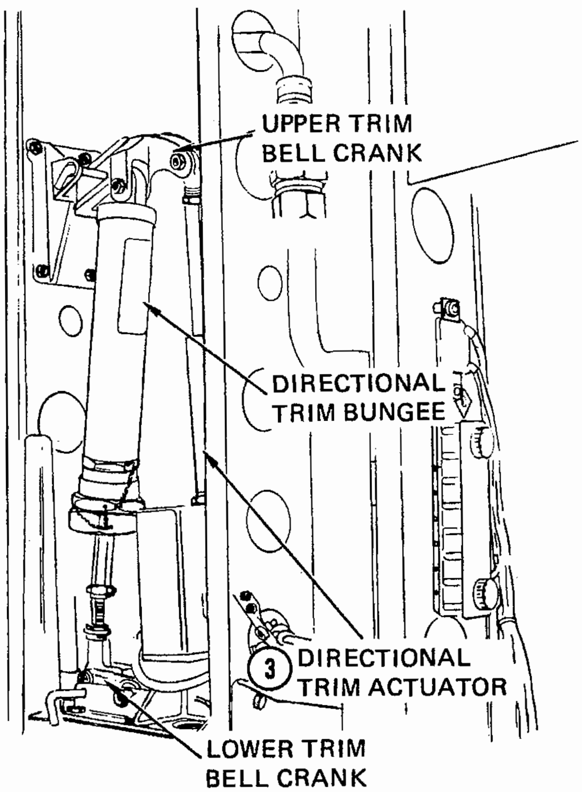


Step 2—Para. 3-135

Table 3-8. Directional Control System Access Panels

PANEL NUMBER	DESCRIPTION	PANEL NUMBER	DESCRIPTION
1	LEFT-HAND MASTER BRAKE CYLINDER	112	CONTROLS
3	CONTROLS	131	CONTROLS
76	CONTROLS	132	CONTROLS, RUDDER
78	RIGHT-HAND MASTER BRAKE CYLINDER	149	CONTROLS
101	CONTROLS	150	CONTROLS, RUDDER

3. Remove rear wall panel from right side of cargo bay. Disconnect directional trim actuator from upper trim bell crank. Disconnect directional trim bungee from lower trim bell crank.

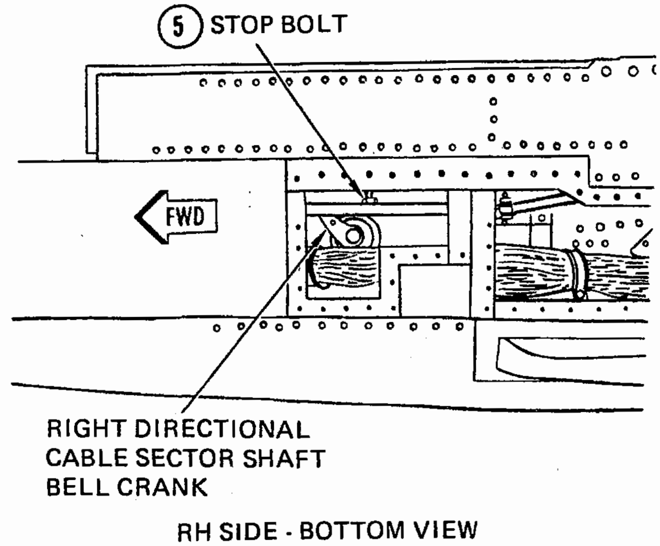


Step 3—Para. 3-135

4. Remove forward cockpit rudder control cover assembly (AFC No. 60 incorporated). Retain hardware for reinstallation.

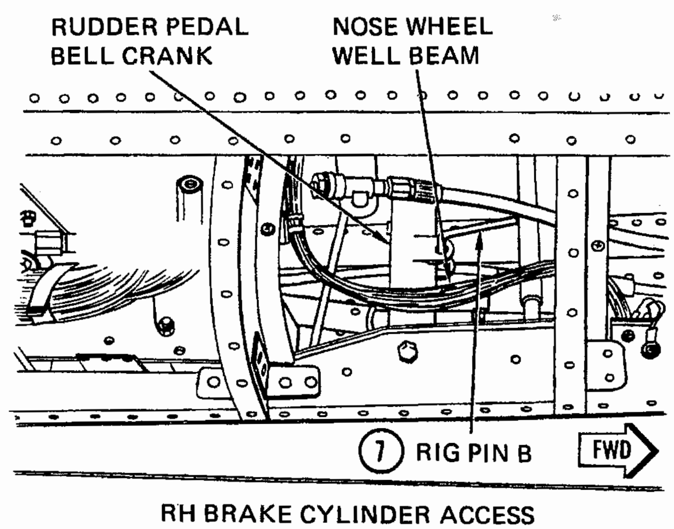
5. See figure 3-23 and locate left and right directional cable sectors. Locate stop bolt on each sector. Cut lockwire on jamnuts, loosen jamnuts, and screw in stop bolts.

6. If available, connect mobile power unit (NC-8A or equivalent) to aircraft. Turn electrical system ON. Electrically operate directional trim switch to "in trim" position (until trim light comes on). Turn electrical system OFF.



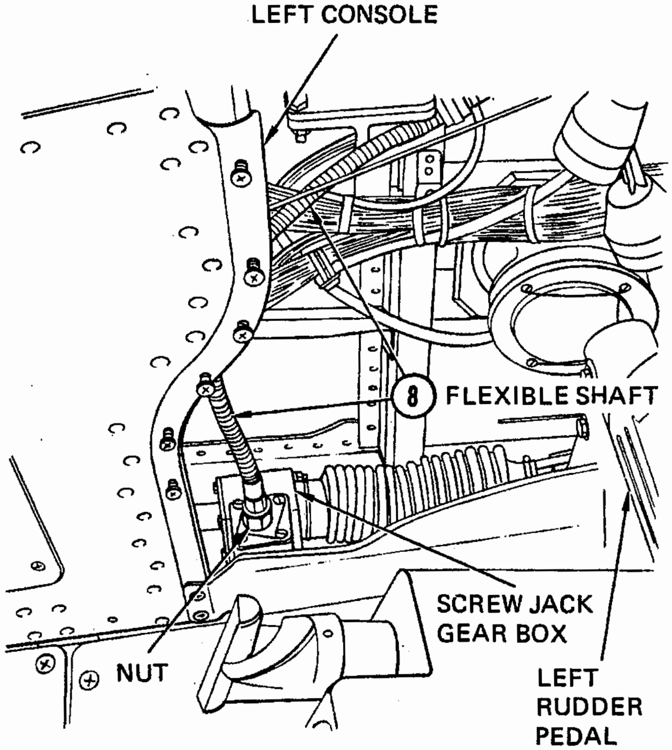
Step 5—Para. 3-135

7. Turn rudder pedal adjust crank until rig pin A (-9) can be inserted through left rudder pedal and brake bell cranks and into nose wheel well beam. Insert rig pin B (-9) through right rudder pedal and brake bell cranks into right nose wheel well beam.



Step 7—Para. 3-135

8. If rig pin B (-9) cannot be installed, remove forward side panel from pilot's left console, and disconnect left flexible shaft from screw-jack gearbox. Have helper turn rudder pedal adjust crank until rig pin B (-9) can be installed. Connect shaft to gearbox. Using a torque wrench (GGG-W-686, No. 6), torque nut 10 to 15 inch-pounds. Safety nut with lockwire (MS20995F32). Ensure that shaft casing does not turn when nut is tightened. Reinstall side panel on console.

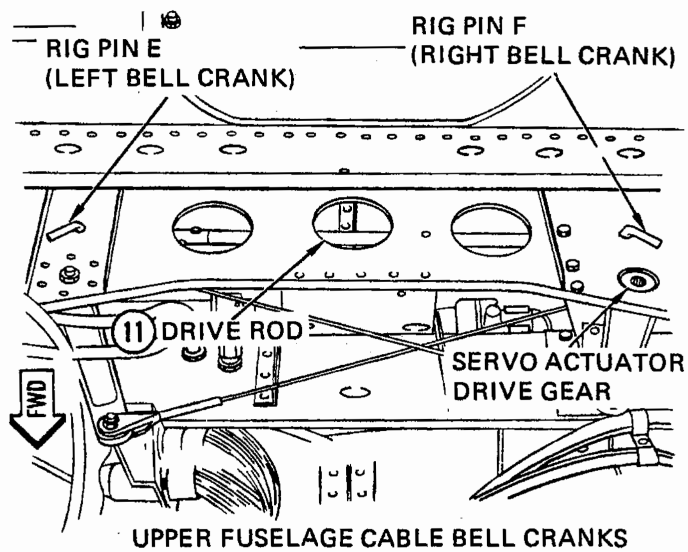


Step 8—Para. 3-135

9. Raise pilot's seat and remove fiberglas cable cover from floor. Remove locking clip from turnbuckle on tension cable connecting both directional cable sectors. Remove armor plate panels below observer's rudder pedals, and locate left and right fuselage cable turnbuckles. Remove locking clips from both turnbuckles.

10. Locate yaw damper actuator on cargo bay ceiling above hydraulic power unit. Remove mounting bracket bolts and swing down power unit. Refer to paragraph 3-123 and remove actuator. Locate left and right upper fuselage cable bell cranks aft of rear wing spar.

11. Insert rig pin E (-7) in left upper fuselage cable bell crank. Remove drive rod at left upper fuselage cable bell crank and adjust until rig pin F (-7) can be installed in right upper fuselage cable bell crank. Tighten jamnut against rod end and safety attach bolt with cotter pin (MS24665-134).

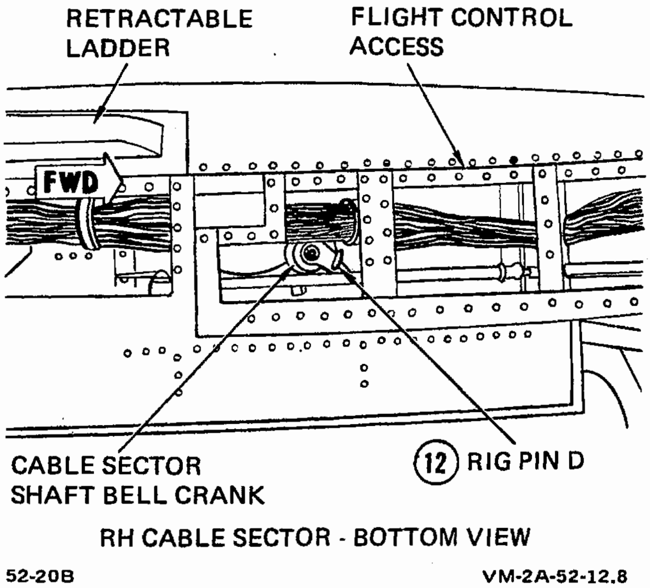


Step 11—Para. 3-135

Note

In the following steps, all rig pins must fit in the respective rig pin holes simultaneously, at the proper cable tension, without binding.

12. Alternately adjust tension cable turnbuckle, left and right fuselage cable turnbuckles, and upper aft fuselage cable turnbuckle until rig pins C (-5) and D (-5) can be installed in left and right cable sectors and rig pin G (-5) can be installed in lower trim bell crank simultaneously.



Step 12—Para. 3-135

Step 13—Para. 3-135

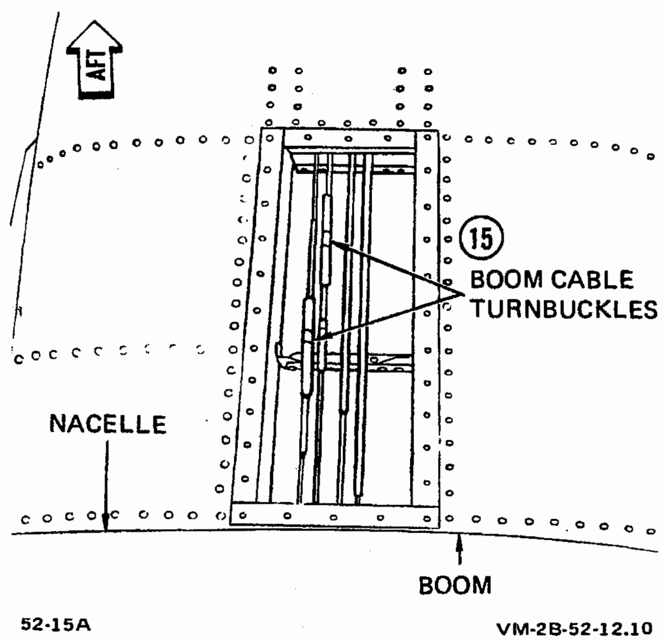
13. Remove rig pins C, D, and G. Using a tensiometer (T-5-8002-105-00), check cable tension at left and right fuselage cables (1/8-inch diameter). Tension must be 80 (±5) pounds. If necessary, again adjust tension cable turnbuckle, left and right fuselage cable turnbuckles, and upper aft fuselage cable turnbuckle, until rig pins C (-5), D (-5), and G (-5) freely fit the respective rig pin holes and fuselage cable tension is 80 (±5) pounds. Fuselage cable tension must be measured with rig pins C, D, and G removed.

14. Once properly adjusted, safety tension cable turnbuckle, fuselage cable turnbuckles, and upper aft cable turnbuckle with locking clips (MS21256-2). Remove rig pins A, B, C and D.

Note

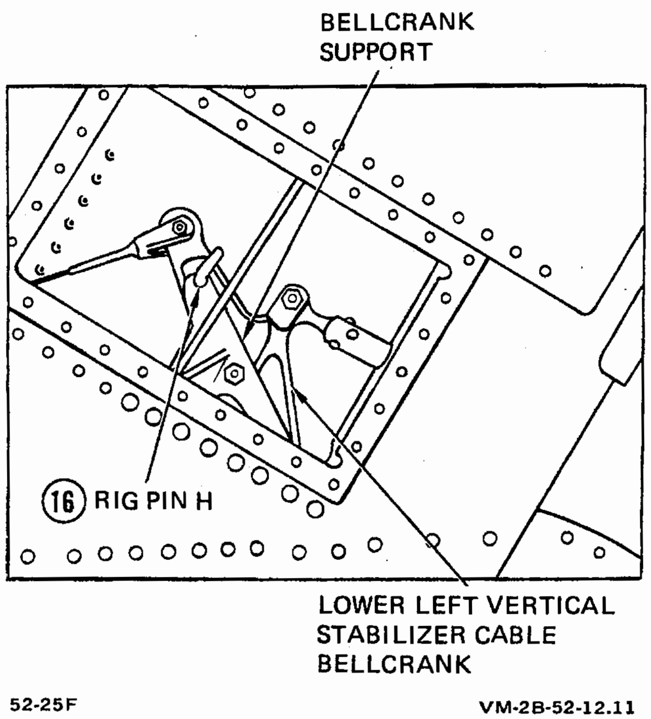
In the following steps, the left and right boom directional cables must be adjusted to 100 (±5) pounds while rig pins E, F, G, H, and I all fit freely in the respective rig pin holes.

15. Alternately adjust left upper and lower boom directional cable turnbuckles until rig pin H (-5) can be inserted freely through left lower vertical stabilizer bell crank and support.



Step 15—Para. 3-135

16. Remove rig pin H (-5) and check cable tension. Using a tensiometer (T-5-8002-105-00), again adjust boom cable turnbuckles until cables (1/8-inch diameter) have a tension of 100 (±5) pounds and rig pin H (-5) fits in left lower cable bell crank and support without binding.

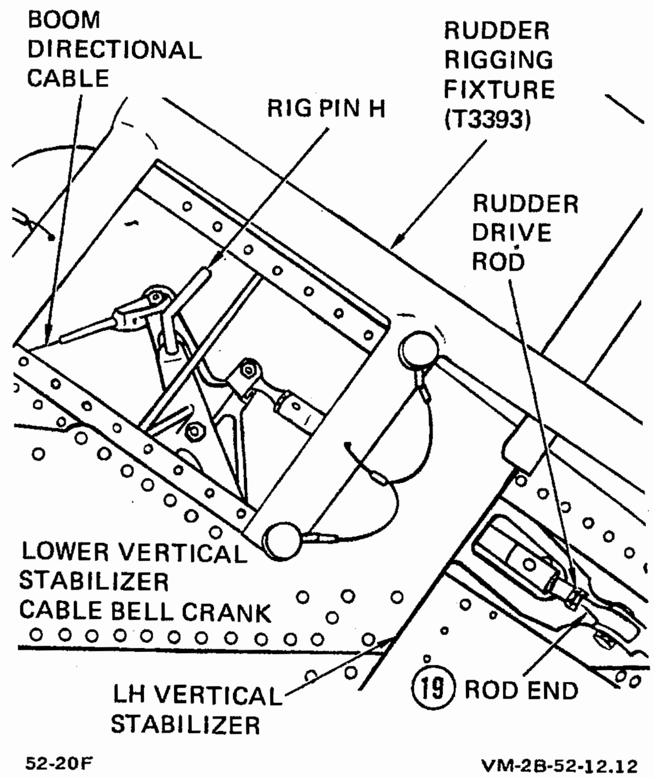


Step 16—Para. 3-135

16. Alternately adjust right upper and lower boom directional cable turnbuckles until rig pin I (-5) can be freely inserted through right lower vertical stabilizer cable bell crank and support.

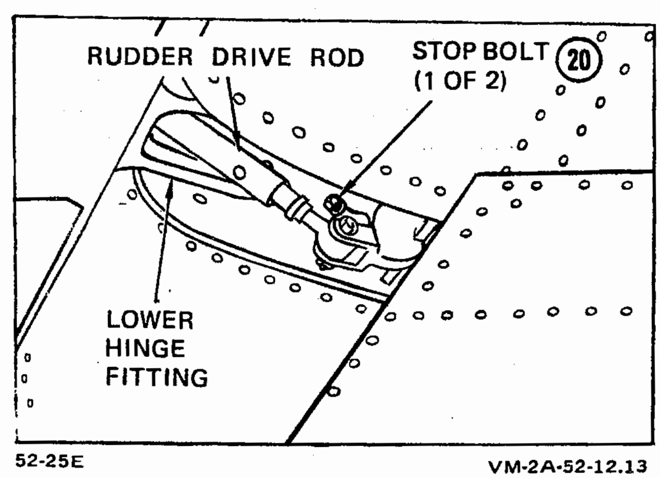
18. Remove rig pin I (-5) and check cable tension. Using a tensiometer (T-5-8002-105-00), again adjust both boom cable turnbuckles until cables (1/8-inch diameter) have a tension of 100 (±5) pounds and rig pin I (-5) fits right lower cable bell crank and support without binding. Reinstall rig pins H and I.

19. Install rudder rigging fixtures (T3393) around access panels on left side of each vertical stabilizer. Adjust left and right rudder drive rod rod ends to position trailing edge of each rudder at 0 (±1/4) degrees (neutral). Tighten jamnuts against rod ends and safety attach bolts with cotter pins (MS24665-134).



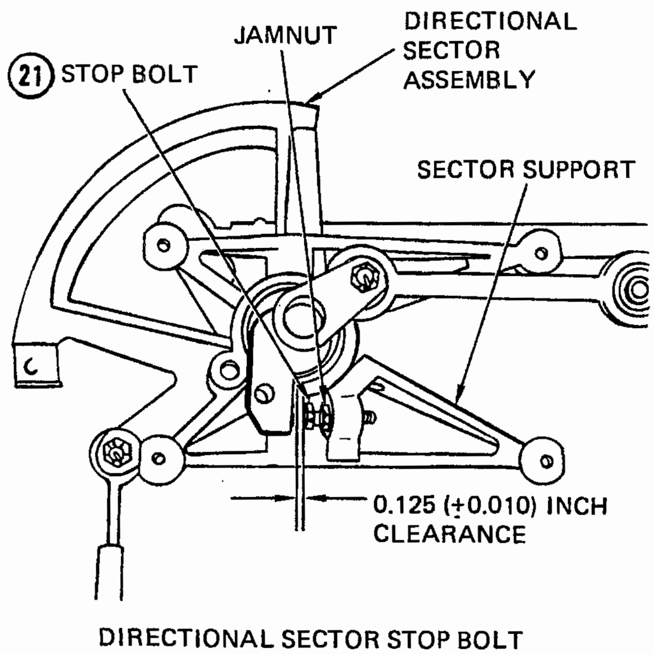
Step 19—Para. 3-135

20. Locate rudder stop bolts at lower rudder hinge fittings. Loosen jamnuts and adjust bolts to limit rudder travel to 25 (±1/2) degrees to left and right of neutral (0 degrees). Tighten stop bolt jamnuts and safety with lockwire (MS20995F32).



Step 20—Para. 3-135

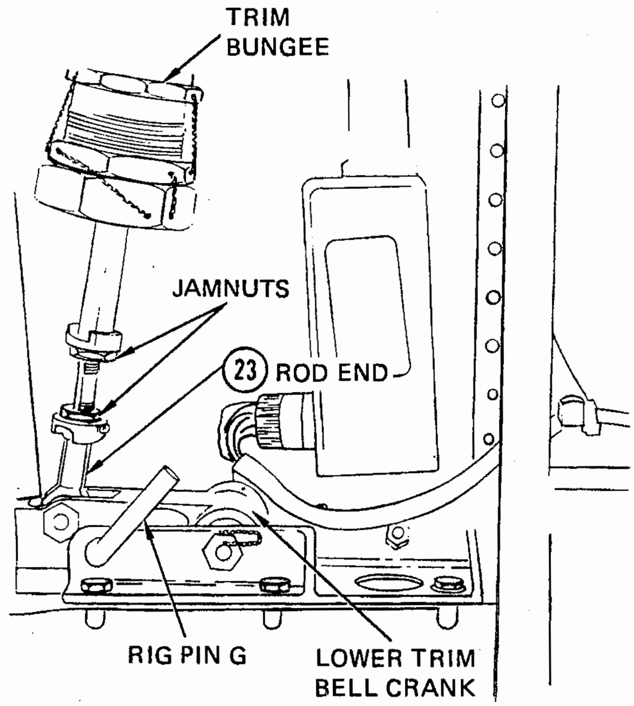
21. Locate left directional cable sector stop bolt. Have helper push and hold left rudder pedal forward until both rudders contact left stop bolts. Set left sector stop bolt clearance at 0.125 (±0.010) inch. Have helper push and hold right rudder pedal forward. Set right sector stop clearance at 0.125 (±0.010) inch. Tighten jamnut stop bolts and safety with lockwire (MS20995F32).



Step 21—Para. 3-135

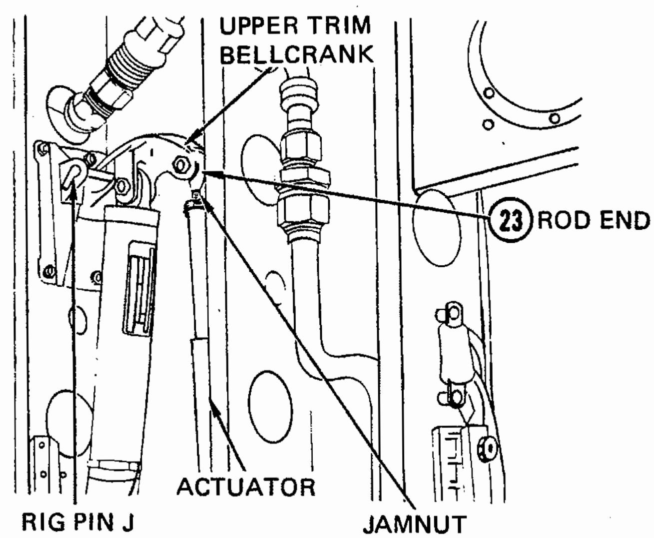
22. Attach a push/pull force gage (S131) to right rudder pedal. A maximum force of 7 pounds is required to move rudders from full left to full right. A force of greater than 7 pounds indicates excessive friction in system. Check all bearings for binding. Check all pulleys and cables for alignment. Check complete system to isolate and correct cause of excessive friction.

23. Install rig pin J (-5) in upper trim bell crank and rig pin G (-5) in lower trim bell crank. Adjust trim bungee rod end until it can be easily attached to lower trim bell crank. Tighten both jamnuts and safety to lock washers with lockwire (MS20995F32). Safety attach bolt with cotter pin (MS24665-134). Remove rig pins G and J.



Step 23—Para. 3-135

24. Turn aircraft electrical system ON. Check that rudders are "in trim" as indicated by rudder trim light in cockpit. Turn electrical system OFF. Adjust actuator rod end until it can be easily attached to upper trim bell crank. Tighten jamnut against lock washer and safety with lockwire (MS20995F32). Safety attach bolt with cotter pin (MS24665-134).



Step 24—Para. 3-135

25. Refer to paragraph 3-123 and reinstall actuator. Reposition hydraulic power unit and secure with two mounting bolts. Using a torque wrench (GGG-W-686, No. 6), torque mounting bolts 50 to 70 inch-pounds.

26. Recheck security of all components in directional control system. Ensure that all bolts are tightened and safetied and all jamnuts are tightened and lockwired. Check that all cables have proper tension.

27. Refer to paragraph 3-95 and perform a ground check of the yaw damper system.

28. To check force trim system, neutralize rudder pedals. Turn aircraft electrical system ON and run directional trim to full nose left (NL). Using a force gage (S131), apply force to right rudder pedal until helper indicates trailing edge of rudder is neutral (0 degrees). Force required must be 76 (± 5) pounds. Run directional trim to full nose right (NR), apply force to left rudder pedal, and repeat procedure. Force must again be 76 (± 5) pounds.

29. Retrim rudders until rudder "in trim" light in cockpit comes on. Turn electrical system OFF. Using a push/pull force gage (S131), push on right rudder pedal until helpers indicate trailing edges of rudders are at 24 (± 1/2) degrees. Pedal force must be 68 (± 5) pounds. Apply force to left rudder pedal and repeat procedure. Force again must be 68 (± 5) pounds.

30. Install nose gear steer damper bungee and safety with cotter pin (MS24665-134).

31. Reinstall forward cockpit rudder control cover assembly (AFC No. 60 incorporated). See figure 2-22.

32. Check all components for security. Check all access areas for loose tools and equipment. Install fiberglas tension cable cover to floor below pilot's seat. Install right rear wall panel in cargo bay.

33. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for location, and install access panels listed in table 3-8.

3-137. WING FLAP SYSTEM.

3-138. Organizational maintenance for the wing flap system includes operational check procedures, system trouble shooting, rigging, adjusting, and component removal and installation. These procedures provide all the instructions necessary to maintain the wing flap systems within the limits of organizational level tools and facilities. Each procedure will include, as required, lists of tools and materials, and illustrations to clarify instructions and accomplish component location.

3-139. OPERATIONAL CHECK.

3-140. The following procedure provides the instructions necessary to accomplish a general verification of wing flap system operation. This procedure is performed when operational check does not warrant a detailed verification of operating forces, travel limitation, etc. To perform an operational check of the wing flap system, see figures 3-24 and 3-25 and proceed as follows:

CAUTION

The aircraft cargo door must be closed when operating the wing flaps to prevent damage to the cargo door and flaps.

1. With electrical power applied to the aircraft, operate FLAPS handle on pilot's left-hand console and observe right and left wings and position indicator on pilot's instrument panel. The flaps should deflect downward as the handle is moved to the DOWN position and return to a faired position as the handle is moved to the UP position. The flaps should stop in any position achieved between full up and full down when the handle is placed in the HOLD position. The flaps should position at the 20-degree position when the handle is placed in the T/O position. At all times, the position indicator should reflect flap position.

2. With FLAP handle in HOLD position, lower and raise flaps electrically with ALT FLAPS switch on pilot's left-hand console. Note that electrical operation is considerably slower than normal operation.

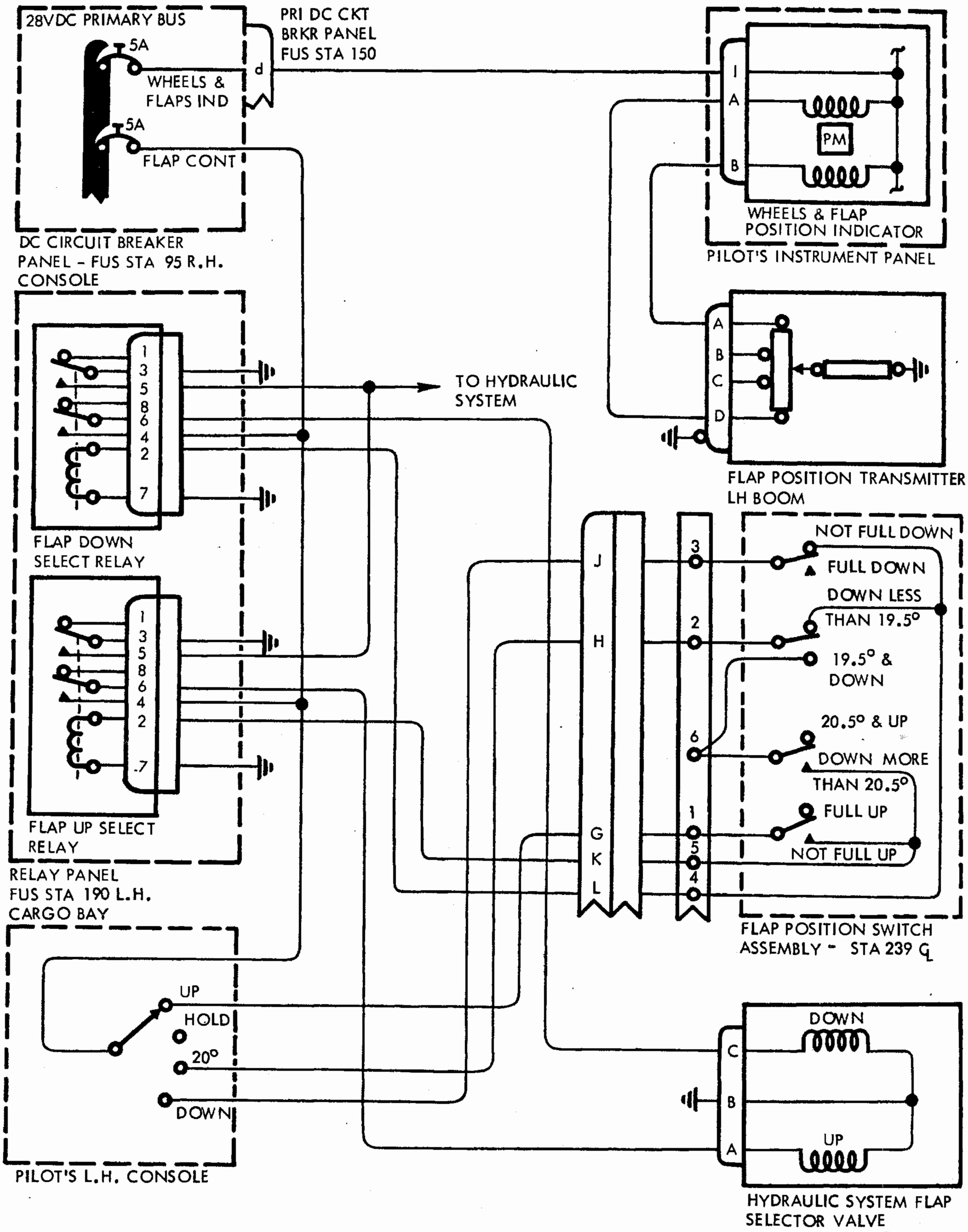


Figure 3-24. Wing Flap System Normal Electrical Schematic

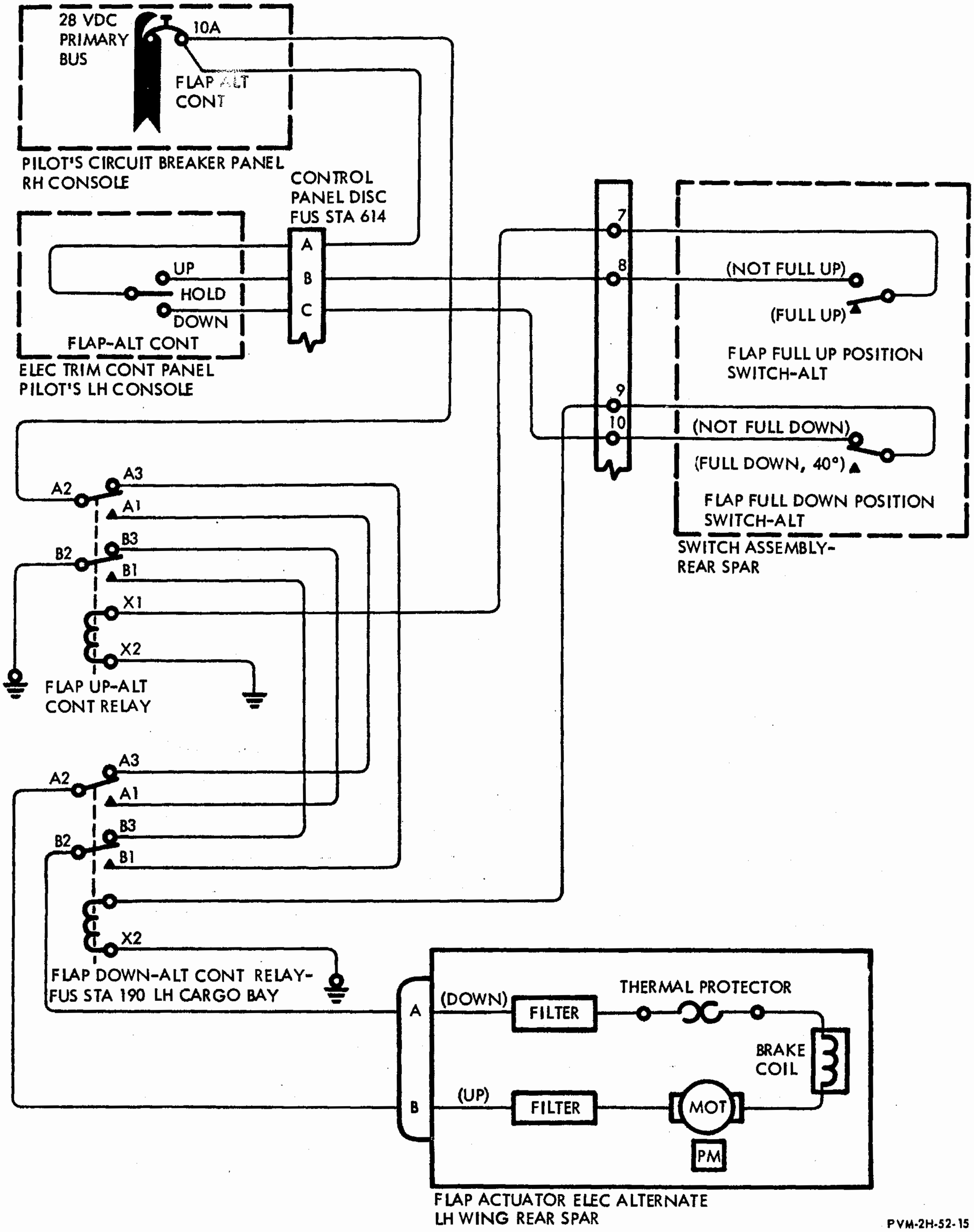


Figure 3-25. Wing Flap System Alternate Electrical Actuation Schematic

3-141. TROUBLESHOOTING.

3-142. To troubleshoot the wing flap system in the normal and alternate operating modes, refer to Wiring Data Manual (NAVAIR 01-60GCB-2-7) for wiring diagrams, and to tables 3-9 and 3-10 for instructions.

Table 3-9. Troubleshooting Normal (Hydraulic) Wing Flap System

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: FLAPS WILL NOT EXTEND TO ANY POSITION.		
1. FLAP CONT circuit breaker CR67.	Check that FLAP CONT circuit breaker is engaged.	Engage FLAP CONT circuit breaker or continue troubleshooting.
2. Pilot's NORMAL flap control switch S48 defective in T/O position.	Place flap handle in T/O position. Turn electrical system ON. Using a multimeter (AN/PSM-4), test point CCAA and ground. Turn electrical system OFF.	Replace flap control switch or continue troubleshooting.
3. Flap position switch S98 sticking or broken.	Place flap handle in T/O position. Turn electrical system ON. Using a multimeter (AN/PSM-4), check for 28 volts dc between test point CCAB and ground. Turn electrical system OFF.	Replace position switch S96 or continue troubleshooting.
4. Flap position switch S98 improperly rigged.	Refer to paragraph 3-185 to adjust position control switch assembly.	Refer to paragraph 3-185 and adjust control switch piston rod end. Replace control switch assembly, or continue troubleshooting.
5. Pilot's NORMAL flap control switch S48 defective in DOWN position.	Place flap handle in DOWN position. Turn electrical system ON. Using a multimeter (AN/PSM-4), check for 28 volts dc between test point CCAC and ground. Turn electrical system OFF.	Refer to paragraph 3-145 and replace flap control switch or continue troubleshooting.
6. Flap position switch S94 defective.	Place flap handle in DOWN position. Turn electrical system ON. Using a multimeter (AN/PSM-4), check for 28 volts dc between test point CCAB and ground. Turn electrical system OFF.	Refer to paragraph 3-173 to replace position switch or continue troubleshooting.
7. FLAP DOWN SELECT relay K39 defective.	Place flap handle in DOWN position. Turn electrical system ON. Using a multimeter (AN/PSM-4), check for 28 volts dc between test point CCAD and ground <u>and</u> between test point CMC and ground. Turn electrical system OFF.	Replace FLAP DOWN SELECT relay or continue troubleshooting.
8. Flap hydraulic selector valve defective.	Using a multimeter (AN/PSM-4), check for continuity between test points CCAD and CCAE.	Refer to paragraph 3-153 to replace hydraulic selector valve or continue troubleshooting.
9. Hydraulic pump power circuit defective.	Refer to table 4-1.	Refer to table 4-1.
10. Flap actuator (s) improperly adjusted causing internal binding.	Refer to paragraph 3-185 for proper adjustment.	Refer to paragraph 3-185 and adjust flap actuator.

Table 3-9. Troubleshooting Normal (Hydraulic) Wing Flap System (Cont)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: FLAPS WILL NOT EXTEND TO ANY POSITION. (Cont)		
11. Position control switch assembly improperly rigged.	Refer to paragraph 3-185 to rig switch assembly.	Refer to paragraph 3-185 and adjust control switch assembly rod end.
TROUBLE: FLAPS WILL NOT RETRACT TO ANY POSITION.		
1. FLAP CONT circuit breaker CB67 disengaged.	Check that FLAP CONT circuit breaker is engaged.	Engage FLAP CONT circuit breaker or continue troubleshooting.
2. Pilot's NORMAL flap control switch S48 defective in T/O position.	Place flap handle in T/O position. Turn electrical system ON. Using a multimeter (AN/PSM-4), check for 28 volts dc between test point CCAA and ground. Turn electrical system OFF.	Refer to paragraph 3-145 to replace flap control switch or continue troubleshooting.
3. Flap position switch S98 defective.	Place flap handle in T/O position. Turn electrical system ON. Using a multimeter (AN/PSM-4), check for 28 volts dc between test point CCAF and ground. Turn electrical system OFF.	Refer to paragraph 3-173 to replace flap position switch or continue troubleshooting.
4. Flap position switch S97 defective.	Place flap handle in T/O position. Turn electrical system ON. Using a multimeter (AN/PSM-4), check for 28 volts dc between CCAG and ground. Turn electrical system OFF.	Refer to paragraph 3-145 to replace flap position switch or continue troubleshooting.
5. FLAP UP SELECT relay K38 defective.	Place flap handle in T/O position. Turn electrical system ON. Using a multimeter (AN/PSM-4), check for 28 volts dc between test point CMC and ground and between test point CCAH and ground.	Replace FLAP UP SELECT relay or continue troubleshooting.
6. Flap hydraulic selector valve defective.	Using a multimeter (AN/PSM-4), check for continuity between test points CCAE and CCAH.	Refer to paragraph 3-153 to replace hydraulic selector valve or continue troubleshooting.
7. Hydraulic pump power circuit defective.	Refer to table 4-1.	Refer to table 4-1.
TROUBLE: FLAPS WILL NOT EXTEND TO FULL DOWN POSITION.		
1. Flap actuator(s) improperly adjusted.	Refer to paragraph 3-185 for proper adjustment.	Refer to paragraph 3-185 and adjust actuator(s) or continue troubleshooting.
2. Full DOWN position switch S94 improperly adjusted.	Check alignment of flap trailing edges with boom fairings.	Refer to paragraph 3-173 to replace position control switch assembly.
3. Position control switch assembly improperly rigged.	Refer to paragraph 3-185 to rig switch assembly.	Refer to paragraph 3-185 to adjust control switch assembly rod end.

Table 3-9. Troubleshooting Normal (Hydraulic) Wing Flap System (Cont)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: FLAPS WILL NOT RETRACT TO FULL UP POSITION.		
1. Flap surface up travel stop bolts improperly adjusted.	Refer to paragraph 3-185 for proper adjustment.	Refer to paragraph 3-185 and adjust stop bolts or continue troubleshooting.
2. Flap actuator(s) improperly adjusted.	Refer to paragraph 3-185 for proper adjustment.	Refer to paragraph 3-185 to adjust actuator(s), or continue troubleshooting.
3. Full UP position switch S100 improperly adjusted.	Check alignment of flap trailing edges with boom fairings.	Refer to paragraph 3-173 to replace position control switch assembly, or continue troubleshooting.
4. Position control switch improperly rigged.	Refer to paragraph 3-185 to rig switch assembly.	Refer to paragraph 3-185 to adjust control switch assembly rod end.
TROUBLE: FLAPS CONTINUE TO EXTEND IN HOLD POSITION.		
1. Pilot's NORMAL flap control switch S48 defective in HOLD position.	Place flap handle in HOLD position. Turn electrical system ON. Using a multimeter (AN/PSM-4), check for 28 volts dc between test point CCAA and ground and between test point CCAC and ground. Turn electrical system OFF.	Refer to paragraph 3-173 and replace flap control switch or continue troubleshooting.
2. FLAP DOWN SELECT relay K39 defective in HOLD position.	Place flap handle in HOLD position. Turn electrical system ON. Using a multimeter (AN/PSM-4), check for 28 volts dc between test point CCDC and ground and between CMC and ground. Turn electrical system OFF.	Replace FLAP DOWN SELECT relay.
TROUBLE: FLAPS CONTINUE TO RETRACT IN HOLD POSITION.		
1. Pilot's NORMAL flap control switch S48 defective in HOLD position.	Place flap handle in HOLD position. Turn electrical system ON. Using a multimeter (AN/PSM-4), check for 28 volts dc between test point CCAJ and ground. Turn electrical system OFF.	Refer to paragraph 3-173 to replace flap control switch S48 or continue troubleshooting.
2. FLAP UP SELECT relay K38 defective.	Place flap handle in HOLD position. Turn electrical system ON. Using a multimeter (AN/PSM-4), check for 28 volts dc between test point CCAH and ground and between CMC and ground. Turn electrical system OFF.	Replace UP select relay.
TROUBLE: HYDRAULIC POWER SYSTEM CONTINUES TO OPERATE WITH FLAPS IN FULL DOWN POSITION.		
1. Flap actuator(s) improperly adjusted.	Refer to paragraph 3-185 for proper adjustment.	Refer to paragraph 3-185 to adjust actuator(s) or continue troubleshooting.

Table 3-9. Troubleshooting Normal (Hydraulic) Wing Flap System (Cont)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: HYDRAULIC POWER SYSTEM CONTINUES TO OPERATE WITH FLAPS IN FULL DOWN POSITION. (Cont)		
2. Flap full DOWN position switch S94 sticking or broken.	Place flap handle in DOWN position. Turn electrical system ON. Using a multimeter (AN/PSM-4), check for 28 volts dc between test point CCAB and ground. Turn electrical system OFF.	Refer to paragraph 3-173 to replace position control switch assembly or continue troubleshooting.
3. Control switch assembly improperly rigged.	Refer to paragraph 3-185 to rig switch assembly.	Refer to paragraph 3-185 to adjust control switch assembly rod end or continue troubleshooting.
4. FLAP DOWN SELECT relay K39 defective.	Place flap handle in DOWN position. Turn electrical system ON. Using a multimeter (AN/PSM-4), check for 28 volts dc between test point CCDC and ground and between test point CMC and ground. Turn electrical system OFF.	Replace FLAP DOWN SELECT relay.
TROUBLE: HYDRAULIC POWER SYSTEM CONTINUES TO OPERATE WITH FLAPS IN FULL UP POSITION.		
1. Flap actuator improperly adjusted.	Refer to paragraph 3-185 for proper adjustment.	Refer to paragraph 3-185 to adjust actuator or continue troubleshooting.
2. Flap full UP position switch S100 sticking, improperly rigged, or broken.	Place flap handle in UP position. Turn electrical system ON. Using a multimeter (AN/PSM-4), check for 28 volts dc between test point CCAG and ground. Turn electrical system OFF.	Refer to paragraph 3-173 to replace position control switch assembly, or continue troubleshooting.
3. FLAP UP SELECT relay K38 defective.	Place flap handle in UP position. Turn electrical system ON. Using a multimeter (AN/PSM-4), check for 28 volts dc between test point CCAH and ground and between test point CMC and ground. Turn electrical system OFF.	Replace FLAP UP SELECT relay.

Table 3-10. Troubleshooting Alternate (Electrical) Wing Flap System

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: FLAPS WILL NOT EXTEND TO ANY POSITION.		
1. FLAP CONT ALT circuit breaker CB111 disengaged.	Check that FLAP CONT ALT circuit breaker is engaged.	Engage FLAP CONT ALT circuit breaker or continue troubleshooting.
2. ALTERNATE flap control switch S60 defective.	Hold ALTERNATE flap control switch in DOWN position. Using a multimeter (AN/PSM-4), check for continuity between test points CCBA and CCBB.	Replace control switch or continue troubleshooting.

Table 3-10. Troubleshooting Alternate (Electrical) Wing Flap System (Cont)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: FLAPS WILL NOT EXTEND TO ANY POSITION. (Cont)		
3. ALTERNATE full DOWN position switch S95 sticking or broken.	Turn electrical system ON. Hold ALTERNATE flap control switch in DOWN position. Using a multimeter (AN/PSM-4), check for 28 volts dc between test point CCBC and ground. Turn electrical system OFF.	Refer to paragraph 3-173 to replace position control switch assembly or continue troubleshooting.
4. ALTERNATE full DOWN position switch S95 improperly rigged.	Refer to paragraph 3-185 to adjust position control switch assembly.	Refer to paragraph 3-185 to adjust control switch piston rod end. Refer to paragraph 3-173 to replace control switch assembly or continue troubleshooting.
5. FLAP UP ALT CONT relay K93 defective.	Turn electrical system ON. Using a multimeter (AN/PSM-4), check for 28 volts dc between test point CCBD and ground. Turn electrical system OFF.	Replace FLAP UP ALT CONT or continue troubleshooting.
6. FLAP DOWN ALT CONT relay K94 defective.	Turn electrical system ON. Place ALTERNATE flap control switch in DOWN position. Using a multimeter (AN/PSM-4), check for 28 volts dc between test point CCBE and ground. Turn electrical system OFF.	Replace FLAP DOWN ALT CONT or continue troubleshooting.
7. Electrical ALTERNATE flap motor defective.	Turn electrical system ON. Place ALTERNATE flap control switch in DOWN position. Turn electrical system OFF.	Replace ALTERNATE flap motor or continue troubleshooting.
8. Flap actuator(s) improperly adjusted causing internal binding.	Refer to paragraph 3-185 for proper adjustment.	Refer to paragraph 3-185 to adjust actuator(s).
TROUBLE: FLAPS WILL NOT RETRACT TO ANY POSITION.		
1. FLAP CONT ALT circuit breaker CB111 defective.	Check that FLAP CONT ALT circuit breaker is engaged.	Engage FLAP CONT ALT circuit breaker or continue troubleshooting.
2. ALTERNATE flap control switch S60 defective.	Hold flap control switch in UP position. Using a multimeter (AN/PSM-4), check for continuity between test points CCBA and CCBF.	Replace control switch or continue troubleshooting.
3. ALTERNATE full up position switch S99 sticking or broken.	Turn electrical system ON. Hold ALTERNATE flap control switch in UP position. Using a multimeter (AN/PSM-4), check for 28 volts dc between test point CCBC and ground. Turn electrical system OFF.	Refer to paragraph 3-173 and replace position control switch assembly or continue troubleshooting.
4. ALTERNATE full up position switch S99 improperly rigged.	Refer to paragraph 3-185 to adjust position control switch assembly.	Refer to paragraph 3-185 and adjust control switch piston rod end. Refer to paragraph 3-173 and replace control switch assembly or continue troubleshooting.

Table 3-10. Troubleshooting Alternate (Electrical) Wing Flap System (Cont)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: FLAPS WILL NOT RETRACT TO ANY POSITION. (Cont)		
5. FLAP UP ALT CONT relay K93 defective.	Turn electrical system ON. Hold ALTERNATE flap control switch in UP position. Using a multimeter (AN/PSM-4), check for 28 volts dc between test point CCBH and ground. Turn electrical system OFF.	Replace FLAP UP ALT CONT relay or continue troubleshooting.
6. FLAP DOWN ALT CONT relay K94 defective.	Turn electrical system ON. Hold ALTERNATE flap control switch in DOWN position. Using a multimeter (AN/PSM-4), check for 28 volts dc between test point CCBM and ground. Turn electrical system OFF.	Replace FLAP DOWN ALT CONT relay or continue troubleshooting.
7. Electrical ALTERNATE flap motor defective.	Turn electrical system ON. Place ALTERNATE flap control switch in UP position. Turn electrical system OFF.	Replace ALTERNATE flap motor.
TROUBLE: FLAPS WILL NOT EXTEND TO FULL DOWN POSITION.		
1. Flap actuator(s) improperly adjusted causing internal binding.	Refer to paragraph 3-185 for proper adjustment.	Refer to paragraph 3-185 to adjust actuator(s) or continue troubleshooting.
TROUBLE: FLAPS WILL NOT RETRACT TO ANY POSITION.		
1. ALTERNATE flap full DOWN position switch S95 improperly rigged.	Refer to paragraph 3-185 for proper adjustment.	Refer to paragraph 3-185 to adjust control switch piston rod end. Refer to paragraph 3-173 control switch assembly.
TROUBLE: FLAPS WILL NOT RETRACT TO FULL UP POSITION.		
1. Flap surface up travel stop bolts improperly adjusted.	Refer to paragraph 3-185 for proper adjustment.	Refer to paragraph 3-185 to adjust stop bolts or continue troubleshooting.
TROUBLE: FLAPS WILL NOT RETRACT TO FULL UP POSITION.		
2. Flap actuator(s) improperly adjusted.	Refer to paragraph 3-185 for proper adjustment.	Refer to paragraph 3-185 to adjust actuator(s) or continue troubleshooting.
3. ALTERNATE full UP position switch S99 sticking or broken.	Turn electrical system ON. Hold ALTERNATE flap control switch in UP position. Using a multimeter (AN/PSM-4), check for 28 volts dc between test point CCBC and ground. Turn electrical system OFF.	Refer to paragraph 3-185 and replace position control switch assembly or continue troubleshooting.
4. ALTERNATE flap full UP position switch S99 improperly rigged.	Refer to paragraph 3-185 to adjust position control switch assembly.	Refer to paragraph 3-185 to adjust control switch piston rod end. Refer to paragraph 3-173 and replace control switch assembly.

Table 3-10. Troubleshooting Alternate (Electrical) Wing Flap System (Cont)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: FLAPS CONTINUE TO EXTEND IN HOLD POSITION.		
1. ALTERNATE flap control switch S60 defective.	Using a multimeter (AN/PSM-4), check for continuity between test points CCBB and CCBF.	Replace control switch or continue troubleshooting.
2. Flap DOWN ALTERNATE control relay K94 defective.	Turn electrical system ON. Using a multimeter (AN/PSM-4), check for 28 volts dc between test point CCBE and ground. Turn electrical system OFF.	Replace relay.
TROUBLE: FLAPS CONTINUE TO RETRACT IN HOLD POSITION.		
1. ALTERNATE flap control switch S60 defective.	Using a multimeter (AN/PSM-4), check for continuity between test points CCBA and CCBF.	Replace control switch or continue troubleshooting.
2. Flap ALTERNATE control relay K93 defective.	Turn electrical system ON. Using a multimeter (AN/PSM-4), check for 28 volts dc between test point CCBI and ground. Turn electrical system OFF.	Replace relay.
TROUBLE: ALTERNATE FLAP MOTOR CONTINUES TO OPERATE WITH FLAPS FULL DOWN.		
1. Flap actuator(s) improperly adjusted.	Refer to paragraph 3-185 for proper adjustment.	Refer to paragraph 3-185 to adjust actuator(s) or continue troubleshooting.
2. ALTERNATE full DOWN position switch S95 sticking or broken.	Using a multimeter (AN/PSM-4), check for continuity between test points CCBC and CCBJ.	Refer to paragraph 3-173 to replace position control switch assembly or continue troubleshooting.
3. ALTERNATE full DOWN position switch S95 improperly rigged.	Refer to paragraph 3-185 to adjust position control switch assembly.	Refer to paragraph 3-185 to adjust control switch piston rod end or replace control switch assembly.
TROUBLE: ALTERNATE FLAP MOTOR CONTINUES TO OPERATE WITH FLAPS FULL UP.		
1. Flap actuator(s) improperly adjusted.	Refer to paragraph 3-185 for proper adjustment.	Refer to paragraph 3-185 to adjust actuator(s) or continue troubleshooting.
2. ALTERNATE full UP switch S95 sticking or broken.	Using a multimeter (AN/PSM-4), check for continuity between test points CCBK and CCBL.	Refer to paragraph 3-185 and replace position control switch assembly or continue troubleshooting.
3. ALTERNATE full UP switch S95 improperly rigged.	Refer to paragraph 3-185 to adjust position control switch assembly.	Refer to paragraph 3-185 to adjust control switch piston rod end. Refer to paragraph 3-173 and replace control switch assembly.

Tools and Equipment List

Multimeter	AN/PSM-4 (or equivalent)
Power Unit, Mobile	NC-8A (or equivalent)

Note

Whenever electrical power is required to isolate and correct a trouble, use a mobile power unit (NC-8A or equivalent) when available.

3-143. SERVICING.

3-144. No servicing is required on the wing flap system.

3-145. PILOT'S FLAP CONTROL BOX AND SWITCH REMOVAL AND INSTALLATION.

3-146. To remove and install the pilot's flap control box and switch, proceed as follows:

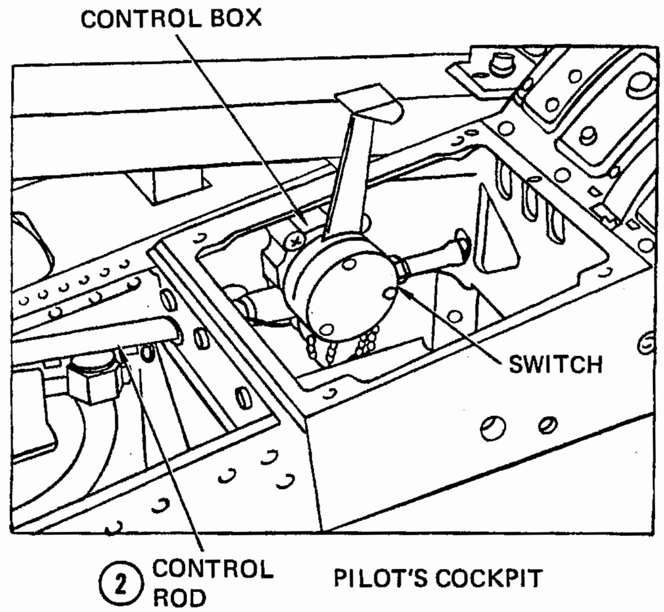
3-147. REMOVING PILOT'S CONTROL BOX AND SWITCH.

1. Remove flap and trim control panel on pilot's left-hand console.

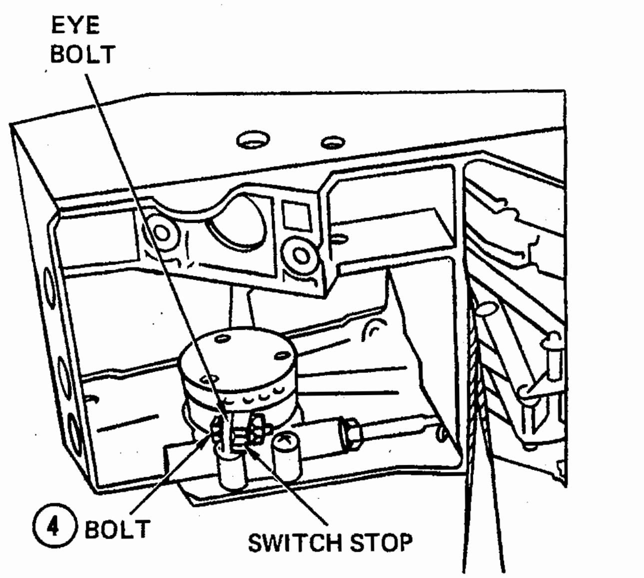
2. Disconnect control rod from control box.

3. Disconnect wires from switch assembly.

4. Remove bolt holding switch stop to eyebolt on lower side of switch and control box assembly.



Step 2—Para. 3-147



Step 4—Para. 3-147

5. Remove nut from outer side of control box and remove switch from box.

6. Remove three screws and eyebolt attaching control box to structure. Remove control box by slipping off of control rod.

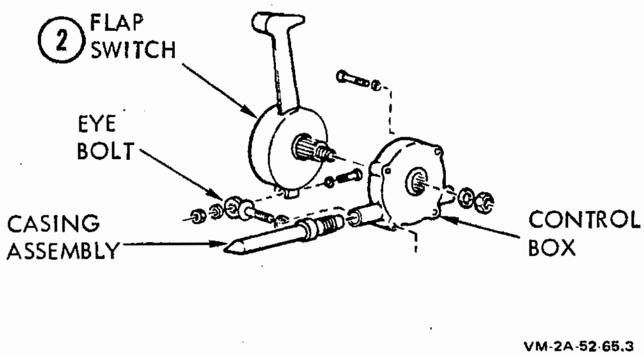
3-148. INSTALLING PILOT'S CONTROL BOX AND SWITCH.

Materials List

Lockwire (0.032-inch diameter steel)	MS20995F32
Pins, Cotter (1/16-inch diameter steel)	MS24665-134

1. Slip control box over control rod and attach to power quadrant casing with screws and eyebolt.

2. Install flap switch on control box.



Step 2—Para. 3-148

3. Install bolt through switch stop and eyebolt (under switch assembly).

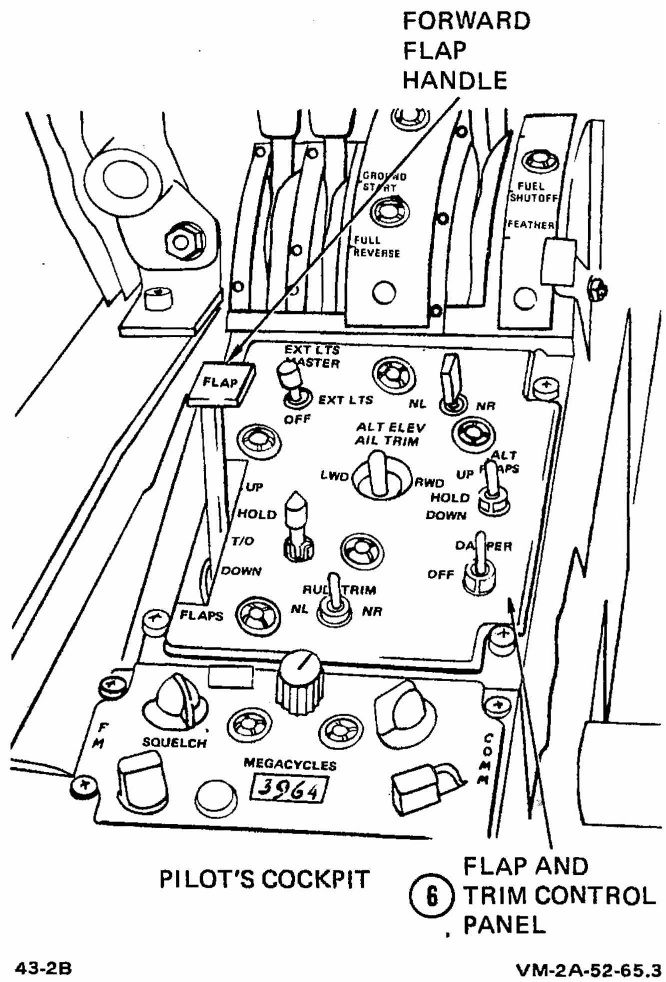
4. With switch in HOLD (second) position install switch in box. Install control cable in control box so that 0.60 (±0.20) inch of cable extends through box. Install casing assembly and cable assembly nuts on control box and safety with lockwire (MS20995F32).

5. Install wires on switch. Refer to Wiring Data Manual (NAVAIR 01-60GCB-2-7).

6. Install flap and trim control panel on pilot's left-hand console.

CAUTION

When installing control panel, ensure wire bundles are routed such that they do not touch the heat and vent ducts.



Step 6—Para. 3-149

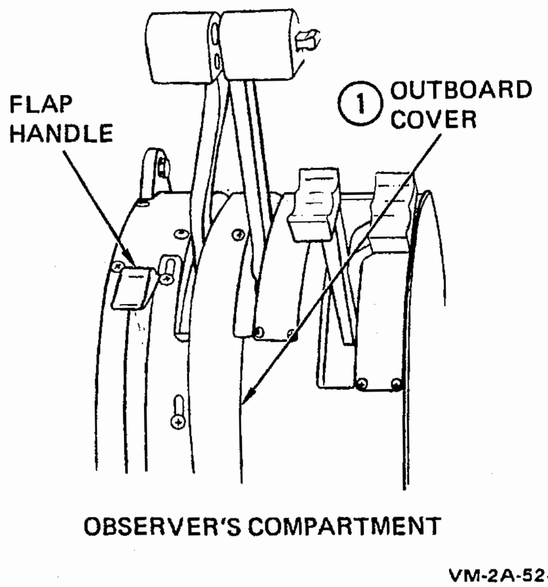
7. Perform operational check of wing flap system (paragraph 3-139).

3-149. OBSERVER'S FLAP CONTROL BOX REMOVAL AND INSTALLATION.

3-150. To remove and install the observer's flap control box, proceed as follows:

3-151. REMOVING OBSERVER'S FLAP CONTROL BOX.

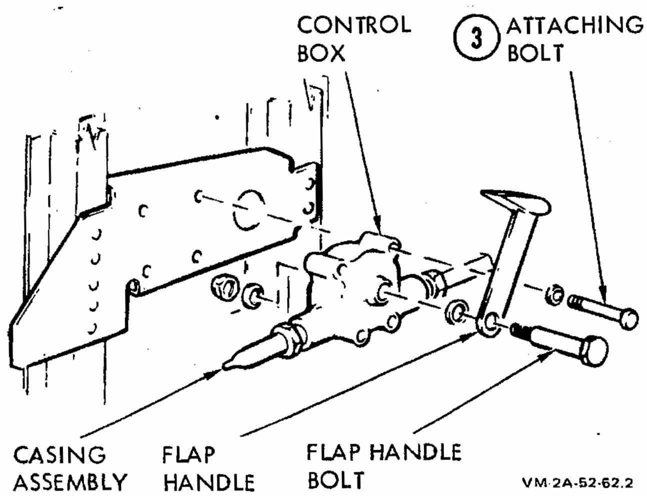
1. Remove outboard cover on aft power quadrant.



Step 1—Para. 3-151

2. Disconnect control cable at aft control box.

3. Remove attaching bolts and remove control box.



Step 3—Para. 3-151

4. Remove flap handle bolt.

3-152. INSTALLING OBSERVER'S FLAP CONTROL BOX.

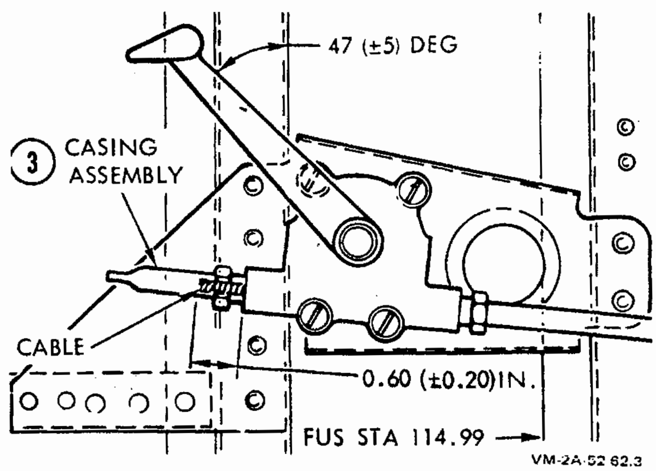
Materials List

Lockwire (0.032-inch diameter steel)	MS20995F32
Pins, Cotter (1/16-inch diameter steel)	MS24665-134

1. Install flap handle bolt and safety with cotter pin (MS24665-134).

2. Install control box on structure with attaching bolts.

3. Remove casing assembly, and install control rod, allowing 0.60 (±0.20) inch of cable to protrude with forward handle at HOLD and aft handle at 47 (±5) degrees. Install casing and cable rod nuts, and safety with lockwire (MS20995F32).



Step 3—Para. 3-152

4. Install outboard power quadrant cover.

3-153. WING FLAP SELECTOR VALVE REMOVAL AND INSTALLATION.

3-154. To remove and install the wing flap selector valve, proceed as follows:

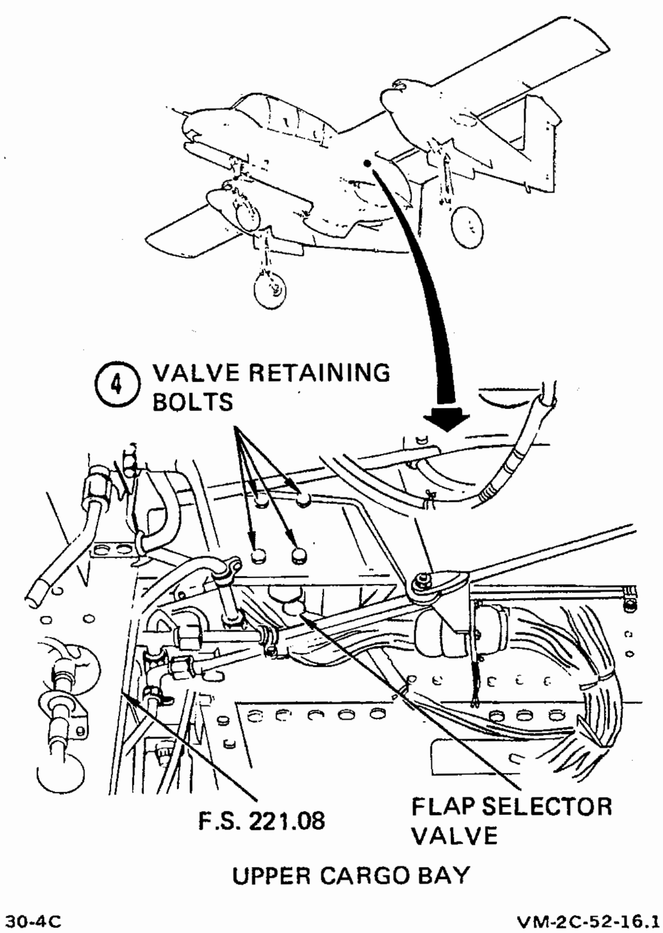
3-155. REMOVING WING FLAP SELECTOR VALVE.

1. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for location, and remove access panel numbered 109 (FLAP MOTOR, ELECTRICAL).

2. Locate flap selector valve to left and below flap-motor gearbox. Disconnect electrical plug from valve receptacle.

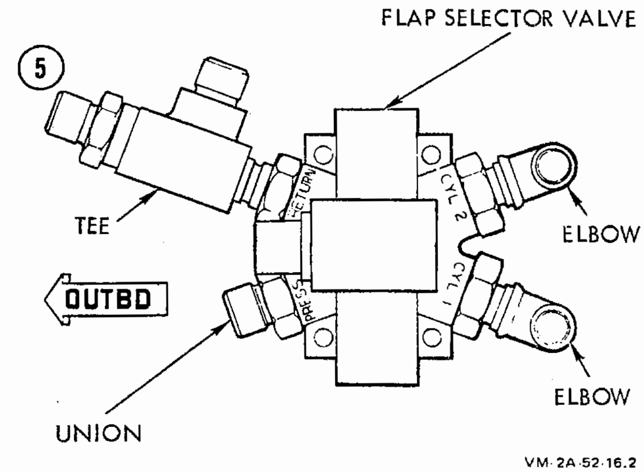
3. Disconnect hydraulic lines from valve fittings and plug to prevent leakage.

4. Remove four retaining bolts and spacers and remove valve, with fittings installed, from aircraft.



Step 4—Para. 3-155

5. Remove four hydraulic fittings from valve ports.



Step 5—Para. 3-155

3-156. INSTALLING WING FLAP SELECTOR VALVE.

Tools and Equipment List

Wrench, Torque (0-200 inch-pounds)	GGG-W-686, No. 6 (or equivalent)

Materials List

O-Ring	MS9058-06 (two required)
Gasket	MS28778-6 (four required)

1. Install four hydraulic fittings in valve ports, using new O-rings and gaskets at each fitting.

2. Position valve in aircraft and install four retaining bolts and spacers. Using a torque wrench (GGG-W-686, No. 6), torque retaining bolts 20 to 25 inch-pounds.

3. Remove plugs and connect hydraulic lines to valve fittings.

4. Connect electrical plug to valve receptacle.

5. Perform servicing of hydraulic system. Refer to paragraph 4-7.

6. Replace wing access panel.

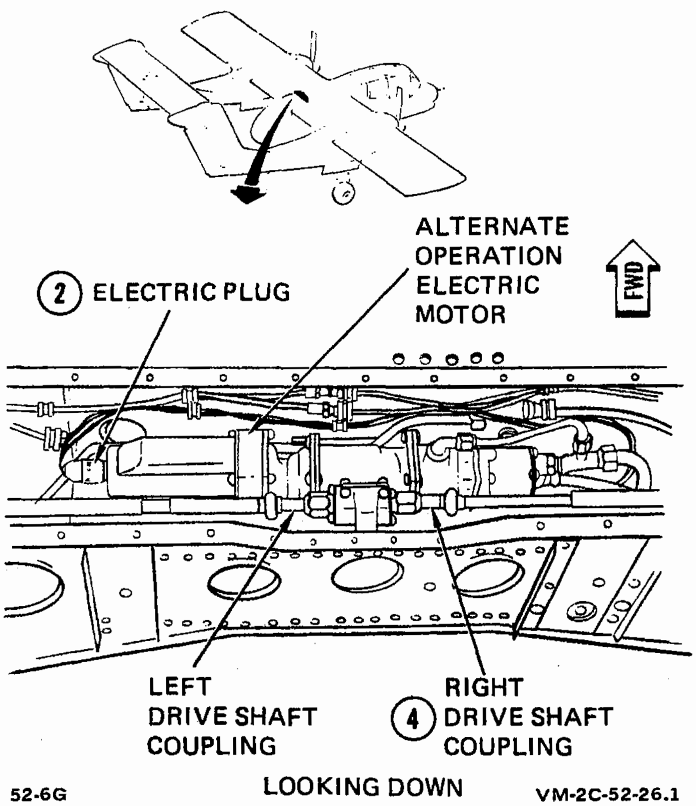
3-157. WING FLAP MOTOR GEARBOX REMOVAL AND INSTALLATION.

3-158. To remove and install the wing flap motor gearbox, proceed as follows:

3-159. REMOVING FLAP MOTOR GEARBOX.

1. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for location, and remove access panel numbered 109 (FLAP MOTOR, ELECTRICAL).

2. Disconnect electrical plug on left side of unit.

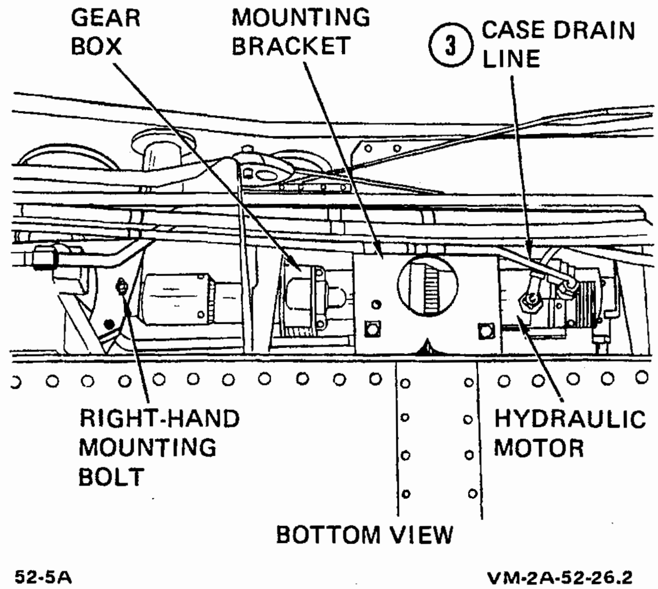


Steps 2 and 4—Para. 3-159

Note

A container should be placed under the hydraulic motor to allow fluid to drain into it.

3. Remove all pressure from system by removing the case drain line at motor fitting on underside of motor.



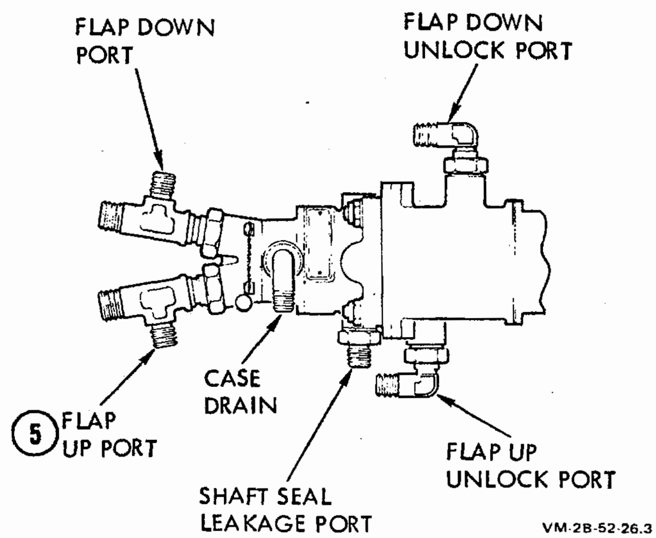
Step 3—Para. 3-159

Note

Drive shafts are spring-loaded inboard toward the motor gearbox assembly. In the following step, in order to disconnect the shafts, a force must be applied outboard from the motor gearbox.

4. Disconnect right and left drive shafts at gearbox couplings.

5. Disconnect flap up, flap down, and shaft seal drain hydraulic lines. Cap all lines to prevent leakage.



Step 5—Para. 3-159

6. Remove four mounting bolts (two on each side) of the motor-gearbox assembly and one bolt mounting the flap alternate actuation electric motor.

7. Remove hydraulic motor-gearbox assembly up through access compartment.

3-160. INSTALLING FLAP MOTOR GEARBOX.

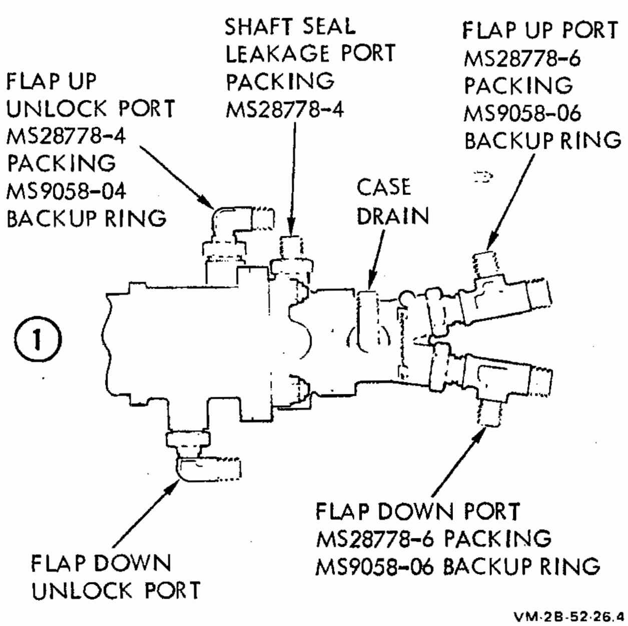
Tools and Equipment List

Wrench, Torque (0-200 inch-pounds)	GGG-W-686, No. 6 (or equivalent)

Materials List

Packing	MS28778-4 (five required)
Backup Ring	MS9058-04 (four required)
Packing	MS28778-6 (two required)
Backup Ring	MS9058-06 (two required)
Lockwire (0.032-inch diameter steel)	MS20995F32

1. Install new packing and backup rings in motor.



Step 1—Para. 3-160

2. Position wing flap motor-gearbox assembly on mounting brackets and install five mounting bolts. Using a torque wrench (GGG-W-686, No. 6), torque mounting bolts 70 to 90 inch-pounds.

3. Remove hydraulic line caps and connect all lines to appropriate tees, unions, and elbows on hydraulic motor.

4. Connect right and left drive shaft couplings to the gearbox. Using a torque wrench (GGG-W-686, No. 6), torque couplings 10 to 15 inch-pounds. Safety with lockwire (MS20995F32).

5. Connect electrical plug to flap alternate actuation motor.

6. Fill and bleed hydraulic motor-gearbox assembly. Refer to paragraph 4-7.

7. Perform an operational check of wing flap system. Refer to paragraph 3-139.

8. Install wing access panel.

3-161. HYDRAULIC MOTOR (WING FLAP MOTOR GEARBOX) REMOVAL AND INSTALLATION.

3-162. To remove and install the hydraulic motor from the flap motor gearbox, proceed as follows:

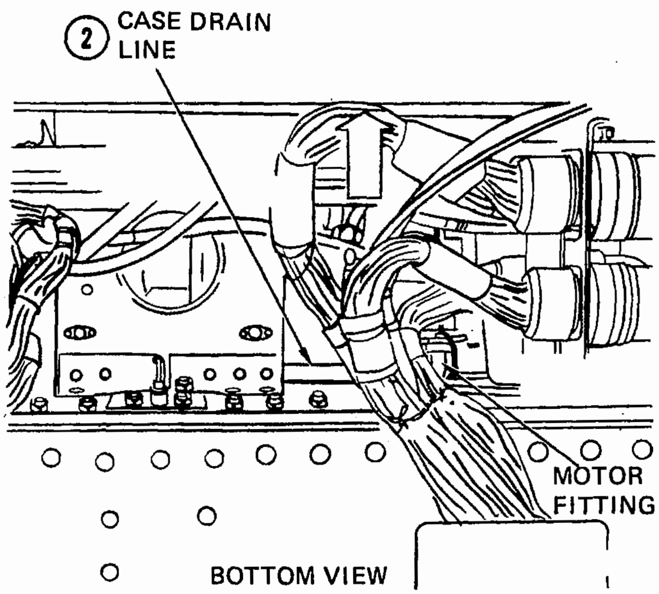
3-163. REMOVING HYDRAULIC MOTOR.

1. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for location, and remove access panel numbered 109 (FLAP MOTOR-ELECTRICAL) from top of wing.

Note

In the following step, a container should be placed under the hydraulic motor to allow hydraulic fluid to drain into it.

2. Remove all pressure from hydraulic system by removing the case drain line at fitting on underside of hydraulic motor.



52-31E VM-2A-52-70.1

Step 2—Para. 3-163

3. Disconnect two hydraulic lines from upper T-fitting (flap up port). Disconnect two hydraulic lines from lower T-fitting (flap down port). Disconnect line from seal drain on underside of motor. Install dust caps on all lines and ports.

4. Remove four self-locking nuts that secure hydraulic motor to brake housing. Remove motor and gasket.

3-164. INSTALLING HYDRAULIC MOTOR.

Tools and Equipment List

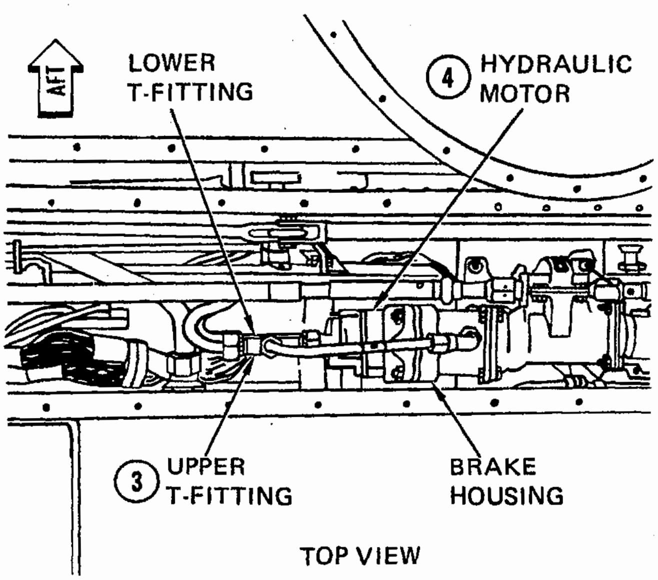
Wrench, Torque (0-200 inch-pounds)	GGG-W-686, No. 6 (or equivalent)

Materials List

Gasket	AN4045-1
Fluid, Hydraulic	MIL-H-5606
Compound, Sealing	MIL-S-8802

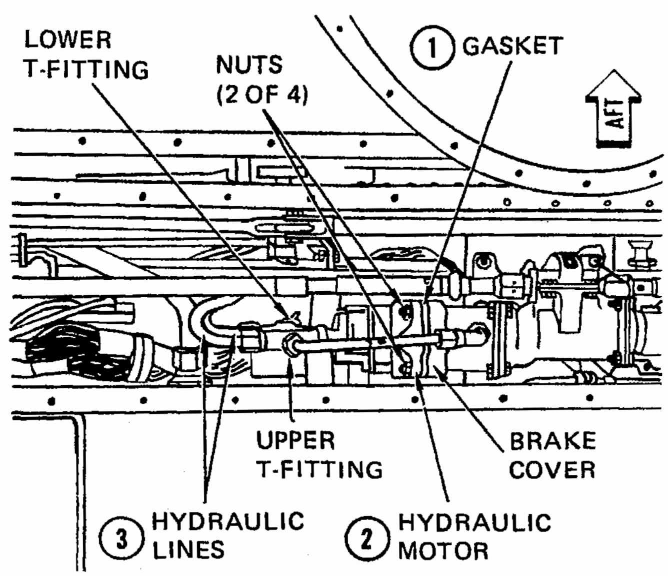
1. Install gasket (AN4045-1) over hydraulic motor mounting studs and position against face of brake cover.

2. Slide hydraulic motor over mounting studs. Secure motor to brake cover with self-locking nuts. Using a torque wrench (GGG-W-686, No. 6 or equivalent), tighten self-locking nuts 50 to 70 inch-pounds.



52-31E VM-2B-52-70.2

Steps 3 and 4—Para. 3-163



52-31D VM-2B-52-70.3

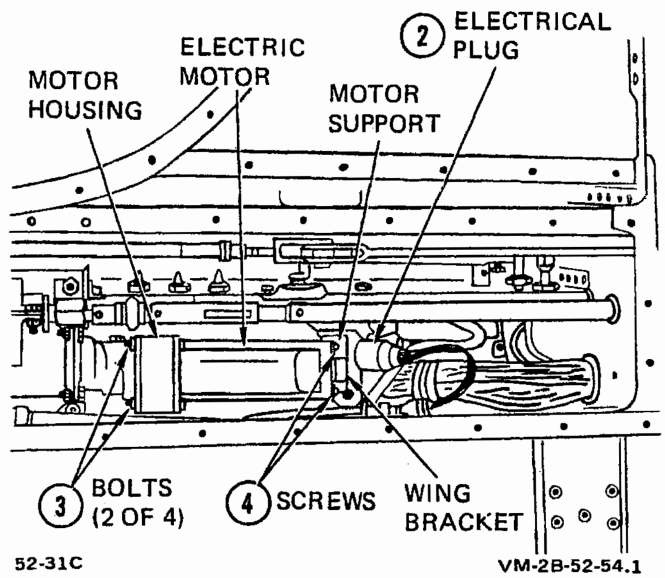
Steps 1 through 3—Para. 3-164

3. Remove dust caps from hydraulic lines, T-fittings, and case drain port. Connect two hydraulic lines to upper and lower T-fittings. Connect lines to seal drain on bottom of motor and case drain on side of motor.

4. Refer to paragraph 4-7. Fill and bleed motor-gearbox assembly.

5. Refer to paragraph 3-139. Perform an operational check of the wing flap system.

6. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for location and install access panel numbered 109 (FLAP MOTOR, ELECTRICAL). See figure 2-21 and seal perimeter of access panel with sealing compound (MIL-S-8002).



Steps 2 through 4—Para. 3-167

3-165. ELECTRIC MOTOR (WING FLAP MOTOR GEARBOX) REMOVAL AND INSTALLATION.

3-166. To remove and to install the electric motor from the wing flap motor gearbox, proceed as follows:

3-167. REMOVING ELECTRIC MOTOR.

1. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for location, and remove access panel numbered 109 (FLAP MOTOR, ELECTRICAL).

2. Disconnect electrical plug from electric motor. Remove bolt that secures motor support to wing bracket.

3. Remove four self-locking nuts, washers, and bolts from electric motor and motor housing. Remove electric motor from motor housing and aircraft.

4. Remove three screws from end of motor and remove motor support.

3-168. INSTALLING ELECTRIC MOTOR.

Tools and Equipment List

Wrench, Torque (0-200 inch-pounds)	GGG-W-686, No. 6 (or equivalent)

Materials List

Lockwire (0.032-inch diameter steel)	MS20995F32
Gasket, Motor	64104-3
Compound, Sealing	MIL-S-8802

1. Install motor support on end of motor. Secure support with three screws. Tighten screws and safety screws together with lockwire (MS20995F32).

2. Fit motor gasket (64104-3) over motor flange.

3. Insert motor drive shaft into motor housing.

4. Install four bolts through motor flange, motor gasket, and motor housing. Install washers and self-

2. Spot-tie wiring as required and route wiring through Adel clamps.

3. Connect wiring to terminal strip 83. Refer to Wiring Data Manual (NAVAIR 01-60GCB-2-7).

4. Adjust the switch in accordance with rigging and adjusting wing flap system (paragraph 3-185). Secure rod end with lockwire (MS20995F41).

5. Replace access panel.

3-177. WING FLAP(S) REMOVAL AND INSTALLATION.

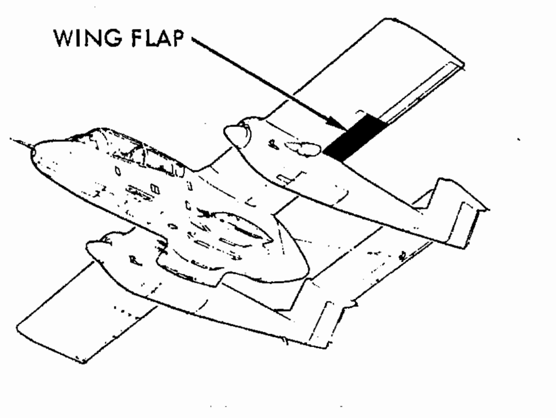
3-178. To remove and install the wing flap(s), proceed as follows:

3-179. REMOVING WING FLAP(S).

Tools and Equipment List

Platform, Aircraft Maintenance	Type B-1 (or equivalent, as required)

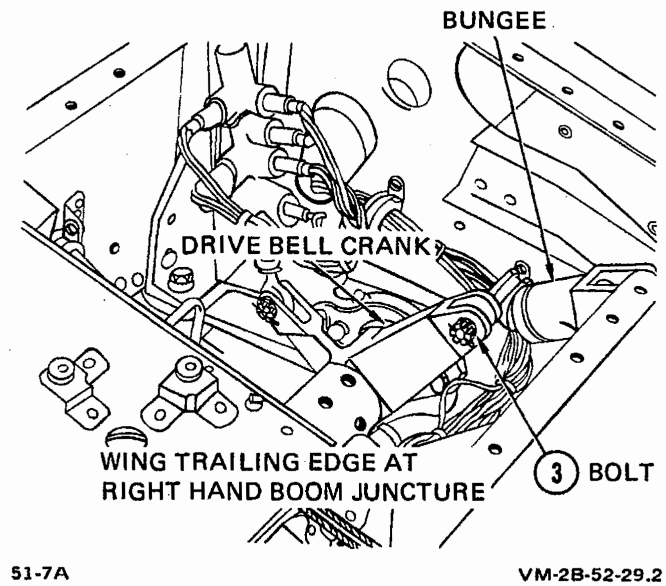
1. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for location, and remove access panels numbered 100 or 114 (CONTROLS, FLAP ACTUATOR), depending upon which flap is to be removed.



Step 1—Para. 3-179

2. Refer to paragraph 3-181 and remove wing flap slot door beneath flap to be removed.

3. Position flaps to full down and remove cotter pin and bolts attaching bungee to flap drive bell crank.



Step 3—Para. 3-179

4. Disconnect bonding jumpers attached at wing flap leading edge.

5. Remove five flap torque arm bolts and washers and disconnect the flap torque arm from wing flap.

CAUTION

Have helper hold flap in position.

6. Remove two hinge bolts at inboard and outboard flap hinges.

7. If necessary, the wing flap vane may be removed by removing three screws in each support.

3-180. INSTALLING WING FLAP(S).

Tools and Equipment List

Platform, Aircraft Maintenance	Type B-1 (or equivalent, as required)

Materials List

Pins, Cotter (1/16-inch diameter steel)	MS24665-134

1. If vane is removed from flap, install vane, using three screws at each support.

Note

Hinge bolts must be installed so that the bolt threads extend outward from the centerline of the flap.

2. While a helper holds the flap in position, install inboard and outboard hinge bolts. Safety with cotter pins (MS24665-134).

3. Connect flaps to flap torque arm with five bolts and washers.

4. Attach the bonding jumpers at each hinge.

5. Check rigging of flap bungee. Adjust as required. Refer to paragraph 3-185.

6. Refer to paragraph 3-181 and reinstall the slot doors.

7. Refer to paragraph 3-139 and perform an operational check of the wing flap system.

8. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for location, and reinstall access panels numbered 100 or 114 (CONTROLS, FLAP ACTUATOR), whichever applies.

3-181. WING FLAP SLOT DOOR REMOVAL AND INSTALLATION.

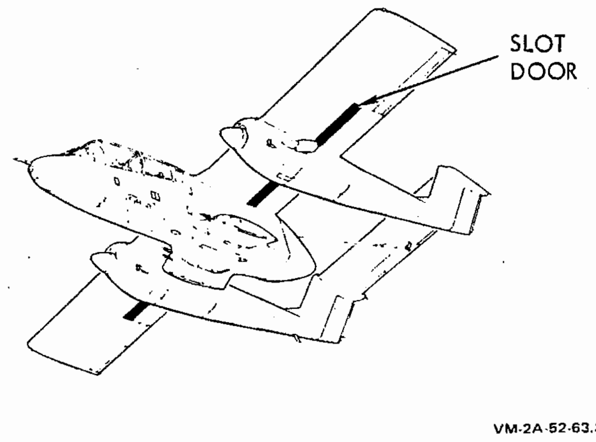
3-182. To remove and install a wing flap slot door, proceed as follows:

3-183. REMOVING WING FLAP SLOT DOOR(S).

Tools and Equipment List

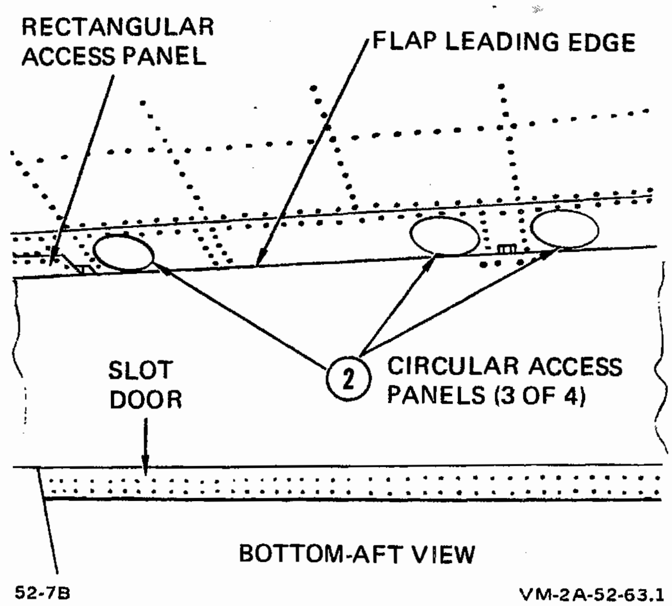
Platform, Aircraft Maintenance	Type B-1 (or equivalent, as required)

1. Lower wing flaps and position maintenance platform (Type B-1) in front of slot door to be removed.



Step 1—Para. 3-183

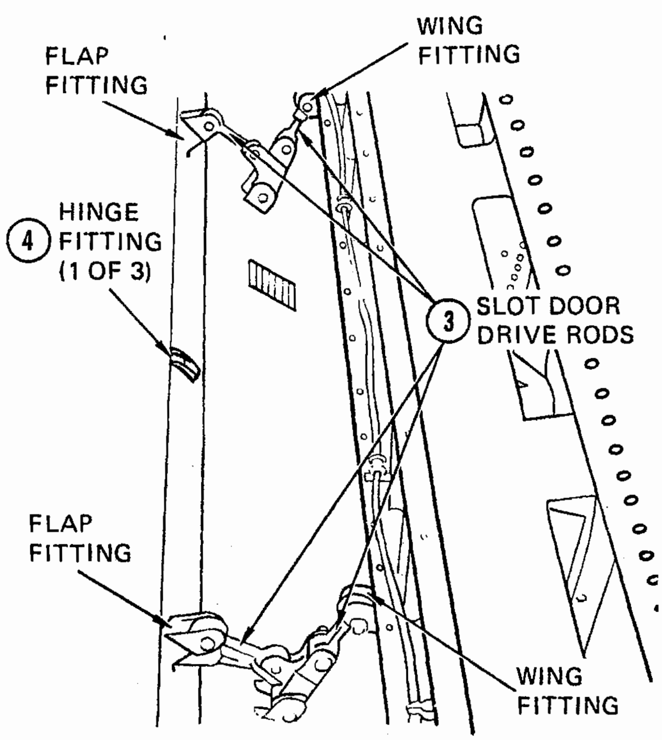
2. Remove four circular access panels and two rectangular access panels near the leading edge of wing flap on lower skin.



Step 2—Para. 3-183

3. Disconnect four slot door drive rods from wing and flap fittings, by removing cotter pins and NAS1104 bolts.

4. Remove three hinge bolts from hinge fittings located in wing flap leading edge.



Steps 3 and 4—Para. 3-183

3-184. INSTALLING WING FLAP SLOT DOOR(S).

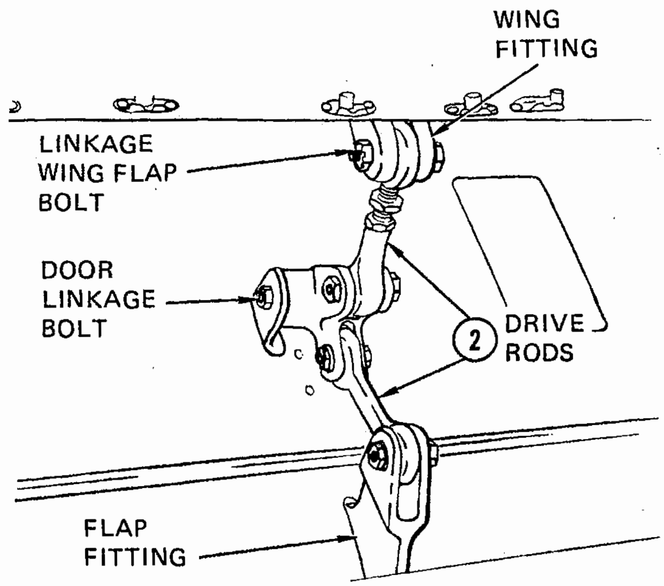
Tools and Equipment List

Platform, Aircraft Maintenance	**Type B-1** (or equivalent, as required)

Materials List

Pins, Cotter (1/16-inch diameter steel)	MS24665-134

1. Position slot door in hinges (located in flap leading edge) and install hardware. Safety with cotter pin (MS24665-134).



Step 1—Para. 3-184

2. Install slot door drive rods on flap and wing fittings with NAS1104 bolts. Tighten nuts and safety with cotter pins (MS24665-134).

3. Perform rigging and adjusting of wing flap system (paragraph 3-185).

4. Install access panels on lower leading edge of flap.

5. Perform an operational check of wing flap system (paragraph 3-139).

3-185. RIGGING AND ADJUSTING WING FLAP SYSTEM.

3-186. To rig and adjust the wing flap system, refer to figure 3-26 and proceed as follows:

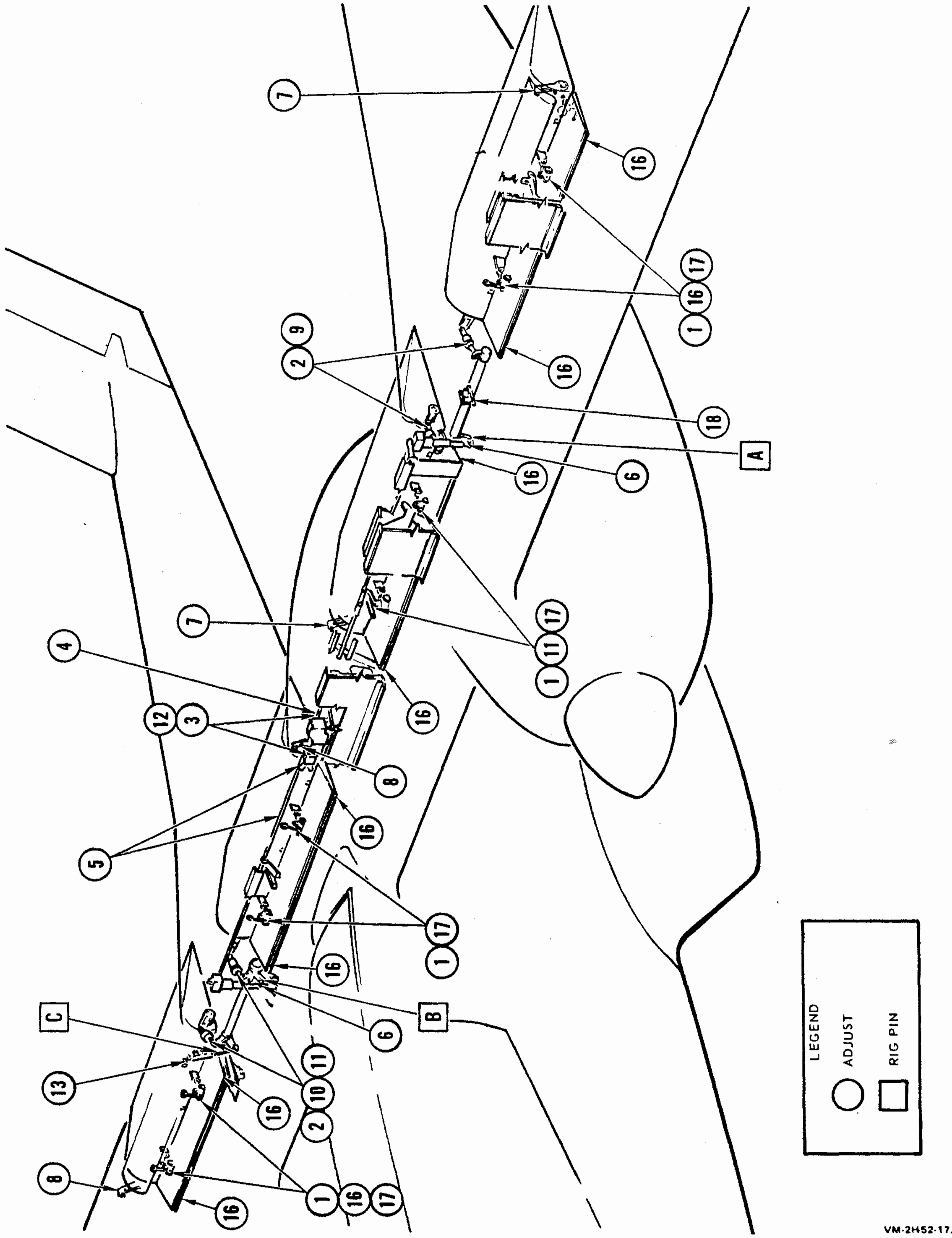


Figure 3-26. Rigging and Adjusting Wing Flap System

Note

The following procedure applies to all aircraft including those that have AFB No. 4 (inspection of flap screw-jack actuators—aircraft 155390 through 155402 and 155408 through 155413) and AFB No. 6 (flap screw jack and limit switch inspection—all aircraft) complied with.

Tools and Equipment List

Platform, Aircraft Maintenance	Type B-1 (or equivalent, two required)
Power Unit, Electrical, Mobile	NC-8A (or equivalent)
Bundle, Rig Pin	T3382

Materials List

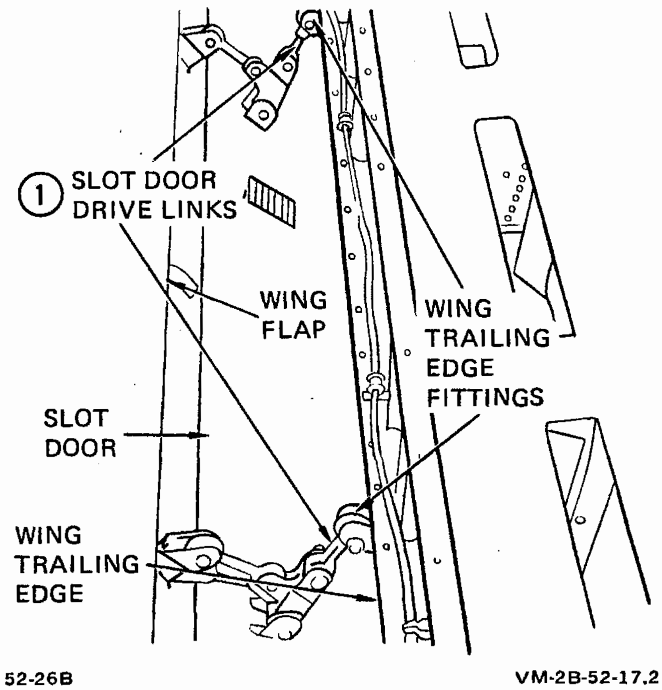
Pins, Cotter (1/16-inch diameter steel)	MS24665-134
Lockwire (0.032-inch diameter steel)	MS20995F32

Note

In the following procedure, the rig pins used must only be installed and removed in the order given.

The diameters and lengths of the rig pins to be used in this procedure are indicated by dash numbers (-7, for example) stamped on the arm of each pin in rig pin bundle T3382.

1. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) and remove access panels listed in table 3-11. **Locate two sets of** slot door drive linkage on upper surface of each flap slot door. Remove two slot door drive links from each wing trailing edge fitting on all four flaps.

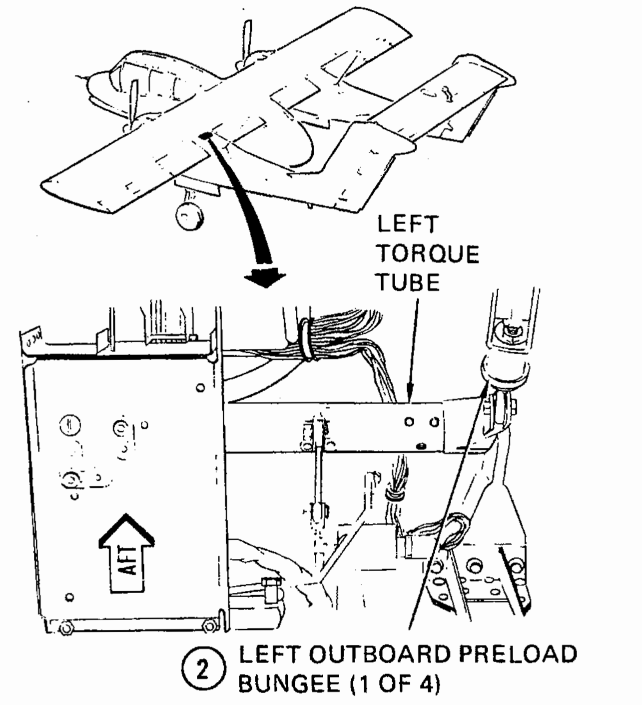


Step 1—Para. 3-185

2. **With flaps full UP, locate and disconnect all four flap preload bungees from both flap torque tubes. Lower all four flaps as bungees are removed.**

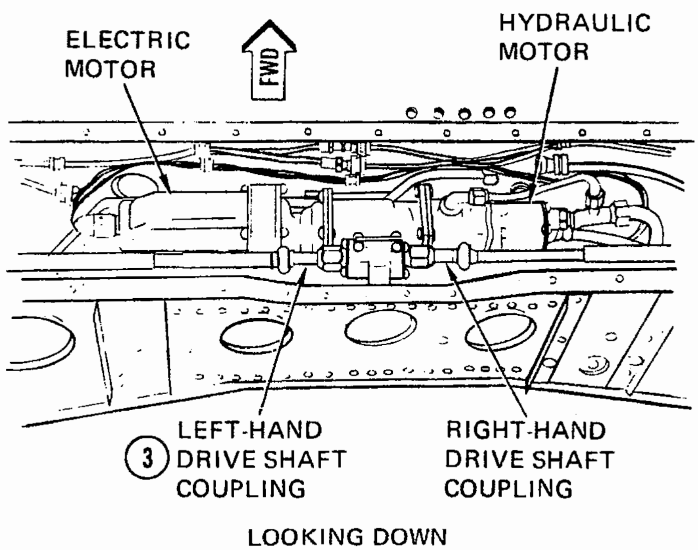
Table 3-11. Wing Flap System Access Panels

PANEL NUMBER	DESCRIPTION	PANEL NUMBER	DESCRIPTION
99	Controls, Spoiler, Flap	111	Controls, Flap
100	Controls, Flap Screwjack	114	Controls, Flap Screwjack
102	Controls, Flap	115	Controls, Spoiler, Flap
109	Flap, Motor, Electrical		



Step 2—Para. 3-185

3. Locate flap motor-gearbox, and disconnect left and right flap drive shaft couplings from electric and hydraulic drive motors.



Step 3—Para. 3-185

CAUTION

Use extreme care in adjusting left flap actuator in the following step. Follow instructions carefully.

4. Locate left flap actuator and manually rotate drive shaft at motor gearbox counterclockwise, as viewed from center of aircraft, until shaft contacts its extend stop. (This can be felt as an increase in the torque required to turn the shaft.) Retract (back-off) shaft clockwise 2-1/2 (±1/4) turns.

CAUTION

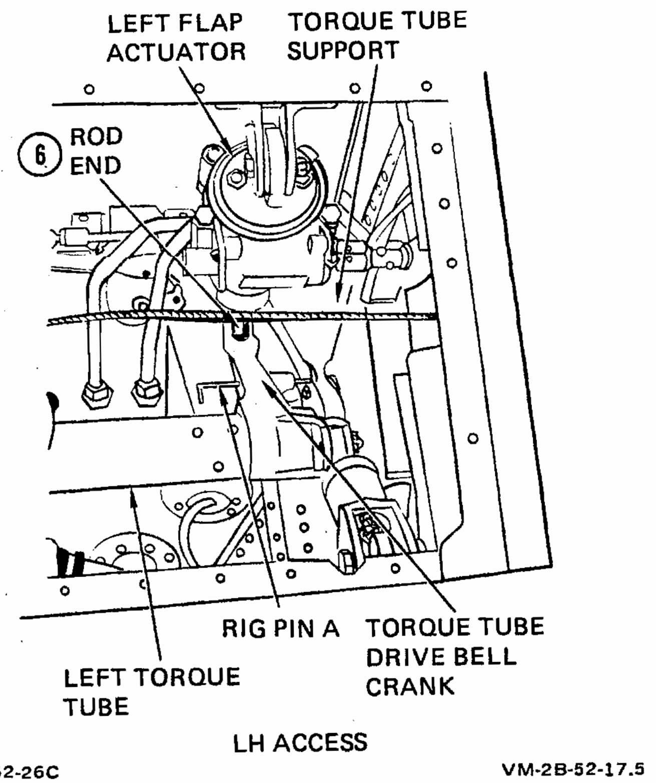
Use extreme care in adjusting right flap actuator in the following step. Follow instructions carefully.

5. Locate right flap actuator and manually rotate drive shaft at motor gearbox clockwise as viewed from center of aircraft, until shaft contacts its extend stop. (This can be felt as an increase in torque required to turn the shaft.) Retract (back-off) shaft counterclockwise 2-1/2 (±1/4) turns.

CAUTION

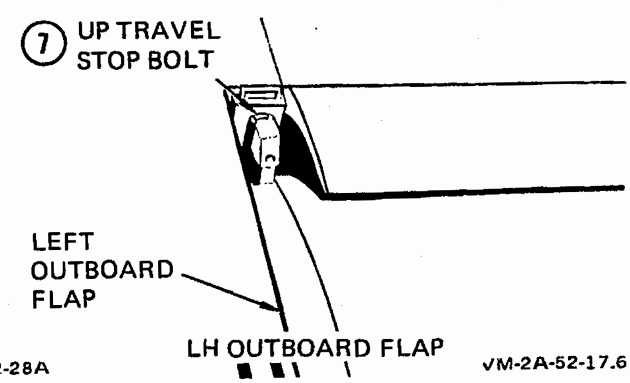
In the following step, after each actuator rod end jamnut is tightened, check that thread safety holes in key slots are not visible. If visible, the rod ends are unsafe and step 6 must be performed again.

6. Insert rig pins A and B (both are -3, rig pin bundle, T3382) through left and right torque tube drive bell cranks and into inboard torque tube supports. Adjust left and right actuator rod ends and install on torque tube drive bell cranks. Tighten jamnuts against lock washers and safety with lockwire (MS20995F32). Safety actuator attach bolts with cotter pins (MS24665-134). Remove rig pins A and B.



Step 6—Para. 3-185

7. Locate flap up travel stop bolts on fittings at outboard end of left outboard flap, and inboard end of left inboard flap. Cut away lockwire from both bolts and loosen jamnuts. Raise left outboard flap and place straightedge on trailing edge. Have helper adjust stop bolt until top of flap trailing edge is in line with top of boom fairing (0-degree position). Once properly adjusted, tighten jamnut against stop bolt and safety with lockwire (MS20995F32). Adjust left inboard flap up travel stop bolt in same manner. Tighten jamnut against stop bolt and safety with lockwire (MS20995F32).



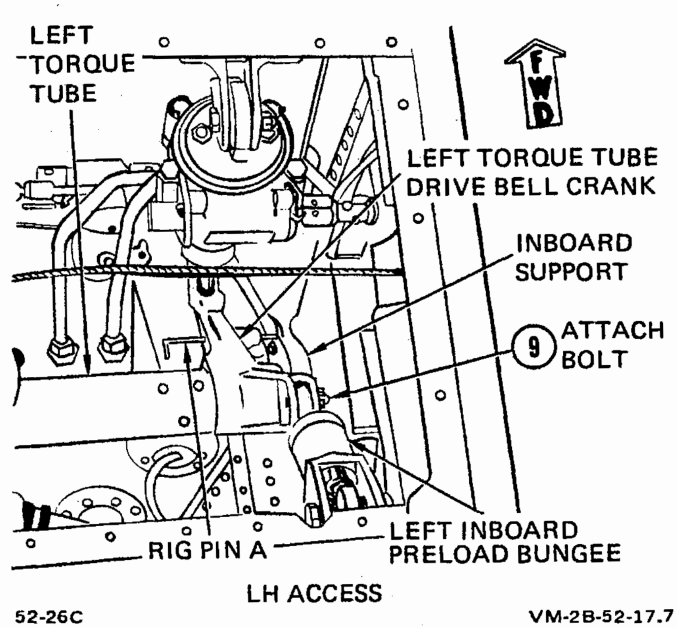
Step 7—Para. 3-185

8. Locate flap up travel stop bolts on fittings at outboard end of right outboard flap, and inboard end of right inboard flap. Cut away lockwire and loosen both stop bolt jamnuts. Raise right outboard flap and place straightedge on top of trailing edge. Have helper adjust stop bolt until top of flap trailing edge is in line with top of boom fairing (0-degree position). Tighten stop bolt jamnuts and safety with lockwire (MS20995F32). Adjust right inboard flap up stop bolt in same manner. Tighten stop bolt jamnut and safety with lockwire (MS20995F32).

Note

Flap preload bungee rod ends must be adjusted so that attach bolts can be easily inserted through torque tube drive bell cranks and bungee rod ends without compressing or extending bungees.

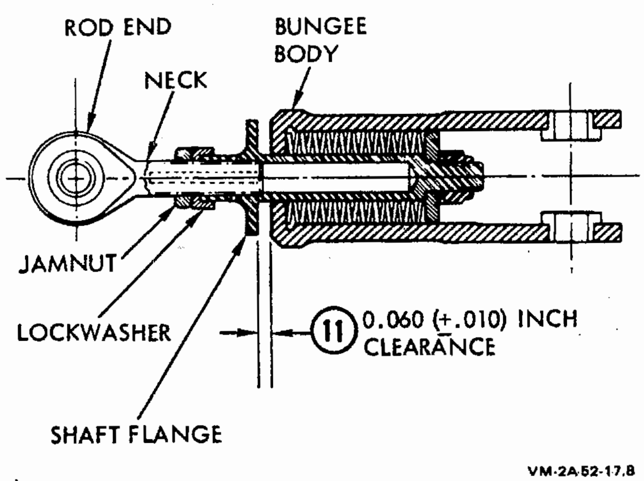
9. Insert rig pin A (-3) through left torque tube drive bell crank into inboard torque tube support. Have helper position left outboard flap against up travel stop. Adjust rod end on left outboard flap preload bungee until it can be easily installed on outboard torque arm. Safety attach bolt with cotter pin (MS24665-134). Have helper position left inboard flap against up travel stop. Adjust and install left inboard flap preload bungee in same manner. Safety attach bolt with cotter pin (MS24665-134).



Step 9—Para. 3-185

10. Insert rig pin B (-3) through right torque tube drive bell crank into inboard torque tube support. Have helper position right outboard flap against up travel stop bolt and adjust rod end on right outboard flap preload bungee until it can be easily installed on torque arm. Safety attach bolt with cotter pin (MS24665-134). Have helper position right inboard flap against up travel stop. Adjust and install right inboard flap preload bungee on inboard torque arm in same manner. Safety attach bolt with cotter pin (MS24665-134).

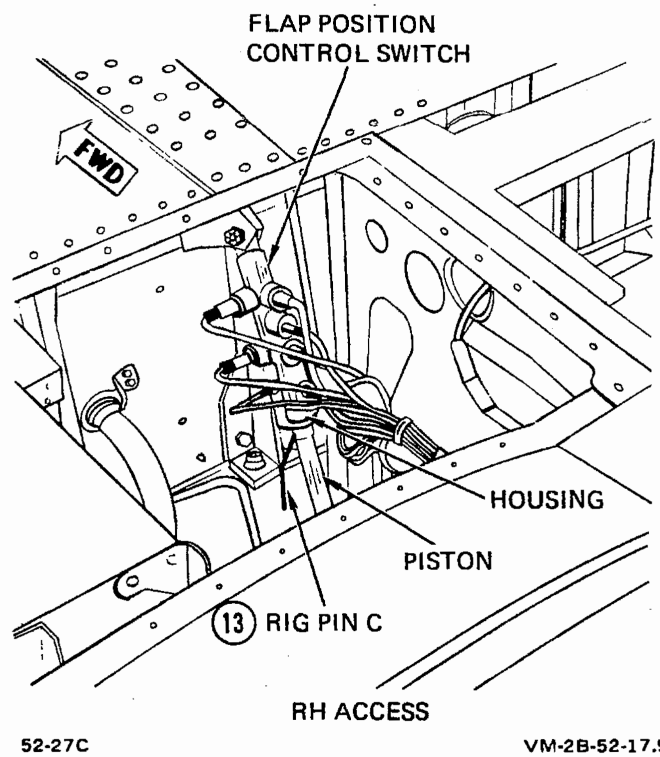
11. Screw bungee rod end jamnuts up to neck of rod end on all four bungees. Slide lock washers down rod end and against jamnuts. Preload all four flap bungees by shortening length of bungee shafts. Using a 11/16-inch open-end wrench, turn lock washer flats to obtain a 0.060 (±0.010)-inch clearance between shaft flange and body of bungee. Slide lock washers down rod end against flanges. Tighten jamnuts against lock washers on all four bungees. Safety jamnuts with lockwire (MS20995F32).



Step 11—Para. 3-185

12. Connect left and right flap drive shafts to motor gearbox. Tighten drive shaft couplings until they bottom out against motors. Safety couplings with lockwire (MS20995F32).

13. Locate flap position control switch at right access actuator area. Disconnect switch piston rod end from outboard torque tube arm. Extend switch piston from housing and locate five rig pin holes. Insert rig pin C (-3) through switch housing and into top rig pin hole in piston. Adjust piston rod end to fit outboard torque tube arm. Safety attach bolt with cotter pin (MS24665-134). Tighten jamnut against lock washer and safety with lockwire (MS20995F32).

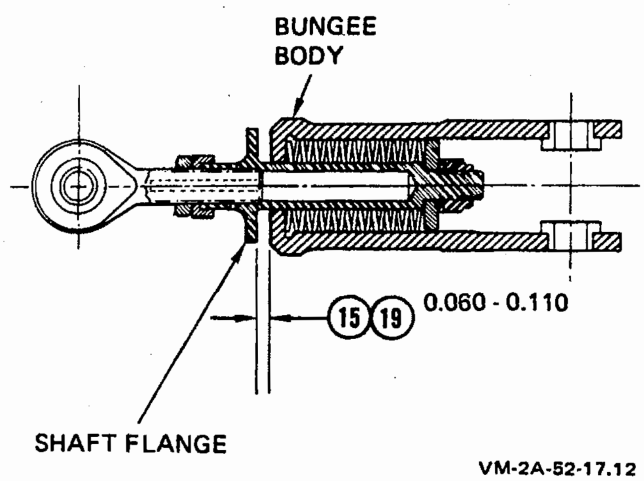


Step 13—Para. 3-185

14. Remove rig pins A, B, and C. If available, connect mobile power unit (NC-8A, or equivalent) to aircraft. Turn aircraft electrical system ON. Using NORMAL flap control system, cycle flaps from full UP to full DOWN. Ensure that some portion of lower rig pin hole in flap position control switch piston is visible through switch housing. If hole is not visible, step 13 must be repeated.

15. Raise flaps to full UP position. Trailing edges of all four flaps must be at the 0 (±1/32) inch/degree position. Check for clearance between bungee shaft flanges and bodies of bungees. Clearance must be 0.060 to 0.110 inch. Ensure that some portion of upper rig pin hole in flap position control switch piston is visible through switch housing. If hole is not visible, step 13 must be repeated.

16. Place flap handle in DOWN position and then move back to HOLD. Flaps must hold in any position from 0 to 40 degrees.



Steps 15 and 19—Para. 3-185

17. If the requirements of steps 14 through 16 cannot be accomplished, or the hydraulic pump fails to shut off during NORMAL system checkout, both the flap position control switch and the flap actuator must be inspected for proper rigging and component failure.

CAUTION

In the following steps, the ALTERNATE flap system must not be operated unless NORMAL flap system flap handle is in HOLD position.

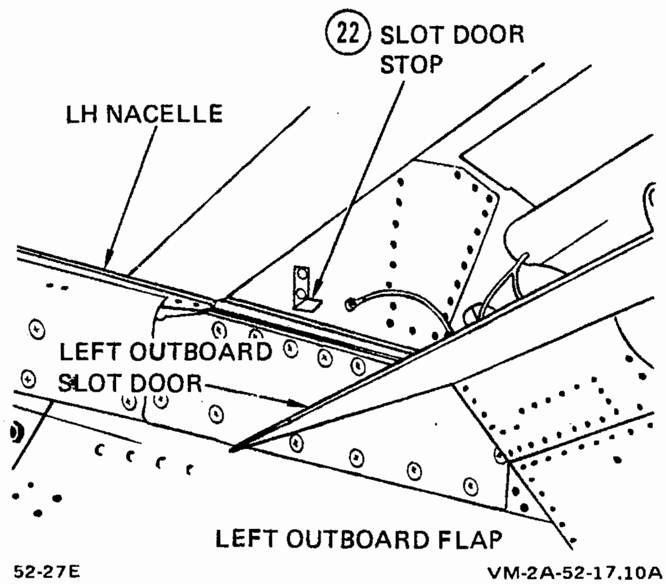
18. Using ALTERNATE flap system switch, operate flaps to full DOWN position. Ensure that some portion of lower rig pin hole in flap position control switch piston is visible through switch housing (refer to step 13). If hole is not visible, step 13 must be repeated.

19. Using ALTERNATE flap control system, raise flaps to full UP position. Trailing edge of all four flaps must be at the 0 ($\pm$1/32 inch) degree position. Check for clearance between bungee shaft flanges and bodies of bungees. Clearance must be 0.060 to 0.110 inch. Ensure that some portion of the upper rig pin hole in flap position control switch piston is visible through switch housing. If hole is not visible, step 13 must be repeated.

20. Using ALTERNATE flap system switch, place switch in DOWN position and then move back to HOLD. Flaps must hold in any position from 0 to 40 degees.

21. If the requirements of steps 18 through 20 cannot be accomplished, or the hydraulic pump fails to shut off during ALTERNATE system checkout, both the flap position control switch and the flap actuators must be inspected for proper rigging and component failure.

22. Connect all slot door drive links to wing trailing edge fittings. Safety attach bolts with cotter pins (MS24665-134). Place flaps in full DOWN position. Locate slot door stops at each end of left outboard flap wing slot. Loosen two bolts on each stop. Using a straightedge on underside of door, adjust each stop until door is flush with lower wing surface. Tighten slot door stop attach bolts. Adjust left and right inboard, and right outboard slot door stops in same manner. Tighten all slot door stop attach bolts.



Step 22—Para. 3-185

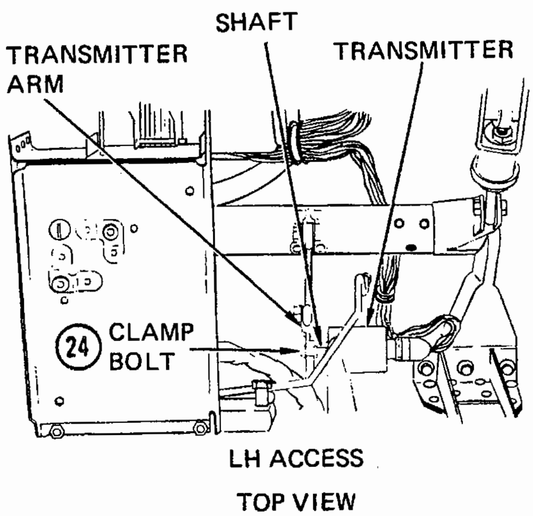
CAUTION

In the following step, initial length of slot door drive links must be long enough to prevent loading slot doors against stops when flaps are raised.

23. Adjust two slot door drive links on left outboard flap slot door so that the door protrudes 0.010 to 0.030 inch from the lower wing surface when flaps are raised to full UP position (0 degrees against

slot door straps). Shorten each drive link rod end an additional two and one-half turns to preload slot door against stop. Adjust left inboard and right outboard flap slot door drive links in same manner. Tighten rod end jamnuts on all drive links.

24. Locate flap position transmitter in left actuator access area. Loosen transmitter arm clamp bolt. Turn aircraft electrical system ON. Turn transmitter shaft until helper indicates cockpit indicator reads 0 degrees. Replace arm and tighten clamp bolt.



Step 24—Para. 3-185

25. Ensure that all jamnuts are tightened and, where necessary, safetied with lockwire (MS20995F32). Ensure that all bolts are safetied with cotter pins (MS24665-134).

26. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for location and install all access panels listed in table 3-11.

3-187. OBSERVER'S CONTROL PACKAGE.

3-188. The observer's control package (305-867021) contains the components necessary for the observer to operate the directional, lateral, longitudinal, and wing flap systems. Also included are components to operate the brakes and landing gear and components to control engine operation. When installed, the operation of the observer's control package parallels the operation of the pilot's flight controls.

3-189. Organizational maintenance for the observer's control package includes the information and procedures to service, to remove and install, and to rig the systems controlled by the package.

3-190. SERVICING.

3-191. To lubricate the observer's control package, refer to NAVAIR 01-60GCB-4 for service intervals and instructions.

3-192. OBSERVER'S CONTROL PACKAGE REMOVAL AND INSTALLATION.

3-193. To remove and install the observer's control package, proceed as follows:

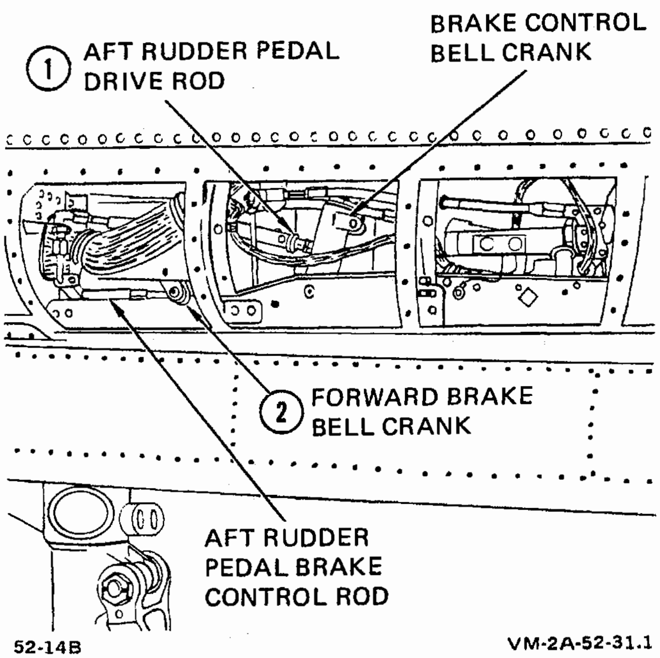
3-194. REMOVING OBSERVER'S CONTROL PACKAGE.

Note

Before removing control package, refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for location, and remove access panels numbered 1 (LEFT-HAND MASTER BRAKE CYLINDER), 4 and 76 (CONTROLS), and 78 (RH MASTER BRAKE CYLINDER).

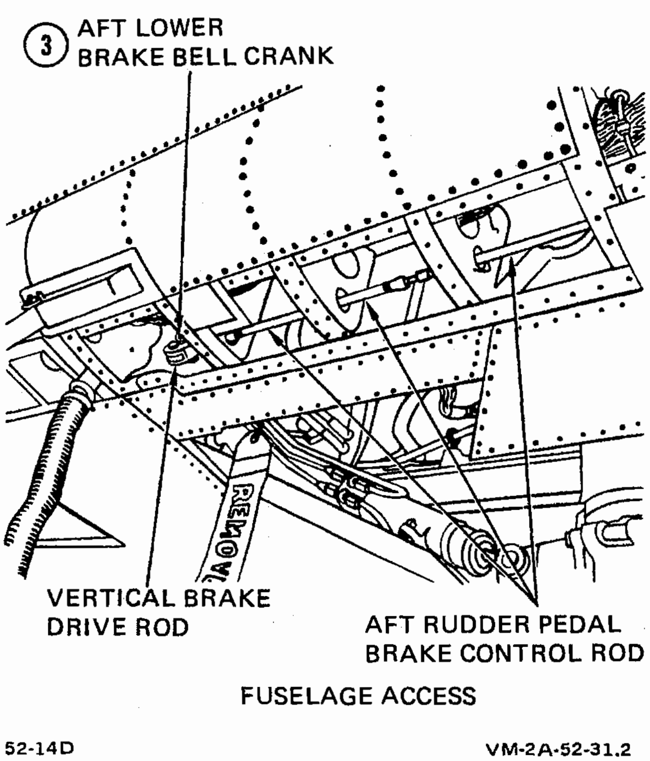
1. Locate aft rudder pedal drive rods and disconnect from pilot's rudder pedal brake bell cranks and from forward brake bell cranks.

2. Remove forward brake bell cranks and aft rudder pedal brake control rods from left- and right-hand sides of fuselage.



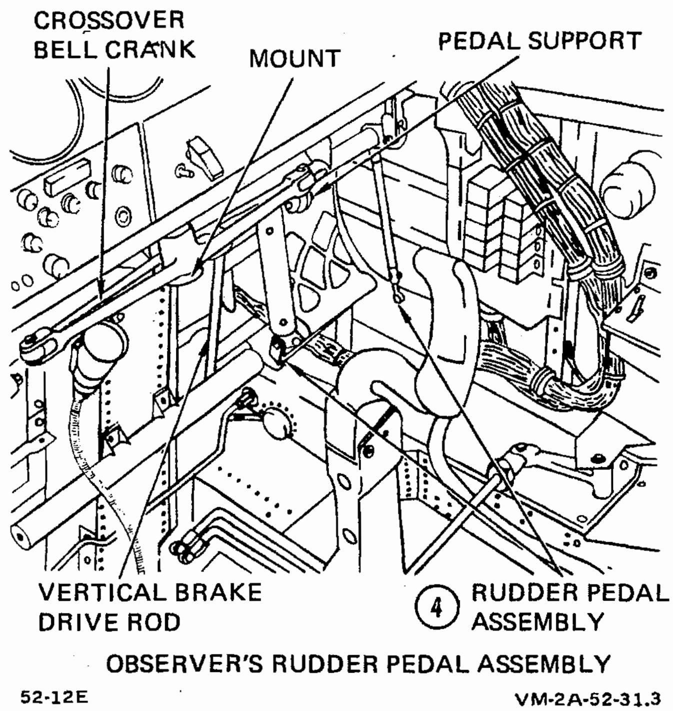
Steps 1 and 2—Para. 3-194

3. Remove aft lower brake bell cranks and aft vertical brake drive rods from both sides of fuselage.



Step 3—Para. 3-194

4. Remove both rudder pedal assemblies, pedal supports, crossover bell crank mount, and crossover bell crank.



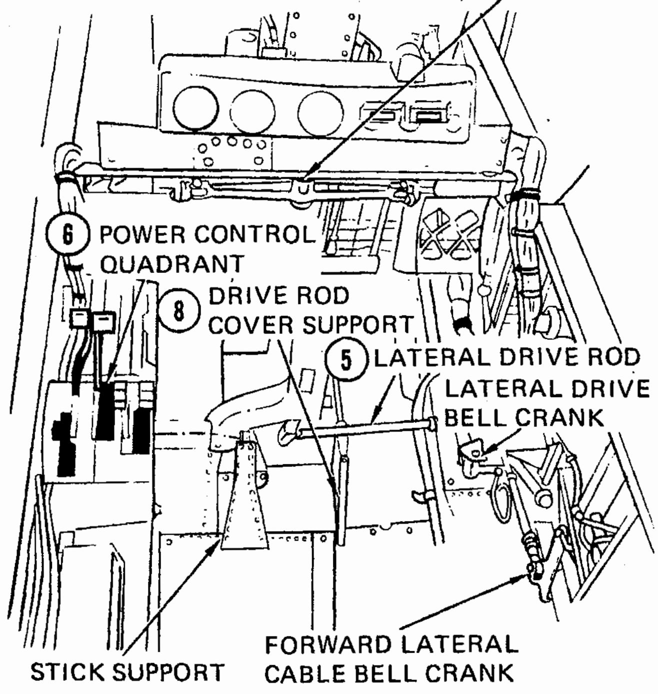
Step 4—Para. 3-194

5. Remove control stick cover and lateral drive rod cover. Disconnect lateral drive rod at base of stick. Remove drive rod at lateral cable bell crank. Remove lateral bell crank and bell crank support.

6. Remove fiberglas cable cover beneath power control quadrant and access panel on top of forward longitudinal cable bell crank cover box. Remove bolts from outboard stick support.

7. Disconnect and remove longitudinal drive rod between forward longitudinal bell crank and drive bell crank on outboard end of stick.

8. Remove lateral drive rod cover support. Remove stick support mounting bolts and lift control stick assembly from aircraft.



OBSERVER'S FLIGHT CONTROLS

52-12C VM-2B-52-31.4

Steps 5, 6, and 8—Para. 3-194

9. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for location, and install access panels numbered 1 (LEFT-HAND MASTER BRAKE CYLINDER), 4 and 76 (CONTROLS), and 78 (RH MASTER BRAKE CYLINDER).

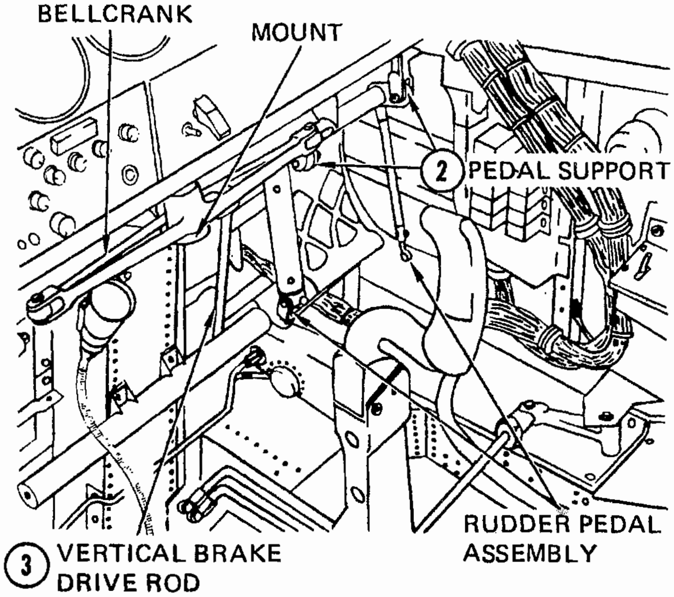
3-195. INSTALLING OBSERVER'S CONTROL PACKAGE.

Materials List

Pins, Cotter (1/16-inch diameter steel)	MS24665-134
Lockwire (0.032-inch diameter steel)	MS20995F32

1. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for location, and remove access panels numbered 1 (LEFT-HAND MASTER BRAKE CYLINDER), 4 and 76 (CONTROLS), and 78 (RH MASTER BRAKE CYLINDER).

2. Install observer's rudder pedal supports and rudder pedal assemblies. Bolt crossover mount and crossover bell crank under instrument panel bulkhead. Tighten all bolts and safety with lockwire (MS20995F32) and cotter pins (MS24665-134).



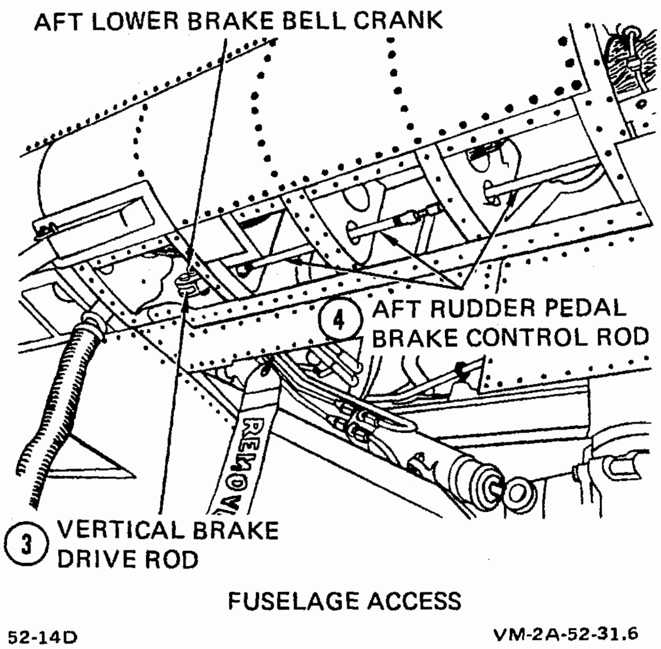
OBSERVER'S COCKPIT

52-12E VM-2A-52-31.5

Steps 2 and 3—Para. 3-195

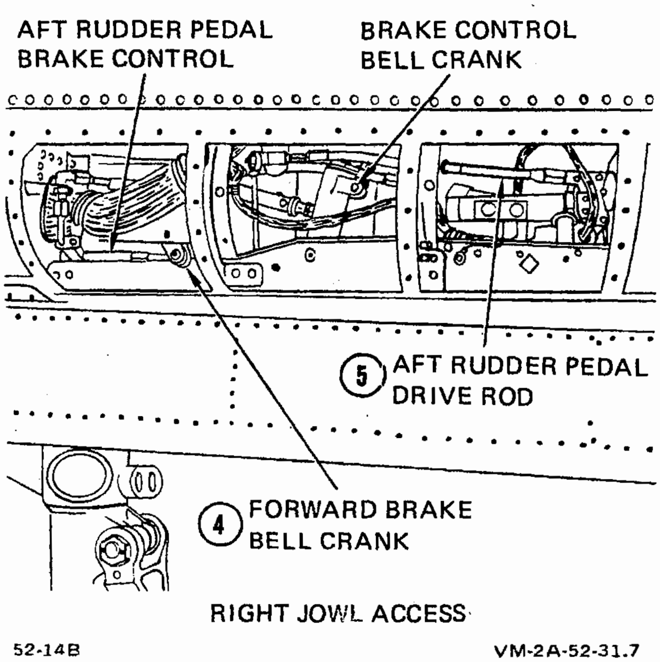
3. Install aft lower brake bell cranks and aft vertical brake drive rods. Safety bolts with cotter pins (MS24665-134).

4. Install forward brake bell cranks and aft rudder pedal brake control rods. Safety bolts with cotter pins (MS24665-134).



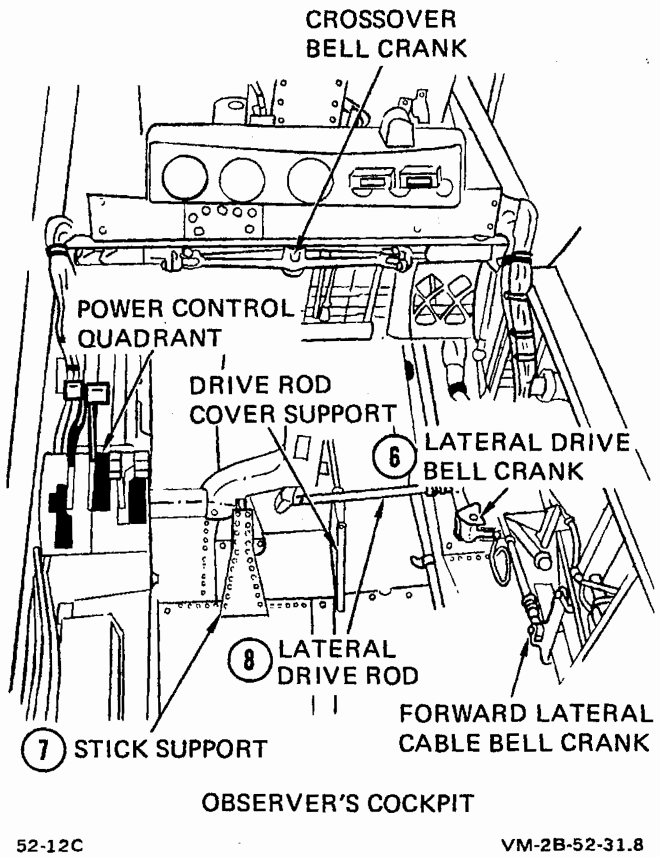
Steps 3 and 4—Para. 3-195

5. Install aft rudder pedal drive rods between rudder pedal brake bell cranks and forward brake bell cranks. Safety with cotter pins (MS24665-134).



Steps 4 and 5—Para. 3-195

6. Attach lateral drive bell crank and support to bulkhead beneath observer's oxygen regulator.

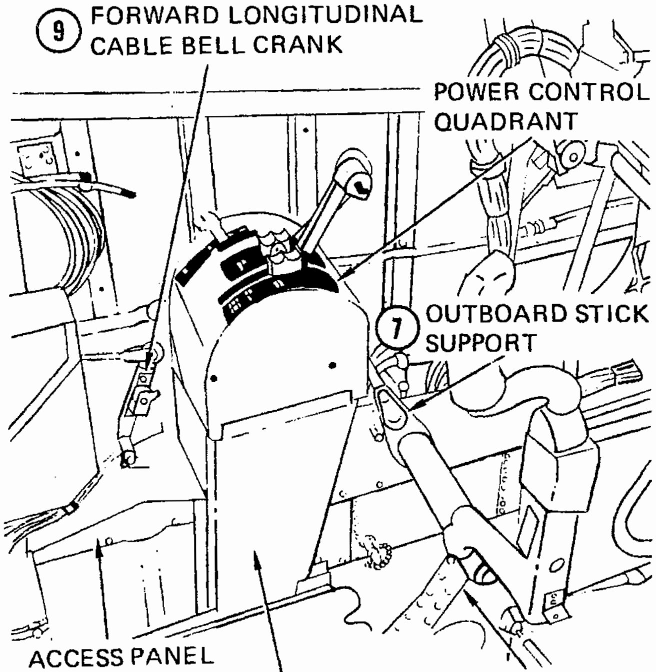


Steps 6 through 8—Para. 3-195

7. Slip stick assembly into stick support bearing and bolt stick support to floor. Bolt outboard stick support to fuselage bulkhead in front of and below power control quadrant.

8. Install lateral drive rod between base of stick and lateral bell crank and between lateral bell crank and forward lateral cable bell crank. Safety drive rods with lockwire (MS20995F32) and cotter pins (MS24665-134).

9. Install longitudinal drive rod between stick bell crank and forward longitudinal cable bell crank. Safety drive rods with lockwire (MS20995F32) and cotter pins (MS24665-134).



Steps 7 and 9—Para. 3-195

10. Refer to paragraph 3-135 and rig and adjust directional control system. Tighten all jamnuts and bolts, and safety with lockwire (MS20995F32) and cotter pins (MS24665-134). Refer to paragraph 3-94 and perform an operational check of directional control system.

11. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for location, and install access panels numbered (LEFT-HAND MASTER BRAKE CYLINDER), 4 and 76 (CONTROLS), and 78 (RH MASTER BRAKE CYLINDER).

3-196. RIGGING AND ADJUSTING.

3-197. To rig and adjust the observer's control equipment package, see figure 3-27, and proceed as follows:

Tools and Equipment List

Bundle, Rig Pin	T3382

Materials List

Pins, Cotter (1/16-inch diameter steel)	MS24665-134
Lockwire (0.032-inch diameter steel)	MS20995F32

Note

All aircraft control systems must be rigged prior to installation and rigging of the observer's control equipment package. Refer to the applicable preceding paragraphs for rigging the flight controls, chapter 5 for rigging the landing gear system and brake control system, and Power Plants and Fuel System Manual (NAVAIR 01-60GCB-2-4), for engine control rigging.

3-198. DIRECTIONAL AND BRAKE CONTROL SYSTEMS.

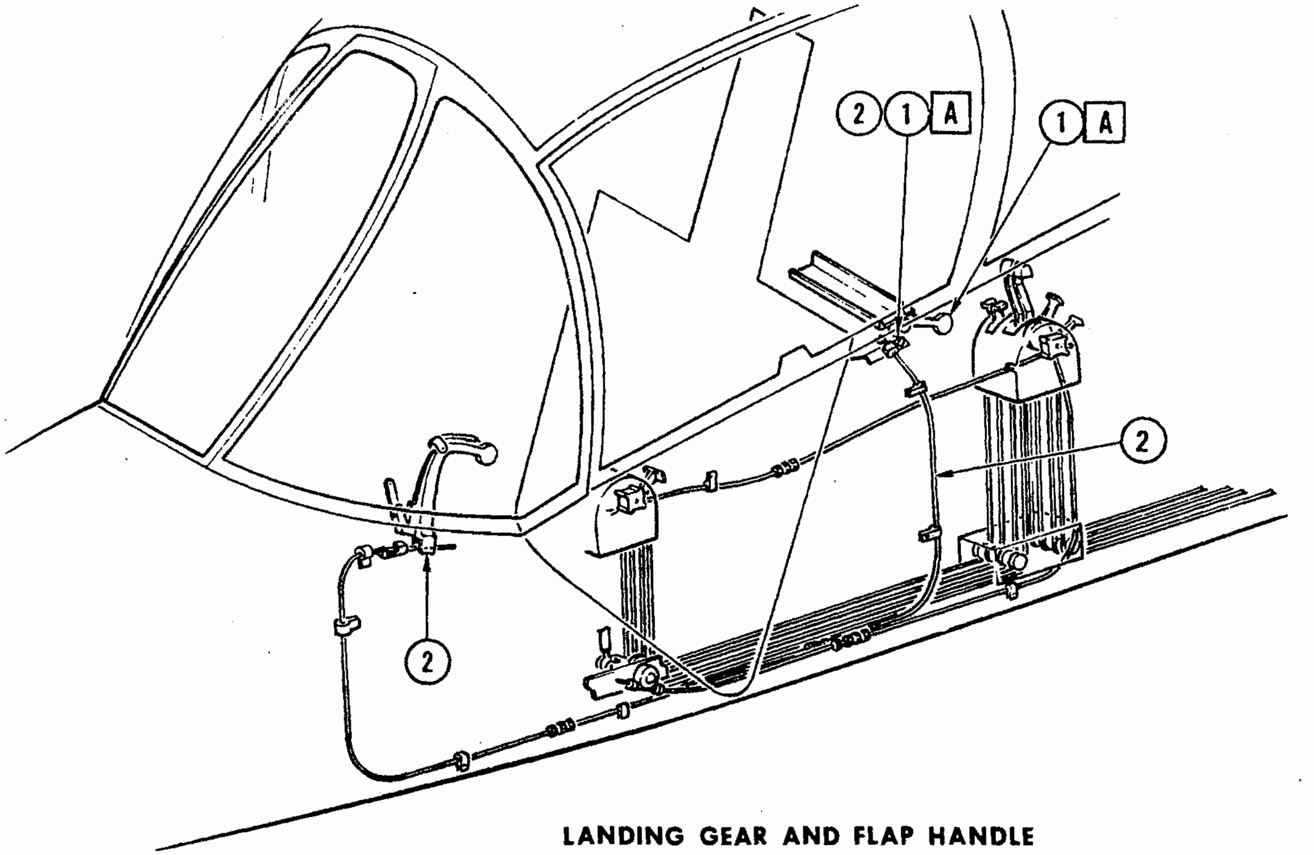
1. Insert rig pins A, B, and C in the forward right-hand cable sector, interconnect bell crank, and right-hand pedal assembly.

2. Adjust and install push rods.

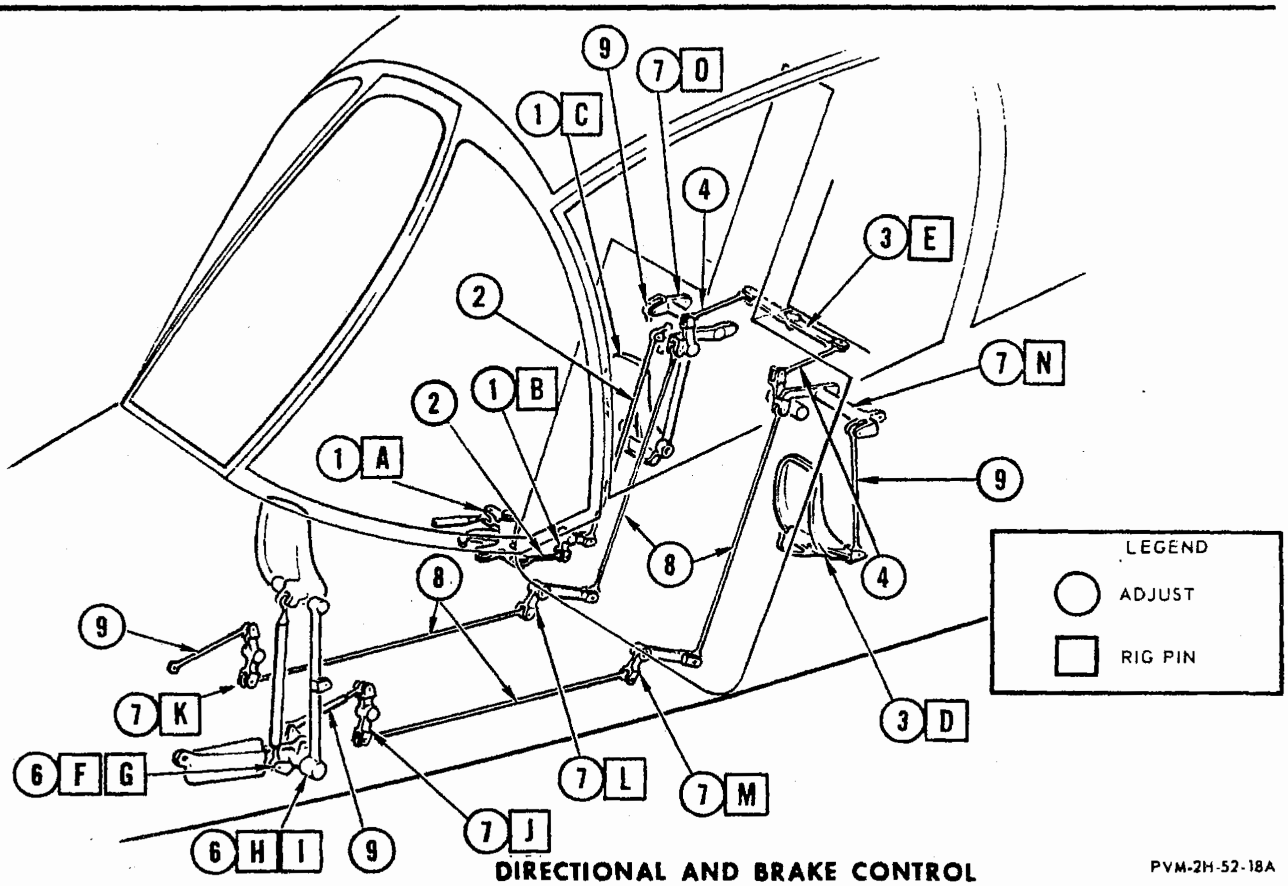
3. Insert rig pins D and E in left-hand pedal assembly and crossover bell crank.

4. Adjust and install push rods.

5. Remove all rig pins and secure all applicable areas with lockwire (MS20995F32).



LANDING GEAR AND FLAP HANDLE



DIRECTIONAL AND BRAKE CONTROL

PVM-2H-52-18A

Figure 3-27. Rigging and Adjusting Observer's Control Equipment Package (Sheet 1 of 2)

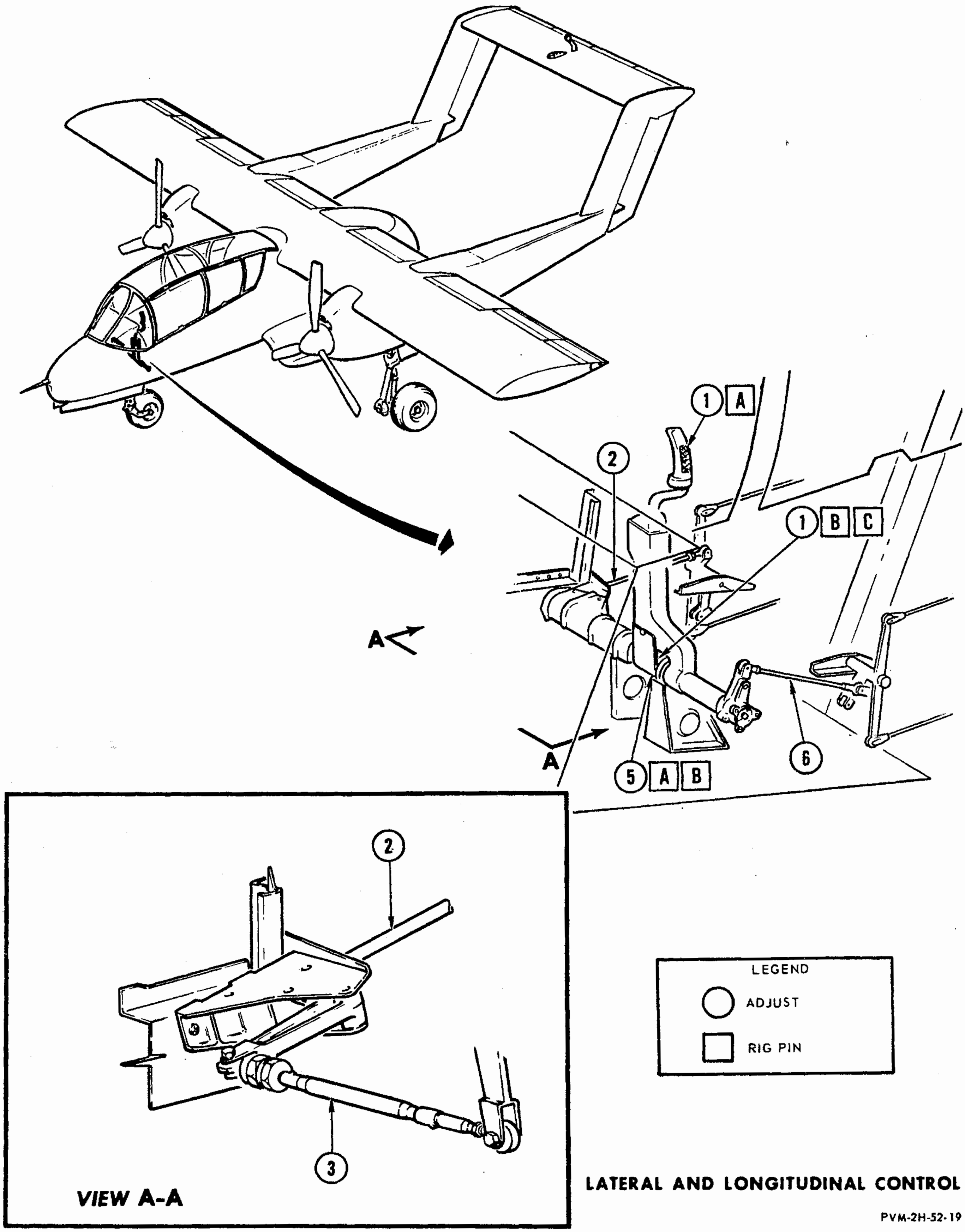


Figure 3-27. Rigging and Adjusting Observer's Control Equipment Package (Sheet 2 of 2)

6. Insert rig pins F, G, H, and I in left- and right-hand forward pedal assemblies and brake bell cranks.

7. Insert rig pins J, K, L, M, N, and O in left- and right-hand intermediate bell cranks, aft lower bell cranks, and aft upper bell cranks.

8. Adjust and install tension rods.

9. Adjust and install compression rods.

10. Remove all rig pins and install cotter pins (MS24665-134).

3-199. AFT COCKPIT LANDING GEAR HANDLE.

1. With the forward cockpit landing gear handle rigged, insert rig pin A through aft landing gear handle and handle support.

2. With forward landing gear handle latched in the down position and the ends of teleflex cable inserted through the holes in the forward and aft swivel bolts and mounting brackets, tighten nuts on swivel bolts to clamp cable securely against swivel spacers.

3. Remove rig pin from aft handle.

3-200. ENGINE CONTROL.

3-201. Refer to Power Plants and Fuel System Manual (NAVAIR 01-60GCB-2-4) for engine control rigging instructions.

3-202. LATERAL AND LONGITUDINAL CONTROL SYSTEMS.

1. Insert rig pins A, B, and C in the lower bell crank of the control stick assembly, the outboard bell crank, and the cable bell crank.

2. Adjust and install swivel rod and secure rod end with lockwire (MS20995F32).

3. Adjust and install rod.

4. Remove all rig pins.

5. Insert rig pins A and B in outboard bell crank of the control stick assembly and cable bell crank.

6. Adjust and install rod. Secure with cotter pins (MS24665-134).

7. Remove rig pins.

3-203. FLAP CONTROL SYSTEM.

3-204. With the pilot's flap control system rigged and the box assembly and cable assembly installed in the observer's compartment, install cable and position to 0.60 (± 0.20) inches with the forward handle in the HOLD position and the aft handle at 47 (±)-degree angle. See figure 3-27.

SECTION III
INTERMEDIATE MAINTENANCE

3-205. GENERAL.

3-206. This section provides maintenance procedures for the flight control systems at intermediate level maintenance.

3-207. LATERAL CONTROL SYSTEM.

3-208. Intermediate maintenance for the components of lateral flight control system is contained in this section. Materials, special tools, and specifications for performing these maintenance procedures are listed as necessary. Repair of components at this level of maintenance generally includes the installation of items contained in provisioned repair kits along with standard supply items.

3-209. PILOT'S CONTROL STICK GRIP ASSEMBLY (6501-19-7) (6501-19-9 ON AIRCRAFT HAVING IAFC NO. 22 INCORPORATED.

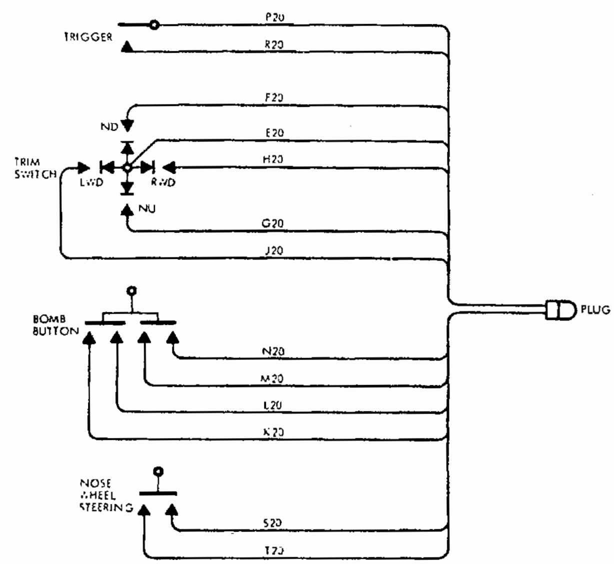
3-210. The pilot's control stick grip assembly provides a grip for the stick column, switches for the electrical control of the lateral and longitudinal trim systems, gunfire, stores release, and nose wheel steering. Intermediate maintenance to be performed on the stick assembly consists of a checkout, repair, and testing.

3-211. CHECKOUT. To checkout the control stick grip assembly, see figure 3-28 and proceed as follows:

Tools and Equipment List

Multimeter	AN/PSM-4C (or equivalent)

Using a multimeter (AN/PSM-4C), check continuity of all switches and wires in stick grip assembly and wire harness to isolate defective component.



VM-2B-52-51.1

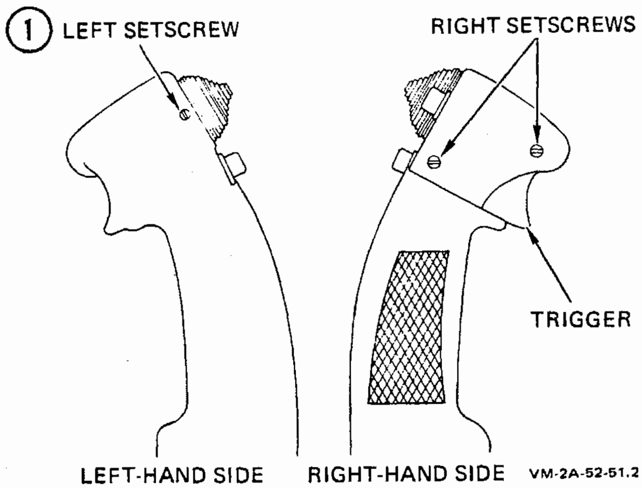
Figure 3-28. Control Stick Grip Wiring Diagram

3-212. REPAIR. To repair the stick grip assembly, proceed as follows:

Materials List

Sealing Compound, Synthetic Rubber, Electrical Connectors and Electrical Systems	MIL-S-8516
Solder, Rosin Core	QQ-S-571

1. Remove sealing compound covering the three setscrews on cap assembly. Remove setscrews and cap assembly.

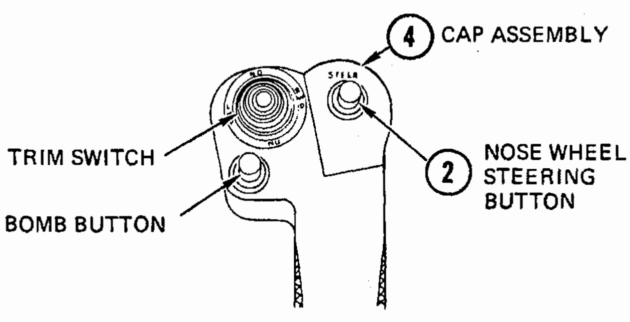


Step 1—Para. 3-212

Note

Aircraft having IAFC No. 22 incorporated have the trigger switch actuating plate (230009-5) and attaching screws **(NSN 5305-00-206-0544) removed.**

2. Unsolder wires from defective nose wheel steer button, bomb button, trim switch, or trigger switch. Note position of wires for correct reinstallation.



Steps 2 and 4—Para. 3-212

3. See figure 3-28. Using rosin core solder (QQ-S-571), solder wires by letter and number to proper terminals on new switch.

4. Install cap assembly with three setscrews. Cover screw holes in grip with sealing compound (MIL-S-8516).

3-213. TESTING. To test the stick grip assembly, see figure 3-28 and proceed as follows:

Tools and Equipment List

Multimeter	AN/PSM-4C (or equivalent)

1. Using a multimeter (AN/PSM-4C), depress nose wheel steer button and bomb button and check for continuity through both switches. Check for continuity through trim switch in ND, NU, LWD, and RWD positions. Depress trigger and check for continuity through switch.

3-214. LATERAL CONTROL SYSTEM CABLE MANUFACTURE.

3-215. See figure 3-29 for the location of the control cables in the lateral control system. Specific information necessary for the local manufacture of cables assemblies is given in table 3-12. Refer to General Structural Repair Manual (NAVAIR 01-1A-1) for specific fabrication methods. Refer to Aircraft Structural Hardware Manual (NAVAIR 01-1A-8) for specific information on cable end fittings. Refer to Illustrated Parts Breakdown (NAVAIR 01-60GCB-4) for specific parts data. To fabricate the cables, obtain the following listed tools.

Tools and Equipment List

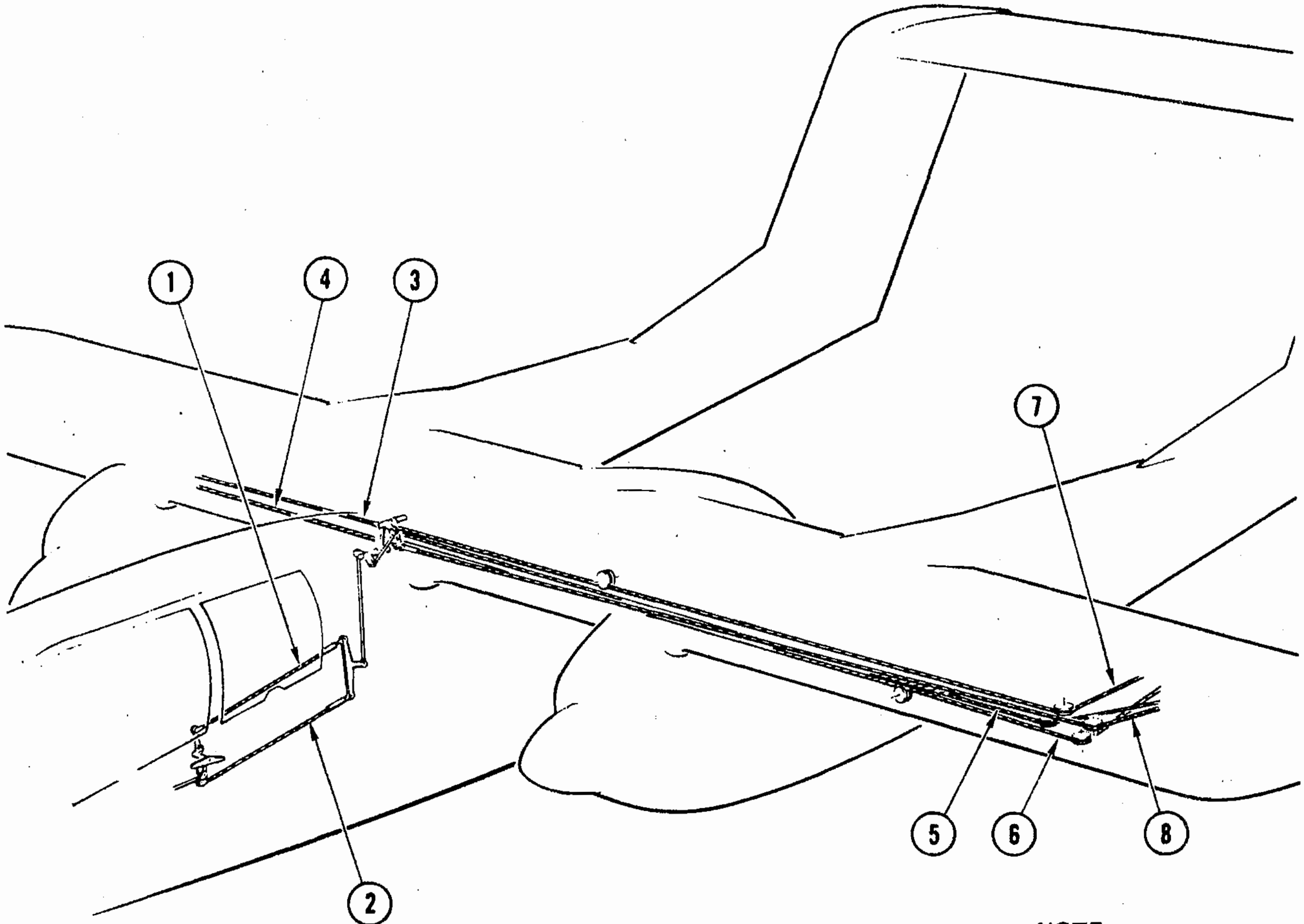
Machine, Swaging, Bench-type, Hand-operated	MIL-S-6180, Type 2 (or equivalent) (81349)
Machine, Cable Testing Hydraulically-operated (4000-pound capacity)	TA19802 (or equivalent)

3-216. LATERAL CONTROL ROD ASSEMBLIES.

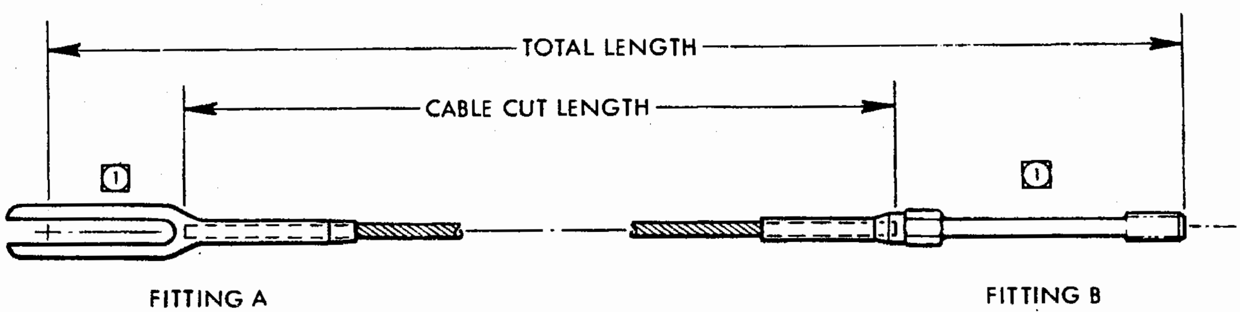
3-217. For intermediate maintenance procedures of the lateral control rod assemblies, refer to paragraph 2-181.

3-218. LATERAL SYSTEM BELL CRANK ASSEMBLIES.

3-219. For intermediate maintenance procedures of the lateral system bell crank assemblies, refer to paragraph 2-190.



NOTE
SEE TABLE 3-12 FOR
CABLE KEY NUMBER



NOTE

SWAGE TERMINALS IN ACCORDANCE WITH MIL-T-6117

TEST CABLE ASSEMBLIES AT 1200 POUNDS PER MIL-C-5688

1 PARTS PROVISIONED FOR INTERMEDIATE MAINTENANCE.

VM 2H 52-41

Figure 3-29. Lateral Control System Control Cable Manufacture

Table 3-12. Lateral Control System Control Cable Manufacturing Chart

CABLE NO.	PART NUMBER AND REQUIREMENT	FITTING A	FITTING B	CABLE DIAMETER (INCHES) AND SPEC. NO.	CABLE CUT LENGTH (INCHES)	TOTAL LENGTH (INCHES)
1	300-522020 (one required)	300-522024	MS21260L4LH	1/8 (0.125) MIL-W-1511	36- 5/16 (±1/8)	40-1/8 (±1/8)
2	300-522021 (one required)	300-522024	MS21260L4LH	1/8 (0.125) MIL-W-1511	36- 5/16 (±1/8)	40-1/8 (±1/8)
3	305-523232 (one required)	300-522024	MS21260L4LH	1/8 (0.125) MIL-W-1511	201- 5/16 (±1/8)	205-1/16 (±1/8)
4	305-523230 (one required)	300-522024	MS21260L4LH	1/8 (0.125) MIL-W-1511	217- 1/2 (±1/8)	221-1/4 (±1/8)
5	305-523289 (one required)	300-522024	MS21260L4LH	1/8 (0.125) MIL-W-1511	455- 1/8 (±1/8)	459 (±1/8)
6	305-523288 (one required)	300-522024	MS21260L4LH	1/8 (0.125) MIL-W-1511	474- 1/2 (±1/8)	478-1/8 (±1/8)
7	305-523233 (one required)	300-522024	MS21260L4LH	1/8 (0.125) MIL-W-1511	225- 1/8 (±1/8)	228-3/4 (±1/8)
8	305-523231 (one required)	300-522024	MS21260L4LH	1/8 (0.125) MIL-W-1511	226-13/16 (±1/8)	230-1/2 (±1/8)

3-220. REDUCED SPOILER DAMPING BUNGEE (305-523376).

3-221. For intermediate maintenance procedures of the reduced spoiler damping bungee, refer to paragraph 3-333.

3-222. LATERAL TRIM ACTUATOR (DL1028M 13-1).

3-223. The lateral trim actuator is an electromechanical, irreversible device used to position the left-hand aileron trim tab. The actuator assembly contains nonjamming mechanical stops which may be adjusted to limit travel. A neutral switch in the actuator can be adjusted to indicate midstroke or center of actuator travel. Intermediate maintenance for the actuator consists of a checkout, partial disassembly, adjustment of neutral switch and end fittings, reassembly of actuator, and functional testing. See figure 3-30.

3-224. CHECKOUT. To checkout the actuator, see figure 3-31 and proceed as follows:

Tools and Equipment List

Power Supply (0-30 volts dc capacity)	Model LH125 (or equivalent)
Multimeter	AN/PSM-4C (or equivalent)

1. Mount actuator on a suitable fixture. Connect power supply (Model LH125, or equivalent) to actuator.

2. Refer to table 3-13 to isolate cause(s) of malfunction. Use a multimeter (AN/PSM-4C) as required to troubleshoot actuator.

3-225. DISASSEMBLY. To partially disassemble the actuator, see figure 3-32 and proceed as follows:

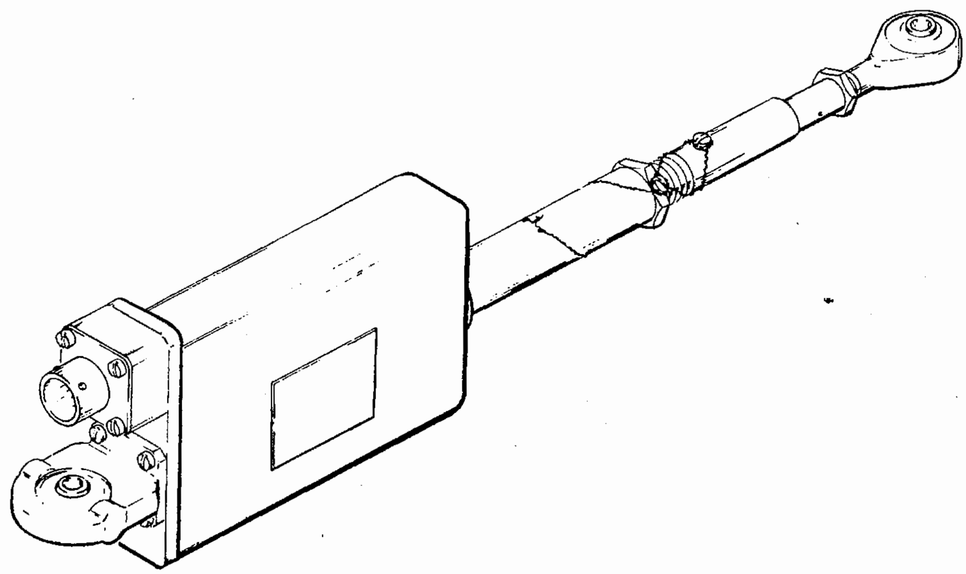


Figure 3-30. Lateral Trim Actuator

Materials List

Thinner, Type C (or equivalent)	(Manufactured by Stabond Corp., Mfrs. Code 25670)

1. Cut and remove lockwire from screws (1 and 2).

2. Loosen nut (3) and remove rod end bearing (4).

3. Remove screw (2), plug (5), and loosen nut (6). Remove guide tube extension (7).

Note

In the following step, use thinner in a well ventilated area. Avoid prolonged contact with skin.

4. Use thinner (Stabond, Type C) to dissolve the sealant which bonds nut (8) to cover (11) and cover (11) to plate (12).

5. Remove nut (8) and O-ring (9). Carefully remove cover (11).

3-226. SWITCH REPLACEMENT. To remove and replace the switch in the actuator, proceed as follows:

Tools and Equipment List

Soldering Iron

1. Perform procedures in paragraph 3-225.

2. Unsolder electrical leads from switch.

3. See figure 3-34 and remove two screws (1), from plate (4).

Note

The switch, actuator, and the plate are attached by screws (1) through the casting.

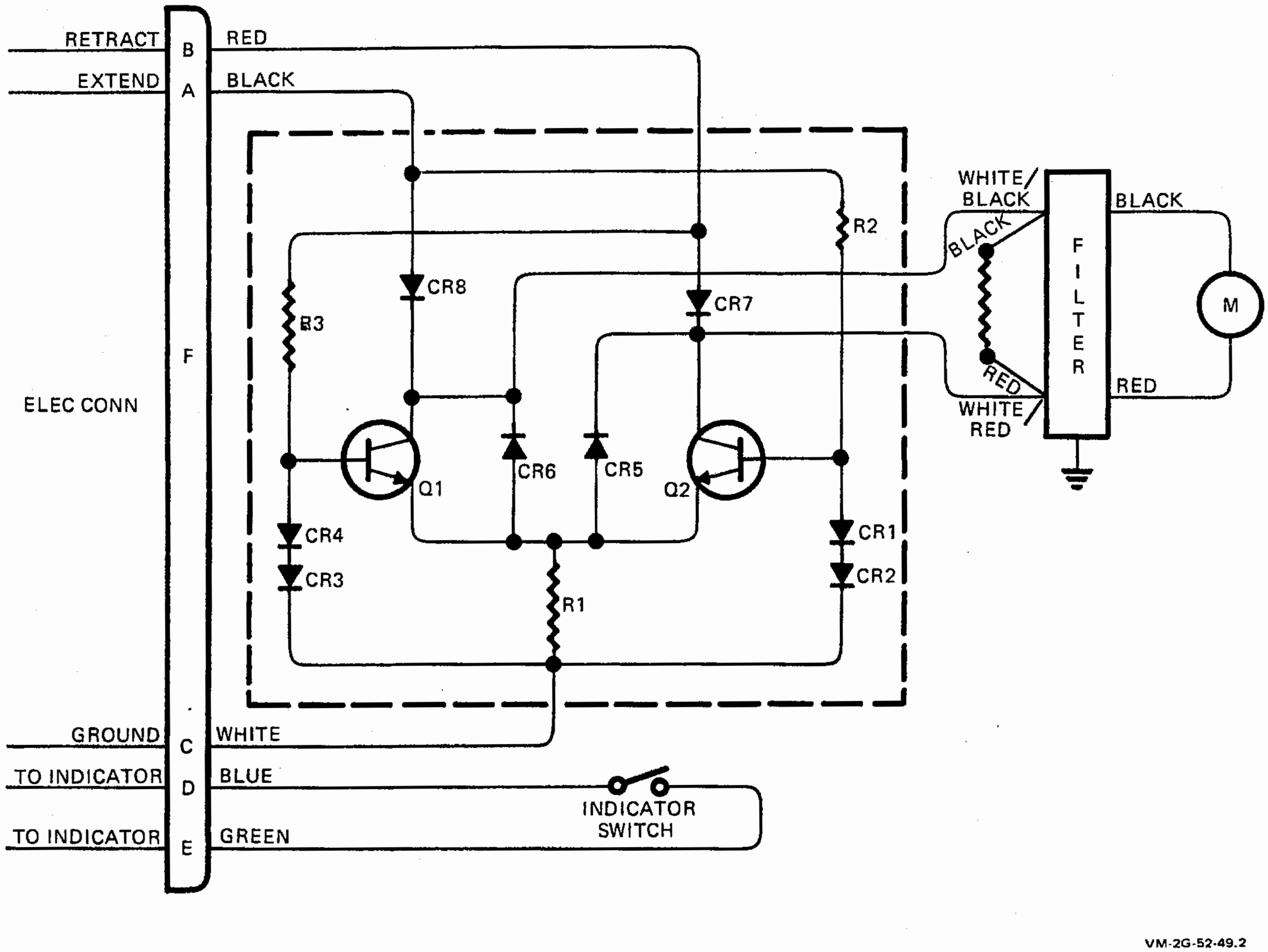


Figure 3-31. Lateral Trim Actuator Schematic Diagram

4. Replace switch and install screws through the switch, actuator, casting and into the plate. (Do not tighten screws until after adjustment. Refer to paragraph 3-227).

5. Solder wires to switch terminals.

3-227. ADJUSTMENT. To adjust the indicator switch, see figure 3-33 and proceed as follows:

Tools and Equipment List

Power Supply (0-30 volts capacity)	LH125 (or equivalent)

1. Mount actuator in suitable fixture.

2. Connect power supply (LH125) to actuator. Operate actuator to its fully retracted position.

Note

To adjust the neutral switch, actuator cover (11, figure 3-32) must be removed, guide tube extension (7), and rod end bearing (4) must be installed.

3. See figure 3-33 and adjust rod end bearing to obtain the full retract dimension [12-1/8 (± 8)

Table 3-13. Troubleshooting Lateral Trim Actuator

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: INOPERATIVE.		
Open connection.	Refer to paragraph 3-225 and remove cover. See figure 3-31 and check all connections.	Repair wiring as necessary.
Motor defective.	See figure 3-31 and check motor.	Forward actuator to depot maintenance for overhaul.
Short circuit.	See figure 3-31 and and check continuity.	Correct cause of short circuit.
Technical interference.	Locate cause of interference.	Remove cause of interference.
TROUBLE: POOR PERFORMANCE–HIGH CURRENT AND NOISE.		
Defective bearing.	Refer to paragraph 3-225 and remove cover. Locate defective bearing.	Forward actuator to depot maintenance for overhaul.
TROUBLE: POOR PERFORMANCE–LOW CURRENT.		
Low input voltage.	Check that input voltage is 26 (+3/–8) volts dc.	Readjust or replace power supply.
High resistance contact.	Refer to paragraph 3-225 and remove cover. Check all connections to locate excessive resistance.	Repair connection(s) as required.

inches]. Tighten nut on rod end bearing to maintain adjustment.

Note

The operating stroke (figure 3-33) must be obtained. The dimensions shown for full retract and extend positions are nominal, for reference use when determining the operating stroke, and the midstroke or neutral position, and to maintain a nominal and uniform length compatability. The rod end bearing may be adjusted to fit at time of installation in aircraft.

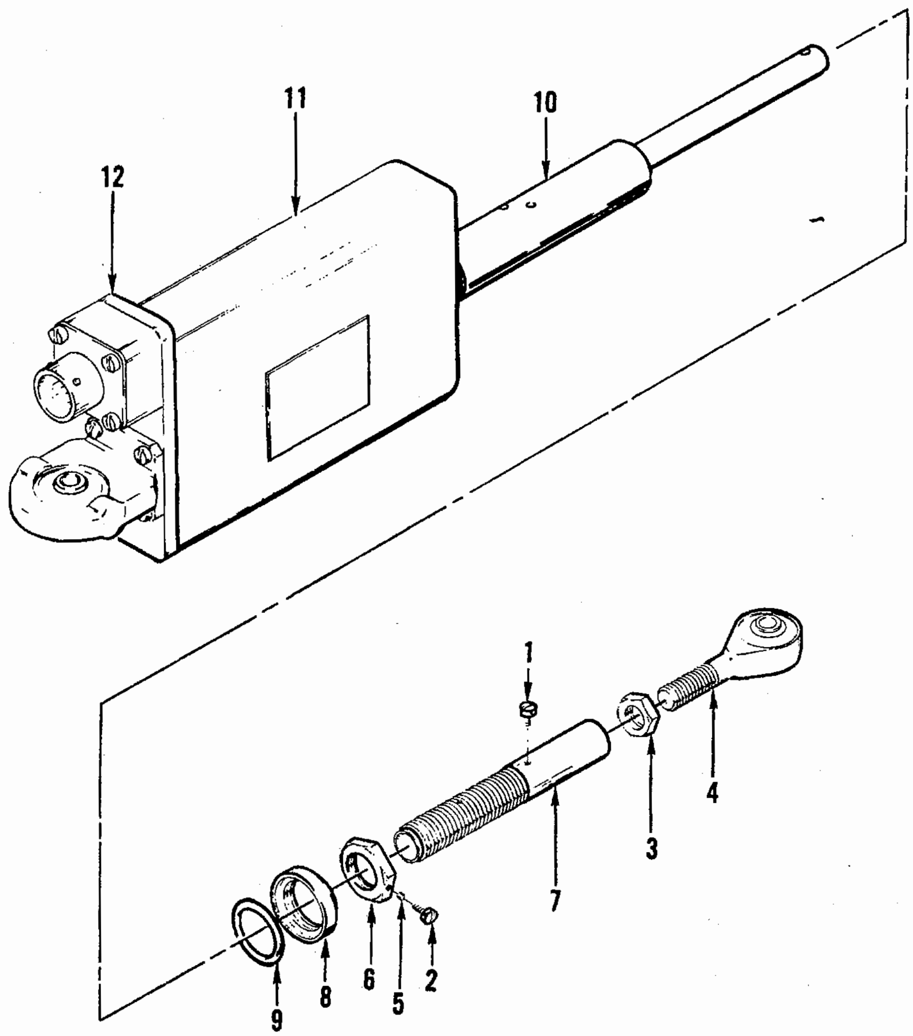


Figure 3-32. Lateral Trim Actuator - Partial Disassembly

4. Operate actuator to full extend position. Adjust guide tube extension to obtain the full extended dimension.

Note

To adjust the guide tube extension, see figure 3-32 and loosen screw (2) and nut (6) and thread guide tube extension clockwise or counterclockwise to obtain mechanical stroke.

5. Operate the actuator to midstroke or neutral position [13-1/8 (± 1/8) inches]. See figure 3-33.

6. Loosen two screws (1) that fasten switch (2), actuator (3), and plate (4) together. See figure 3-34.

7. Slide switch (2) and actuator (3) until actuator (3) comes in contact with cam (5) and actuates the switch (2). Tighten two screws (1) to secure switch setting.

8. Remove rod end bearing and guide tube extension. Refer to paragraph 3-228 for assembly procedures.

3-228. ASSEMBLY. To assemble the actuator, see figure 3-32 and proceed as follows:

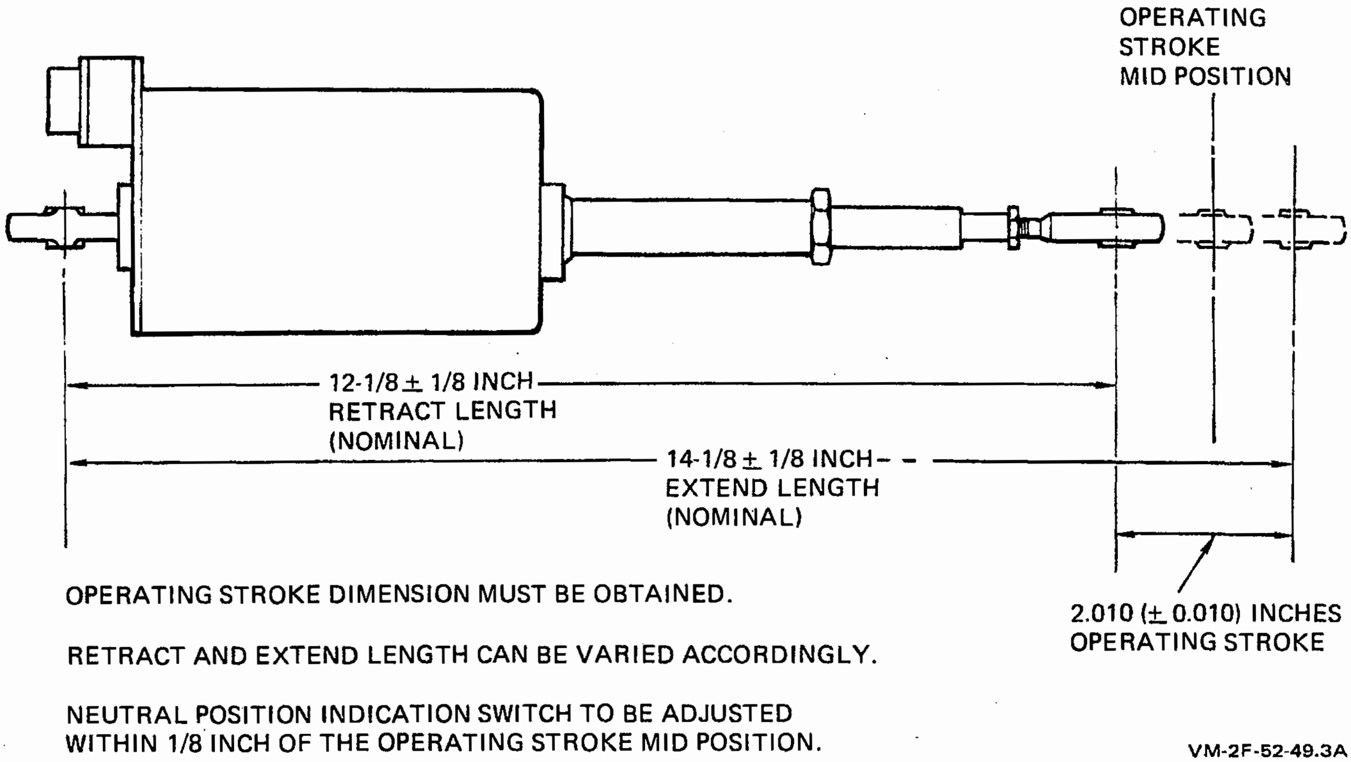


Figure 3-33. Lateral Trim Actuator Stroke Diagram

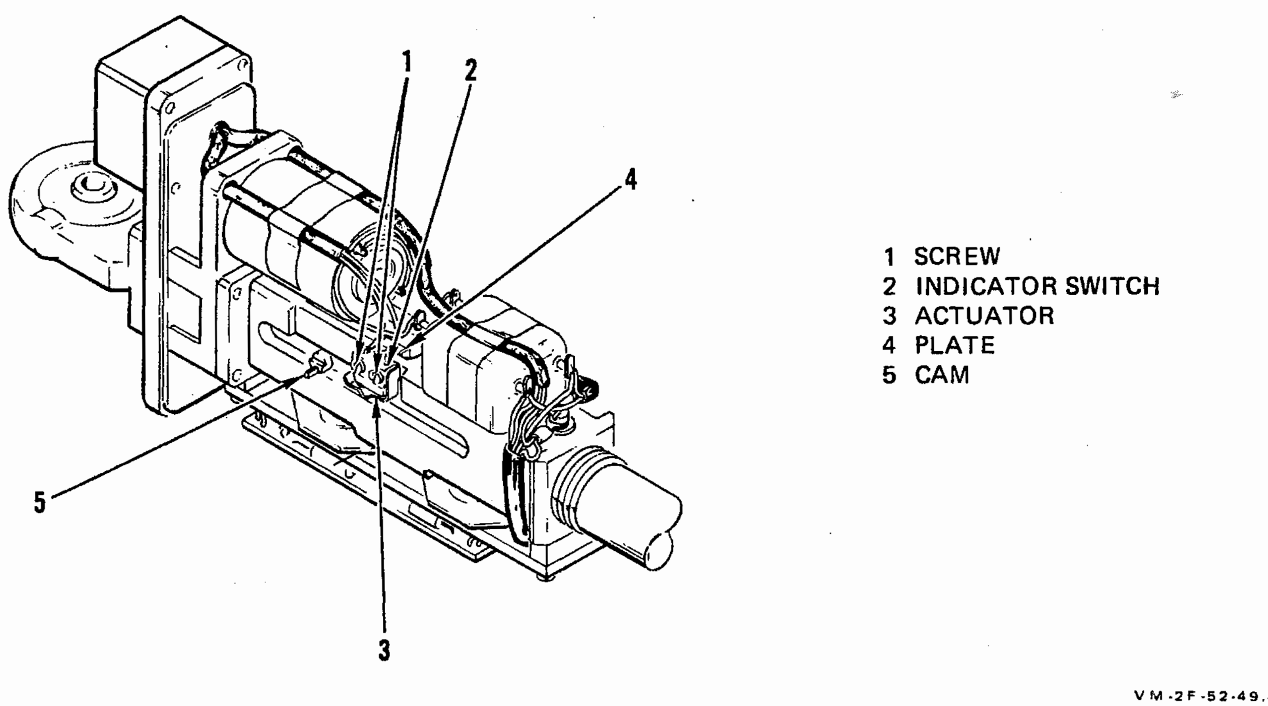


Figure 3-34. Lateral Trim Actuator Indicator Switch Adjustment

Materials List

Lockwire (0.032-inch diameter steel)	MS20995F32
Sealant Compound, Sealing and Thread Retaining (Loctite, Grade B)	MIL-S-22743, Grade C
Packing	MS28775-017

1. Apply sealant (MIL-S-22743, Grade C) to seam of cover (11) and plate (12) and to cover and nut (8).

2. Carefully slide cover (11) over guide tube (10) to cover internal components. Slip O-ring (9) and nut (8) over guide tube (10). Carefully seat O-ring (9) and tighten nut (8).

3. Thread nut (3) onto rod end bearing (4). Thread rod end bearing (4) into guide tube extension (7).

4. Thread nut (6) onto guide tube extension (7). Install plug (5) and screw (2) into nut (6), but do not tighten screw (2).

5. Refer to paragraph 3-225 and see figures 3-32 and 3-33 to adjust length of guide tube extension (7, figure 3-32) and rod end bearing (4, figure 3-32).

6. Tighten screws (1 and 2). Safety screws (1 and 2), and guide tube (10) with lockwire (MS20995F32). See figure 3-32.

3-229. TESTING. To perform a functional test of the actuator, proceed as follows:

Tools and Equipment List

Multimeter	AN/PSM-4C (or equivalent)
Power Supply (0-30 volts dc capacity)	Model LH125 (or equivalent)

1. Mount actuator in a suitable fixture. Connect power supply (Model LH125 or equivalent) to actuator.

2. See figure 3-33. Operate actuator to fully retracted and fully extended positions. Check operating stroke dimensions.

3. See figures 3-33 and 3-34 and, using a multimeter (AN/PSM-4C), check indicating switch dimensions.

3-230. LONGITUDINAL CONTROL SYSTEM.

3-231. Intermediate maintenance pertaining to the longitudinal flight control system is contained in this section. Materials, special tools and specifications for performing these maintenance procedures are listed as necessary. Repair of components at this level of maintenance generally includes the installation of items contained in provisioned repair kits along with standard supply items.

3-232. LONGITUDINAL CONTROL SYSTEM CABLE MANUFACTURE.

3-233. See figure 3-35 for the location of the control cables in the longitudinal control system. Specific information necessary for the local manufacture of cable assemblies is given in table 3-14. Refer to General Structural Repair Manual (NAVAIR 01-1A-1) for specific fabrication methods. Refer to Aircraft Structural Hardware Manual (NAVAIR 01-1A-8) for specific information on cable end fittings. Refer to Illustrated Parts Breakdown (NAVAIR 01-60GCB-4) for specific parts data. To fabricate the cables, obtain the following listed tools.

Tools and Equipment List

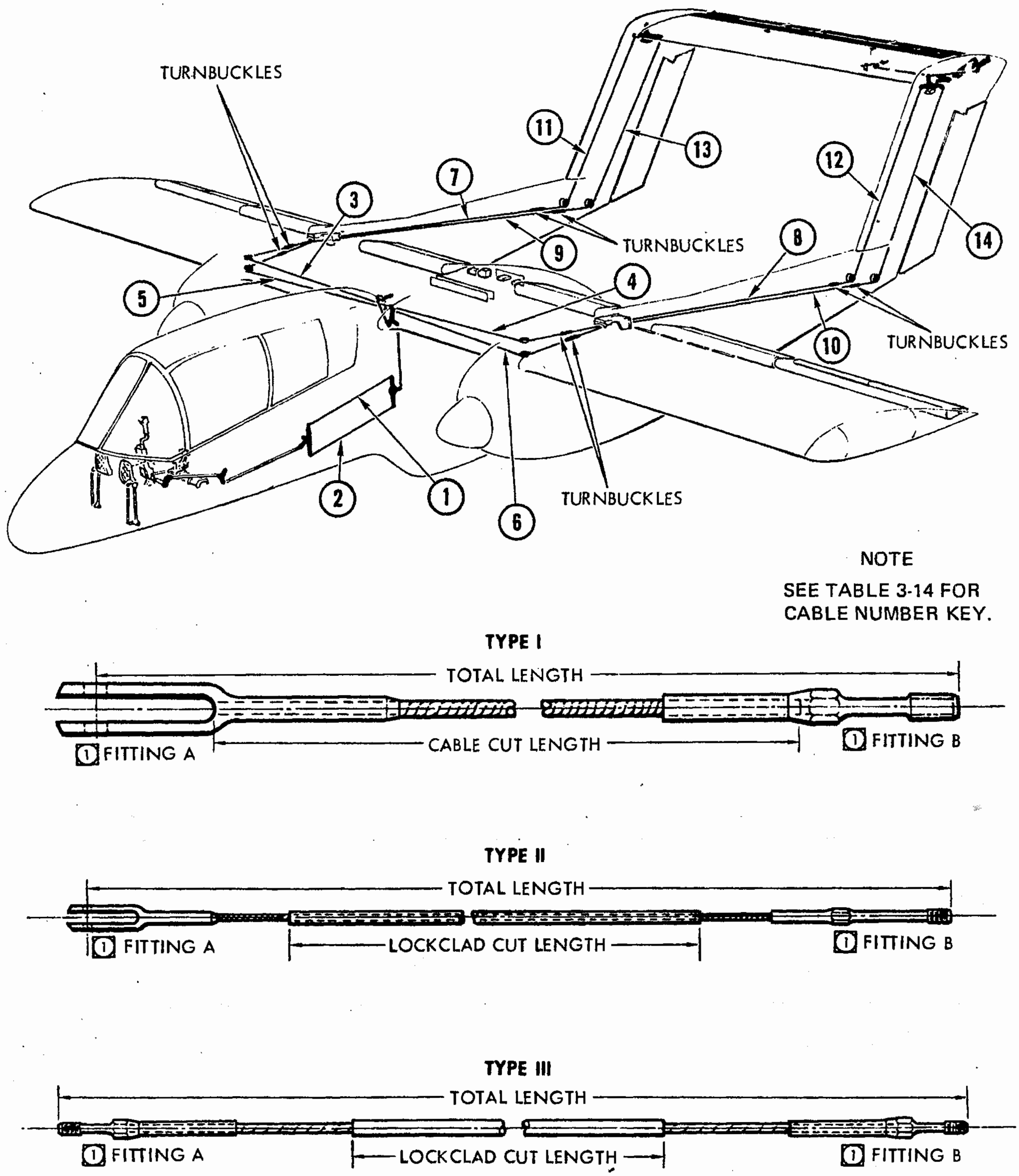
Machine, Swaging, Bench-type, Hand-operated	MIL-S-6180, Type 2 (or equivalent)
Machine, Cable Testing, Hydraulically-operated (4000-pound capacity)	TA 19802 (or equivalent)

3-234. LONGITUDINAL CONTROL ROD ASSEMBLIES.

3-235. For intermediate maintenance procedures of the longitudinal control rod assemblies, refer to paragraph 2-181.

3-236. LONGITUDINAL SYSTEM BELL CRANK ASSEMBLIES.

3-237. For intermediate maintenance procedures



NOTE

SWAGE TERMINALS IN ACCORDANCE WITH MIL-T-6117.

TEST CABLE ASSEMBLIES AT 1200 POUNDS PER MIL-C-5688.

1 PARTS PROVISIONED FOR INTERMEDIATE MAINTENANCE REPAIR.

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Figure 3-35. Longitudinal Control System Control Cable Manufacture

Table 3-14. Longitudinal Control System Control Cable Manufacturing Chart

CABLE NO.	Cable No. and Reqmt.	Cable Type	Fitting A	Fitting B	Cable Dia. (Inches) and Spec. No.	Cable Cut Length (Inches)	Lockclad Spec. No.	Lockclad Cut Length (Inches)	Total Length (Inches)
1	300-522020 (one required)	I	300-522024	MS21260L4LH	1/8 (0.125) MIL-W-1511	36-5/16 (±1/8)	N/A	N/A	40-1/8 (±1/8)
2	300-522021 (one required)	I	300-522024	MS21260L4LH	1/8 (0.125) MIL-W-1511	36-5/16 (±1/8)	N/A	N/A	40-1/8 (±1/8)
3	305-522269 (one required)	II	300-522024	MS21260L4LH	1/8 (0.125) MIL-W-1511	As required	6061-T6 Al Alloy Tube	85-23/64 (±1/2)	120-1/2 (±1/8)
4	305-522272 (one required)	II	300-522024	MS21260L4RH	1/8 (0.125) MIL-W-1511	As required	6061-T6 Al Alloy Tube	62-9/32 (±1/2)	94-3/8 (±1/8)
5	305-522273 (one required)	II	300-522024	MS21260L4RH	1/8 (0.125 MIL-W-1511	As required	6061-T6 Al Alloy Tube	77-1/2 (±1/2)	109-5/8 (±1/8)
6	305-522274 (one required)	II	300-522024	MS21260L4LH	1/8 (0.125) MIL-W-1511	As required	6061-T6Al Alloy Tube	68-7/8 (±1/2)	104-1/32 (±1/8)
7 and 8	305-522268 (two required)	III	MS2126054LH	MS21260L4RH	1/8 (0.125) MIL-W-1511	As required	6061-T6Al Alloy Tube	103-3/4 (±1/2)	144-1/8 (±1/8)
9 and 10	305-522271 (two required)	III	MS2126054RH	MS21260L4LH	1/8 (0.125) MIL-W-1511	As required	6061-T6Al Alloy Tube	116-3/4 (±1/2)	159-3/8 (±1/8)
11 and 12	305-522267 (two required)	II	MS20658-4	MS2126054RH	1/8 (0.125) MIL-W-1511	As required	6061-T6 Al Alloy Tube	79-3/4 (±1/2)	116-13/32 (±1/8)
13 and 14	305-522270 (two required)	II	MS26058-4	MS2126054LH	1/8 (0.125) MIL-W-1511	As required	6061-T6 Al Alloy Tube	73-3/4 (±1/2)	112.00 (±1/8)

for the longitudinal system bell crank assemblies, refer to paragraph 2-193.

3-238. ELEVATOR SPRING TAB BUNGEE (305-522239).

3-239. The elevator spring tab bungee is a two-way compression-tension bungee. Because of its construction, disassembly, cleaning, inspection, assembly, and adjustment are within the capability of intermediate maintenance.

3-240. DISASSEMBLY. To disassemble the bungee, see figure 3-36 and proceed as follows:

1. Remove lock washer (9), check nut (10), and rod end bearing (11) from shaft (8).

2. Remove cylinder nut (2) and end fitting (1) from cylinder (3).

3. Remove check nuts (4), pistons, (5, 7), and spring (6) from shaft.

3-241. CLEANING. To clean the bungee components, see figure 3-36 and proceed as follows:

Materials List

Solvent, Dry-cleaning	P-D-680, Type II

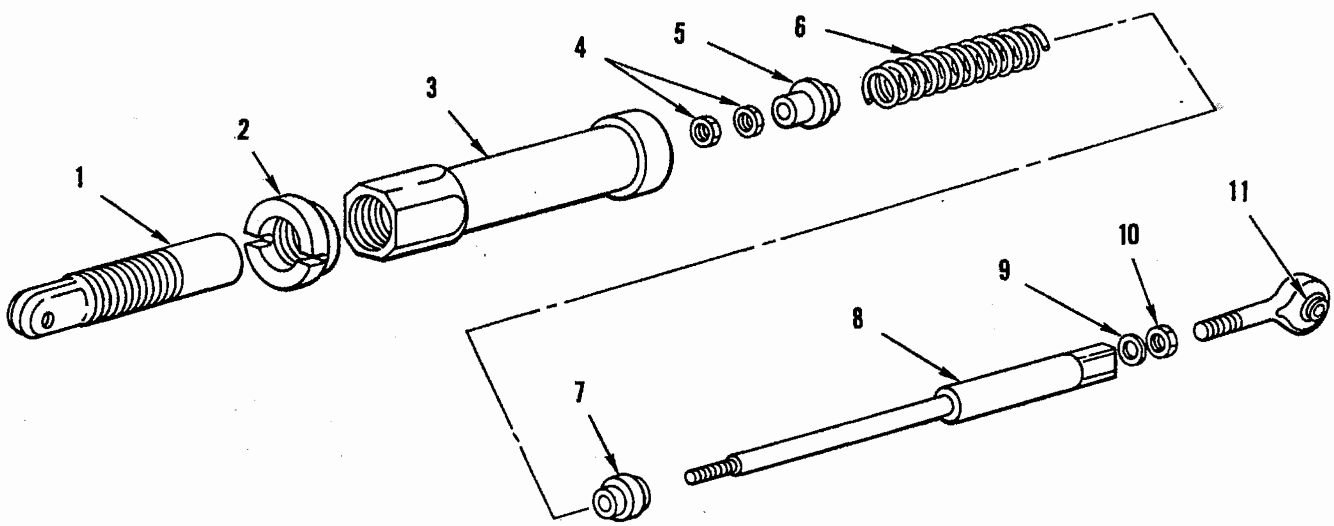
WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

1. Using a soft brush, clean all parts in dry-cleaning solvent (P-D-680, Type II).

2. Dry with clean, compressed air.

3-242. INSPECTION. If a part does not meet the conditions given in the following steps, it must be replaced.



1 END FITTING
2 CYLINDER NUT
3 CYLINDER
4 CHECK NUTS
5 PISTON
6 SPRING
7 PISTON
8 SHAFT
9 LOCK WASHER
10 CHECK NUT
11 ROD END BEARING

VM-2F-52-38A

Figure 3-36. Elevator Spring Tab Bungee

Tools and Equipment List

Tester, Spring Resiliency,	Type PB4-D (or equivalent)

Materials List

Primer, Zinc-chromate	MIL-P-8585 or TT-P-1757

1. Inspect all parts for general condition. Check all threads for damage and all machined surfaces for smoothness. Inspect all parts for cracks, dents, scratches, and worn threads.

2. Check end fitting (1) bolt holes (0.250-inch) for radial wear. Maximum allowable radial wear is 0.025 inch.

3. Check spring (6) for cracks and breakage. Check that ends are within 2 degrees of spring axis. Measure length of spring. Free length must be 2.615 (±0.030) inches.

4. Place spring in spring tester (PB4-D). Compress spring to 2.5 (± 0.010) inches in length and record force. Compress spring to 1.90 (± 0.010) inches length and record force. Difference must be 69.6 (± 3.43) pounds.

5. Spot-paint all nicked or scratched surfaces with zinc-chromate primer, (MIL-P-8585 or TT-P-1757).

3-243. ASSEMBLY. To assemble the bungee, see figure 3-36 and proceed as follows:

Tools and Equipment List

Scale, Spring	L-30M

Materials List

Silcone Fluid, Dow Corning 200 20-centistoke	VV-D-1078
Lockwire (0.032-inch diameter steel)	MS20995F32

1. Check that all parts are clean before assembly. Coat internal parts and inside of cylinder with Dow Corning 200 silicon fluid (VV-D-1078).

Note

Lockwire must be snug against shaft and nuts to clear inside of cylinder.

2. Install pistons (5, 7) and spring (6) on shaft (8). Using a spring scale (L-30M), preload spring to 2.0 (± 0.5) pounds by adjusting check nuts (9). After adjusting, tighten check nuts and safety with lockwire (MS20995F32).

3. Install spring and shaft assembly into cylinder. Install end fitting (1) and tighten to remove end plug.

4. Install cylinder nut (2) and tighten against end fitting. Tighten nut and safety with lockwire (MS20995F32).

5. Install lock washer (9), check nut (10), and rod end bearing (11) on shaft.

3-244. ADJUSTMENT. To adjust the elevator spring tab bungee, see figure 3-36 and proceed as follows:

Materials List

Lockwire (0.032-inch diameter steel)	MS20995F32

1. Adjust rod end bearing (11) to mid-position.

2. Tighten check nut (10) and safety to lock washer (9) with lockwire (MS20995F32).

3-245. LONGITUDINAL TRIM ACTUATOR (R5219-1 AND R5219M1).

3-246. The longitudinal trim actuator is an electromechanical, irreversible device used to position the left elevator spring tab to obtain nose up or nose down trim. Intermediate maintenance for the actuator consists of a checkout, partial disassembly, cleaning, inspection, minor repair, limit switch adjustment, reassembly, and functional testing.

3-247. CHECKOUT. To check out the actuator, see figure 3-37 and proceed as follows:

Tools and Equipment List

Power Supply, Electrical (0- to 30-volt capacity)	Model LH125 (or equivalent)
Multimeter	AN/PSM-4C

1. Mount actuator on a suitable fixture. Connect power supply (Model LH125, or equivalent) to actuator.

2. Refer to table 3-15 and isolate cause of malfunction. Use multimeter (AN/PSM-4C) as required to test circuitry.

3-248. DISASSEMBLY. To partially disassemble the actuator, see figure 3-38 and proceed as follows:

1. Cut lockwire between connector retaining nut and guide fitting retaining nut.

2. Remove electrical connector retaining nut. **Remove guide fitting retaining nut and O-ring seal under nut.**

3. Slide cover off of actuator.

3-249. CLEANING. To clean the actuator, proceed as follows:

CAUTION

Do not use cleaning solvents of any kind to clean any electrical components of the actuator.

1. Clean all electrical parts and nonmetallic parts using a stiff, nonwire brush. Blow away loose foreign particles using dry, filtered, low-pressure compressed air.

2. Wipe the parts of the actuator with a clean, lint-free cloth.

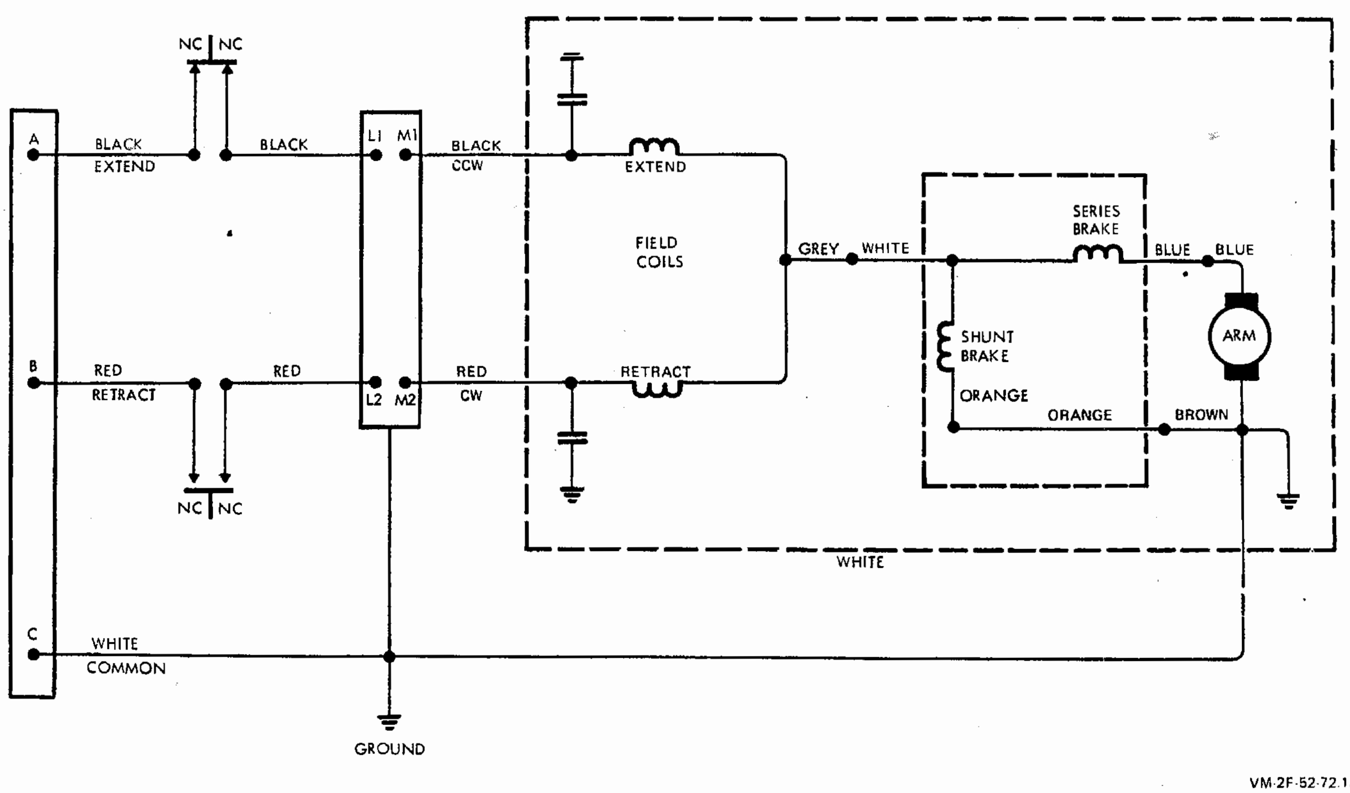


Figure 3-37. Longitudinal Trim Actuator Wiring Diagram

Table 3-15. Troubleshooting Longitudinal Trim Actuator

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: INOPERATIVE–NO CURRENT.		
Open connection.	Refer to paragraph 3-248, see figure 3-38, and remove cover. See figure 3-37 and check all connections.	Repair wiring as required.
Defective limit switch.	See figure 3-37 and check continuity through switches.	Replace defective switch.
Limit switch improperly adjusted.	Refer to paragraph 3-252 and see figure 3-39 for correct switch adjustment.	Adjust switches.
TROUBLE: LOW SPEED, HIGH CURRENT, AND NOISY OPERATION.		
Mechanical interference with gears, bearings, or other components.	Refer to paragraph 3-248, see figure 3-38, and remove cover. Visually inspect gears and bearings for mechanical interference, wear, and damage.	Forward actuator to depot maintenance for overhaul.

3-250. INSPECTION. To inspect actuator, see figure 3-37 and proceed as follows:

Tools and Equipment List

Multimeter	AN/PSM-4C

1. Visually examine all parts for damage and corrosion.

2. Inspect all leadwires for cracked insulation. Using multimeter (AN/PSM-4C), check leadwires for continuity.

3. See figure 3-61. Inspect switches for damaged cases. See figure 3-37. Using a multimeter (AN/PSM-4C), check electrical operation of switches.

4. See figure 3-62. Inspect brushes (6) for excessive wear. Wear mark must be clearly visible.

5. See figure 3-38. Check condition of rubber gasket.

3-251. REPAIR. Refer to paragraph 3-250 and replace those components found to be worn or defective.

3-252. ADJUSTMENT. To adjust the actuator, see figures 3-39 and 3-40 and proceed as follows:

Tools and Equipment List

Power Supply, Electrical (0- to 30-volt dc capacity)	Model LH125 (or equivalent)

Materials List

Lockwire (0.032-inch diameter steel)	MS20995F32

1. Mount actuator in a suitable fixture.

2. Connect electrical power supply (Model LH125, FSCM 80103, or equivalent) to actuator.

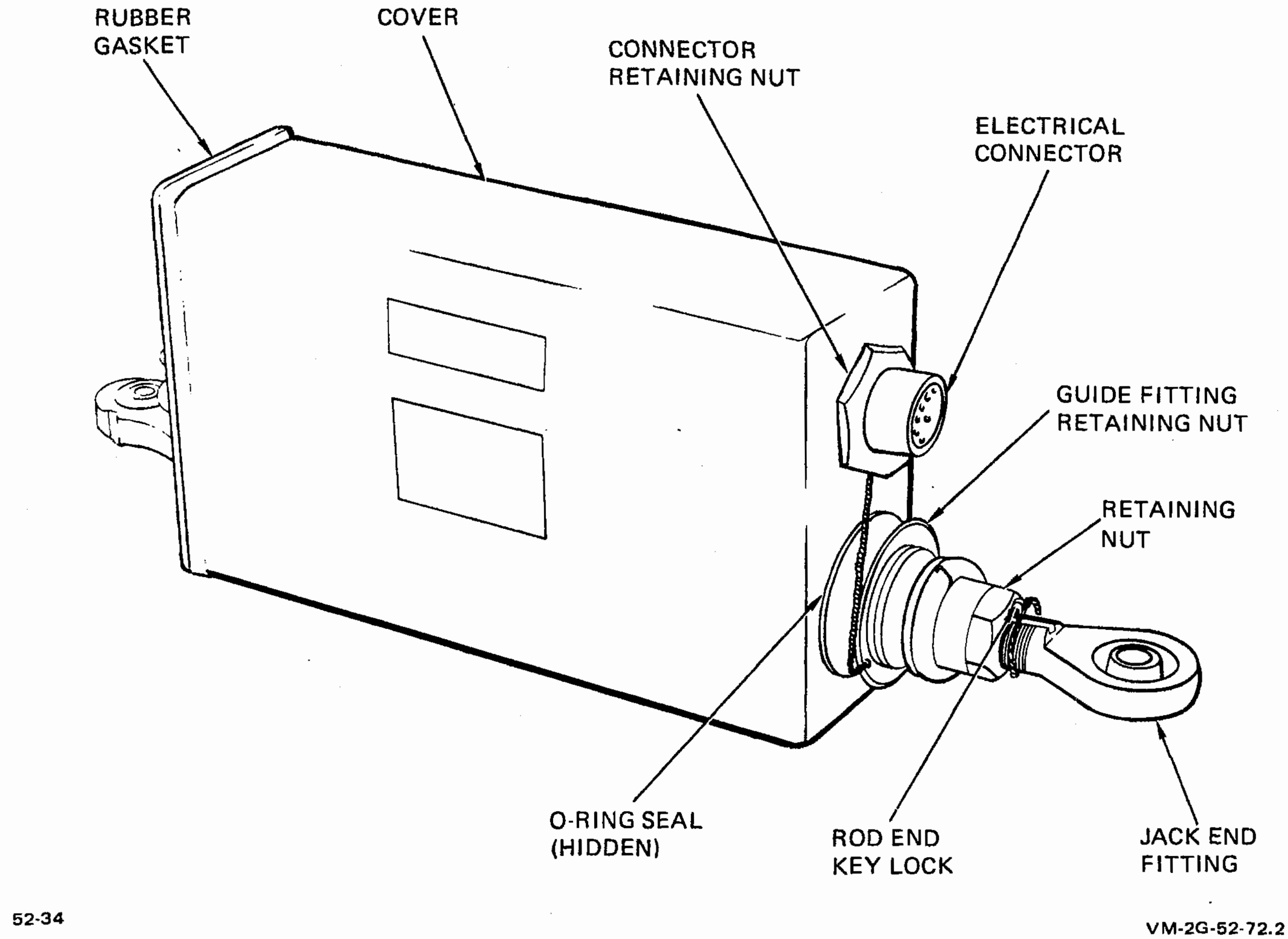


Figure 3-38. Longitudinal Trim Actuator - Partial Disassembly

3. See figure 3-39. Adjust screws on switch levers to obtain a 0.005 to 0.010-inch clearance between flat surface of lever rods and switch levers when buttons of switches are bottomed out.

4. Make further adjustments as required by sliding each bracket assembly as necessary. Press down switch levers and check for clearance.

5. See figure 3-40. Loosen jack-end fitting retaining nut. Turn jack-end fitting clockwise or counterclockwise to obtain required mechanical extend and retract dimensions. Tighten retaining nut and safety with lockwire (MS20995F32).

3-253. ASSEMBLY. To assemble the actuator, see figure 3-38 and proceed as follows:

Materials List

Adhesive	Type EC-870, FSCM 55101 (or equivalent)
Lockwire (0.032-inch diameter steel)	MS20995F32
Gasket	4820189-1 (81039)

1. If required, install new rubber gasket (4820189-1) on edge of cover using adhesive (type EC-870, FSCM 55101, or equivalent).

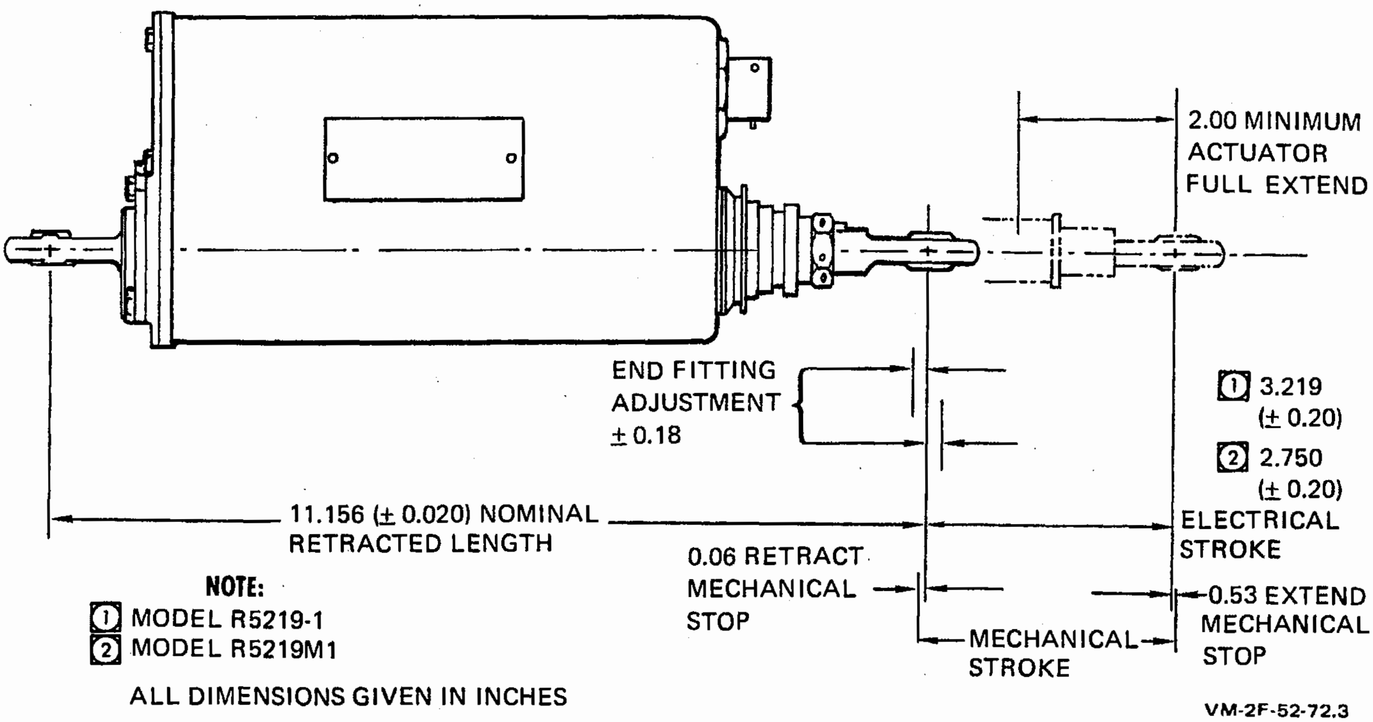


Figure 3-39. Longitudinal Trim Actuator - Limit Switch Adjustment

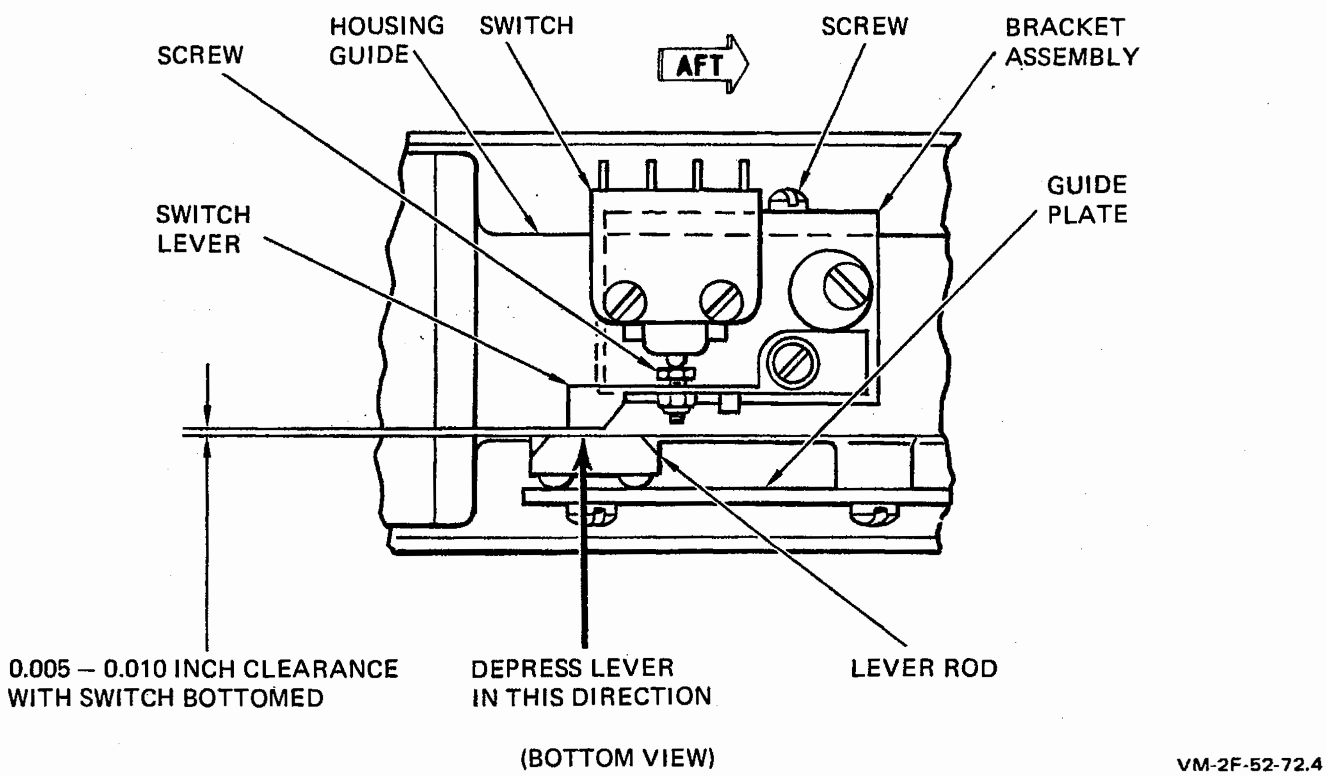


Figure 3-40. Longitudinal Trim Actuator - Stroke Diagram

2. Position electrical connector through cover. Install and tighten connector retaining nut. Seal perimeter of nut with adhesive (type EC-870, FSCM 55101, or equivalent).

3. Slide cover over actuator. Install O-ring seal and guide fitting retaining nut. Tighten retaining nut.

4. Safety guide fitting retaining nut against connector retaining nut with lockwire (MS20995F32).

3-254. TESTING. Testing the actuator is limited to functional testing. Proceed as follows:

Tools and Equipment List

Power Supply, Electrical (0- to 30-volt dc capacity)	Model LH125 (or equivalent)

Materials List

Lockwire (0.032-inch diameter steel)	MS20995F32

1. Mount actuator on a suitable fixture. Connect power supply (Model LH-125, FSCM 80103, or equivalent) to actuator.

2. See figure 3-40. Cycle actuator at 26 volts dc to fully extended and fully retracted positions. Check mechanical stroke and mechanical stop dimensions.

3-255. LONGITUDINAL TRIM SPRING SUPPORT ARM (300-522260).

3-256. Intermediate maintenance for the support arm consists of bearing replacement. Refer to paragraph 2-189 for procedures in bearing replacement.

3-257. DIRECTIONAL CONTROL SYSTEM.

3-258. Intermediate maintenance pertaining to the directional control system is contained in this section. Materials, special tools, and specifications for performing these maintenance procedures are listed as necessary. Repair of components at this level of maintenance generally includes the installation of items contained in provisioned repair kits along with standard supply items.

3-259. DIRECTIONAL CONTROL SYSTEM CABLE MANUFACTURE.

3-260. See figure 3-41 for the location of the control cables in the directional control system. Specific information necessary for the local manufacture of cable assemblies is given in table 3-16. Refer to General Structural Repair Manual (NAVAIR 01-1A-1) for specific fabrication methods. Refer to Aircraft Structural Hardware Manual (NAVAIR 01-1A-8) for specific information on cable end fittings. Refer to Illustrated Parts Breakdown (NAVAIR 01-60GCB-4) for specific parts data. To fabricate the covers, obtain the following listed tools.

Tools and Equipment List

Machine, Swaging, Bench-type, Hand-operated	MIL-S-6180, Type 2 (or equivalent)
Machine, Cable Testing, Hydraulically-operated (4000-pound capacity)	TA 19802 (or equivalent)

3-261. DIRECTIONAL SYSTEM CONTROL ROD ASSEMBLIES.

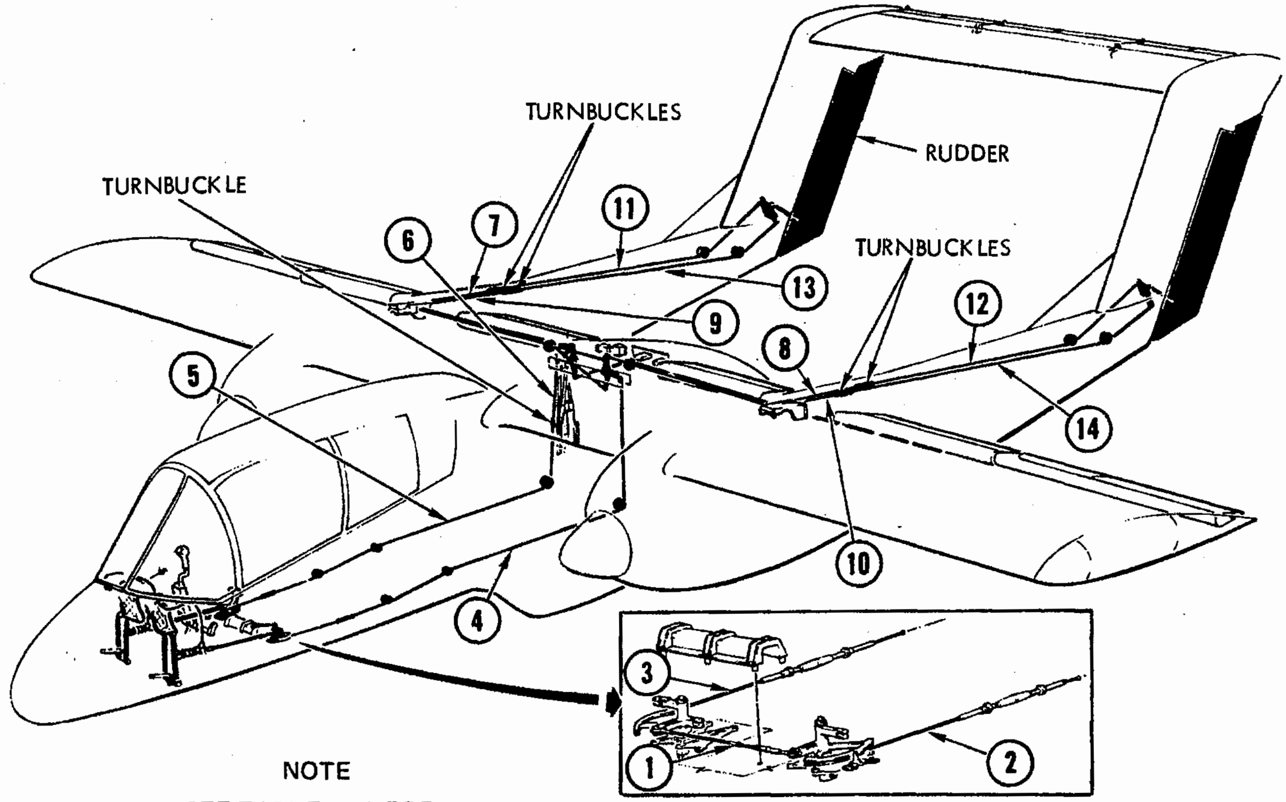
3-262. For intermediate maintenance procedures for the directional control rod assemblies, refer to paragraph 2-181.

3-263. DIRECTIONAL SYSTEM BELL CRANK ASSEMBLIES.

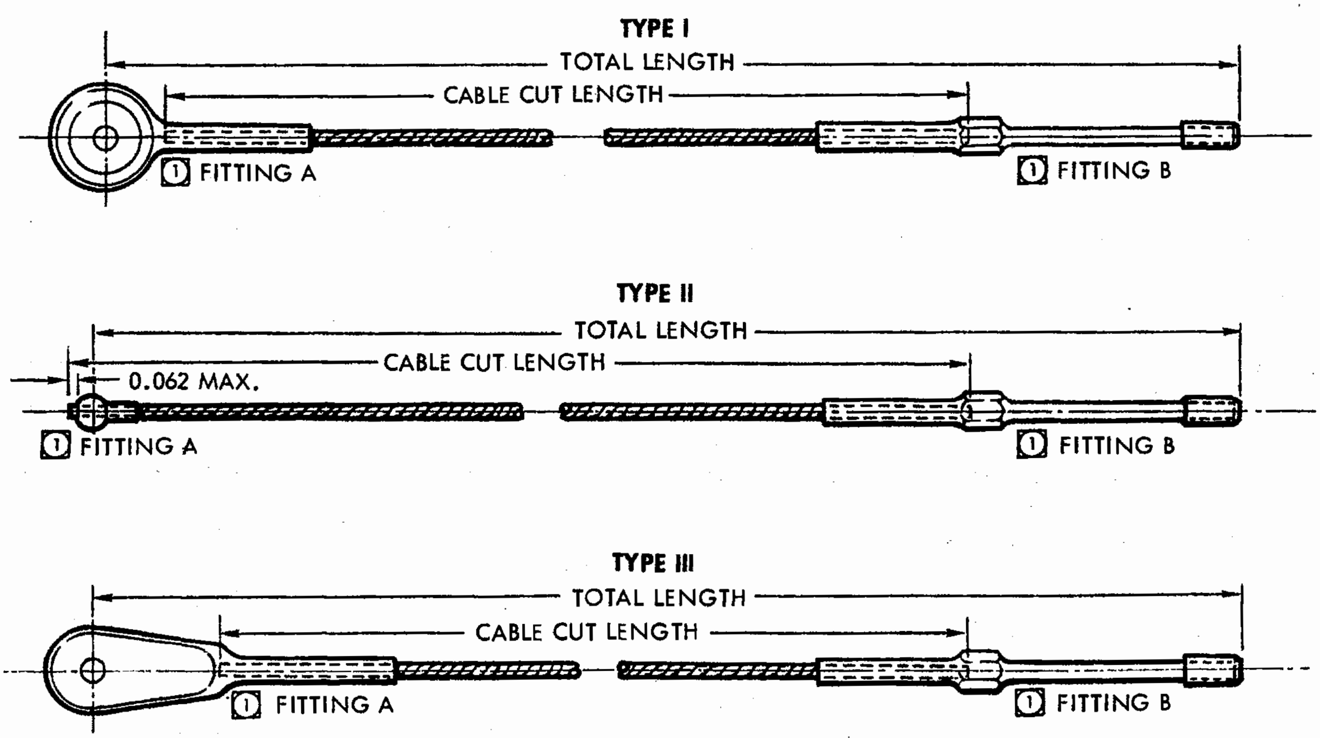
3-264. For intermediate maintenance for the directional system bell crank assemblies, refer to paragraph 2-193.

3-265. RUDDER PEDAL ADJUST SCREW-JACK ASSEMBLY (300-524113).

3-266. For depot maintenance procedures for the rudder pedal adjust screw-jack assembly, refer to paragraph 3-389.



NOTE
SEE TABLE 3-16 FOR
CABLE KEY NUMBER



NOTE: 1 SWAGE TERMINALS IN ACCORDANCE WITH MIL-T-6117.
1 LIST CABLE ASSEMBLIES AT 1200 POUNDS PER MIL-C-5688.
1 PARTS PROVISIONED FOR INTERMEDIATE MAINTENANCE REPAIR.

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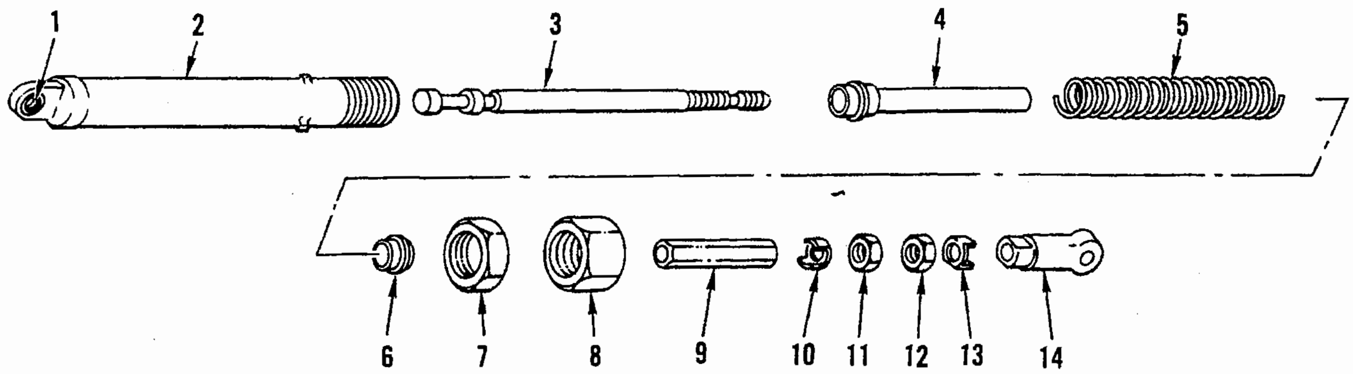
Figure 3-41. Directional Control System Control Cable Manufacture

Table 3-16. Directional Control System Control Cable Manufacturing Chart

Cable No.	Cable No. and Reqmt.	Cable Type	Fitting A	Fitting B	Cable Dia. (Inches) and Spec. No.	Cable Cut Length (Inches)	Total Length (Inches)
1	300-524104 (one required)	I	300-524035	MS21260L4LH	1/8 (0.125) MIL-W-1511	12-1/4 (±1/8)	15-1/2 (±1/8)
2 and 3	300-524108 (two required)	II	MS20664C4	MS21260L4RH	1/8 (0.125) MIL-W-1511	21-1/2 (±1/8)	24- (±1/8)
4	305-524206 (one required)	III	300-522024	MS21260L4LH	1/8 (0.125) MIL-W-1511	159-3/8 (±1/8)	163-1/8 (±1/8)
5	305-524205 (one required)	III	300-522024	MS21260L4LH	1/8 (0.125) MIL-W-1511	131-1/8 (±1/8)	134-15/16 (±1/8)
6	300-524090 (one required)	III	300-522024	MS21260L4LH	1/8 (0.125) MIL-W-1511	17-1/4 (±1/8)	20-7/8 (±1/8)
7	305-524216 (one required)	III	300-522024	MS21260L4LH	1/8 (0.125) MIL-W-1511	95-3/4 (±1/8)	99-7/16 (±1/8)
8	305-524214 (one required)	III	300-522024	MS21260L4RH	1/8 (0.125) MIL-W-1511	110-7/8 (±1/8)	114-1/2 (±1/8)
9	305-524215 (one required)	III	300-522024	MS21260L4LH	1/8 (0.125) MIL-W-1511	110-1/4 (±1/8)	113-13/16 (±1/8)
10	305-524213 (one required)	III	300-522024	MS21260L4LH	1/8 (0.125) MIL-W-1511	90- (±1/8)	93-5/8 (±1/8)
11	300-524217 (one required)	III	MS20658-4	MS21260L4LH	1/8 (0.125) MIL-W-1511	147- (±1/8)	150-3/4 (±1/8)
12	300-524215 (one required)	III	MS20658-4	MS21260L4LH	1/8 (0.125) MIL-W-1511	146-13/16 (±1/8)	150-9/16 (±1/8)
13	300-524218 (one required)	III	MS20658-4	MS21260L4RH	1/8 (0.125) MIL-W-1511	153-1/4 (±1/8)	157-1/16 (±1/8)
14	300-524216 (one required)	III	MS20658-4	MS21260L4RH	1/8 (0.125) MIL-W-1511	153-1/4 (±1/8)	157-1/16 (±1/8)



1 END FITTING BEARING *
2 CYLINDER
3 SHAFT
4 PISTON *
5 SPRING *
6 PISTON *
7 CYLINDER LOCK NUT *
8 END CAP *
9 SLEEVE
10 LOCK WASHER *
11 CHECK NUT *
12 CHECK NUT *
13 LOCK WASHER *
14 ROD END BEARING *

* REPAIR PARTS PROVISIONED FOR INTERMEDIATE MAINTENANCE.

PVM-2F-52-39

Figure 3-42. Directional System Force Trim Bungee

3-267. DIRECTIONAL SYSTEM FORCE TRIM BUNGEE (300-524088).

3-268. The directional system force trim bungee is a two-way compression bungee. Because of its construction, disassembly, cleaning, inspection, and assembly are within the capability of intermediate maintenance.

3-269. DISASSEMBLY. To disassemble bungee, see figure 3-42 and proceed as follows:

1. Remove rod end bearing (14), check nuts (11, 12), lock washers (10, 13), and sleeve (9) from shaft (3).

2. Remove end cap (8) and cylinder check nut (7). Remove pistons (4, 6), spring (5), and shaft (3).

3-270. CLEANING. To clean the bungee, see figure 3-42 and proceed as follows:

Materials List

Solvent, Dry-cleaning	P-D-680, Type II

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

1. Using a soft brush, clean all parts with dry-cleaning solvent (P-D-680, Type II).

2. Dry parts with clean compressed air.

3-271. INSPECTION. If a part does not meet the conditions given in the following steps, it must be replaced.

Tools and Equipment List

Tester, Spring Resiliency	Type PB4-D (or equivalent)

Materials List

Primer, Zinc-chromate	MIL-P-8585 or TT-P-1757

Note

If cylinder (2) or sleeve (9) is found defective, discard bungee.

1. Check all provisioned parts for wear, cracks, worn threads, scratches, dents, and other damage.

2. Check rod end bearing (14) and rod fitting bearing (1) for radial wear. Maximum allowable radial wear is 0.025 inch.

3. Check spring (5) for cracks and breakage. Measure length of spring. Free length must be 8.75 (±0.03) inches. Ends must be square within 3 degrees of spring axis.

4. Place spring in spring tester (Type PB4-D). Compress spring to 8.50 (± 0.010) inches length and record force. Compress spring to 7.50 (± 0.010) inches length and record force. Difference must be 111 (± 5.0) pounds.

5. Spot-paint nicked and scratched surfaces with zinc-chromate primer (MIL-P-8585 or TT-P-1757).

3-272. ASSEMBLY. To assemble bungee, see figure 3-42 and proceed as follows:

Tools and Equipment List

Scale, Spring	L-30M

Materials List

Silicone Fluid, Dow Corning 200 20-centistoke	MIL-S-21568
Lockwire (0.032-inch diameter steel)	MS20995F32
Glyptal, No. 1286	General Electric Co, Waterford, N.Y. 12188 (01139)

1. Ensure that all parts are clean before and during assembly.

2. Lightly coat internal components and inside of cylinder with Dow Corning 200 silicone fluid (MIL-S-21568).

3. Install pistons (4, 6) and spring (5) on shaft (3) and secure by screwing sleeve (9) onto shaft. Using a spring scale (L-30M), adjust sleeve to preload spring 4 (± 1) pounds. Install lock washer (10) and check nut (11). Tighten check nut and safety with lockwire (MS20995F32). Apply Glyptal to safetywire area. Safetywire plus Glyptal shall not exceed 0.95-inches diameter maximum.

4. Install spring and shaft assembly in cylinder (2). Screw on cylinder check nut (7) and end cap (8). Tighten end cap until it contacts piston (6). Do not compress spring.

5. Tighten nut (7) insuring there is no free play in spring assembly. Safety cap (8), and nut (7) and housing (2) together using lockwire (MS20995F32).

6. Install check nut (12), lockwasher (13), and rod end bearing (14) on shaft.

3-273. ADJUSTMENT. To adjust the bungee, see figure 3-42 and proceed as follows:

Materials List

Lockwire (0.032-inch diameter steel)	MS20995F32

1. Adjust rod end bearing to obtain a bungee center to center free length of 14.84 inches.

2. Tighten check nut (12) against lock washer (13) and safety with lockwire (MS20995F32).

3-274. RUDDER ATTACH LINK (249-24416).

3-275. Intermediate maintenance for the rudder attach link consists of bearing replacement. To replace the bearing refer to paragraph 2-186.

3-276. DIRECTIONAL TRIM ACTUATOR (DL 1326M72-1 AND 305-524052).

3-277. The directional trim actuator is an irreversible, electromechanical device used to position the rudders to trim the aircraft in directional flight. It includes self-contained limit switches and a trim position transmitter. Intermediate maintenance for the actuator consists of a checkout, partial disassembly, adjustment of limit switches and indicator transmitter switches, assembly, and functional testing.

3-278. CHECKOUT. To checkout the actuator, see table 3-17 and proceed as follows:

Tools and Equipment List

Power Supply, (0- to 30-volt dc capacity)	Model LH125 (or equivalent)
Multimeter	AN/PSM-4 (or equivalent)

1. Mount actuator on a suitable fixture. Connect power supply to actuator.

2. Refer to table 3-17 to isolate cause(s) of actuator malfunction. Use a multimeter (AN/PSM-4) as required to troubleshoot actuator.

3-279. DISASSEMBLY. To disassemble the actuator, see figure 3-44 and proceed as follows:

Materials List

Thinner, Stabond Type C (or equivalent)	(Stabond Corp., Mfrs. Code 25670)

Note

Remove clamp (2) at rod end (4) and slide back boot (5) if AYC 315 is incorporated.

1. Cut and remove lockwire from nut (1) and washer (3).

2. Back out nut (1), and backout washer (3) to permit removal of bearing (4). Remove washer (3) and nut (1).

Note

Remove clamp (2) and boot (5) if AYC 315 is incorporated.

3. Loosen two plate screws (10) and remove two cover screws (6) from connector. Do not remove connector (7).

4. Use Stabond thinner to remove Loctite and remove nut (8).

WARNING

In the following step, use thinner in a well-ventilated area. Avoid prolonged contact with skin.

5. Use Stabond thinner (Type C, Stabond Corp., Mfrs. Code 25670) to dissolve the sealant which bonds the cover (9) to the plate (10).

6. Carefully slide off cover (9).

3-280. SWITCH REPLACEMENT. To remove and replace the two limit switches and the two indicating switches in the directional trim actuator, see figure 3-46 and proceed as follows:

1. Remove actuator cover. Refer to paragraph 3-279.

2. Remove wires from switch to be replaced.

3. Remove switch mounting screws. (Screws mount through switch, switch actuator, trim actuator casting, and into retainer plate. Components will fall free when screws are removed.)

Table 3-17. Troubleshooting Directional Trim Actuator

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: INOPERATIVE.		
Open connections.	Refer to paragraph 3-279 and remove cover. See figure 3-43 and check all connections.	Repair wiring as necessary.
Defective extend and/or retract switches.	See figure 3-43 and check all switches.	Replace switch(es).
Motor defective.	See figure 3-43 and check operation of motor.	Forward actuator to depot maintenance for overhaul.
Short circuit.	See figure 3-43 and check continuity.	Correct cause of short circuit.
Mechanical interference.	Visually check actuator to locate interference.	Remove cause of interference.
TROUBLE: POOR PERFORMANCE–HIGH CURRENT AND NOISE.		
Defective bearing.	Visually check actuator and locate defective bearing.	Forward actuator to depot maintenance for overhaul.
TROUBLE: POOR PERFORMANCE–LOW CURRENT.		
Low input voltage.	Check power supply voltage for between 18 and 29 volts dc.	Adjust or replace power supply.
High resistance contact.	Refer to paragraph 3-279 and remove cover. Check all connections to locate excessive resistance.	Repair connection(s) as required.

Table 3-17. Troubleshooting Directional Trim Actuator (Cont)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: INTERMITTENT OPERATIONS.		
Defective extend or retract switch(es).	Refer to paragraph 3-279 and remove cover. See figure 3-43 and check condition of switch(es).	Replace switch(es).

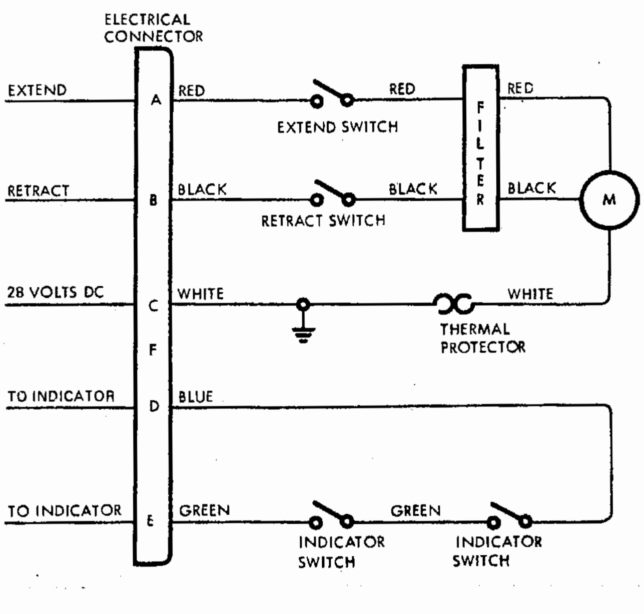


Figure 3-43. Directional Trim Actuator Schematic Diagram

Note

Switch actuators and switches are alternately mounted to trim actuator casting. See figure 3-46.

4. Replace and install switch or switches. Install screws through switch and/or switch actuator, trim actuator casting, and into retainer plate. Leave mounting screws loose until after adjustment. Refer to paragraph 3-281.

5. Install wires to switch.

3-281. ADJUSTMENT. To adjust the travel limit switches and position indicator transmitter switch, see figures 3-45 and 3-46 and proceed as follows:

Tools and Equipment List

Power Supply, (0- to 30- volts dc capacity)	Model LH125 (or equivalent)

Materials List

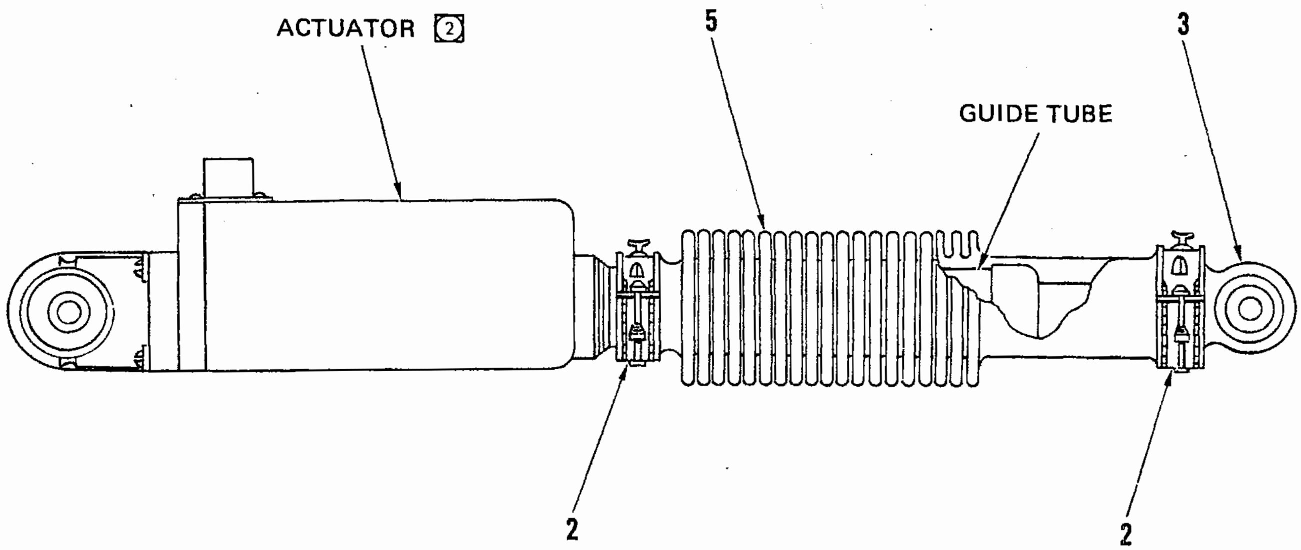
Loctite, Grade B	MIL-S-22743, Grade C

1. Secure actuator in vise or other suitable fixture.

2. Connect power supply to actuator.

3. See figure 3-45. Energize actuator at 18 volts dc to obtain the electrical retract dimension of 2.75 (± 0.02) inches.

4. Loosen screws (1). Slide retract switch (2) and actuator (3) until actuator (3) comes in contact with cam (4) and actuates the switch (2).



1. NUT [1]
2. CLAMP [2]
3. WASHER
4. ROD END (REP4M6-4) [1]
   ROD END (305-524051) [2]
5. BOOT [2]
6. SCREWS
7. CONNECTOR
8. NUT
9. COVER
10. PLATE
11. NUT TUBE

[1] AYC 315 NOT INCORPORATED

[2] AYC 315 INCORPORATED

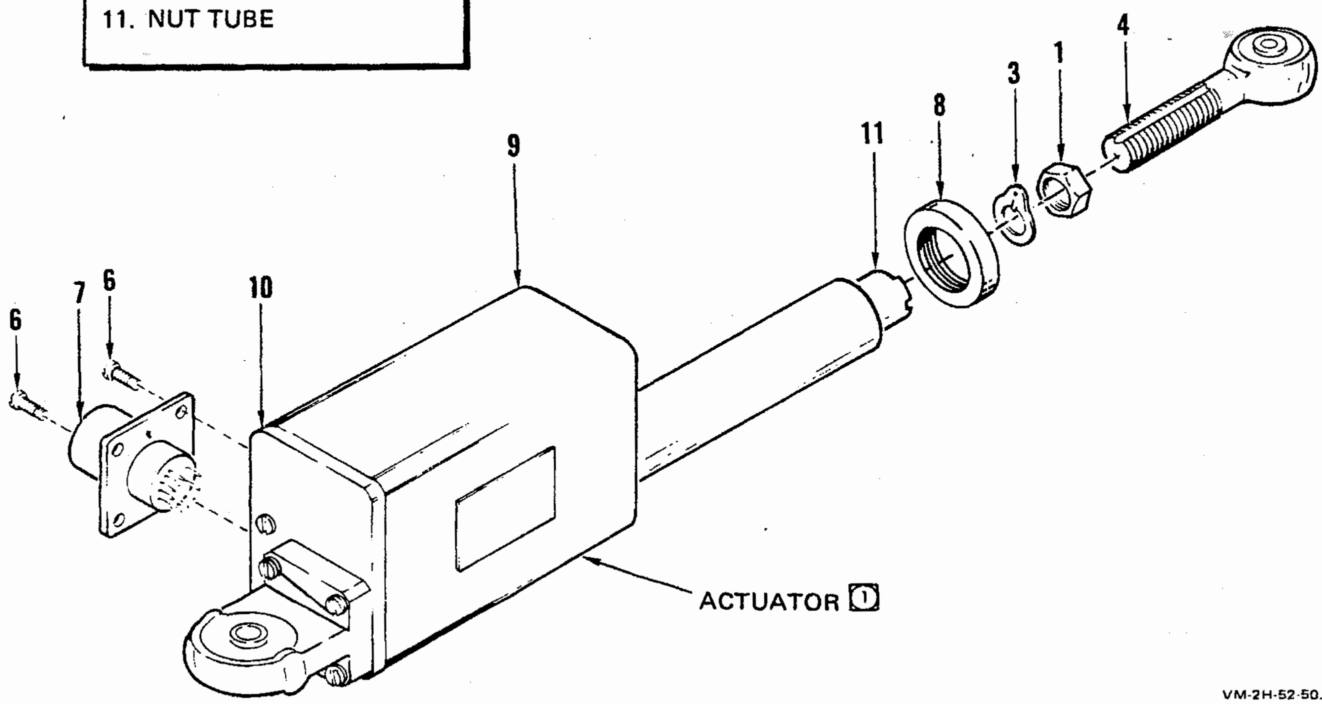


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Figure 3-44. Directional Trim Actuator - Partial Disassembly

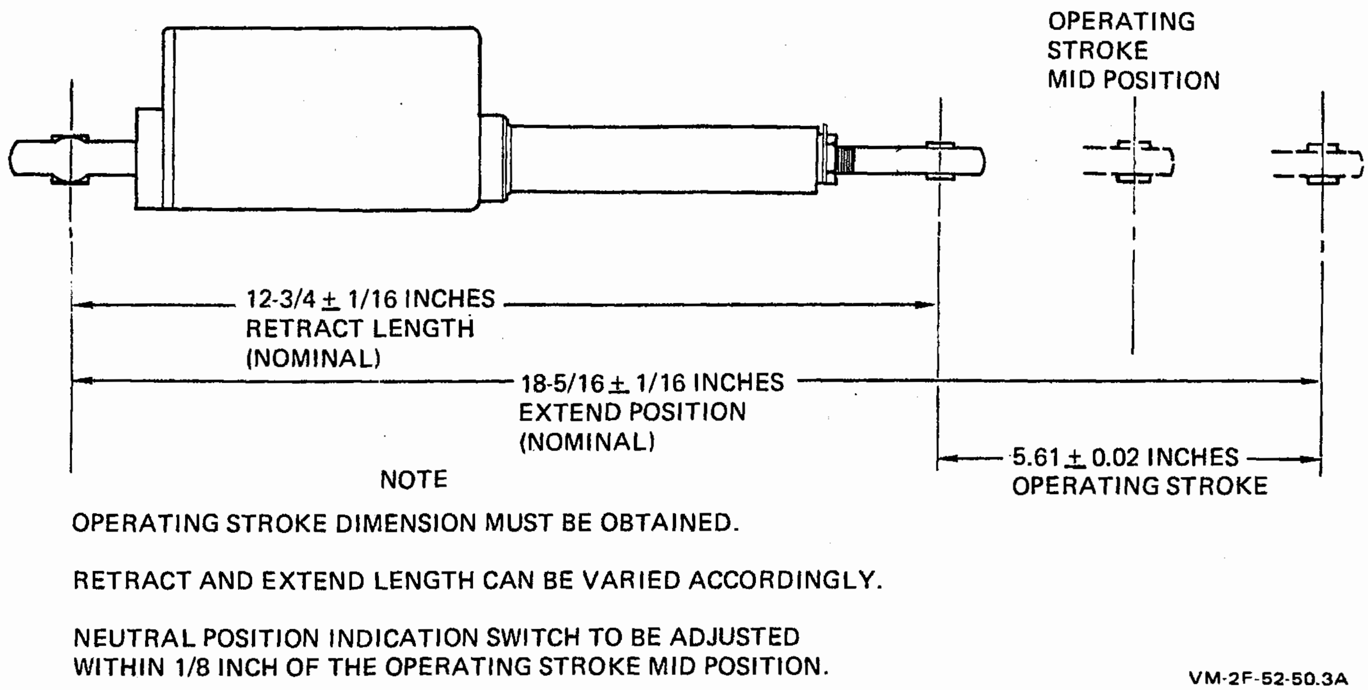


Figure 3-45. Directional Trim Actuator Stroke Diagram

5. Apply Loctite (MIL-S-22473, Grade C) between switch (2) and guide tube (5) surface. Tighten screws (1).

6. See figure 3-45. Energize actuator at 18 volts dc to obtain the electrical extend dimensions of 2.86 (± 0.02) inches.

7. Loosen screws (6). Slide extend switch (7) and actuator (8) until actuator (8) comes in contact with cam (4) and actuates the switch (7).

8. Apply Loctite (MIL-S-22473, Grade C) between switch (7) and guide tube (5) surface. Tighten screws (6).

9. See figure 3-45. Energize actuator at 18 volts dc to obtain the indicator switch setting dimension of 15.460 (± 0.010) inches.

10. Loosen screws (9 and 10). Slide indicating switches (11 and 12) and actuators (13 and 14) until actuators (13 and 14) come in contact with cam (4).

11. Apply Loctite (MIL-S-22473, Grade C) between switches (11 and 12) and guide tube (5) surface. Check that actuators are in contact with cam (4) and tighten screws (9 and 10).

3-282. ASSEMBLY. To assemble the actuator, see figure 3-44 and proceed as follows:

Materials List

Lockwire (0.032-inch diameter nickel-copper)	MS20995NC32
Lockwire (0.032-inch diameter steel)	MS20995F32
Loctite, Grade C	MIL-S-22473
Compound, Sealing	Stabond C-136, Stabond Corp., Mfrs. Code 25670 (or equivalent)

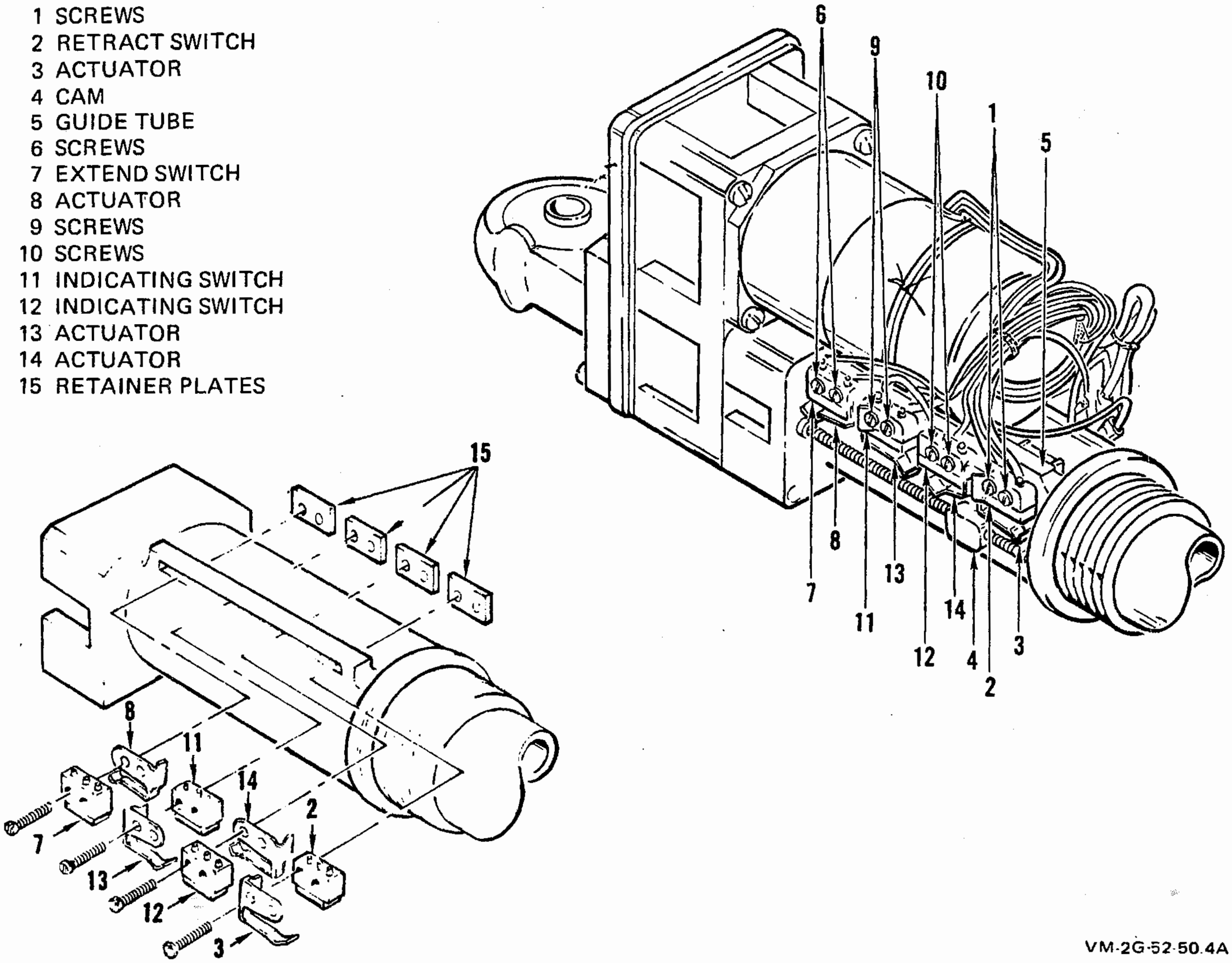


Figure 3-46. Directional Trim Actuator Position Switch Adjustment

1. Apply sealing compound (Stabond C-136, or equivalent) to perimeter of plate (10) and connector. Slide cover (9) over actuator and fit onto plate (10).

2. Install screws (6) through connector (7) into actuator.

3. Apply Loctite (MIL-S-22473) to threads of nut (8) and install nut (8) on actuator.

Note

If AYC 315 is incorporated, slide short end of boot (5) over guide tube and install clamp (2). Safety clamp with lockwire (MS20995NC32).

4. Install nut (1) and washer (3) on rod end bearing (4). Screw rod end bearing (4) into nut tube (11).

5. See figure 3-45. Operate actuator to full retract. Adjust rod end bearing (3, figure 3-44) to obtain a full retract dimension of 12.710 (± 0.010) inches.

6. See figure 3-44. Tighten nut (1) against washer (3) and nut tube (11). Safety nut (1) to washer (3) with lockwire (MS20995F32).

Note

If AYC 315 is incorporated, install boot (5) over shoulder on rod end (4) with clamp (2). Safety clamp with lockwire (MS20995NC32).

3-283. TESTING. To perform a functional test of the actuator, see figure 3-45 and proceed as follows:

Tools and Equipment List

Multimeter	AN/PSM-4 (or equivalent)
Power Supply (0- to 30-volt dc capacity)	Model LH125 (or equivalent)

1. Mount actuator in a suitable fixture. Connect power supply to actuator.

2. See figure 3-45. Operate actuator to fully retracted and fully extended positions. Check operating stroke dimension.

3. See figures 3-43 and 3-45 and, using a multimeter (AN/PSM-4C), check indicating switch dimensions.

Note

After testing, leave actuator in neutral position for ease of installation in aircraft.

3-284. YAW DAMPER AMPLIFIER (1806-2000).

3-285. The yaw damper amplifier functions as a component of the yaw damper system by converting signal voltage from a rate gyro to a polarity sensitive direct current with appropriate gain and frequency shaping for driving a magnetic clutch. The amplifier is a current amplifier consisting of an rc shaping network, a dc preamplifier and a differential clutch driver circuit. The amplifier requires two dc power supplies to supply power to the circuit and clutch coils, as well as a reference voltage for an external potentiometer pickoff. Intermediate maintenance for the amplifier includes information required for checkout, disassembly, cleaning, inspection, repair, assembly, testing, calibration alignment and adjustment, and troubleshooting.

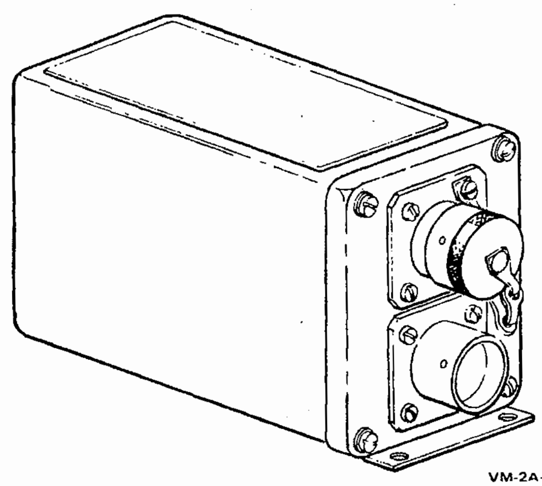


Figure 3-47. Yaw Damper Amplifier

Table 3-18. Yaw Damper Amplifier General Characteristics

Rated voltage	15-volt 400-cycle, single phase, 28-volt dc control
Temperature range	−30°C (-22°F) to +71°C (+160°F)
Test temperature . .	+25 (±8) °C to 77 (±18) °F
Altitude	Sea level to 30,000 feet
Operating life	1,000 hours
Warm-up time	1 minute
Weight	1.5 pounds, maximum
Overall dimensions .	5.125 (±0.030) inches long by 2.95 inches high by 2.390 (±0.030) inches wide

3-286. CHECKOUT. To check out the yaw damper amplifier, see figure 3-48, sheet 1. Arrange test set-up as indicated in figure 3-48, sheet 2 and proceed as follows:

Tools and Equipment List

Tester	1806-9809 (96264) (or equivalent)
Voltmeter, Vacuum Tube	AN/URM-45 (or equivalent)
Oscilloscope	0S8CEU (or equivalent)
Power Supply, 115 volts ac, 400Hz	Powertron 12815, (99060) (or equivalent)
Power Supply (0- to 30-volt dc capacity)	Model LH125 (or equivalent)
Multimeter	AN/PSM-4C (or equivalent)

3-287. YAW RATE GYRO PICKOFF. Apply 115-volt, 400 Hz power and measure +12.0 (± 0.6) volts dc at pin M and -12.0 (± 0.6) volts dc at pin N with respect to ground, using a vacuum tube voltmeter 310 (Ballantine Lab, or equivalent). Using an oscilloscope (AN/USM-140B, or equivalent), verify that the ripple on both the +12.0 and -12.0 excitations does not exceed 0.5 volts peak-to-peak.

3-288. QUIESCENT CURRENTS.

1. With the 115-volt 400 Hz operating power on apply +28.0 volts dc to the control logic, pin L of J1.

2. With signal input at pin A grounded, verify that bias currents I_A and I_B are both set at 6.5 (±0.5) milliamperes.

Table 3-19. Transistor Checkout Voltages

TRANSISTOR	INPUT (PIN A) + POLARITY				INPUT (PIN A) – POLARITY			
	GRNDED 0.0V	0.5V	1V	5V	GRNDED 0.0V	0.5V	1V	5V
Q1BC	+3.620	+4.146	+4.661	+7.1844	+3.621	+3.100	+2.591	+0.266
Q1AC	+3.346	+2.818	+2.305	+0.221	+3.347	+3.881	+4.405	+7.258
Q1BB	+0.008	+0.021	+0.019	+0.085	–0.007	–0.020	–0.031	–0.104
Q1AB	+0.007	+0.020	+0.040	+0.182	–0.003	–0.025	–0.047	–0.255
Q1ABE	–0.626	–0.609	–0.591	–0.447	–0.626	–0.642	–0.657	–0.744
Q2B	+0.018	–0.342	–0.685	–2.412	+0.020	+0.383	+0.745	+2.294
Q3B	+0.055	+0.414	+0.766	+2.169	+0.055	–0.299	–0.645	–2.593
Q2E	–0.347	–0.461	–0.461	–0.460	–0.340	–0.004	+0.344	+1.759
Q3E	–0.326	+0.005	+0.343	+1.628	–0.326	–0.441	–0.441	–0.441
Q2C	+10.89	+10.55	+10.27	+9.60	+10.93	+11.06	+10.85	+1.914
Q3C	+13.45	+13.50	+11.31	+1.809	+13.43	+12.97	+12.52	+16.52
Q4E	+17.69	+18.00	+17.23	+15.62	+17.67	+15.10	+12.37	+2.534
Q5E	+17.71	+15.05	+12.20	+2.448	+17.60	+17.96	+17.20	+15.46
Q4C	+0.770	+0.328	+0.318	–0.308	+0.768	+1.140	+1.507	+2.512
Q5C	+0.756	+1.124	+1.480	+2.411	+0.749	+0.191	+0.199	+0.199
Q6E	+0.109	+0.002	+0.001	+0.000	+0.112	+0.450	+0.799	+1.762
Q7E	+0.115	+0.447	+0.788	+1.683	+0.116	+0.002	+0.001	+0.000
Q6C	+18.05	+18.08	+17.33	+15.73	+18.02	+15.43	+12.60	+5.300
Q7C	+17.96	+15.47	+12.84	+6.007	+17.97	+18.07	+17.30	+15.59
M =	+12.24							
N =	–12.13							

Above voltages are measured with respect to signal ground and with the washout capacitor shorted.

A ± 5% deviation from the above voltages is acceptable.

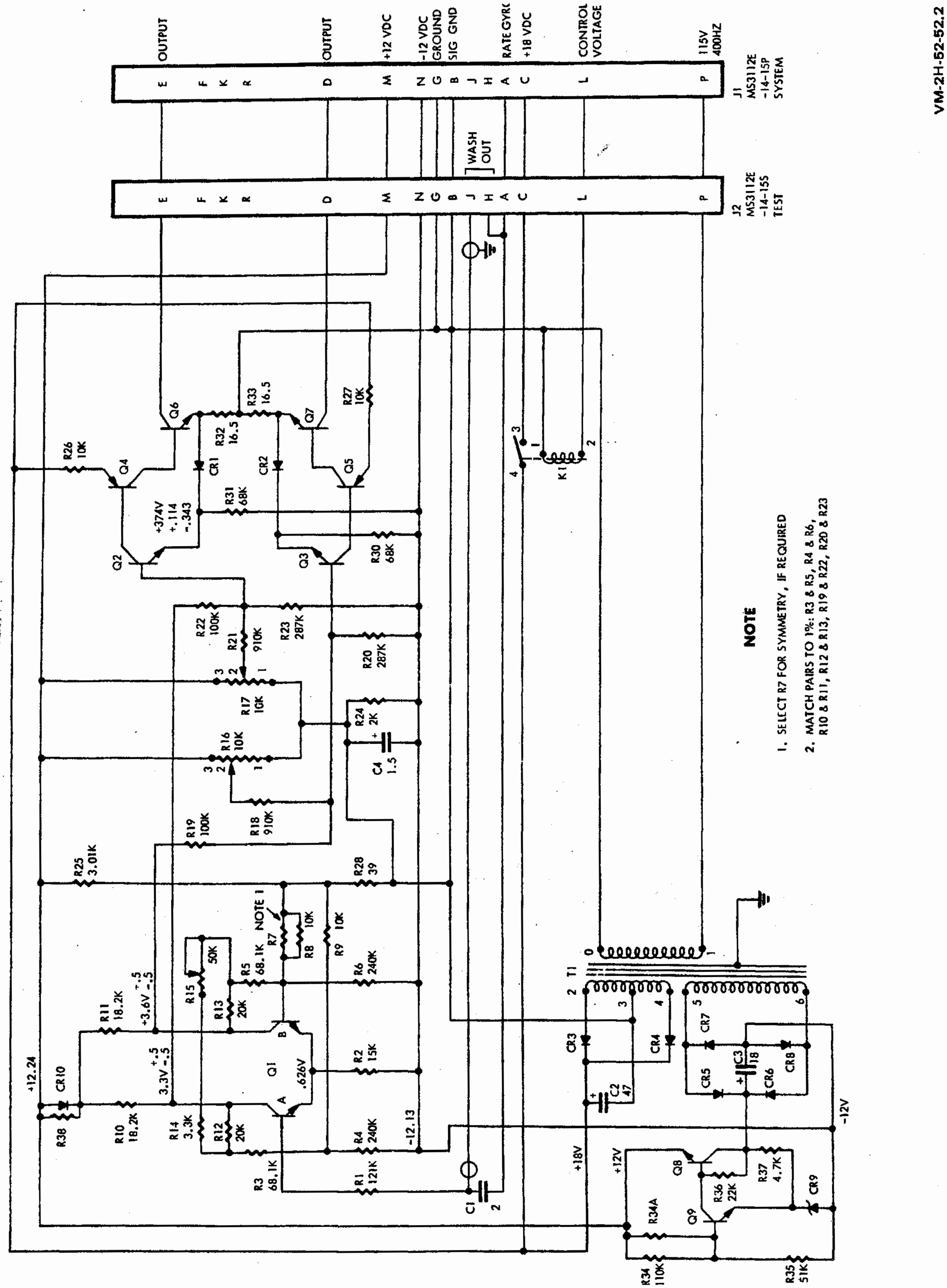


Figure 3-48. Yaw Damper Amplifier Electrical and Test Schematic (Sheet 1 of 2)

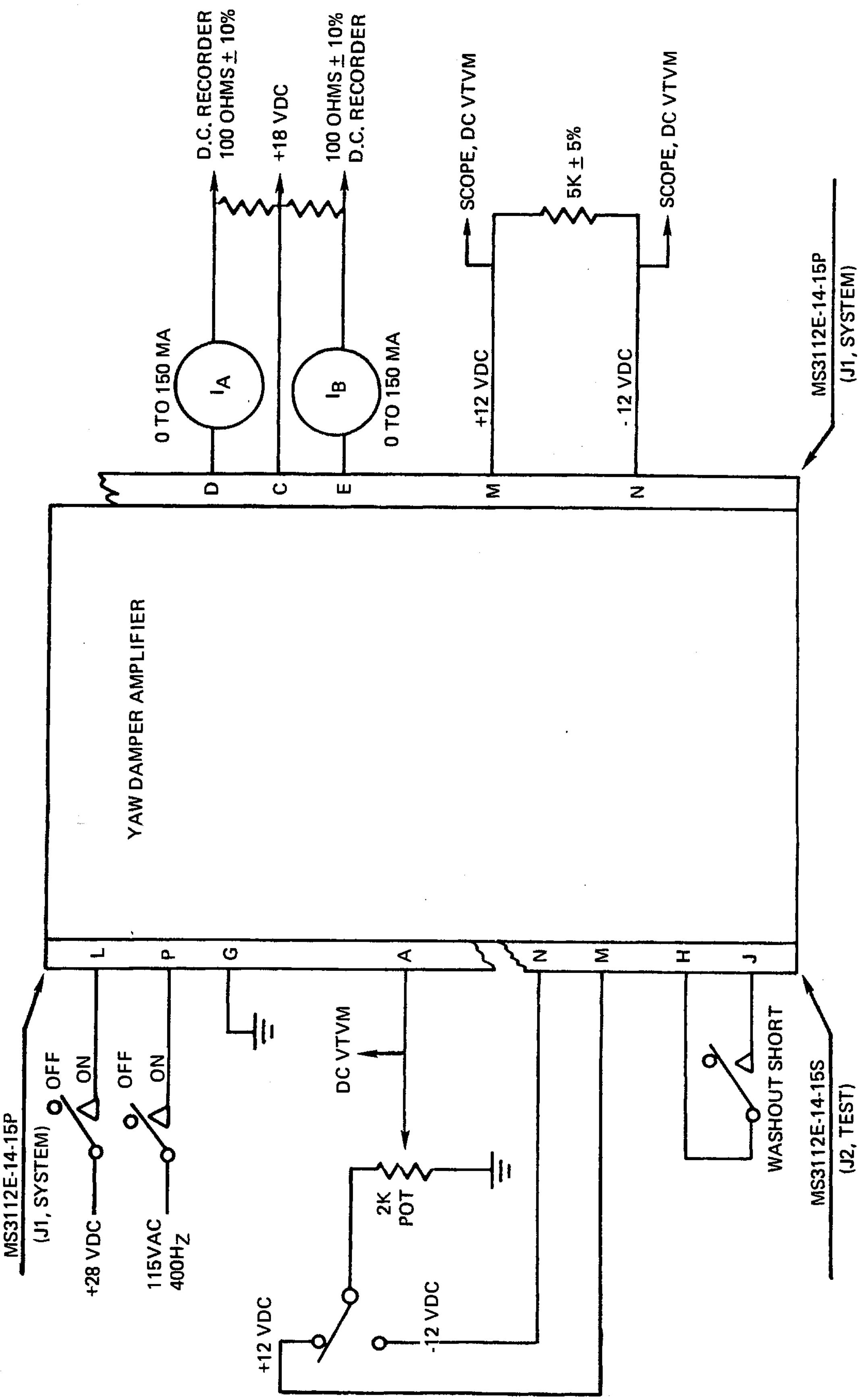


Figure 3-48. Yaw Damper Amplifier Electrical and Test Schematic (Sheet 2 of 2)

3. Remove ±28.0-volt dc control power and verify that both I_A and I_B have decreased to zero.

3-289. NULL AND SIGNAL PHASING.

Short the washout capacitor; apply 115-volt operating power and ±28-volt dc control power.

1. Apply a slowly increasing positive dc voltage to pin A.

2. Check that current I_A increases and current I_B decreases.

3. Continue to increase the voltage at pin A until the current I_B stops decreasing and then verify that the null is less than 4 milliamperes.

4. Repeat this test for the I_A null with a negative voltage applied to pin A.

3-290. GAIN AND MAXIMUM OUTPUT.

1. Short the washout capacitor; apply 115-volt operating power and +28-volt dc control power.

2. Apply +0.5 volts dc to the input pin A and verify that I_A has increased by 19.6 (±2) milliamperes from the bias setting.

3. Continue increasing the input voltage past +5.0 volts dc and verify that current I_A is at least 70 milliamperes but less than 140 milliamperes.

4. Repeat this test with negative input voltage for current I_B gain and maximum output.

3-291. TRANSISTOR CHECKOUT VOLTAGES.

1. Refer to paragraph 3-279 and see figure 3-45 to disassemble unit. Refer to table 3-19 and measure voltages at points indicated, using a vacuum tube voltmeter (310 Ballantine Lab, or equivalent) with one lead connected to the ground lug (5).

2. Incorrect voltage readings will indicate defective component(s).

3. Replace and recheck for proper function.

3-292. DISASSEMBLY. See figure 3-49. Under normal circumstances it will be necessary to remove only the case (2) by removing attaching screws (3) from the assembly. If during check out one or more components are found to be defective, see figure 3-49 and proceed as follows to disassemble the amplifier as required.

1. Remove cover assembly (4) and lugs (5) from boards (22, 44), by removing attaching screws (6, 7), locking nuts (8), and flat washers (9).

2. Remove dust cap (10) from cover assembly (4) by removing attaching screw (11) and locking nut (12).

3. Remove connectors (13, 14), cover (15), gasket (16), straight pins (17), cover (18), and bracket (19) from cover assembly (4) by removing attaching screws (20) and locking nuts (21).

4. Remove board (22) by removing screws (23), lock washers (24), and flat washers (25).

5. Remove clamp (26) and transformer (27) from board (22) by removing screws (28), hex nuts (29), and flat washers (30).

6. Remove capacitor (31) from board (22).

7. Remove diodes (32) from board (22).

8. Remove diode (33) from board (22).

9. Remove capacitor (34) from board (22).

10. Remove resistors (35, 36, 37, 38, 39) from board (22).

11. Remove reed relay (40) from board (22).

12. Remove transistors (41, 42) from board (22).

13. Remove board (45) and standoffs (46) by removing attaching screws (47), lock washers (48), and flat washers (49).

14. Remove transistors (50) from heat sink adapters (51).

15. Remove heat sink adapters (51) from heat sink by removing attaching nylon screws (52).

16. Remove heat sink (53) from board (45).

17. Remove resistors (54) from board (45).

18. Remove transistors (55, 56) from board (45).

19. Remove diodes (57) from board (45).

20. Remove resistors (58, 59, 60, 61, 62) from board (45).

21. Remove capacitor (63) from board (45).

Note

In the following step, resistor (67) is used for symmetry when required.

22. Remove resistors (64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76) from board (45).

23. Remove capacitor (77) from board (45) by removing tie (78).

24. Remove adjustable resistors (79, 80) from board (45).

25. Remove transistor (81) from board (45).

3-293. CLEANING. To clean the components of the amplifier, proceed as follows:

1. Wash component boards with cleaning solution (AP20, or equivalent).

2. Coat all cleaned surfaces with moisture and fungus resistant varnish (MIL-V-173B).

Materials List

Cleaning Solution	AP20 (or equivalent)
Varnish, Moisture and Fungus Resistant	MIL-V-173B

3-294. INSPECTION. To inspect the components of the amplifier, see figure 3-49 for nomenclature, refer to table 3-20 for inspection requirements and proceed as follows:

1. Refer to table 3-20. Inspect all parts for wear tolerances and/or surface conditions requiring replacement of damaged part.

2. Inspect all parts for corrosion and thread damage.

3. Inspect all wires for breaks and fraying.

3-295. REPAIR. To repair the amplifier, see figure 3-49 and refer to tables 3-19 and 3-20 for inspection requirements of electronic and mechanical components, and proceed as follows:

1. Repair minor thread damage on threaded components with careful use of tap. If threads cannot be reworked, replace components.

2. Replace all of the transistors which do not meet the standards in table 3-19.

3. Replace all of the components which do not meet the standards in table 3-20.

4. Replace all worn or distorted parts. Replace all broken or frayed wires.

3-296. ASSEMBLY. To assemble the amplifier, see figures 3-49 and 3-50 and proceed as follows:

Materials List

Cement, Epoxy	Acquire locally
Acetone	O-A-51C
Humiseal	1B12 (or equivalent)
Cement, Bonding	Delta Bond 152 (or equivalent)

Note

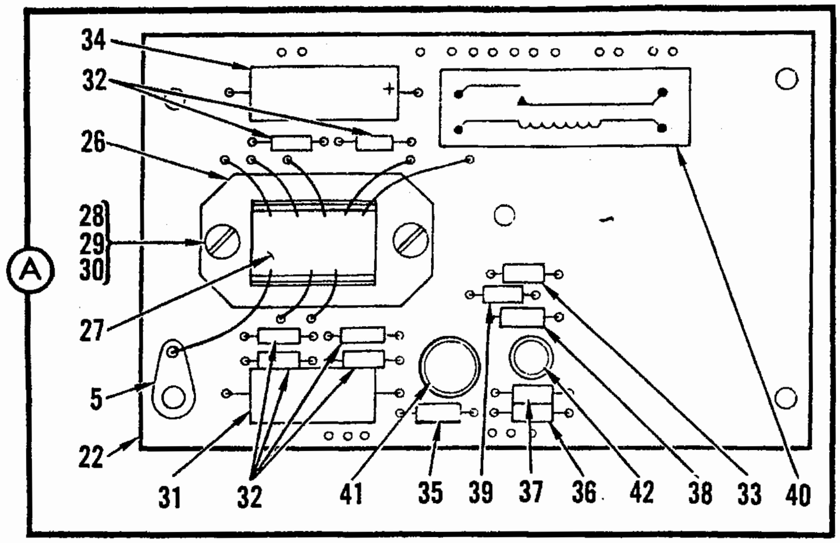
Bond capacitor (77) to board (45) with epoxy cement.

Surfaces to be bonded must be cleaned with acetone (O-A-51C) before applying bonding cement.

Resistor (67) is used for symmetry when required.

1. Reassemble electronic components (54, 77, 79, and 81) on board (45).

2. Using bonding cement (Delta Bond 152, or equivalent), bond heat sink adapters (51) to heat sink (53) and attach nylon screws (52).



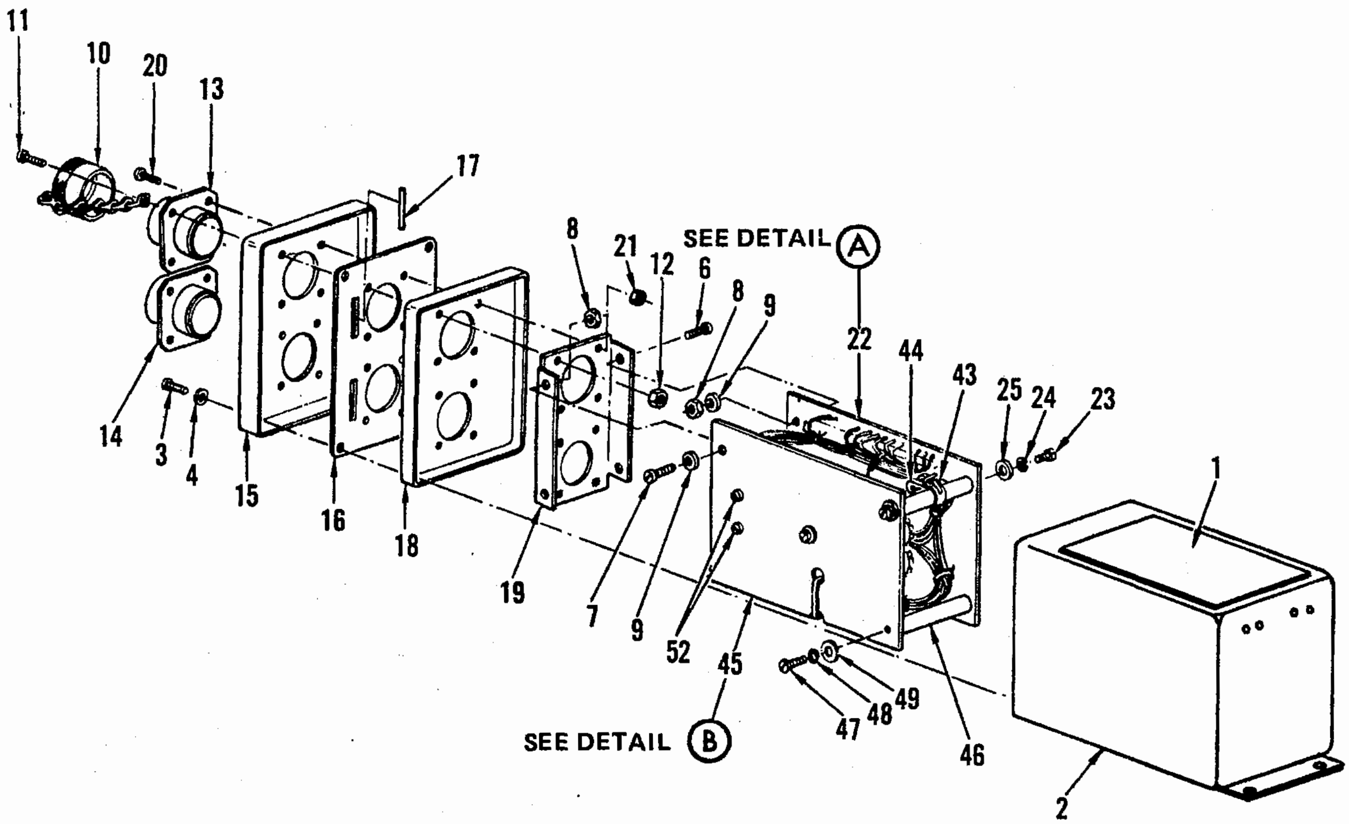
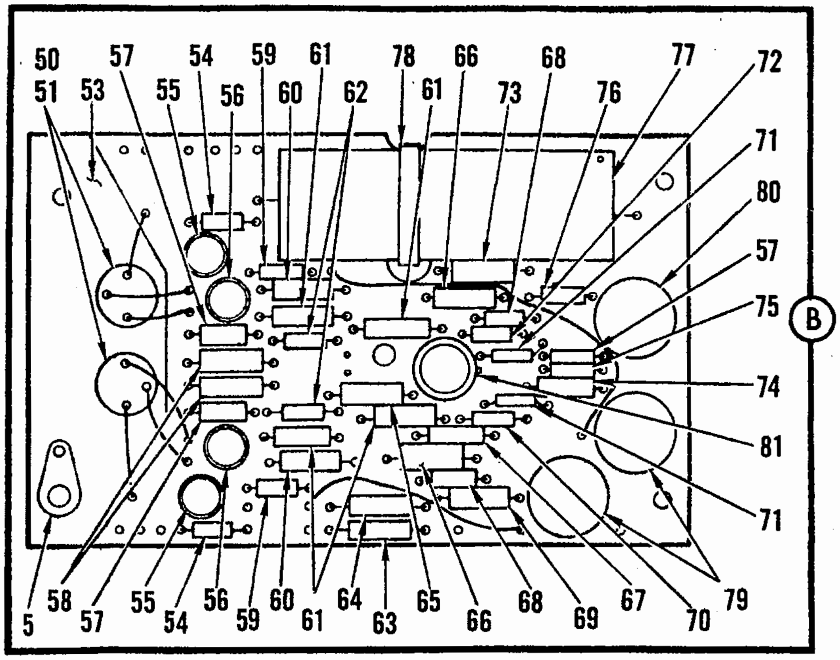


Figure 3-49. Yaw Damper Amplifier - Exploded View (Sheet 1 of 2)



1	PLATE, IDENTIFICATION	28	SCREWS	55	TRANSISTORS (Q4, Q5)
2	CASE ASSEMBLY	29	NUT, HEX	56	TRANSISTORS (Q2, Q3)
3	SCREWS	30	WASHER, FLAT	57	DIODES (CR1, CR2, CR10)
4	WASHERS, LOCK	31	CAPACITOR (C3)	58	RESISTORS (R32, R33)
5	LUGS	32	DIODES (CR3 - CR8)	59	RESISTORS (R18, R21)
6	SCREW	33	DIODE (CR9)	60	RESISTORS (R19, R22)
7	SCREW	34	CAPACITOR (C2)	61	RESISTORS (R4, R6, R20, R23)
8	NUTS, LOCKING	35	RESISTOR (R36)	62	RESISTORS (R30, R31)
9	WASHERS, FLAT	36	RESISTOR (R34A)	63	CAPACITOR (C4)
10	CAP, DUST	37	RESISTOR (R34)	64	RESISTOR (R24)
11	SCREW	38	RESISTOR (R37)	65	RESISTOR (R2)
12	NUT, LOCKING	39	RESISTOR (R35)	66	RESISTOR (R8, R9)
13	CONNECTOR (J2)	40	RELAY REED (K1)	67	RESISTOR (R7)
14	CONNECTOR (J1)	41	TRANSISTOR (Q8)	68	RESISTOR (R12, R13)
15	COVER	42	TRANSISTOR (Q9)	69	RESISTOR (R28)
16	GASKET	43	TIE	70	RESISTOR (R5)
17	PINS, STRAIGHT	44	CLAMP, LOCKING	71	RESISTOR (R10, R11)
18	COVER	45	BOARD NO. 2	72	RESISTOR (R3)
19	BRACKET	46	STANDOFF	73	RESISTOR (R1)
20	SCREWS	47	SCREWS	74	RESISTOR (R25)
21	NUTS, LOCKING	48	WASHERS, LOCK	75	RESISTOR (R38)
22	BOARD NO. 1	49	WASHER, FLAT	76	RESISTOR (R14)
23	SCREWS	50	TRANSISTOR (Q6, Q7)	77	CAPACITOR (C1)
24	WASHER, LOCK	51	ADAPTERS HEAT SINK	78	TIE
25	WASHER, FLAT	52	SCREWS, NYLON	79	RESISTOR, ADJUSTABLE (R16, R17)
26	CLAMP	53	SINK, HEAT	80	RESISTOR, ADJUSTABLE (R15)
27	TRANSFORMER	54	RESISTOR (R26, R27)	81	TRANSISTOR (Q1)

Figure 3-49. Yaw Damper Amplifier - Exploded View (Sheet 2 of 2)

Table 3-20. Inspection Standards

NOMENCLATURE	INDEX NO.	CRITICAL SURFACE OR DIMENSION	ALLOW WEAR	CONDITION REQ. REPL. OR PART
Cover	15	2.000 (±0.005) inches width and 2.375 (±0.005) inches length	None	Visible score marks
Cover	18	2.000 (±0.005) inches width and 2.375 (±0.005) inches length	None	Visible score marks
Gasket	16	2-1/4 (±1/64) inches width and 2-5/8 (±1/64) inches length	None	Any wear or loss of shape
Heat sink	53	2-7/16 (±1/64) inches width and 13/16 (±1/64) inches length	None	Visible score marks

3. Replace transistors (50) in heat sink adapters (51).

CAUTION

See figure 3-46. In the following step do not coat top 3/8 inch of heat sink (53).

4. Coat board (45) and components with Humiseal (1B12, or equivalent).

5. Install standoffs (46) on board (45) by using flat washers (48), lock washers (49), and attaching screws (47).

6. Reassemble electronic components (31-42) on board (22).

7. Install clamp (26) and transformer (27) on board (22), using attaching screws (28), hex nuts (29), and flat washers (30).

8. Using epoxy cement (acquired locally), bond capacitors (31 and 34) and reed relay (40) to board (22). After bonding, clean all surface with acetone (O-A-51C).

9. Coat board (22) and components with Humiseal (1B12, or equivalent).

10. Install board (22) to board (45), using attaching screws (23), lock washers (24), and flat washers (25).

11. Attach bracket (19), cover (18), straight pins (17), gasket (16), cover (15), and connectors (13, 14) to cover assembly (4), using attaching screws (20) and locking nuts (21).

12. Attach dust cap (10) to cover assembly (4), using attaching screw (11) and locking nut (12).

13. Attach cover assembly (4) and lugs (5) to boards (22, 45), using attaching screws (6, 7), locking nuts (8), and flat washers (9). Resolder connector and interboard wiring, providing stress loops between connection points.

14. Install cable clamps, assuring that cable does not lie on transistor leads, and clamp clears clips on back of case.

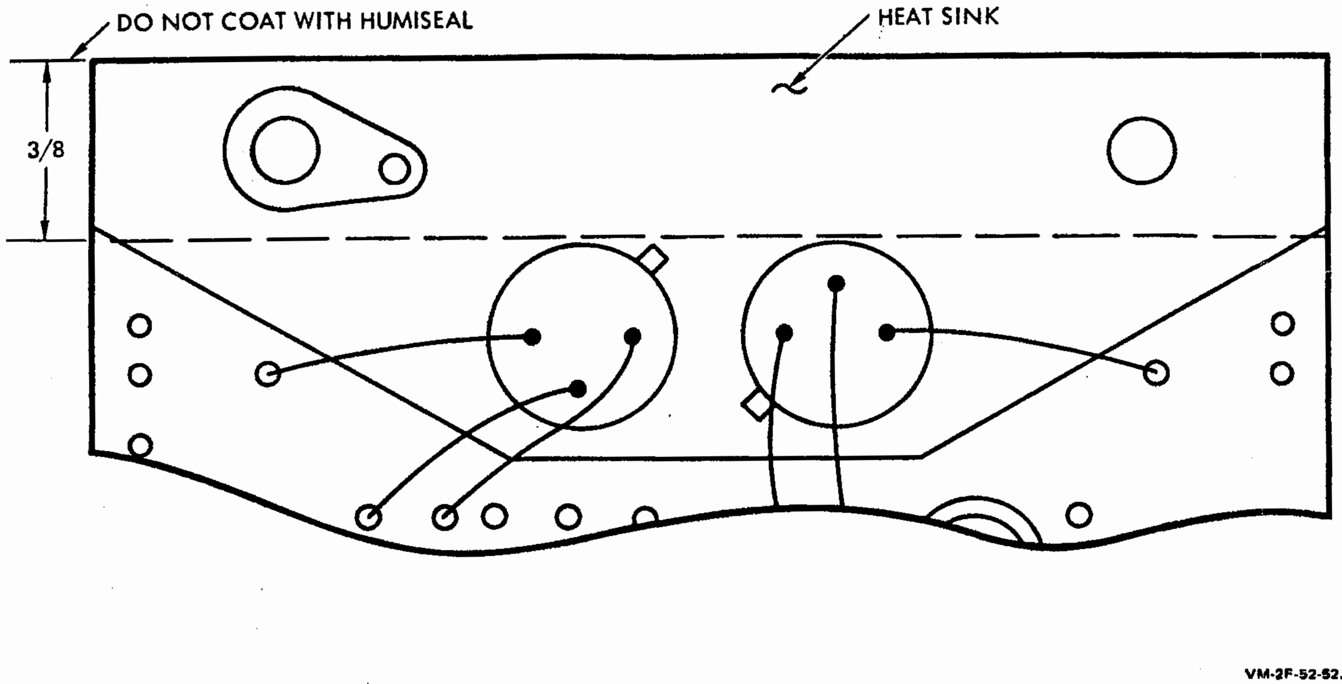


Figure 3-50. Application of Humiseal to Board No. 2

CAUTION

When reassembling the unit, care should be exercised to align the board subassembly so that electrical shorts are not created between the boards (22 and 45), the mounting clips, or the screw standoffs (46).

15. Apply bonding cement (Delta Bond 152, or equivalent) to case bosses.

16. Attach case assembly (2) to cover assembly (4), using attaching screws (3).

17. Refer to paragraph 3-284 and check out unit.

3-297. ALIGNMENT AND ADJUSTMENT. To align and adjust the amplifier, see figure 3-48 and arrange test set-up as indicated in figure 3-48.

Tools and Equipment List

Power Supply, 115 volts ac, 400 Hz	Powertron 12815, Mfrs. Code 99060 (or equivalent)
Power Supply (0-30 volts dc capacity)	LH-125 (or equivalent)
Multimeter	AN/PSM-4C (or equivalent)
Tester	1806-9809 (96264) (or equivalent)

Materials List

Glyptal	No. 1286, General Electric Co., Mfrs. Code 01139, Waterford, N. Y.

Note

Three potentiometers are provided internally to adjust the amplifier.

3-298. GAIN.

1. Connect 115-volt ac power supply (Powertron 12815, or equivalent) and 28-volt dc power supply (LH-125, or equivalent) to amplifier. Short out the washout capacitor (76).

2. Apply +0.5 volts dc to the input pin A and verify that I_A has decreased by 19.6 (± 2) milliamperes from the bias setting.

3. Continue increasing the input voltage to +5.0 volts dc and verify that current I_A is at least 70 milliamperes but less than 140 milliamperes. If necessary, adjust potentiometers R15 and R16 to obtain an I_A current between 70 and 140 milliamperes.

4. Apply input voltage of -5.0 volts dc. If necessary, adjust potentiometers R15 and R17 to obtain an I_B current between 70 and 140 milliamperes.

5. Repeat step 3 and verify that R-15 does not need readjusting. Apply Glyptal to maintain settings of R-15, R-16 and R-17.

3-299. QUIESCENT CURRENT OUTPUTS I_A AND I_B.

1. Apply 115-volt RMS operating power (power supply-Powertron 12815, or equivalent) and +28.0 volts dc (power supply-LH-125, or equivalent) to control logic.

2. With signal input at pin A grounded, verify that bias currents I_A and I_B are both set at 6.5 (± 0.5) milliamperes. If necessary, adjust potentiometers R15, 16 and/or 17 to obtain proper bias currents. Apply glyptal (No. 1286, General Electric Co.).

3-300. TESTING. To test the amplifier, refer to paragraph 3-284.

3-301. TROUBLESHOOTING. To troubleshoot the amplifier, see figure 3-48 and refer to table 3-21 for instructions.

Tools and Equipment List

Multimeter	AN/PSM-4C

3-302. RUDDER PEDAL ASSEMBLY REPAIR (300-524014), FORWARD COCKPIT.

3-303. To repair rudder pedal assembly, proceed as follows:

1. Repair elongated holes in arm tube (300-524014-5), by removing Jo-bolts from the end fittings and arm tube attachment end.

2. Use a 3/8-inch drill bit and line drill holes in tube fitting to 0.37555 (+0.003/-0.000).

3. Reinstall appropriate end fittings and attach each fitting with two each, bolts (NAS1106-22), washers (AN960C616L), and nuts (NAS1291-6). Turn each nut until snug and torque to 10 inch-pounds.

4. Install rudder pedal assembly in aircraft and check clearance of bolthead and nut throughout the full range of rudder pedal movement.

Note

This repair need be accomplished only on those pedal assemblies with objectional looseness. Jo-bolts should be replaced at both ends of tube at time of repair.

3-304. WING FLAP SYSTEM.

3-305. Intermediate maintenance for components in the wing flap system is contained in this section. Materials, special tools, and specifications for performing these maintenance procedures are listed as necessary. Repair of components at this level of maintenance generally includes the installation of items contained in provisioned repair kits along with standard supply items.

3-306. WING FLAP SELECTOR VALVE [HYDRAULIC SOLENOID CONTROL VALVE (305-586103)]. Refer to paragraph 7-27 for instructions to perform intermediate maintenance on the wing flap selector valve (hydraulic solenoid control valve).

Table 3-21. Troubleshooting Yaw Damper Amplifier

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: NO GYRO PICKOFF.		
No input power.	Check condition of power supply.	Replace power supply.
No clutch bias voltage at pin C.	See figure 3-48. Check condition of relay K1, diodes CR3 and CR4, and capacitor C2.	Replace relay, diodes, or capacitor.
TROUBLE: QUIESCENT CURRENT TOO HIGH.		
Improper adjustment of potentiometers R16 or R21.	Refer to paragraph 3-299 and check quiescent currents.	Adjust potentiometers R16 or R21 as required.
TROUBLE: LOW GAIN.		
Improper adjustment of potentiometer R15.	Refer to paragraph 3-298 and check for current gain.	Adjust potentiometer R15 as required.

3-307. FLAP CONTROL SURFACE PRELOAD BUNGEE (305-526032). The flap control surface preload bungee is a compression-type bungee. Because of its construction, disassembly, cleaning, inspection, assembly, and testing are within the capability of intermediate maintenance.

3-308. DISASSEMBLY. To disassemble the flap preload bungee, see figure 3-51 and proceed as follows:

1. Remove rod end bearing (1), check nut (2), and lock washer (3) from shaft (4).

2. Remove nut (10), washer (9), and piston (8) from shaft (4). Remove washer (7) and disk springs (6) from housing (5).

3-309. CLEANING. To clean the flap preload bungee, see figure 3-51 and proceed as follows:

Materials List

Solvent, Dry-cleaning	P-D-680, Type II

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

1. Using a soft brush, clean all parts with dry-cleaning solvent, (P-D-680, Type II).

2. Dry parts with clean, dry, compressed air.

3-310. INSPECTION. If a part does not meet the conditions given in the following steps, it must be replaced. See figure 3-51 and proceed as follows:

Materials List

Primer, Zinc chromate	MIL-P-8585 or TT-P-1757

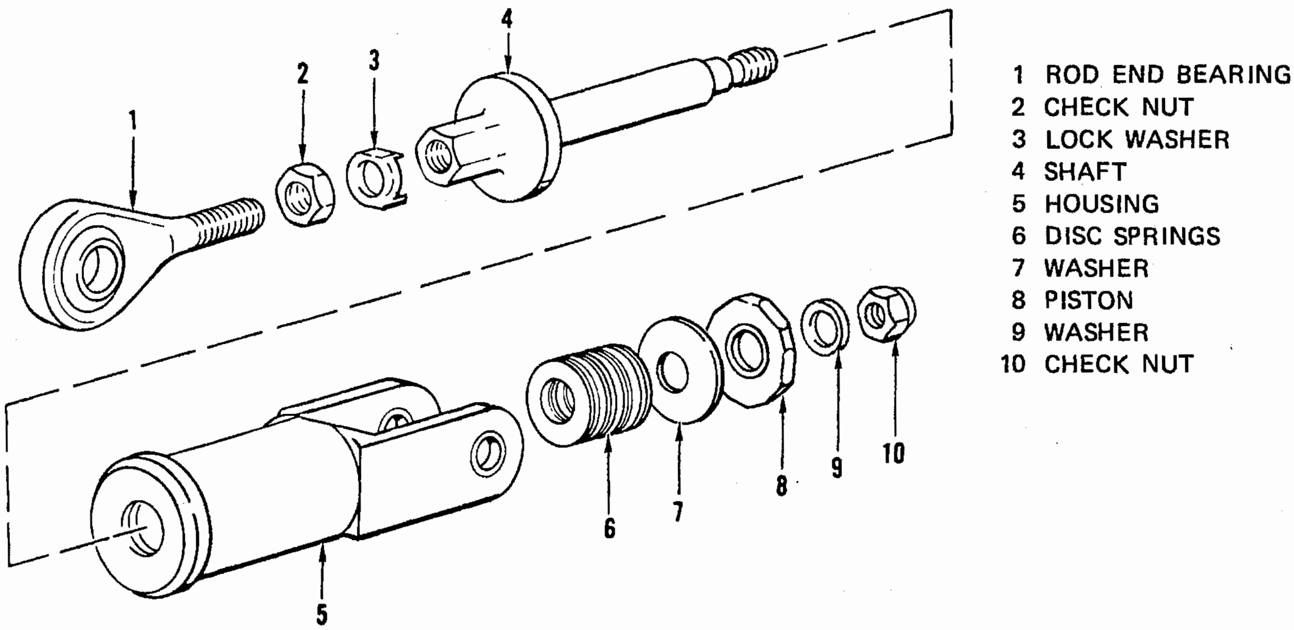


Figure 3-51. Flap Control Surface Preload Bungee

Note

During inspection, if shaft (4), piston (8), or housing (5) is found to have obvious defects, such as cracks, scratches, dents, abrasions, or distortion, discard bungee.

1. Check all provisioned parts for wear, cracks, worn threads, dents, and other damage.

2. Inspect rod end bearing (1) (0.250 inch) for radial wear. Maximum allowable wear is 0.025 inch.

3. Spot-paint nicked and scratched surfaces with zinc chromate primer (MIL-P-8585 or TT-P-1757).

3-311. ASSEMBLY. To assemble the flap preload bungee, see figure 3-51 and proceed as follows:

Materials List

Silicone Fluid, Dow Corning 200, 20 centistokes	VV-D-1078
Lockwire (0.032-inch diameter)	MS20995F32
Pin, Cotter (1/16-inch diameter)	MS24665-134
Lock Washer	2W15-6

1. Lightly coat internal parts with Dow Corning 200 silicone fluid (VV-D-1078). Apply fluid to inside walls of housing (5).

Note

In the following step, install the first disk spring with the concave face against inside end of housing (5) as shown in figure 3-51.

2. Install shaft (4) in housing (5). Insert all 23 disk springs (6) into housing (5).

Note

In the following step, check that the last disk spring (6) and washer (7) are installed on shaft (4) and not clamped between piston (8) and shoulder of shaft (4) before installing nut (10).

3. Install washer (7), piston (8), washer (9), and check nut (10). Tighten nut (10) and safety with cotter pin (MS24665-134). Rotate shaft (4) inside housing (5) to ensure that cotter pin does not rub housing.

4. Install lock washer (3), check nut (2), and rod end bearing (1) on shaft (4).

3-312. ADJUSTMENT. To adjust the flap preload bungee, see figure 3-51, and proceed as follows:

1. Loosen check nut (2) and screw to neck of rod end bearing (1). Slide lock washer (2) from shaft flange. Adjust rod end bearing (1) to obtain a 5-11/32 (±1/16)-inch dimension from center of rod end bearing mounting bolt hole to center of housing mounting bolt holes.

2. Slide lock washer (3) over shaft (4) flange and tighten check nut (2) against lock washer (3).

3-313. TESTING. To test the flap preload bungee, see figure 3-51 and proceed as follows:

Tools and Equipment List

Test Stand, Linear Actuator	Model NY-200 (or equivalent)

Install bungee on linear actuator test stand (Model NY-200). Extend bungee to obtain a dimension of 0.400 (±0.010) inch between shaft flange and housing (5). Force must be 550 to 750 pounds.

3-314. WING FLAP MOTOR GEARBOX (64101-2).

3-315. The wing flap motor gearbox (figure 3-52) is used to transmit torque to the wing flap actuators located in the left and right-hand ends of the wing. For normal operation, the gearbox is driven by a hydraulic motor. For emergency operation, the gearbox is driven by an electric motor. Intermediate maintenance to be performed on the motor gearbox consists of a checkout, troubleshooting, limited disassembly, cleaning, reassembly, and testing. Intermediate maintenance disassembly is limited to the removal of hydraulic (58127) and/or electric (100A370) motor from gearbox (64101-102).

3-316. CHECKOUT. To check out the flap motor gearbox, prepare the checkout setup shown in figure 3-53 and proceed as follows:

Tools and Equipment List

Power Supply (0- to 30-volt dc capacity)	Model LH125 (or equivalent)
Stand, Test, Aircraft Hydraulic System	S-610 (or equivalent)
Adapter, Splined Shaft, Universal	T105344
Scale, Spring (0–10-pound capacity)	CATL719-20 (or equivalent)
Wrench, Torque (0–200-inch-pound capacity)	GGG-W-686, No. 6 (or equivalent)
Tachometer, Electronic	E212
Cylinder, Graduated	Commercial

Materials List

Fluid, Hydraulic	MIL-H-5606

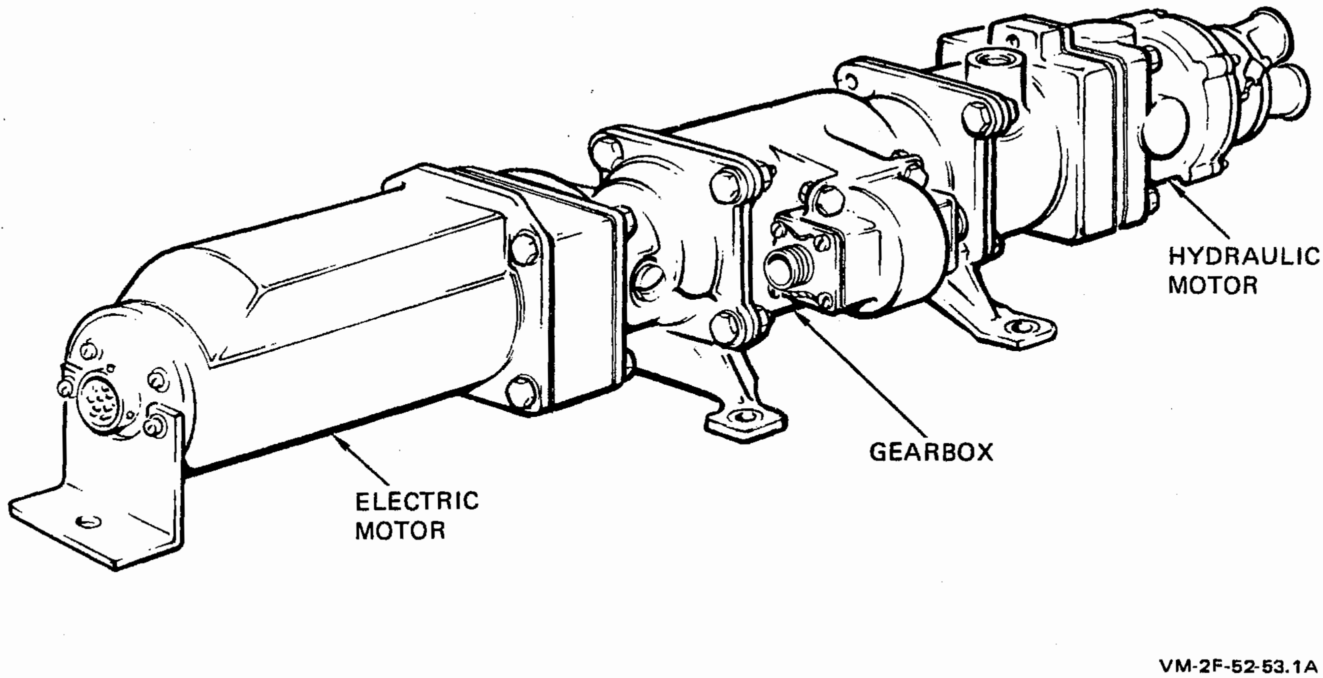


Figure 3-52. Wing Flap Motor Gearbox (305-526010)

3-317. REVERSE TORQUE CHECK.

Note

The following check must be performed without hydraulic power applied to the hydraulic motor and without electrical power applied to the electric motor.

1. Using a splined shaft adapter (T105344), attach a torque wrench (GGG-W-686, No. 6 or equivalent) to one of the output shafts of the gearbox. See figure 3-53.

2. Apply a force of 86 inch-pounds to the output shaft. Output shaft must not turn beyond limits of backlash. Remove torque wrench and shaft adapter from shaft.

3. Repeat steps 1 and 2 on opposite output shaft. Output shaft must not turn beyond limits of backlash.

4. Remove splined shaft adapter.

3-318. OPERATING SPEED CHECK (HYDRAULIC).

1. Set three-way selector valve on hydraulic test stand to either open position. Increase pressure to 1500 psig. See figure 3-53.

2. Using a tachometer, check rotational speed of output shafts. Output shaft speed must be 1290 (±50) rpm.

3. Set the three-way selector valve to the second open position and repeat steps 1 and 2.

4. Set the three-way selector valve to the closed position.

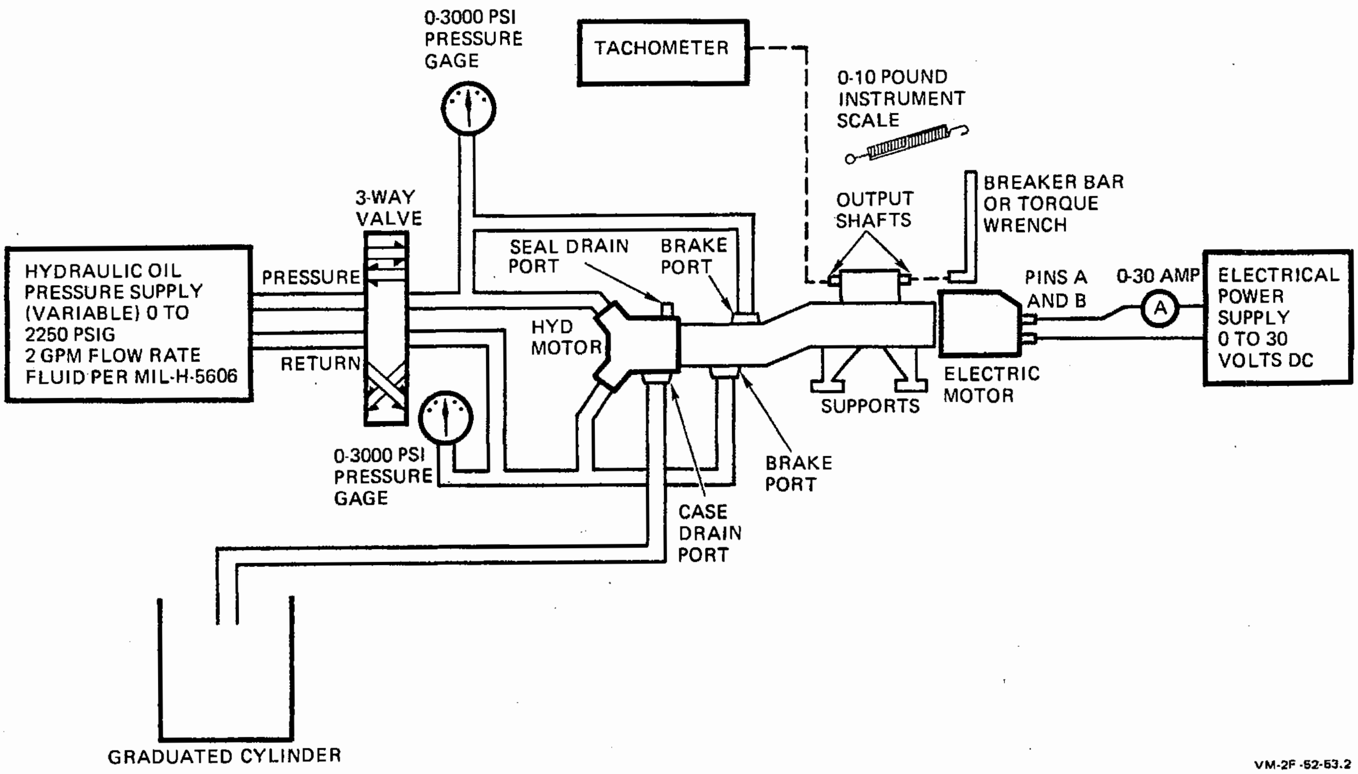


Figure 3-53. Gearbox Checkout Setup

3-319. PROOF PRESSURE CHECK.

1. Attach splined shaft adapter (T105344) and 3/8-inch drive breaker bar to output shaft of gearbox. See figure 3-53.

2. Manually restrain output shaft from rotating. Set three-way selector valve to either open position. Increase hydraulic pressure gradually to 2250 psig.

3. Observe area where hydraulic motor attaches to the gearbox and seal drain port for signs of leakage.

4. Observe the entire surface of the hydraulic motor for any evidence of leakage or other damage.

5. There must be no evidence of leakage or other damage anywhere on the motor or gearbox housing.

6. Reduce pressure to 0 psig; then, set the three-way selector valve to the OFF position.

7. Remove breaker bar from splined shaft adapter. Do not remove adapter.

3-320. STALL TORQUE CHECK (HYDRAULIC).

1. Attach a torque wrench (GGG-W-686, No. 6 or equivalent) to splined shaft adapter (T 105344) and output shaft. See figure 3-53.

2. Set pressure on hydraulic test stand at 1500 psig. Set three-way selector valve to either open position.

3. Gearbox must stall out at less than 70 inch-pounds, the maximum allowable stall torque.

4. Repeat steps 2 and 3 with the output shaft turning in the opposite direction. Set three-way selector valve to the closed position. Remove torque wrench from splined shaft.

3-321. STALLED LEAKAGE CHECK.

1. Attach a 3/8-inch drive breaker bar to splined shaft adapter. (T105344) and output shaft. See figure 3-53.

2. Secure breaker bar to prevent output shaft from rotating.

3. Set three-way selector valve for operation in either direction.

4. Disconnect return line from hydraulic motor. Place graduated cylinder (commercial) under return line.

5. Increase hydraulic pressure gradually to 1500 psig. Measure accumulation of hydraulic fluid, if any, from return line and motor case drain line into graduated cylinder in a 30-second interval. Accumulation must be less than 15.0 cubic inches.

6. Connect return line to hydraulic motor. Remove breaker bar and splined shaft adapter from output shaft.

3-322. OPERATING SPEED CHECK.

1. Adjust power supply to supply 26 volts dc.

2. Using a tachometer, check rotational speed of either output shaft. Tachometer must indicate 130 to 1300 rpm.

3. Disconnect power supply from electric motor.

3-323. STALL TORQUE CHECK (ELECTRICAL).

1. Install splined shaft adapter (T105344) over output shaft of gearbox. Attach 3/8-inch drive breaker bar to spline adapter. See figure 3-53.

2. Attach a torque wrench (GGG-W-686, No. 6, or equivalent) to spline shaft adapter.

3. Energize electric motor with 26-volt dc power. Gearbox must stall out at less than 86 inch-pounds.

4. Disconnect power supply from electric motor. Remove torque wrench and spline shaft adapter from output shaft.

3-324. TROUBLESHOOTING. To troubleshoot the motor gearbox, refer to table 3-22 for instructions.

Table 3-22. Troubleshooting Wing Flap Motor Gearbox

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: OUTPUT SHAFT CAN BE ROTATED WITH LESS THAN 86.0 INCH-POUNDS TORQUE (NO HYDRAULIC PRESSURE APPLIED TO BRAKE PARTS).		
Defective electric motor brake.	Refer to paragraph 3-325 and remove electric motor.	Replace electric motor.
Weak or defective hydraulic spring.	Refer to paragraph 3-316 and perform a REVERSE TORQUE CHECK.	Forward motor gearbox to depot maintenance for overhaul.
Defective or contaminated plates.	Refer to paragraph 3-316 and perform a REVERSE TORQUE CHECK.	Forward motor gearbox to depot maintenance for overhaul.

Table 3-22. Troubleshooting Wing Flap Motor Gearbox (Cont)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: OUTPUT SHAFT CAN BE ROTATED WITH LESS THAN 86.0 INCH-POUNDS TORQUE (NO HYDRAULIC PRESSURE APPLIED TO BRAKE PARTS). (Cont)		
Damaged gears.	Check gearbox for ease of operation and excessive noise.	Forward motor gearbox to depot maintenance for overhaul.
TROUBLE: EXCESSIVE BACKLASH.		
Worn teeth on gears.	Manually rotate output shafts and check backlash.	Forward motor gearbox to depot maintenance for overhaul.
Distorted or cracked housings.	Visually check motor and gearbox housings for cracks and hydraulic leaks.	Forward motor gearbox to depot maintenance for overhaul.
TROUBLE: ELECTRIC MOTOR CANNOT DRIVE FLAP LOAD.		
Defective hydraulic brake.	Refer to paragraph 3-316 and perform a REVERSE TORQUE CHECK.	Forward motor gearbox to depot maintenance for overhaul.
Defective electric motor gearset.	Refer to paragraph 3-316 and perform a STALL TORQUE CHECK (ELECTRICAL).	Forward motor gearbox to depot maintenance for overhaul.
TROUBLE: GEARBOX INOPERATIVE HYDRAULICALLY.		
Piston frozen in brake cylinder or switch disks do not release.	Refer to paragraph 3-316 and perform an OPERATING SPEED CHECK (HYDRAULIC). Check pressure differential between pressure and return brake parts.	Forward motor gearbox to depot maintenance for overhaul.
Gearbox gears, bearing, or shaft failure.	Refer to paragraph 3-325 and disassemble motor gearbox. Check gearbox output shafts for freedom of movement.	Forward motor gearbox to depot maintenance for overhaul.
Defective hydraulic motor.	Do not attempt to check out hydraulic motor.	Forward motor gearbox to depot maintenance for overhaul.

Table 3-22. Troubleshooting Wing Flap Motor Gearbox (Cont)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: GEARBOX INOPERATIVE HYDRAULICALLY. (Cont)		
Improper hydraulic connections to brake and drain.	Check that hydraulic lines are connected to proper ports.	Make proper hydraulic connections as required.
TROUBLE: GEARBOX INOPERATIVE ELECTRICALLY.		
Gearbox gear, bearing, or shaft failure.	Refer to paragraph 3-325 and disassemble motor gearbox. Check gearbox output shafts for freedom of movement.	Forward motor gearbox to depot maintenance for overhaul.
Defective electric motor.	Check operation of electric motor.	Replace electric motor.
TROUBLE: GEARBOX OPERATES BUT WILL NOT DRIVE THE FLAP LOAD HYDRAULICALLY.		
Damaged gears in gearbox.	Refer to paragraph 3-325 and disassemble motor gearbox. Check output shafts for ease of operation. Check for excessive noise.	Forward motor gearbox to depot maintenance for overhaul.
Defective electric motor brake.	Electrically check operation of magnetic brake.	Replace electric motor.
TROUBLE: GEARBOX OPERATES BUT WILL NOT DRIVE THE FLAP LOAD ELECTRICALLY.		
Defective hydraulic brake.	Refer to paragraph 3-316 and perform a REVERSE TORQUE CHECK.	Forward motor gearbox to depot maintenance for overhaul.
Damaged gearbox gears.	Refer to paragraph 3-325 and disassemble gearbox. Check gearbox for ease of operation and excessive noise.	Forward motor gearbox to depot maintenance for overhaul.

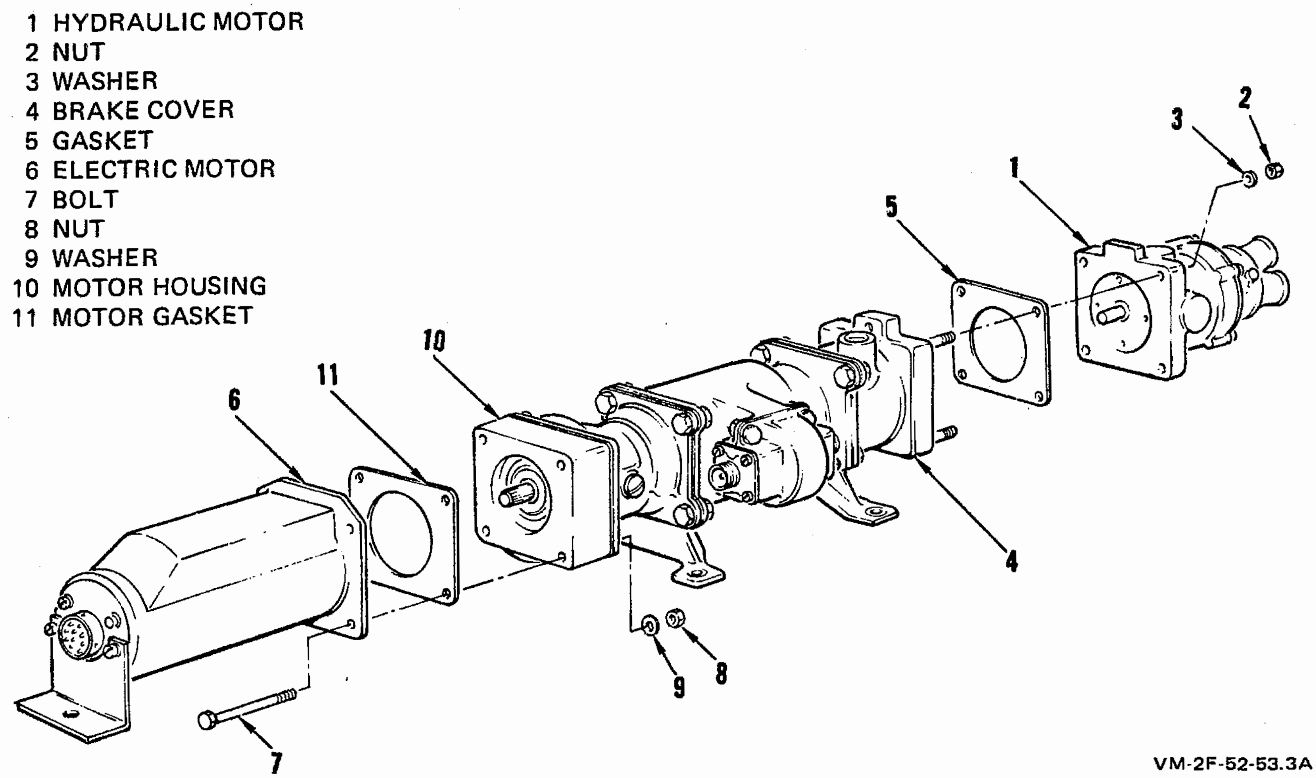


Figure 3-54. Wing Flap Motor Gearbox - Partially Exploded View

Tools and Equipment List

Stand, Test, Aircraft Hydraulic System	S-610 (or equivalent)
Power Supply (0- to 30-volt dc capacity)	Model LH125 (or equivalent)

3-325. DISASSEMBLY. To partially disassemble the flap motor gearbox, see figure 3-54 and proceed as follows:

1. Remove nuts and washers (3) that secure hydraulic motor (1) to brake cover (4). Separate motor and gasket (5) from brake cover.

2. Remove bolts (7), nuts (8), and washers (9) that secure electric motor (6) to housing extension (10). Separate electric motor and gasket (11) from housing.

3-326. CLEANING. To clean the components of the motor gearbox, proceed as follows:

Materials List

Solvent, Dry-cleaning	P-D-680, Type II

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

1. Clean surfaces of gearbox and motors with dry-cleaning solvent (P-D-680, Type II).

2. Dry components with a soft cloth or clean, dry compressed air at moderate pressure.

3-327. INSPECTION. To inspect the components of the motor gearbox, proceed as follows:

1. Visually inspect exterior of gearbox and motors for cracks, dents, distortion, corrosion, or other damage.

2. Examine all mounting holes for elongation.

3. Check condition of electric motor connector.

4. Visually inspect interior of all hydraulic port threads for stripping or other damage.

5. Damaged units should be sent to next maintenance level.

3-328. ASSEMBLY. To assemble the motor gearbox, proceed as follows:

Tools and Equipment List

Wrench, Torque (0-200 inch-pounds capacity)	GGG-W-686, No. 6 (or equivalent)

Materials List

Gasket	AN4045-1
Gasket	641043-1

1. Align the splined shaft and secure electric motor (6) and gasket (11) to housing extension (10), using bolts (7), washers (9), and nuts (8). Using a torque wrench tighten nuts (8) 20 to 25 inch-pounds.

2. Align the splined shaft and secure hydraulic motor (1) and gasket (5, AN4045-1) to brake cover (4), using washers (3) and nuts (2). Using a torque wrench, tighten nuts (2) 50 to 70 inch-pounds.

3-329. TESTING. After replacing either hydraulic motor or electric motor, refer to paragraph 3-316 for information and test the motor gearbox assembly.

3-330. PRESERVATION. If the motor gearbox is to be inactive or stored for a period of 6 months or longer, proceed as follows:

Materials List

Fluid, Hydraulic Preservative	MIL-H-6083

1. Flush hydraulic system with hydraulic fluid preservative (MIL-H-6083).

2. Fill system with hydraulic fluid preservative (MIL-H-6083). Cap or plug all hydraulic fittings.

3. Store thoroughly cleaned and preserved unit in moisture-proof paper. Pack in strong corrugated paper or wooden box.

SECTION IV
DEPOT MAINTENANCE

3-331. GENERAL.

3-332. This section provides maintenance procedures for the flight control systems at depot level maintenance.

3-333. LATERAL CONTROL SYSTEM.

3-334. Depot maintenance of components of the lateral control system consists of disassembly, cleaning, inspection, repair, assembly, adjustment, and preservation.

3-335. REDUCED SPOILER DAMPING BUNGEE (305-523376) (AIRCRAFT BUNO 155497 THROUGH 155503 AND AIRCRAFT HAVING AFC 19 INCORPORATED). (REMOVED FROM AIRCRAFT WITH AFC 73 INCORPORATED).

3-336. The reduced spoiler damping bungee is a two-way, hydraulic, compression-type bungee. The purpose of the bungee is to return the spoilers from the full to the reduced spoiler position. Depot maintenance for the bungee consists of disassembly, cleaning, inspection, repair, assembly, adjustment, testing, and preservation.

3-337. DISASSEMBLY. To disassemble the bungee, see figure 3-55 and proceed as follows:

1. Loosen check nut (1) and thread up to neck of rod end bearing (2). Slide lock washer (3) up to neck of bearing (2). Screw bearing (2) out of shaft (11).

Note

The bungee is filled with hydraulic fluid. Hold bungee upright while performing the following step.

2. Remove lockwire between housing (5) and end cap assembly (4). Hold bungee upright and screw off end cap (4). Pour out hydraulic oil and remove spring (6) and piston (7).

3. Remove cotter pin (8) from nut (9). Screw off nut (9) and remove washer (10). Remove shaft (11) and spring (12) from housing (5). Remove plug (17) from shaft (11).

4. Remove packings (14, 15, 16, and 19) from Piston (7), shaft (11), and housing (18).

5. Press bearing (13) out of cap assembly (4).

3-338. CLEANING. To clean the components of the bungee, proceed as follows:

Materials List

Solvent, dry-cleaning	P-D-680, Type II

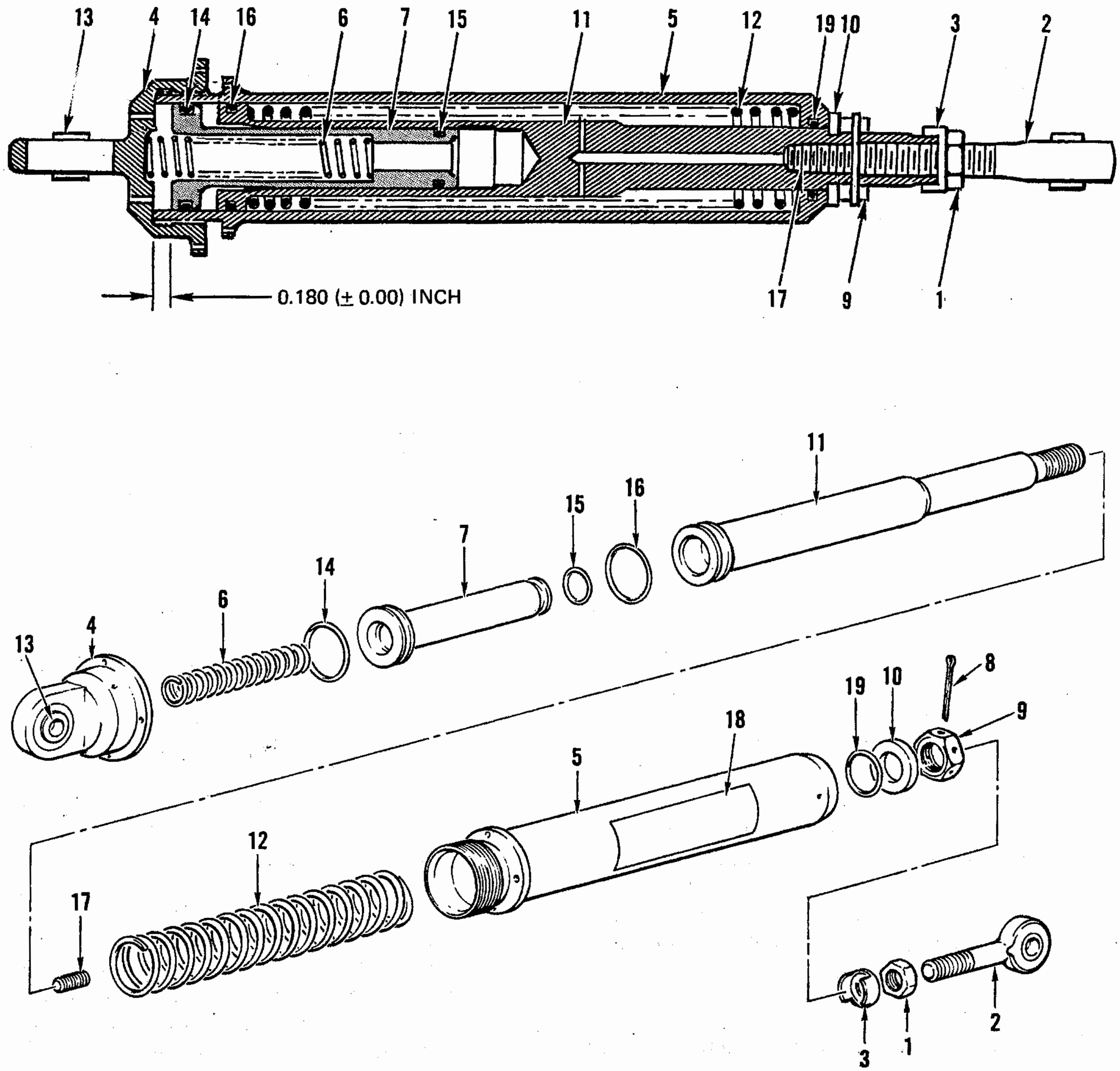
WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

1. Using a soft, nonmetallic brush, clean all parts of bungee in dry-cleaning solvent (P-D-680, Type II).

CAUTION

Before beginning the following step, see figure 3-55 and check that both orifices at the flanged end of the shaft (11) are open and clear.



1	CHECK NUT	8	COTTER PIN	15	PACKING
2	ROD END	9	NUT	16	PACKING
3	LOCK WASHER	10	WASHER	17	PLUG
4	CAP ASSEMBLY	11	SHAFT	18	IDENTIFICATION PLATE
5	HOUSING	12	SPRING, COMPRESSION	19	PACKING
6	SPRING, COMPRESSION	13	BEARING		
7	PISTON	14	PACKING		

VM-2H-52-74.1

Figure 3-55. Reduced Spoiler Damping Bungee (305-523376) - Exploded View

2. Dry all parts with dry, filtered, compressed air. Wipe all components with a clean, lint-free cloth.

3-339. INSPECTION. To inspect components of the bungee, see figures 3-56 and 3-57 and proceed as follows:

Tools and Equipment List

Tester, Spring Resiliency	Type PB4-D (or equivalent)

Note

See figure 3-55. If bungee housing (5) and end cap (4) do not meet the conditions in the following steps, discard the entire bungee.

1. Check condition of end cap assembly (4, figure 3-55). Examine condition of threads. Check entire cap for cracks, deep nicks, scratches, and corrosion.

2. See figure 3-56. Inspect housing for excessive wear. Examine bore for smoothness and cracks. Check condition of threads. Inspect exterior of housing for deep nicks, scratches, and corrosion.

3. Inspect piston for excessive wear. Check bore of piston for smoothness. Examine exterior for general condition.

4. Inspect shaft for excessive wear. Check exterior for cracks.

5. See figure 3-55. Inspect lock washer (3), washer (10), nuts (1 and 9), and plug (17), for general condition. Examine identification plate (18) for legibility.

6. Using a spring resiliency tester (Type PB4-D), or equivalent), check that both compression springs (6 and 12, figure 3-55) meet the inspection standards in figure 3-57.

3-340. REPAIR. To repair the bungee, see figure 3-55 and proceed as follows:

Materials List

Cloth, Abrasive, Aluminum Oxide	P-C-451, No. 600-800 Grade
Primer, Zinc Chromate	MIL-P-8585 or TT-P-1757

1. Refer to Illustrated Parts Breakdown (NAVAIR 01-60GCB-4) and replace all worn, distorted, or damaged components which do not meet the inspection requirements in paragraph 3-339.

2. Using abrasive cloth (P-C-451, No. 600-800 grade), polish out all nicks, scratches, and abrasions on all nonmachined and noncritical surfaces. Apply zinc chromate primer (MIL-P-8585 or TT-P-1757) to all polished areas.

3. Stake new bearing (13) into cap assembly (4). Discard old rod end (2) and replace with new rod end.

4. If identification plate (18) is damaged, transfer data from damaged plate to the new plate. Install new plate on housing (5).

3-341. ASSEMBLY. To assemble the bungee, see figure 3-55 and proceed as follows:

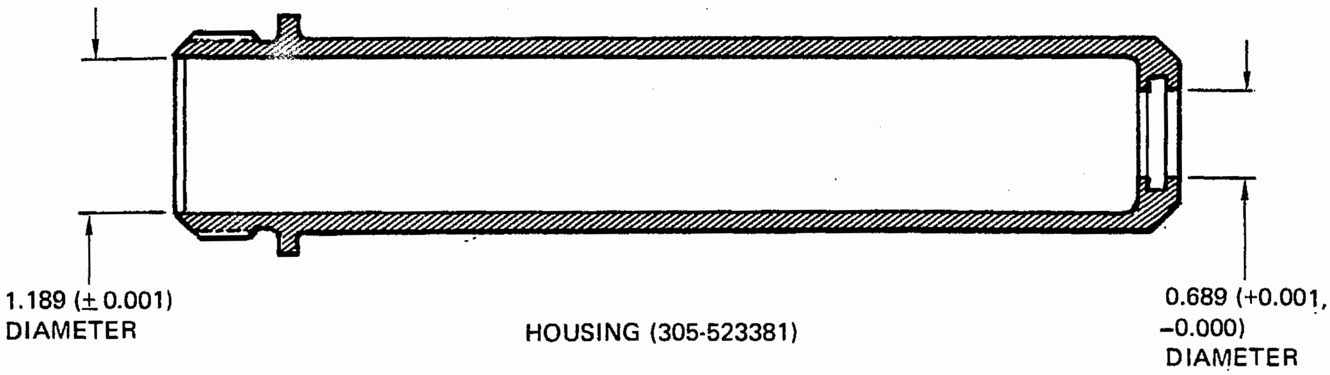
Materials List

Lockwire (0.041-inch diameter steel)	MS20995F41
Oil, Preservative, Hydraulic Equipment	MIL-O-6083
Pin, Cotter	MS24665-140
Primer, Zinc Chromate	MIL-P-8585 or TT-P-1757
Compound, Antiseize, Thread and Gasket	Led-Plate No. 250, FSCM 84180 (or equivalent)

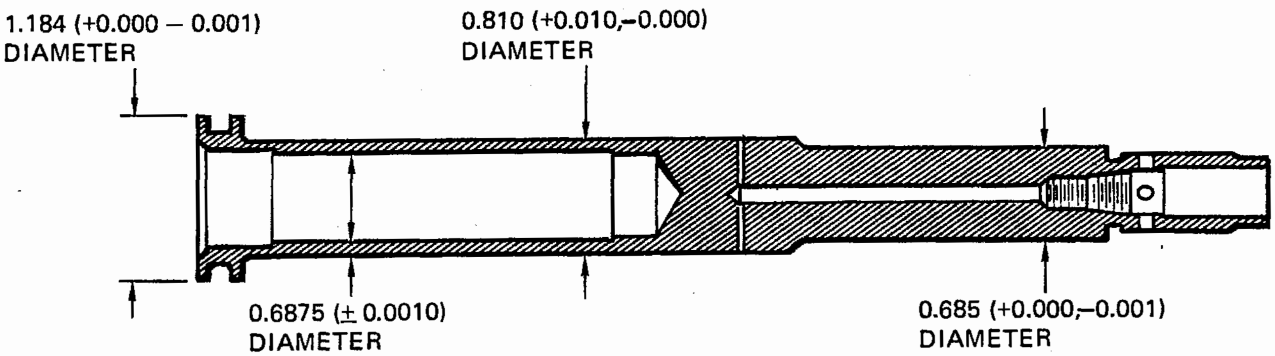
Note

All components must be thoroughly cleaned prior to and during assembly.

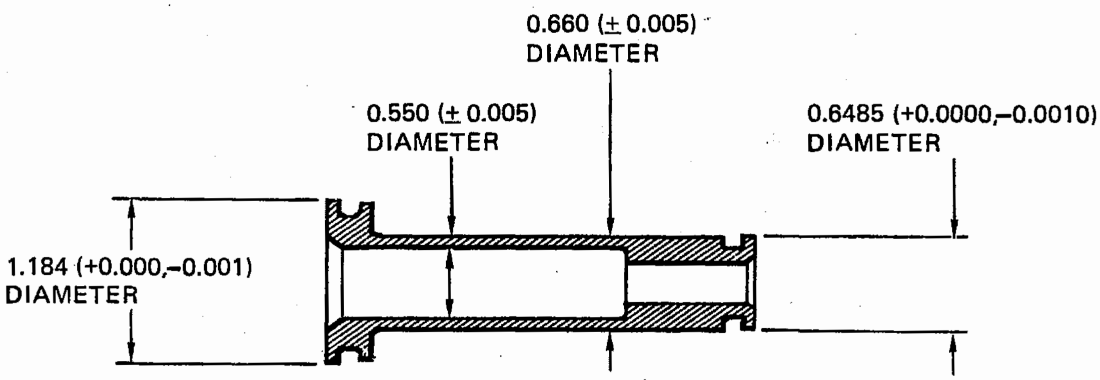
1. Coat packings (16 and 19) with hydraulic oil (MIL-H-6083). Install packing (16) onto shaft (11). Install packing (19) inside of housing (5).



HOUSING (305-523381)



SHAFT (305-523379-3)



PISTON (305-523380-3)

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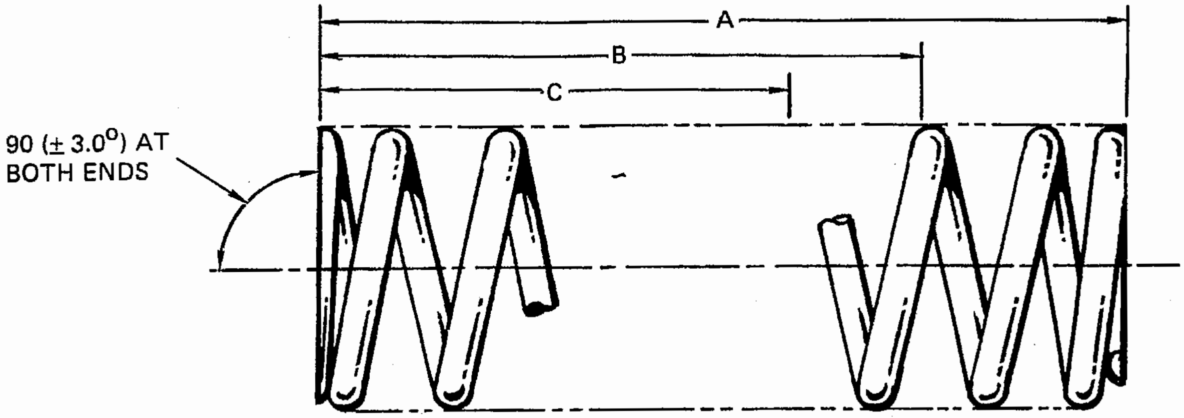
Figure 3-56. Reduced Spoiler Damping Bungee (305-523376) Housing, Shaft, and Piston - Wear Limits



NOMENCLATURE AND PART NUMBER	A TRUE LENGTH (INCHES)	B COMPRESSED LENGTH UNDER TEST LOAD	C SOLID LENGTH (INCHES)
COMPRESSION SPRING (6) (305-523377)	8.55 (±0.03)	6.00 (±0.03) INCHES AT 25.0 (±2.50) POUNDS	3.84 (±0.00)
COMPRESSION SPRING (12) (305-523378)	3.32 (±0.03)	2.45 (±0.03) INCHES AT 43.25 (±4.50) POUNDS	1.96 (±0.00)

VM-2F-52-74.3

Figure 3-57. Compression Spring Inspection Standards

2. Slide compression spring (12) over shaft (11). Install spring (12) and shaft (11) assembly into housing (5). Secure shaft (11) with washer (10) and nut (9). Tighten nut (9), aligning holes in nut (9) with holes in shaft (11). Do not install cotter pin (8).

3. Coat packings (14 and 15) with hydraulic oil (MIL-H-6083). Install packings (14 and 15) on piston (7).

4. Fill the assembly from step 2 with hydraulic oil (MIL-H-6083). Install piston (7) into housing (5) and shaft (11).

5. The flanged end of piston (7) must be installed 0.180 (±0.00) inch down within the lip of the housing (5). Excess hydraulic oil will escape through two orifices in shaft (11). Check that hydraulic oil is free of air pockets.

6. Install plug (17) in end of shaft (11) to a depth of one thread. Coat exposed threads with antiseize compound (Led-Plate No. 250, FSCM 84180, or equivalent). Thread plug (17) into shaft (11).

7. Insert spring (6) into piston (7). Align cap assembly (4) with spring (6) and install cap assembly (4). Tighten cap assembly (4) and safety to housing (5) with lockwire (MS20995F41).

8. Install cotter pin (MS24665-140) through nut (9) and shaft (11).

9. Thread check nut (1) onto rod end (2). Slide lock washer (3) onto rod end (2) shaft. Screw rod end (3) into shaft (11). Temporarily tighten check nut (1) against lock washer (3) and shaft (11).

3-342. ADJUSTMENT. To adjust the bungee, see figure 3-58 and proceed as follows:

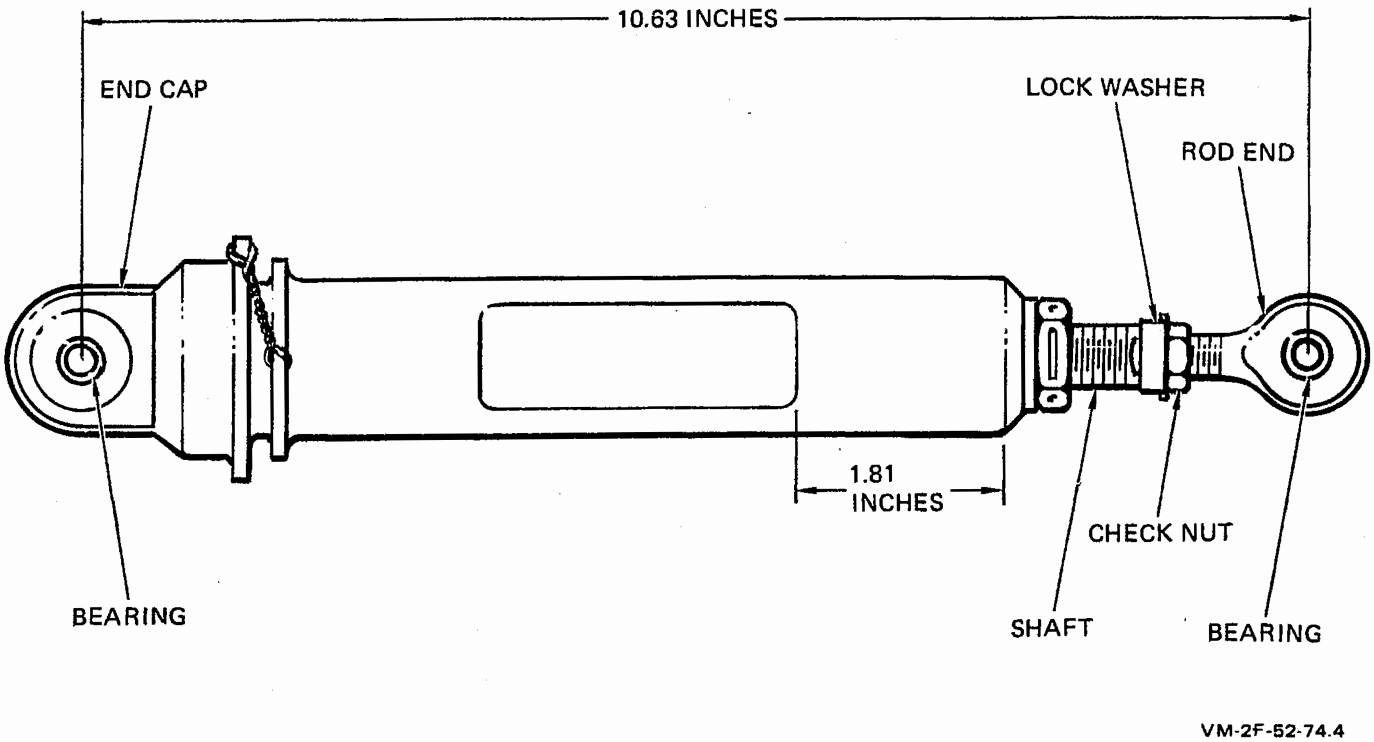


Figure 3-58. Reduced Spoiler Damping Bungee (305-523376) - Adjustment

1. Loosen check nut. Adjust rod end to obtain a dimension of 10.63 (±0.00) inches from center of end cap bearing bolt hole to center of the rod end bolt hole. Slide lock washer over end of shaft and tighten check nut against washer.

3-343. TESTING. To test the bungee, proceed as follows:

Tools and Equipment List

Gage, Force, Push-pull	0-100-pound capacity, S131 (or equivalent)

1. Install end cap of bungee in a suitable stationary fixture. Attach a force gage (S131, or equivalent) to rod end.

2. Pull on force gage and note reading on gage as bungee just begins to move from rest position. See figure 3-59. Minimum reading must be 13.0 (±0.00) pounds. Maximum reading must be 45.0 (±5.00) pounds.

3. Extend bungee 1.70 (±0.00) inches from full retract. Minimum reading on force gage must be 29.1 (±0.00) pounds. Maximum reading on gage must be 60.0 (±5.00) pounds.

4. Extend and hold bungee 1.70 (±0.00) inches from full retract. Release bungee and measure time to full retract. Time must be 1.25 (±0.25) seconds.

3-344. PRESERVATION. To preserve the bungee, proceed as follows:

Materials List

Barrier Material, Waterproofed, Flexible	MIL-B-121, Grade A

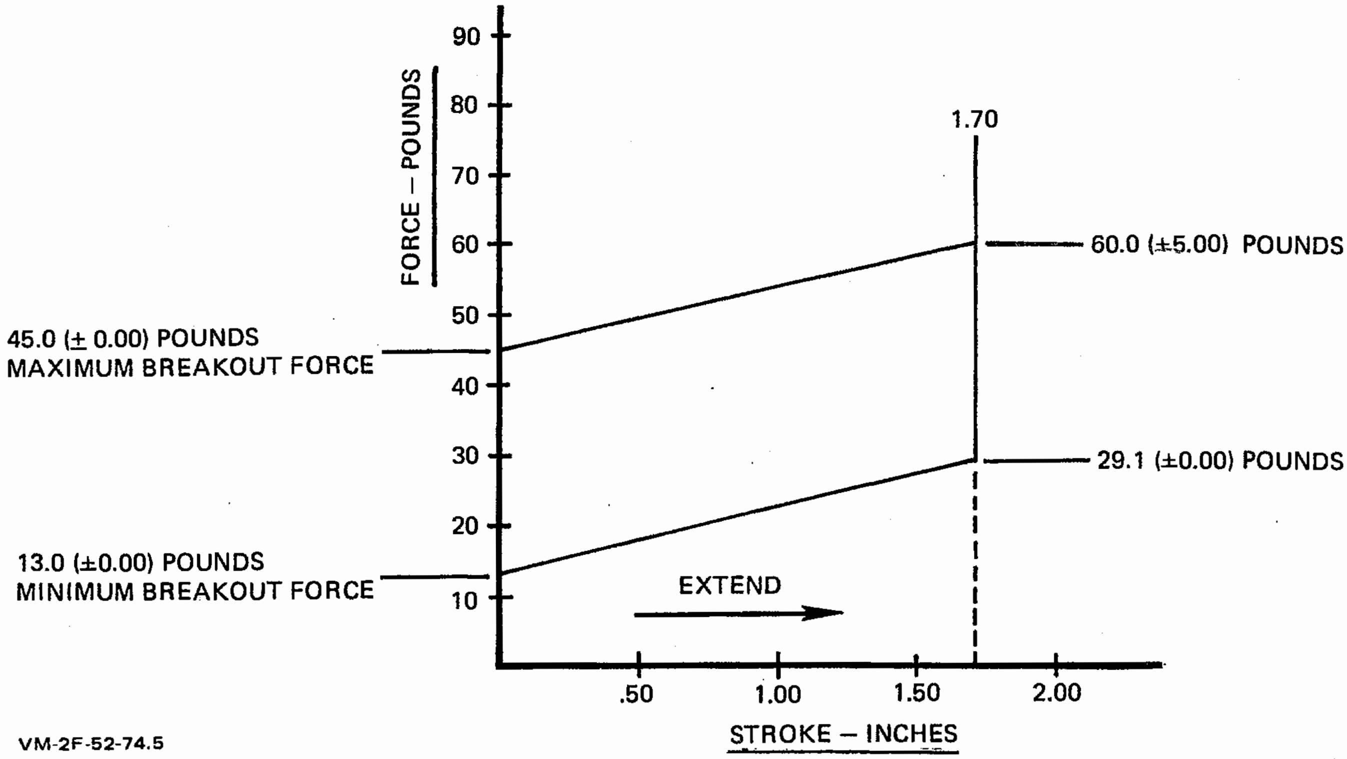


Figure 3-59. Reduced Spoiler Bungee (305-523376) Force Check

Check that bungee is thoroughly clean. Wrap bungee in moistureproof paper (MIL-B-121, grade A). Pack in suitable container and store in a cool, dry, place.

3-345. REDUCED SPOILER ACTUATOR (NYLC 9834-1).

3-346. For depot level maintenance procedures of the reduced spoiler actuator, refer to Torque Limit Electromechanical Rotary Actuator Technical Manual (NAVAIR 03-75BA-17).

3-347. LONGITUDINAL CONTROL SYSTEM.

3-348. Depot maintenance of components of the longitudinal control system consists of checkout, disassembly, cleaning, inspection, repair, tolerance limits, assembly, adjustment, calibration, preservation, and shipment. In some instances, depot maintenance may include manufacture of parts, modification, testing, and reclamation of assemblies or subassemblies.

3-349. ELEVATOR SPRING TAB BUNGEE (305-522239).

3-350. The elevator spring tab bungee is a two-way compression-tension bungee. The bungee is attached to the outboard ends of the elevator and elevator balance weights. Depot maintenance for the bungee consists of disassembly, cleaning, inspection, repair, assembly, adjustment, testing, and preservation.

3-351. DISASSEMBLY. Refer to paragraph 3-240 for instructions to disassemble the bungee.

3-352. CLEANING. Refer to paragraph 3-241 for instructions to clean the bungee.

3-353. INSPECTION. To inspect the bungee, see figure 3-36 and proceed as follows:

Tools and Equipment List

Tester, Spring Resiliency	Type PB4-D (or equivalent)

1. Visually inspect all parts for general condition. Check all threads for damage and all machined surfaces for smoothness. Inspect all parts for cracks, dents, scratches, and worn threads.

2. Check radial wear in end fitting (1) bolt holes and rod-end bearing (11). Maximum allowable radial wear is 0.025 inch.

3. Check spring (6) for cracks and breakage. Check that ends are within 2 degrees of spring axis. Measure length of spring. Free length must be 2.615 (±0.030) inches.

4. Place spring in spring tester (Type PB4-D). Compress spring to 2.5 (± 0.010) inches in length and record force. Compress spring to 1.90 (± 0.010) inches length and record force. Difference must be 69.6 (± 3.43) pounds.

3-354. REPAIR. To repair the bungee, proceed as follows:

Materials List

Cloth, Abrasive, Aluminum Oxide	P-C-451, No. 600-800 Grade
Primer, Zinc-chromate	MIL-P-8585 or TT-P-1757

1. Replace all parts that do not meet the requirements in paragraph 3-353.

Note

In the following step, ensure that all data from old nameplate has been transferred to new nameplate before it is installed on cylinder.

2. See figure 3-36. If found defective, manufacture new end fitting (1) and shaft (8). If nameplate on cylinder is defective, manufacture new nameplate and install on cylinder (3).

3. Polish out all scratches with abrasive cloth (P-C-451, No. 600-800 grade). Cover areas with zinc-chromate primer (MIL-P-8515).

3-355. ASSEMBLY. Refer to paragraph 3-243 for instructions to assemble the bungee.

3-356. ADJUSTMENT. Refer to paragraph 3-244 for instructions to adjust the bungee.

3-357. TESTING. To test bungee, see figures 3-36 and 3-60 and proceed as follows:

Tools and Equipment List

Gage, Force, Push-pull	0-100-pound capacity, (S131 or equivalent)

3-358. EXTENSION FORCE CHECK. See figure 3-60 and proceed as follows:

1. Install cylinder end fitting (1, figure 3-36) in a suitable stationary fixture. Mark center of rod end bearing (11) bolt hole.

2. Attach force gage (S131, or equivalent) to rod end bearing (11) on end of shaft (8).

Note

The following step must be completed in one continuous operation. A helper must indicate when the bungee shaft just begins to move from rest, when center of rod-end bearing is at 0.665 and 0.750 inch from the rest position, and again just before the shaft bottoms out at the rest position.

3. Pull on force gage (S131, or equivalent) and record gage readings at breakout (just as bungee shaft begins to move from rest position), and at 0.665 inch from rest position. Continue to pull shaft to 0.750 inch from rest and then slowly allow shaft to return to rest position. Record gage readings at 0.665 inch and just before shaft bottoms out at rest.

4. Breakout force reading on extension must be 2.0 (±0.5) pounds. The difference between the gage reading at initial shaft movement and gage reading just before shaft bottoms out at rest position must not exceed 1.0 pound.

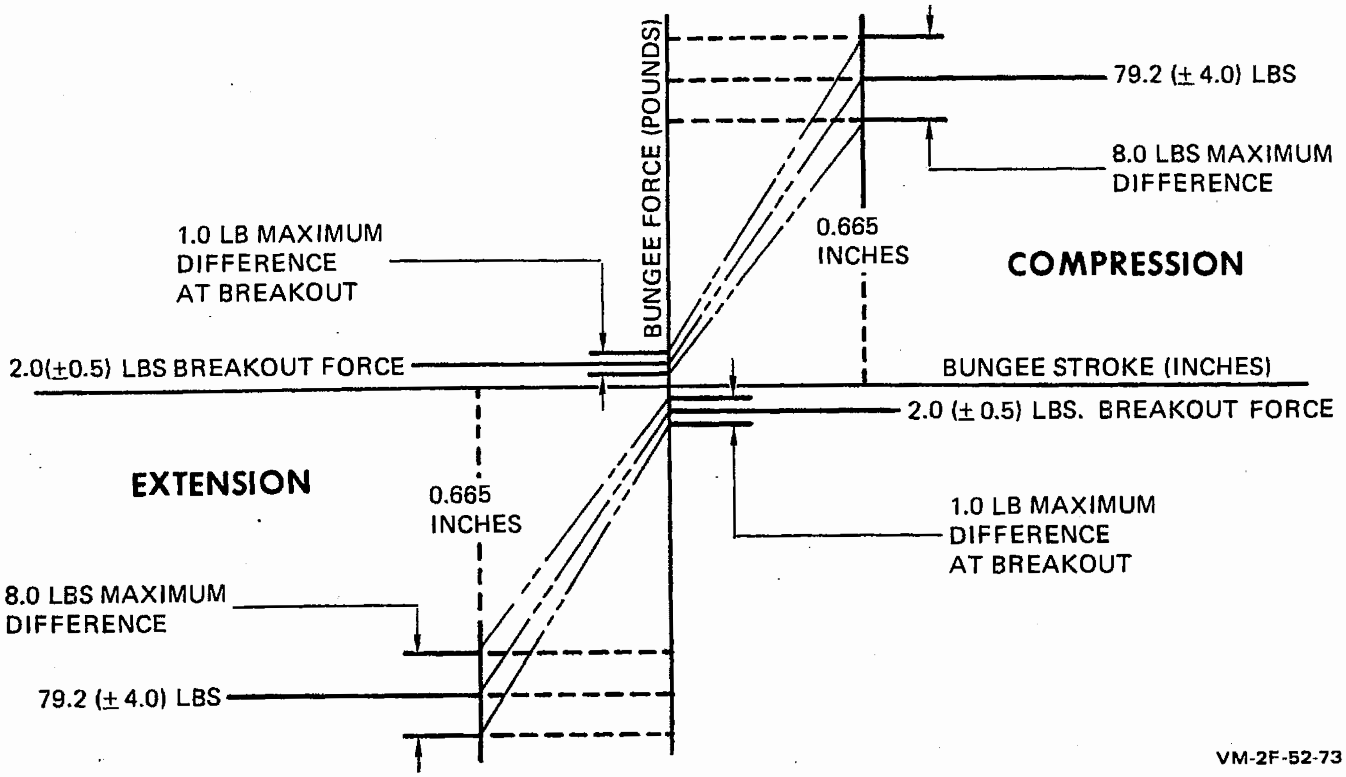


Figure 3-60. Longitudinal Spring Tab Bungee Force Check

5. Gage reading at 0.665 inch during extension must be 79.20 (±4.0) pounds. The difference between gage reading at 0.665 inch extension and 0.665 inch retraction must not exceed 8.0 pounds.

3-359. COMPRESSION FORCE CHECK. See figure 3-60 and proceed as follows:

Note

The following step must be completed in one continuous operation. A helper must indicate when the bungee shaft just begins to move from rest, when center of rod end bearing is at 0.665 and 0.750 inch from the rest position, and again just before the shaft bottoms out at the rest position.

1. Push on force gage (S131, or equivalent) and record gage readings at breakout (just as bungee shaft beings to move from rest position), and at 0.665 inch from rest position. Continue to pull shaft to 0.750 inch from rest and then slowly allow shaft to return to rest position. Record gage readings at 0.665 inch and just before shaft bottoms out at rest.

2. Breakout force reading on compression must be 2.0 (±0.5) pounds. The difference between gage reading at initial shaft movement and gage reading just before shaft bottoms out at rest position must not exceed 1.0 pound.

3. Gage reading at 0.665 inch during compression must be 79.20 (±4.0) pounds. The difference between gage reading at 0.665 inch compression and 0.665 inch on the return to rest position must not exceed 8.0 pounds.

3-360. PRESERVATION. To preserve the bungee, proceed as follows:

Materials List

Barrier Material, Waterproofed, Flexible	MIL-B-121, Grade A

1. Check that bungee is thoroughly clean.

2. Wrap bungee is moistureproof paper (MIL-B-121, grade A).

3. Pack in suitable container and store in a cool, dry, place.

3-361. LONGITUDINAL SPRING TRIM ACTUATOR (R5219-1 AND R5219M1).

3-362. The longitudinal spring trim actuator (figure 3-38) is an electromechanical device which converts electrical energy into mechanically controlled linear motion. It contains nonjamming mechanical stops which operate in conjunction with a jackscrew and traveling acme nut. Linear travel of the acme nut is controlled by limit switches. A ball detent-type slip clutch is incorporated to protect the structural members of the actuator against damage due to overloading or limit-switch failure. The actuator is powered by a dc, split field, series wound, reversible motor, incorporating an integral brake. This brake controls actuator travel when the motor is deenergized by the limit switches. Depot maintenance for the longitudinal spring trim actuator consists of a checkout, disassembly, cleaning, inspection, repair, assembly, adjustment, testing, and preservation. See table 3-23 for a listing of general characteristics.

Table 3-23. General Characteristics - Longitudinal Spring Trim Actuator (R5219-1 and R5219M1)

Voltage range	18 to 29 volts dc
Operating altitude	Sea level to 30,000 feet
Temperature range	22°F (−5.56°C) to +160°F (71°C)
Normal operating load (R5219-1)	1100 pounds
Normal operating load (R5219M1)	750 pounds
Maximum operating load (R5219-1)	2170 pounds
Maximum operating load (R5219M1)	1500 pounds
Duty cycle	One full stroke (extend or retract) followed by 3 minutes off
Pulse duty cycle	1 second extend followed by 7.5 seconds off; 0.75 seconds retract followed by 7.25 seconds off.
Weight	4 pounds

3-363. CHECKOUT. To identify the cause of actuator malfunction, proceed as follows:

Tools and Equipment List

Power Supply, Electrical	E601869 FSCM 08783, or equivalent, (0-30 volts dc capacity)
Multimeter	AN/PSM-4C (or equivalent)

1. Mount actuator on a suitable fixture. Connect power supply (E601869 or equivalent) to actuator. See figure 3-36.

2. Refer to tables 3-24 and 3-25 to isolate cause of malfunction. See figure 3-36 and use a multimeter (AN/PSM-4C) to test actuator circuitry.

Table 3-24. Troubleshooting Actuator Assembly

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: INOPERATIVE — NO CURRENT.		
Open connection.	Refer to paragraph 3-364 and remove cover (42). See figure 3-36 and check all connections.	Repair wiring as required.
Defective limit switches (61).	See figure 3-36 and check continuity through switches.	Replace defective switches (61)
Limit switches (61) improperly adjusted.	See figure 3-39 and check adjustment of switches.	Refer to paragraph 3-250 and adjust as required.
TROUBLE: LOW SPEED, HIGH CURRENT — NOISY OPERATION.		
Mechanical interference due to gears, bearings, or other components.	Refer to paragraph 3-364 and disassemble actuator. Refer to paragraph 3-368 and inspect all gears and bearings.	Replace defective gears and bearings.
TROUBLE: CLUTCH (39) SLIPPING.		
Clutch (39) improperly adjusted.	Refer to paragraph 3-377 for proper adjustment.	Adjust/replace clutch assembly.

Table 3-25. Troubleshooting Motor and Brake Assembly

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: INOPERATIVE — NO CURRENT.		
Open connection.	Refer to paragraph 3-364 and remove cover (42). See figure 3-36 and check all connections.	Repair wiring as required.
TROUBLE: INOPERATIVE — STALL CURRENT.		
Brake not releasing; damaged or burned out core and coil assembly (10, figure 3-62).	Refer to paragraph 3-377 and check operation of brake. Inspect core and coil assembly (10) for damage.	Repair brake as required. Replace core and coil assembly.
Brake not releasing; insufficient brake air gap.	Refer to paragraph 3-377 and check clearance between core and coil assembly (10) and spacer (11).	Remove or install shims (12) to obtain proper clearance.

3-364. DISASSEMBLY. The following disassembly instructions are divided into two parts. The first part describes disassembly of the actuator (figure 3-61) and all respective parts except the motor and brake assembly. The second part contains instructions to disassemble the motor and brake assembly (figure 3-62). To completely disassemble the actuator, proceed as follows:

Tools and Equipment List

Plate, Bearing Removal	AT 770-1 FSCM 81039
Plate, Bearing Removal	AT770-2 FSCM 81039
Puller, Brake Disk	AT2156 FSCM 81039
Wrench, Special	AT226-1 FSCM 81039
Wrench, Special	AT1795 FSCM 81039
Press, Arbor, Hydraulic	1 1-2 (15746) (or equivalent)

Note

Keep all attaching hardware with respective components. Record thickness of shims removed during disassembly to aid in reassembling the actuator. Tag all wiring disconnected during disassembly for identification during reassembly.

3-365. ACTUATOR DISASSEMBLY. See figure 3-61 and proceed as follows:

1. Locate drilled-head screws at end of actuator, Cut and remove all lockwire from screws.

2. Do not remove trademark plate (43) or identification plate (44) from cover (45) unless they are illegible or otherwise damaged and require replacement.

3. Remove retaining nut (6) and O-ring seal (7).

4. Remove locking nut from connector (8) and pull off cover (45).

5. Remove rubber gasket (26) from cover (45).

6. Do not remove electrical paper insulation (46) from cover (45) unless it is damaged and requires replacement.

7. Remove potting compound and unsolder actuator leadwires, as necessary, from their internal connections.

8. Remove guide plate (58) from guide housing (81) by removing screws (59).

9. Remove clamp (54) by removing screw (51) and nut (50). Mounting spacer (52) and shims (53) will fall free. Remove strap (56) from motor and brake assembly (55).

10. Remove strap (57) from leadwires.

CAUTION

Do not pull on motor leadwires when removing motor and brake assembly (55). Damage to intermal connections would require replacement of field assembly (29, figure 3-62).

11. Remove motor and brake assembly (55) by removing screws (47 and 48).

12. Swing up lever rod (63) and remove spring (60).

13. Remove one cotter pin (62) from support pin (61) and pull out support pin releasing lever rod (63).

14. Remove switches (64) by removing screws (65) and washers (66).

15. Do not remove screws (67) from switch levers (68 and 70) unless they are damaged.

16. Remove switch levers (68 and 70) and shims (72) by removing screws (69 and 71).

17. Remove adjustment disks (73) by removing screws (77).

18. Remove mounting brackets (74 and 78) by removing screws (75 and 79) and washers (76 and 80).

19. Loosen retaining nut (2) and unscrew jack-end fitting assembly (3) from nut tube (85).

20. Remove retaining nut (2) and rod end lock (1).

21. Remove self-aligning bearing (4) from jack-end fitting (3).

22. Remove key (12) from retaining plate (24) by removing screw (11).

23. Remove fixed-end fitting assembly (14).

24. Remove self-aligning bearing (13) from fixed-end fitting (14).

25. Remove cotter pin (16) and retaining nut (17).

26. Pull bearing mounting flange (22) from front housing by removing bolts (21) and remove shims (16 and 13) and duplex bearing (19).

27. Remove retaining plate (24) with attached parts from front housing by removing screw (23).

28. Remove filter assembly (29) and terminal (30) by removing screws (27 and nuts (28).

29. Remove drain tube (25) from retaining plate (24).

30. Pull off front housing (31) with attached parts.

31. Press out bearing (37) and disk (38) from front housing (31).

32. Remove spur and pinion gear (34). Remove bearings (35 and 36) from pinion ends of spur and pinion gears (32 and 33). Remove spur and pinion gears. Remove bearings (35) from bores of intermediate housing (49).

33. Slide bearing bushing (20) and ball clutch assembly (41) off shaft of screw and nut assembly (87).

34. Remove intermediate housing (49) with attached parts and press out bearing (39) and disk (40).

35. Pull off guide housing (81) from screw and nut assembly (87) and remove guide fitting (5).

36. Remove key (86) and stop washer (82) from screw and nut assembly (87).

37. Remove stop washer (82).

38. Remove key (84) from nut tube (85) and remove nut tube and shim (83) from screw and nut assembly (87).

Note

Nut (88) and acme jackscrew assembly (89) are a matched set.

39. Remove nut (88) from jackscrew (89), using a strap wrench.

3-366. MOTOR AND BRAKE DISASSEMBLY. See figure 3-62 and proceed as follows:

1. Cut and remove lockwire from all drilled-head screws.

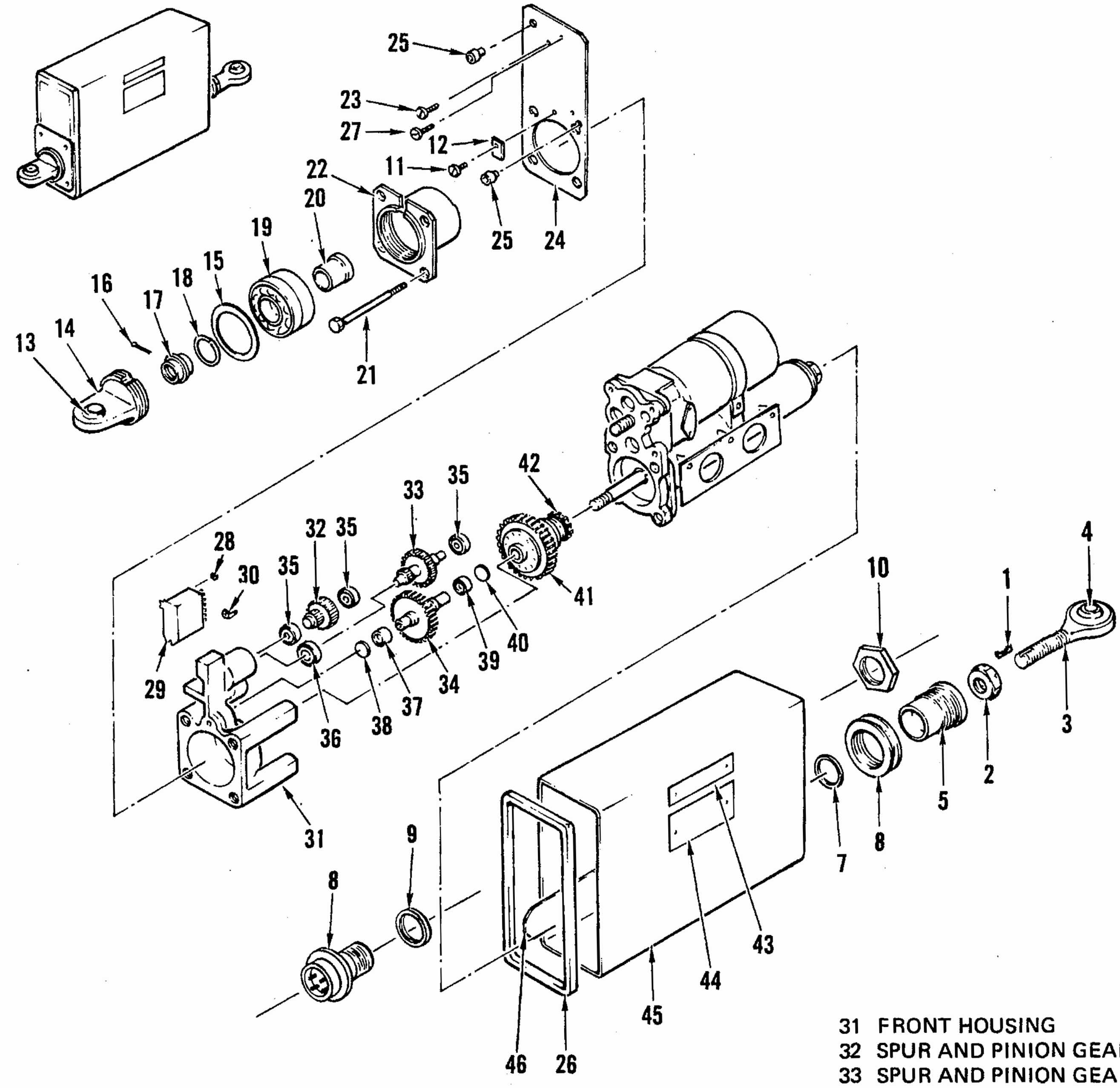
2. Do not remove decal (1) from housing of field assembly (27) unless it is illegible or otherwise damaged and requires replacement.

3. Detach covers (2) by removing screws (3). Withdraw insulator disks (4) and remove retaining screws (5) and brush assemblies (6).

4. Detach cover (7) by removing screws (8).

5. Using special wrench (AT1795), remove retaining screw (9). Drill out stake marks, if necessary to avoid damaging threads.

6. Carefully cut away heat-shrinkable tubing and unsolder leadwires of core and coil assembly (10) from leadwires of field assembly (27). Remove core and coil assembly (10), spring (11), shims (12), disk assembly (13) and spacer (14).



1 KEY
2 RETAINING NUT
3 JACK END FITTING ASSEMBLY
4 SELF ALIGNING BEARING
5 GUIDE FITTING
6 RETAINING NUT
7 O-RING SEAL
8 CONNECTOR
9 O-RING SEAL
10 NUT
11 SCREW
12 KEY
13 FIXED END FITTING ASSEMBLY
14 SELF ALIGNING BEARING
15 SHIM SET
16 COTTER PIN
17 RETAINING NUT
18 SHIM SET
19 DUPLEX BEARING
20 BUSHING
21 BOLT
22 BEARING MOUNTING FLANGE
23 SCREW
24 RETAINING PLATE
25 DRAIN TUBE
26 GASKET
27 SCREW
28 NUT
29 FILTER ASSEMBLY
30 TERMINAL
31 FRONT HOUSING
32 SPUR AND PINION GEAR
33 SPUR AND PINION GEAR
34 SPUR AND PINION GEAR
35 BEARING
36 BEARING
37 NEEDLE BEARING
38 DISK
39 NEEDLE BEARING
40 DISK
41 CLUTCH ASSEMBLY
42 SPANNER NUT
43 TRADEMARK PLATE
44 IDENTIFICATION PLATE
45 COVER
46 PAPER INSULATION

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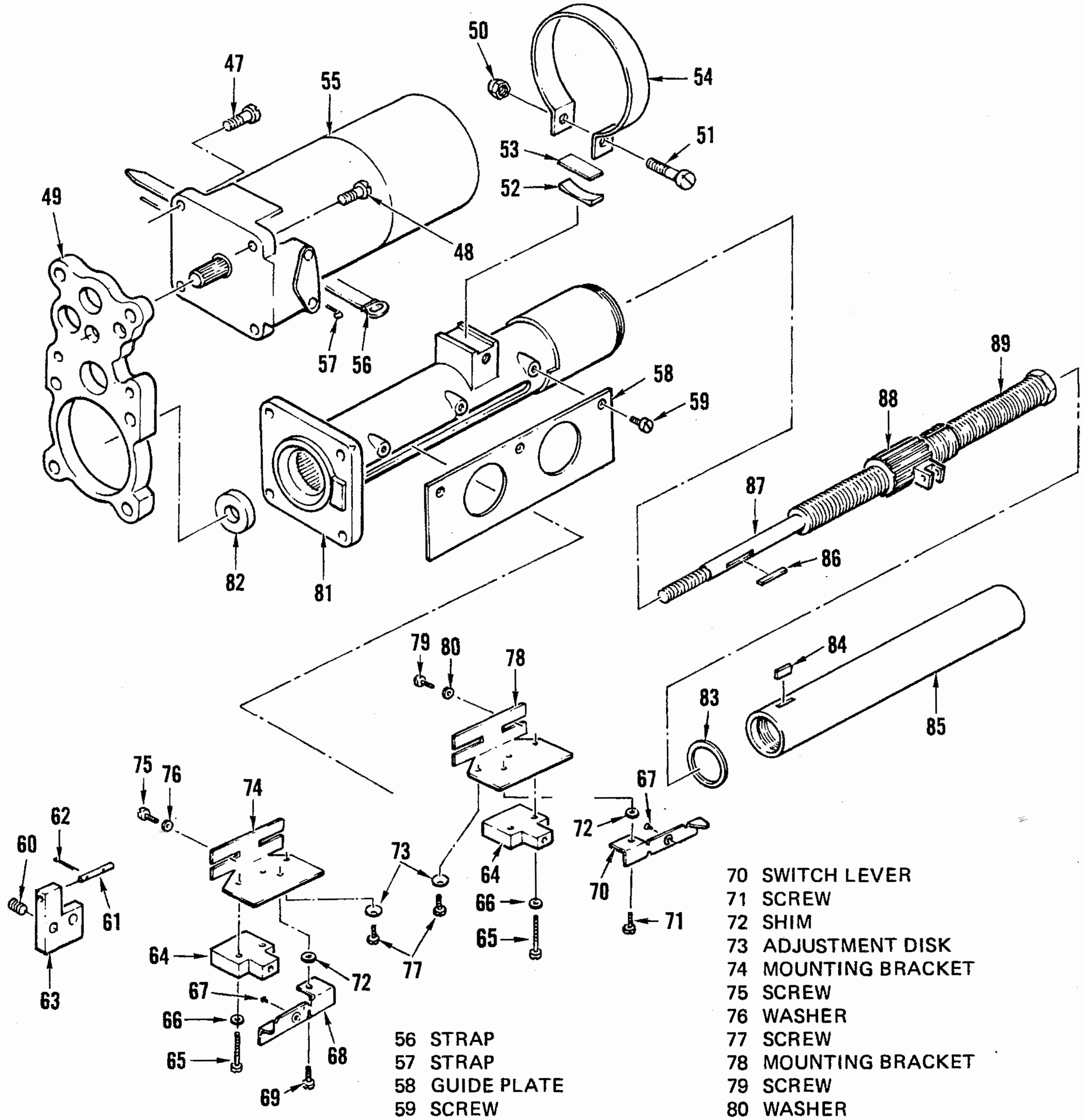
Figure 3-61. Longitudinal Spring Trim Actuator - Exploded View (Sheet 1 of 2)



47 SCREW
48 SCREW
49 INTERMEDIATE HOUSING
50 NUT
51 SCREW
52 SPACER
53 SHIM
54 CLAMP
55 MOTOR AND BRAKE ASSEMBLY
56 STRAP
57 STRAP
58 GUIDE PLATE
59 SCREW
60 SPRING
61 SUPPORT PIN
62 COTTER PIN
63 LEVER ROD
64 SWITCH
65 SCREW
66 WASHER
67 SCREW
68 SWITCH LEVER
69 SCREW
70 SWITCH LEVER
71 SCREW
72 SHIM
73 ADJUSTMENT DISK
74 MOUNTING BRACKET
75 SCREW
76 WASHER
77 SCREW
78 MOUNTING BRACKET
79 SCREW
80 WASHER
81 GUIDE HOUSING
82 STOP WASHER
83 SHIM
84 KEY
85 TUBE
86 KEY
87 SCREW AND NUT ASSEMBLY
88 ACME NUT
89 ACME JACK SCREW ASSEMBLY

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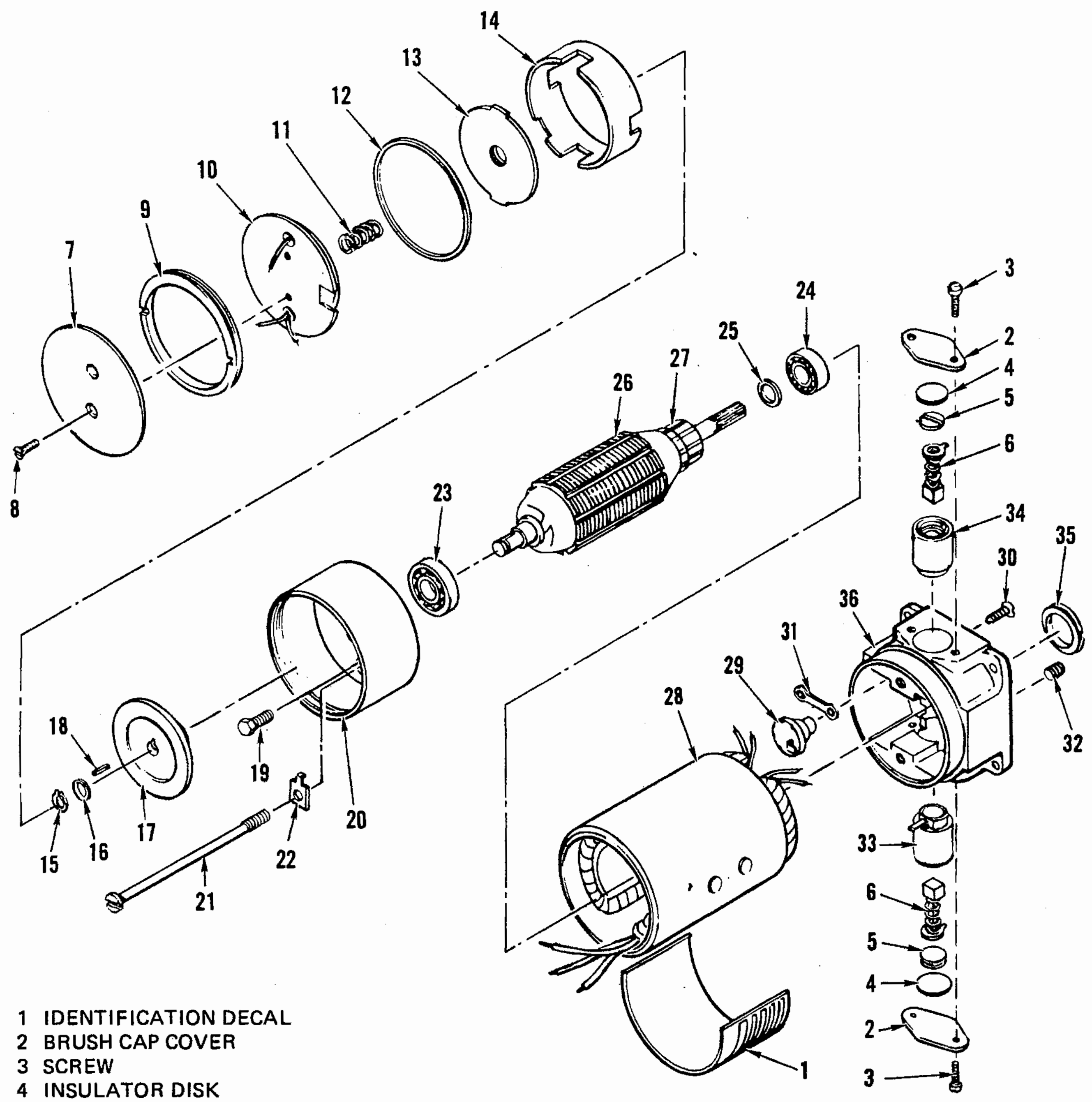
Figure 3-61. Longitudinal Spring Trim Actuator - Exploded View (Sheet 2 of 2)



1 IDENTIFICATION DECAL
2 BRUSH CAP COVER
3 SCREW
4 INSULATOR DISK
5 RETAINING SCREW
6 BRUSH ASSEMBLY
7 COVER
8 SCREW
9 RETAINING SCREW
10 CORE AND COIL ASSEMBLY
11 HELICAL SPRING
12 SHIM
13 BRAKE DISK ASSEMBLY
14 SPACER
15 RETAINING RING
16 SHIM
17 BRAKE DISK
18 KEY
19 SCREW
20 HOUSING ASSEMBLY
21 SCREW
22 RETAINING LUG
23 BEARING
24 BEARING
25 WASHER
26 ARMATURE ASSEMBLY
27 COMMUTATOR
28 FIELD ASSEMBLY
29 CAPACITOR
30 SCREW
31 TERMINAL
32 SET SCREW
33 BRUSH HOLDER ASSEMBLY
34 BRUSH HOLDER
35 SCREW
36 COMMUTATOR HOUSING

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Figure 3-62. Motor and Brake Assembly - Exploded View

7. Remove retaining ring (15). Withdraw shims (16). Using brake disk puller (AT2156), remove brake disk (17). Remove key (18). Do not remove drive screw (19) from housing assembly (20) unless replacement is necessary.

8. Remove housing assembly (20) by removing screws (21) and retaining lug (22).

9. Remove armature assembly (26) with attached parts. Use bearing removal plate (AT770-2) and suitable arbor press (1 1-2) and remove ball bearing (23) from shaft of armature assembly (26). Use bearing removal plate (AT770-1) and arbor press and remove ball bearing (24) from shaft of armature assembly (26). Remove washer (25).

10. Gently loosen field assembly (28) from engagement with housing (36) and unsolder field leadwires from capacitors (29). Remove field assembly (28).

11. Detach capacitors (29) and terminal (31) from housing (36) by removing screws (30).

12. Do not disassemble parts (32 through 33) unless replacement is necessary.

13. Use special wrench (AT226-1) to remove retaining screw (35) from housing (36) if necessary. Drill out stake marks, if necessary to avoid damaging internal threads of housing (37).

3-367. CLEANING. To clean all the components of the actuator, proceed as follows:

Tools and Equipment List

Cleaner, Ultrasonic	UCW-200, (or equivalent)

Materials List

Solvent, Trichloroethane	MIL-T-81533
Lubricating,Oil, Aircraft Instrument, Low Volatility	MIL-L-6085A-2

CAUTION

Chlorinated solvents such as trichloroethane, MIL-T-81533; and trichlorotrifluoroethane (freon 113), MIL-C-81320, may be hydrolyzed in contact with free water and form highly corrosive acids. Free water is often found in hydraulic systems, therefore the use of chlorinated solvents should be restricted to external surfaces of hydraulic systems. Chlorinated solvents may be applied to internal surfaces of disassembled hydraulic components for cleaning purposes provided none of the liquid solvent is allowed to remain in the component after cleaning.

CAUTION

In the following step, do not use cleaning solvent of any kind to clean any electrical parts.

1. Clean all electrical parts and nonmetallic parts using a stiff, nonwire brush. Blow the loose foreign particles from the part, using dry, filtered, low-pressure compressed air. Wipe the parts with a clean, lint-free cloth.

WARNING

If trichloroethane is used with a vapor degreaser, the cleaning should be performed only with adequate ventilation. Avoid prolonged breathing of vapor, avoid spilling, and avoid contact with skin.

2. Clean all other parts using an ultrasonic cleaner (UCW-200, or equivalent) or vapor liquid degreaser. If ultrasonic cleaner is used, use cleaning solvent approved by manufacturer. If vapor liquid degreaser is used, use trichloroethane (MIL-T-81533). Dry parts with dry, filtered, low-pressure compressed air. Wipe dry with a clean, lint-free cloth. Apply a thin coat of aircraft instrument oil

(MIL-L-6085A-2) to all steel parts. Thoroughly wipe off all excess oil with a clean, lint-free cloth.

3-368. INSPECTION. To inspect the components of the actuator, proceed as follows:

Tools and Equipment List

Bridge, Impedance	Model No. 1650-A, FSCM 24655 (or equivalent)
Bridge, Megohm	Model 544B, FSCM 24655 (or equivalent)
Bridge, Wheatstone	Model RN-1, FSCM 88939 (or equivalent)
Hypot	Model 404, FSCM 04237 (or equivalent)
Multimeter	AN/PSM-4C (or equivalent)
Tester, Dielectric	Model 411, FSCM 04237 (or equivalent)
Tester, Spring	Model LCT10, FSCM 91692 (or equivalent)

3-369. ACTUATOR ASSEMBLY. See figure 3-61 and proceed as follows:

1. Examine all parts for damage or corrosion.

2. Inspect all gear teeth for tooth deformation, stress cracks, and scored teeth.

3. Inspect all tapped holes and threaded parts for stripped or crossed threads.

4. Inspect all leadwires for cracked insulation. Using a multimeter (AN/PSM-4C), test all leadwires for continuity.

5. Using an impedance bridge (Model 1650-A), check the capacitance of filter (29). Capacitance when measured between terminal M1 and case (ground) and terminal M2 and case (figure 3-37) must be 0.44 ($\pm$ 0.04) microfarads. Dissipation factor must be 0.01 maximum (information only; measure at 1 KHz).

WARNING

After dielectric test, discharge filter assembly (29) to avoid shock.

6. Using a dielectric tester (Model 411), check the dielectric requirements of filter (29). Apply 200 volts dc for 1 second between terminal M1 and case (ground) and terminal M2 and case. Any evidence of insulation breakdown is cause for rejection.

7. Inspect switches (64) for damaged cases and malfunction. Check electrical operation with multimeter (AN/PSM-4C, or equivalent).

8. Using a suitable vernier, measure the inside diameter of guide fitting (81). Maximum allowable dimension must not exceed 0.843 inch.

3-370. MOTOR AND BRAKE ASSEMBLY. See figure 3-62 and proceed as follows:

1. Visually examine all parts for damage and corrosion.

2. Inspect all tapped holes and threaded parts for stripped or crossed threads.

3. Inspect burshes (6) for excessive wear. Wear mark must be clearly visible.

4. Using a hypot (Model 404), check the ac dielectric requirements of brake core and coil assembly (10). Apply 480 volts rms at 60 Hg for 1 second between coil leadwires (together), and the core and coil case (ground). Any evidence of insulation breakdown is cause for rejection.

5. Use a suitable spring tester (Model LCT10. FSCM 91692, or equivalent), and measure the force required to compress spring (11) to a 0.229 to 0.239-inch working length. The force required to compress spring to working length must be between 3.04 and 3.36 pounds.

6. Inspect the contact surface condition of the commutator (27) for pit marks, burns, or oil that

cleaning does not remove. Measure diameter of commutator. Minimum permissible diameter is 0.485 inch and the undercut of the mica must be 0.010 to 0.020-inch deep by 0.013 to 0.023-inch wide.

CAUTION

Keep the hypot test probes outside the brush path to avoid damaging contact surfaces of the commutator (27).

7. Using a hypot (Model 404), check the a-c dielectric requirements of armature assembly (26). Apply 400 volts rms, at 60 Hz, for 1 minute between the armature shaft and each commutator bar. Any evidence of insulation breakdown is cause for rejection.

8. Using a hypot (Model 404), check a-c dielectric requirements of field assembly (28). Apply 400 volts rms, at 60 Hz, for 1 minute between each leadwire and the field housing (28) ground. Any evidence of insulation breakdown is cause for rejection.

9. Using a Wheatstone bridge (Model RN-1), measure individual coil resistance of the field assembly (28). Resistance, when measured between gray and red leadwires and between gray and black leadwires, must be 0.70 (±0.07) ohms.

WARNING

After the insulation resistance test is completed, discharge capacitors (29) to avoid shock.

10. Using a megohm bridge (Model 544B), measure the insulation resistance of capacitors (29). Apply 400 volts dc between capacitor terminals and case (ground). The insulation resistance when measured must be 10,000 megohms minimum.

11. Using an impedance bridge (Model 1650-A), check the capacitance of capacitors (29). Capacitance, when measured between terminal and case (ground), must be 1000 (±100) microfarads.

12. Inspect disk assembly (13) for warped or scored surfaces. Faces must be flat and parallel within 0.002 inch. Using a suitable micrometer, measure the thickness of disk assembly (13). The minimum permissible thickness is 0.070 inch.

3-171. REPAIR. To repair actuator assembly components proceed as follows:

3-372. ACTUATOR ASSEMBLY. See figure 3-61 and proceed as follows:

1. Replace all parts that do not meet the inspection criteria of paragraph 3-368.

2. Replace all bearings and bearing balls at each overhaul.

3-373. MOTOR AND BRAKE ASSEMBLY. See figure 3-62 and proceed as follows:

1. Replace all parts that do not meet the inspection criteria of paragraph 3-368.

2. Replace ball bearings (23 and 24) at each overhaul.

3. If inspection of contact surface of the commutator (27) indicates pit marks, burns, or oil that cleaning does not remove, the contact surface of commutator (27) may be refaced. The minimum commutator diameter is 0.0485 inch.

3-374. ASSEMBLY. To assemble the actuator, proceed as follows:

Tools and Equipment List

Adapter, Pressing	AT3479, FSCM 81039
Bushing, Split	AT2037-6, FSCM 81039
Fixture, Brush Alignment	AT431 FSCM 81039
Fixture, End Play Checking	AT2037 FSCM 81039
Fixture, Pressing	AT3346 FSCM 81039
Fixture, Pressing	AT3347 FSCM 81039
Panel, Control	Model NT131, FSCM 12511
Press, Arbor, Hydraulic	1 1-2 (15746) (or equivalent)

Tools and Test Equipment List (Cont)

Thermogun	Model 500, FSCM 08795 (or equivalent)
Wrench, Special	**AT226-1** FSCM 81039
Wrench, Special	AT1795 FSCM 81039
Wrench, Torque	**F200-1, FSCM 58322** (0-200 inch-pound capacity or equivalent)

Materials List

Adhesive	Glyptal ZV903, FSCM 24451
Adhesive	Glyptal 1276, FSCM 24451
Adhesive	EC-870, FSCM 04963
Adhesive	Silastic 140, FSCM 71984
Compound, Potting	MIL-S-8516, FSCM 05027
Compound, Sealing, Locking, and Retaining	MIL-S-22473, Loctite, Grade C, FSCM 05972
Compound, Sealing, Locking, and Retaining	MIL-S-22473, XL-8 (clear), G. S. Plastics Co., Cleveland, Ohio
Compound, Thread, Antiseize	**MIL-T-5544**
Grease, Aircraft and Instrument	MIL-G-23827,
Lockwire (0.032-inch diameter steel)	MS20995F32
Lubricant	Aero-Lubriplate, FSCM 73219
Molybdenum Disulfide, Technical	MIL-M-7866,
Pin, Cotter (1/16-inch diameter steel)	MS24665-153
Sleeving, Insulation	Nos. 8, 12, and 16, Vinylflex 4000, FSCM 81851, (or equivalent)
Solder	QQ-S-571, Type SN40 and SN60, FSCM 75297
Tape, Pressure-sensitive, Adhesive, Electrical	MIL-T-23594
Tubing, Heat-shrinkable	Type RNF-100, 3/16- and 3/32-inch Diameter, Black, FSCM 08795
Wire, Electrical, Insulated, High-temperature	MIL-W-16878, Type IV, E22, Extruded Teflon, White

Note

Test procedures in paragraph 3-37 must be performed concurrently with applicable assembly procedure.

Coat all gears and working parts with grease conforming to MIL-G-23827, unless otherwise specified.

Apply antiseize compound conforming to MIL-T-5544 to all aluminum screw parts and to all steel screws that anchor into aluminum, unless otherwise specified.

Make all solder connections per MIL-S-6872, using solder conforming to QQ-S-571.

Lockwire all drilled-head screws and fittings with wire conforming to MS20995, using practices conforming to MS33540.

During assembly, install same thickness shims as removed and recorded during disassembly.

3-375. MOTOR AND BRAKE ASSEMBLY. See figure 3-62 and proceed as follows:

1. If parts 32 through 34 were removed during disassembly, install brush holders (33 and 34) into applicable bores of housing (36). Position housing (36) onto brush alignment fixture (AT431). Using tee-handle alignment bar of fixture, align brush holders (33 and 34). Coat threads of setscrews (32) lightly with adhesive (Glyptal ZV903). Ensure brush holders (33 and 34) are fully seated in bores of housing (36). Secure brush-holder alignment by installing setscrews (32).

2. Solder 7 inches of 22 gage electrical wire (MIL-W-16878, type IV) to terminal (31).

3. Lightly coat threads of screws (30) with adhesive (Glyptal, ZV903). Install capacitors (29) and terminal (31) with attached leadwire. Secure capacitors (29) to housing (36) with screws (30).

Note

Capacitor (29), furthermost from leadwire exit hole in housing (36), must have its leadwire looped and positioned so that it will be retained by screw (32) (when installed) and prevented from interfering with armature assembly (27).

Leadwires from field assembly must be routed in such a manner to prevent interference with the armature assembly.

4. Assemble field assembly (28) to commutator end housing (36) after routing field assembly leadwires through exit hole in housing (36). See figure 3-37 and connect leadwires. Orient field assembly (28) so that brush holders in housing (36) are centered in openings between windings of field assembly (28).

5. If retaining screw (35) was removed during disassembly, install retaining screw (35) into commutator end housing (36). Use special wrench (AT226-1) to sufficiently engage threads of commutator end housing (36).

6. Using a pressing fixture (AT3346), install washer (26) and press ball bearing (24) onto shaft of armature assembly (26). Using a pressure fixture (AT3347), press ball bearing (23) onto opposite end of armature (26) shaft. Using an arbor press (NSN 3444-00-254-2121 or equivalent), press key (18) into keyway of armature assembly (26). Seat fully.

7. Install armature assembly (26), with attached parts into field assembly (28) and commutator end housing (36). Ensure ball bearing (24) is seated in bore of housing.

8. If drive screw (19) was removed from housing assembly (20) during disassembly, press it into applicable hole in housing assembly. Distance from face of housing to top of drive screw shall be 0.10 inch. Insert leadwires of field assembly (28) through leadwire exit hole in housing assembly and engage housing assembly with field assembly. Secure housing assembly (20) to housing (36) with screws (21) and retaining lug (22). Lockwire each screw (21) to drive screw (19) with lockwire (MS20995F32).

9. Use end play checking fixture (AT2037) and split bushing (AT2037-6) to measure end play of armature assembly (26). Drill out existing stake marks prior to adjustment. Use special wrench (AT226-1) to adjust retaining screw to obtain required end play. End play, when measured with a 10-pound reversing axial load applied, must be 0.001 to 0.003 inch. After required end play is obtained, lightly stake retaining screw in commutator end housing to retain setting.

10. Install brake disk (17) and shims (16) onto shaft of armature shaft (26). Install retaining ring (15). Add or remove shims (16) as required, to eliminate all end play of brake disk (17).

11. Install spacer (14), disk assembly (13), spring (11) and core and coil assembly (10). Route blue, brown, and gray leadwires of field assembly (27) through leadwire slot in core and coil assembly (10).

12. Temporarily connect leadwires and insulate with electrical tape (MIL-T-23594) as follows:

a. Orange with brown.
b. Blue with blue.
c. Gray with white.

13. Using special wrench (AT1795), install and tighten retaining screw (9) against core and coil assembly (10). Using electrical control panel (NT131), energize motor and brake assembly (10) with 17 volts dc. Using special wrench (AT1795), adjust retaining screw (9) to allow brake to release and motor to operate.

14. Deenergize motor and brake assembly and manually compress core and coil assembly (10) against resistive force of spring (11), measuring the gap between core and coil assembly (10) and retaining screw (9) using a suitable feeler gage. Gap less 0.003 to 0.010 inch is the amount of shims (12) required between core and coil assembly (10) and spacer (14) to obtain 0.003 to 0.010-inch brake air gap.

15. Install calculated shims (12). Reconnect and solder all leadwires. Using special wrench (AT1795), reinstall and tighten retaining screw (9). Stake retaining screw (9) to secure.

16. Install heat-shrinkable tubing (type RNF-100, or equivalent) over spliced leadwires. Shrink tubing using thermogun (Model 500).

17. Coat threads of screws (8) with adhesive (Glyptal ZV903). Install cover (7) using screws (8).

18. Coat threads of screws (3) lightly with adhesive (Glyptal ZV903). Install brushes (6) into brush holders (32 and 33) and secure in place with retaining screws (5). Install insulator disks (4) and covers (2). Secure covers to commutator end housing (35) with screws (3).

Note

Ensure that all data from old decal (1) has been transferred to new decal prior to installation.

19. If decal (1) had been removed from housing of field assembly (27), install new decal.

3-376. ACTUATOR ASSEMBLY. See figure 3-62 and proceed as follows:

1. Coat jackscrew (89) with Molykote Powder Type Z and Aero-Lubriplate mixed half and half by volume, and thread on nut (88) approximately half way.

2. Using a suitable arbor press (1 1-2, or equivalent), install key (86) in key slot of jackscrew assembly (87).

3. Install shims (83) on nut (88) and thread nut tube (85) onto nut (88). Add or remove shims (83) as necessary to align slots of jackscrew with nut tube and install key (84).

4. Stake nut tube (85) lightly to retain key (84) and fill cavity between jackscrew assembly and nut tube with Molykote Powder Type Z and Aero-Lubriplate mixed half and half by volume.

5. Install stop washer (82) on shaft of screw and nut assembly (88).

6. Slide guide housing (81) over nut tube (85), engaging tang of nut (88) in slot of guide housing (81).

7. Install guide fitting (5) in nut tube (85) and hand-tighten.

8. Insert disk (40) into applicable bore of intermediate housing (49). Install bearing (39) in same housing bore, using an arbor press (1 1-2, or equivalent) and pressing adapter (AT3479). Dimension from bottom of intermediate housing (49) to bearing face (39) must be 0.04 to 0.06 inch.

Note

In the following step, press bearing from stamped end only.

9. Install intermediate housing (49) with attached parts onto guide housing (81).

10. Install bearing bushing (20) onto shaft of screw and nut assembly (87) shouldered end first.

Note

Adjust spanner nut (42) to permit clutch assembly (41) to slip at 240 (± 10) inch-pounds. Bend tab of key washer into slot of spanner nut (87). Clutch assembly may require additional adjustment during testing.

11. Install clutch assembly (41) onto shaft of screw and nut assembly (87) engaging key (86).

12. Install bearings (35) on both shafts of spur and pinion gear (32) and install spur and pinion gear into applicable bore of intermediate housing (49).

13. Install bearing (36) on pinion end of spur and pinion gear (33). Install bearing (35) on opposite end and install spur and pinion gear, gear end first, into applicable bore of intermediate housing (49).

14. Install shaft of spur and pinion gear (34) into bearing (39) previously installed in intermediate housing (49).

Note

Press bearing from stamped side only.

15. Insert disk (38) into applicable bore of front housing (31). Using an arbor press (1 1-2, or equivalent) and pressing adapter (AT3479) install bearing (37) into front housing (31).

16. Install front housing (31) with attached bearing and disk onto spur and pinion gear (34, 33, and 32), seating bearings (36 and 35) fully.

17. Using an arbor press (1 1-2, or equivalent), install drain tube (24) into applicable bore of retaining plate (25). Install retaining plate onto front housing (31) using screw (23).

18. Install filter assembly (29) onto retaining plate (24), using one screw (27) and nut (28) nearest top of plate. Install remaining screw (27), terminal (30), and nut (28).

19. Install duplex bearing (19) into bore of bearing mounting flange (22) and install shims (15).

20. Install bearing mounting flange (22) with bearing and shims inserted through hole of retaining plate (24) and into front housing (31). Seat fully and insert bolts (21) through holes in housing assembly (31) and secure into threaded holes in guide housing (81).

21. Install shims (18) and retaining nut (17) onto shaft of screw and nut assembly (87). Add or remove shims (18) as required to align hole in shaft of screw and nut assembly with slot of retaining nut (17). Using a torque wrench (GGG-W-686, Type I, No. 6, or equivalent) and torque adapter (AT3561), torque retaining nut (17) to 95 (± 5) inch-pounds.

22. Using an arbor press (1 1-2, or equivalent), press in and stake bearing (13) in fixed end fitting (14).

23. Thread fixed end fitting assembly (14) with attached bearing into bearing mounting flange (22). Add or remove shims (15) to obtain alignment of key slots.

24. Install key (12) into slots of bearing mounting flange (22) and fixed end fitting assembly (14) and secure, using screw (11). Fill voids around key using adhesive (Silastic 140).

25. Using an arbor press (1 1-2, or equivalent), press in and stake bearing (4) into jack end fitting (3).

Note

Do not tighten nut (2) until satisfactory completion of test procedures.

26. Install rod end lock (1) on retaining nut (2) and thread nut onto jack end fitting assembly (3).

27. Loosely install mounting brackets (74 and 78) on guide housing (81) with screws (75 and 79) and washers (76 and 80).

28. Coat threads of screws (65) with locking compound (Loctite, Grade C). Coat mating surfaces of switches (64) and mounting brackets (74 and 78) with adhesive (Glyptal 1276). Install switches (64) on mounting brackets, using screws (65) and, if required, washers (66) to prevent excessive protrusion of screws through mounting brackets (74 and 78).

29. Thread screws (67) into switch levers (68 and (70) approximately half way.

30. Install shims (72) onto posts of mounting brackets (74 and 78) as required to obtain clearance of 0.001 to 0.003 inch between switch lever and screw heads when screws (69 and 71) are installed.

31. Coat threads of screws (69 and 71) with locking compound (Loctite, Grade C). Install switch levers (68 and 70) onto posts of mounting brackets (74 and 78) and secure using screws (69 and 71).

32. Install one cotter pin (62) in one end of support pin (61) and bend up tabs. Trim as required.

Align hole of lever rod (63) with matching holes on nut (88) and insert support pin. Install remaining cotter pin (62) in support pin hole, bend up tabs, and trim as required.

33. Lift up lever rod (63) and insert spring (60) and retrun lever rod to its original position.

34. Install guide plate (58) on guide housing (81) and secure using screws (59).

35. See figure 3-39 and adjust each switch (64) as follows:

a. Position entire switch, bracket, and switch lever assembly on top of flat on rod lever (63).

b. Tighten screws (75 and 79).

c. Adjust screws (67) to obtain a 0.005 to 0.010-inch gap between flat on lever rod (63) and switch lever (68 and 70) when buttons of switches (64) are bottomed.

d. Make further adjustments by sliding the entire bracket assemblies (74 and 78). Press down switch lever (68 and 70) to check for clearance.

36. Coat screws (77) with locking compound (Loctite, Grade C). Install adjustment disks (73) onto mounting brackets (74 and 78) using screws (77). Adjust disks to allow screws (67) to touch switch buttons in the free position.

Note

In the following step, screw (48) must be on the side nearest top of filter assembly (29).

37. Install a 1 1/2-inch length of insulation sleeving (No. 8, Vinylflex 4000), over motor leadwires and route leadwires through applicable hole in intermediate housing (49). Install motor and brake assembly (55) onto intermediate housing (49) and secure, using screws (47 and 48).

38. Slide clamp (54) over end of motor and brake assembly (55) and insert mounting spacer (52).

39. Insert shims (53), as necessary, under mounting spacer (52) to fill void between spacer and clamp mounting block on guide housing (81) and attach clamp (54) with screw (51) and nut (50).

40. Install a 3/16-inch ID by 1/2-inch long piece of black heat-shrinkable tubing (type RNF-100), over exposed threads of screw (48) nearest top of filter assembly (29) and shrink on with thermogun (Model 500).

41. Cut one 18-inch piece of white, black, and red electrical wire (MIL-W-16878, type IV). Solder wires to applicable pins of electrical connector (8). See figure 3-37 for wiring diagram.

42. Upon satisfactory completion of test procedures in paragraph 3-377, form a potting mold around electrical connector (8) and leadwires, using pressure-sensitive tape (MIL-T-23594). Using potting compound (MIL-S-8516), pot leadwires. After potting has cured, fold leadwires of electrical connector down 90 degrees from polarizing key.

43. Connect applicable leadwires from electrical connector (8) to applicable pins of switches (64). See figure 3-37 for wiring diagram.

44. Install a 5 1/2-inch length of insulation sleeving (No. 8, Vinylflex 4000, FSCM 81851, or equivalent) over leadwires from switches (64) and route under motor and brake assembly (55) to filter assembly (29).

45. Install strap (56) around leadwires from switches (64) and motor and brake assembly (55).

46. Install suitable lengths of insulation sleeving (No. 16 Vinylflex 4000) over each leadwire terminating at filter assembly (29) except white leadwires which shall have a suitable length of No. 12 Vinylflex 4000.

47. Make all electrical connections to filter assembly (29) and pot, using potting compound (MIL-S-8516). See figure 3-37 for wiring diagram.

48. Install strap (57) securing motor and switch leadwires to screw (48).

Note

In the following step, ensure that leadwires are dressed away from spur gears (33 and 34).

49. Using potting compound (MIL-S-8516), pot all leadwires attached to switches (64).

50. Upon satisfactory completion of test procedures in paragraph 3-377, secure all drilled-head screws and fittings with lockwire (MS20995F32).

51. If insulation was removed during disassembly, install new insulation in cover (45) using adhesive (Silastic 140).

52. If trademark or identification plates (43 and 44) were removed during assembly, install new plates.

53. Secure gasket (26) to edge of cover (45), using adhesive (EC-870). Position electrical connector (8) through hole in cover (45). Secure with nut supplied.

54. Position cover (45) onto guide housing (81) of actuator assembly and install O-ring seal (7) and retaining nut (6). Tighten retaining nut (6) and safety to electrical connector (8) with lockwire (MS20995F32).

3-377. ADJUSTMENT AND TESTING. To adjust and test the actuator and motor brake assembly, proceed as follows:

Tools and Equipment List

Adapter, Coast	AT1061-2 FSCM 81039
Attachment, Variable Load	AT2904, FSCM 81039
Bushing, Split	AT2037-6, FSCM 81039
Bushing, Split	AT2500-13, FSCM 81039
Bushing, Split	AT2500-14, FSCM 81039
Cam, Load Test (used with R5219-1)	AT2904-14, FSCM 81039
Cam, Load Test (used with R5219M1)	AT2904-16, FSCM 81039
Fixture, End Plug Checking	AT2037 FSCM 81039

Tools and Test Equipment List (Cont)

Fixture, Motor Holding, Test	AT916 FSCM 81039
Fixture, Load Limit Test, Hydraulic	AT2400, FSCM 81039
Hypot	Model 404, FSCM 04237 (or equivalent)
Panel, Test, DC	Model NT 131, FSCM 12511
Pins	AT2500-4, FSCM 81039
Pin, End Play, Checking	AT3556 FSCM 81039
Pulley, Motor Load, Test	AT1901-2 FSCM 81039
Scale, Spring	Model 9EG, FSCM 91692 (or equivalent)
Tachometer, Electronic	Model 4600 FSCM 03692 (or equivalent)
Timer, Electric, Millisecond	Model MST-500, FSCM 56631 (or equivalent)
Wrench, Torque	Model F32-I-O, FSCM 58332 (or equivalent)

Materials List

Primer, Zinc-chromate	MIL-P-8585 or TT-P-1757
Compound, Sealing	MIL-S-22473
Varnish, Moisture and Fungus Resistant	MIL-V-173B
Lockwire (0.032-inch diameter steel)	MS20995F32
Solvent, Dry-cleaning	P-D-680, Type II

3-378. ACTUATOR ASSEMBLY.

Note

Use a d-c test panel (Model NT131, FSCM 12511 or equivalent) to provide necessary control of electric power to operate actuator assembly during functional and operational testing.

Use an electric timer (Model MST-500, FSCM 56631, or equivalent) for all timing requirements during functional and operational testing.

Note

Use 26 volts dc for all tests unless otherwise specified.

1. Install variable load attachment (AT2904) on linear load test fixture (AT2400 or equivalent).

2. Mount the actuator on the linear load test fixture (AT2400) with pins (AT2500-4), split bushings (AT2500-14), and load test cam (AT2904-14, Model R5219-1) or (AT2904-16, Model R5219M1).

3. Using an end play checking pin (AT3556) and split bushing (AT2500-13) check end play of actuator assembly with a 100-pound reversing load applied. End play must not exceed 0.010 inch with play between end fitting and bearing eliminated.

4. Adjust mechanical stops to conform to dimensions shown in figure 3-40 as follows (at bench):

Note

Remove pins (AT3556) and bushings (AT2500-13). Install pins (AT2500-4) and bushings (AT2500-14).

a. To adjust retract and extend mechanical stops inside actuator, loosen retaining nut (2, **(figure 3-38) and turn jack-end fitting assembly (3, figure 3-38) clockwise or counterclockwise to** provide required dimension; tighten and secure retaining nut with lockwire (MS20995F32). This must be accomplished with no load.

b. Operate actuator into each mechanical stop twice at no load speed. The clutch (39, figure **3-61) must slip when stops are impacted. Allow** clutch to slip for 0.60 to 0.75 second at each impact. Damage or jamming must not occur at either stop. Check stop locations.

5. Check that clutch will carry 2500-pound opposing load with actuator in extend and retract for 1/2 inch at each end of stroke on load test fixture (AT2400 or equivalent).

6. Set variable load attachment (AT2904) at no load (at bench). Check for correct direction of operation. Check reset of each switch (61, figure **3-61) at no load speed. Reset must not exceed** 0.080 inch. Check that unit will instantaneously reverse without malfunction.

Note

At midstroke, press the compression button, letting the actuator complete its extend stroke. Turn off the test stand motor and actuator. Wait 3 minutes, at the finish of each full stroke, to allow actuator motor to cool.

7. Operate actuator to full retract. Apply a 3020-pound static tension load. Decrease load to 2170 pounds tension (Model R5219-1), or 1500 pounds tension (Model R5219M1). From this load point, operate through extended stroke with varying load in accordance with load curve (figure 3-63). **The brake in the motor and brake assembly** must not fall out (become engaged). Repeat twice and verify the following time and current.

MODEL	TIME FOR EXTENDED STROKE	MAX CURRENT
R5219-1	15 to 25 seconds	8 amperes
R5219M1	10 to 19 seconds	8 amperes

Note

At midstroke, press the tension button, letting the actuator complete its retract stroke. Turn off test stand motor and actuator and wait 3 minutes, at the finish of each full stroke, to allow actuator motor to cool.

8. Operates actuator to full extend. Apply a 3020-pound static compression load. Decrease load to 2170 pounds compression (Model R5219-1) or 1000 pounds compression (Model R5219M1). From this load point, operate through the retract stroke with a varying load in accordance with load **curve (figure 3-63). The brake in the motor and** brake assembly must not fall out (become

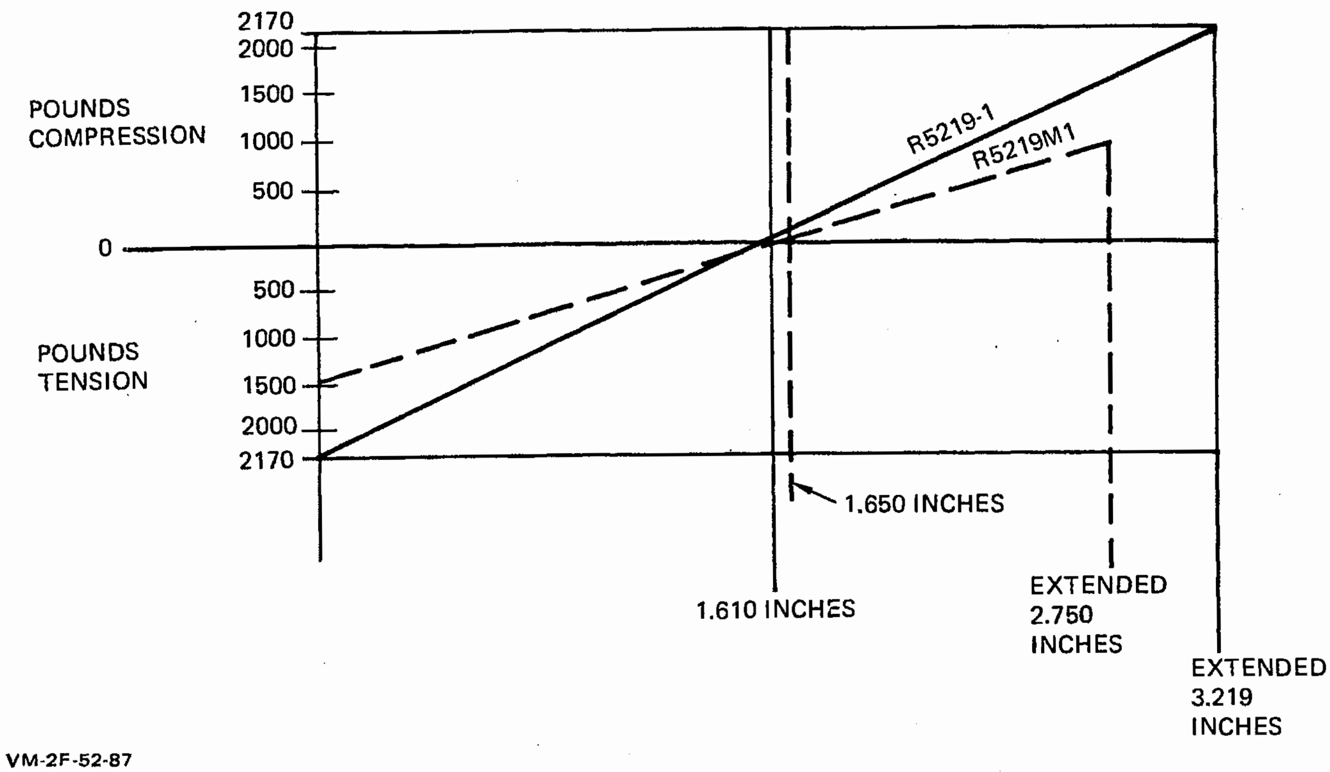


Figure 3-63. Longitudinal Actuator Stroke vs Load Curve

engaged). Repeat twice and verify the time and current from step 7. Adjust the cam-operated pressure regulator valve to zero load at mid-point of stroke by moving in or out as required.

9. Repeat steps 7 and 8 at 18 volts dc instead of 26 volts dc. Cycle actuator once in each step, there is no speed requirement.

10. Actuator coast must not exceed the following limits:

a. Model R5219-1–Actuator coasting after limit switch cutoff must not exceed 0.015 inch at no-load speed and with 2170-pound load assisting motion of actuator with 29 volts applied. Test at finish of extend stroke and retract stroke.

b. Model R5219M1–Actuator coasting after limit switch cutoff must not exceed 0.015 inch at no-load speed with 1000-pound load assisting extend motion of actuator with 29 volts applied. Follow same procedure for retract stroke with 1500-pound load assisting motion.

11. Check the actuator duty cycle as follows:

a. Full stroke duty cycle at normal load and 26 volts shall be: one extended stroke, followed by 3 minutes off. Repeat in retract direction.

b. Pulse duty cycle shall be: 1 second extended followed by 7 seconds off, 0.75 second retracted followed by 7.25 seconds off. Reverse sequence at end of stroke.

12. Safety all applicable nuts and screws with lockwire (MS20995F32). Seal and paint actuator as follows:

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

a. Using a clean, dry, lint-free cloth, clean all surfaces of actuator assembly with dry-cleaning solvent (P-D-680, Type II).

b. Coat all seams and external screw heads and nuts with a thin layer of sealing compound (MIL-S-22473), using a suitable brush. If more than one coat is required, allow 1 hour drying time between coats.

c. Finish with two coats of zinc-chromate primer (MIL-P-8585 or TT-P-1757).

d. Apply one coat of waterproof varnish (MIL-V-173B) to all nameplates, instruction plates, and decals.

3-379. MOTOR AND BRAKE ASSEMBLY.

Note

Use 26 volts for all operational tests unless otherwise specified.

Perform all tests with the motor and brake assembly cool (room temperature).

1. Install motor and brake assembly in a motor-holding test fixture (AT916).

2. Connect dc test panel (Model NT131) to actuator.

3. Using an end play checking fixture (AT2037) and split bushing (AT2037-6), measure the end play of the motor output shaft with a 10-pound reversing axial load applied. End play must be 0.001 to 0.003 inch.

4. Check rotation. Energize Red (+) and white (-) leadwires (figure 3-37) of the motor and brake assembly. Check the pinion rotation of the motor output shaft. Rotation must be clockwise when viewed facing motor pinion.

5. Check brush seating. If brush assemblies (6, figure 3-62) have been replaced, the brushes shall be seated by operating the motor and brake assembly for approximately 2 hours, at no-load speed, with 26 volts dc applied. Direction of rotation must be reversed occasionally and care shall be taken to prevent overheating by operating 1 minute on and 4 minutes off. Run-in time may be adjusted as required until 80 percent minimum brush seating is obtained.

6. Check brake. Energize either positive leadwire and the negative (ground) with 17 volts dc. The magnetic brake must release.

7. Check brake holding torque. Using a motor load test pulley (AT1901-2) and torque wrench (Model F32-I-O, or equivalent), the output shaft must resist a torque of 12 ounce-inches minimum when the brake flange is engaged.

8. Check no-load speed. Using an electronic tachometer (Model 4600) a dc test panel (Model NT 131), and coast adapter (AT1061-2), measure the no-load speed of the motor output shaft. Speed must not exceed 30,000 rpm, in both directions of operations. Speed in either direction of rotation must be within 5 percent. Motor must not draw more than 1.6 amperes.

9. Using a dc test panel (Model NT 131) and a coast adapter (AT1061-2), measure the coast of the motor output shaft. Coast must not exceed 30 revolutions in either direction of operation when measured from the no-load speed to rest, after the circuit is opened.

10. Check stall torque. Using a motor load test pulley (AT1901-2) and a spring scale (Model 9EG, or equivalent), measure the torque required to stall the motor output shaft. Stall torque must be 18 ounce-inches minimum for each direction of rotation and current draw must not exceed 14 amperes.

11. Remove negative brush assembly (6) from brush holder (33), using hypot (Model 404, or equivalent). See figure 3-62. Dielectrically test the motor and brake assembly by applying 480 volts at 60 Hz for 1 second across each positive leadwire and the motor frame (ground). Any evidence of insulation breakdown is cause for rejection.

3-380. PRESERVATION. To preserve the trim actuator, proceed as follows:

Materials List

Barrier Material, Waterproofed, Flexible	MIL-B-121, Grade A

1. Ensure that actuator is thoroughly clean.

2. Wrap actuator in moistureproof paper (MIL-B-121, Grade A).

3. Pack in suitable cardboard container and store in a cool, dry place.

3-381. LONGITUDINAL VISCOUS DAMPER (305-522280-11).

3-382. The longitudinal control system viscous damper is used to dampen control oscillation feedback to the control stick. To perform depot maintenance on the unit, proceed as follows:

3-383. CHECKOUT. To check out the assembled damper, see figure 3-64 and proceed as follows:

1. Inspect for leakage, cracks, loose or broken lockwire.

2. Check shaft (20) for side play and binding.

3. If defects in steps 1 and 2 are not apparent, refer to paragraph 3-388 and test unit for torque values.

4. If defects in steps 1 and 2 are apparent or if torque values do not meet test requirements, refer to paragraph 3-384 and proceed with disassembly.

3-384. DISASSEMBLY. To disassemble the damper, see figure 3-64 and disassemble in order of key index numbers, observing the following:

1. Helicoil (9) and insert (18) are not to be removed unless damaged.

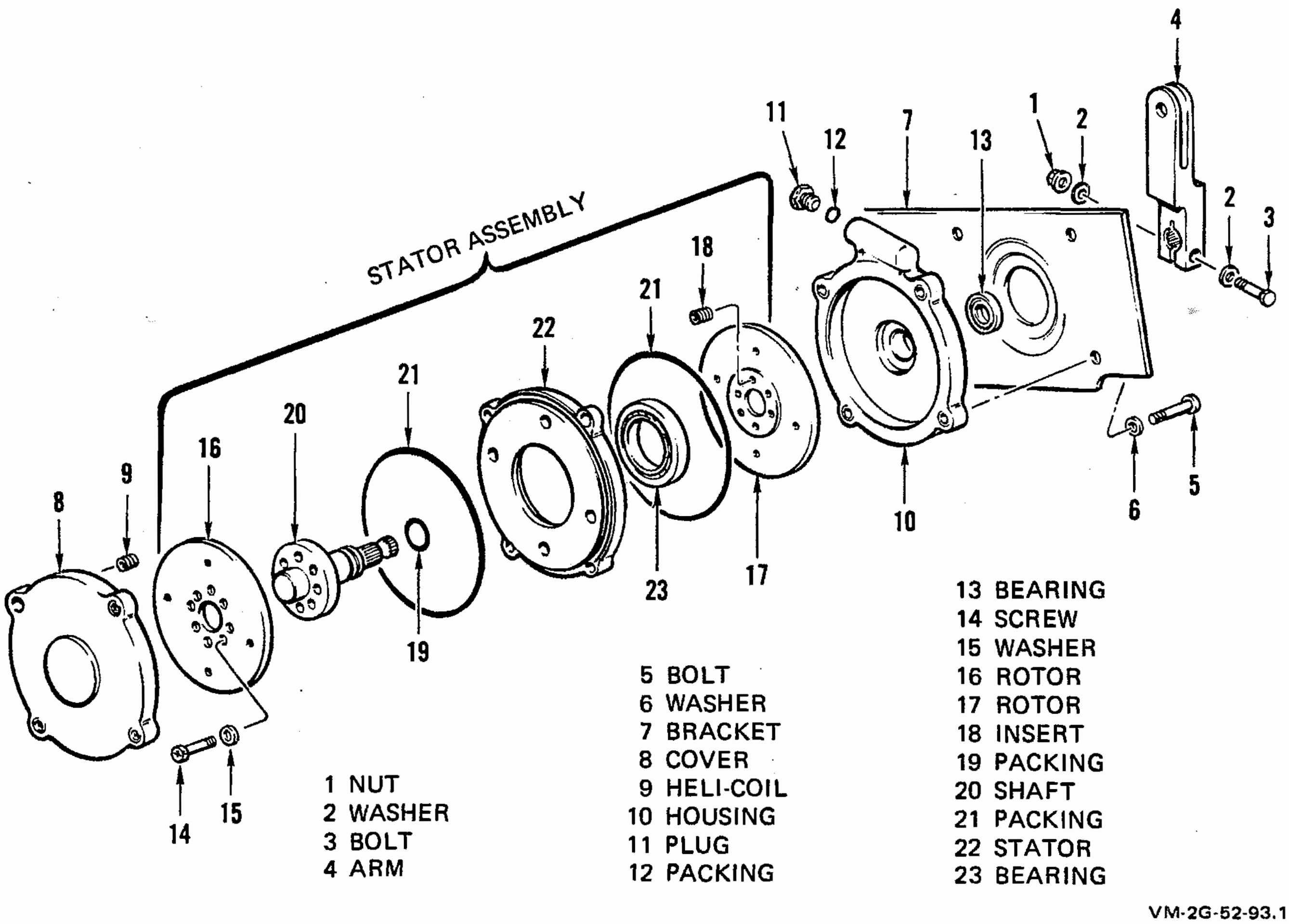


Figure 3-64. Longitudinal Control System Viscous Damper - Exploded View

2. Bearings (13 and 23) are not to be removed unless damaged.

3-385. CLEANING. To clean the damper, proceed as follows:

Materials List

Solvent, Dry-cleaning	P-D-680, Type II

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

1. Clean all parts in dry-cleaning solvent (P-D-680, Type II). Dry with clean, lint-free cloth or dry compressed air. Ensure that all parts are clean and all passages are free of obstruction.

3-386. INSPECTION. After cleaning, inspect all parts of damper for obvious damage and defects. Check the following as specifically indicated (figure 3-64):

Note

If a component of the damper does not meet the requirements given in the following steps, it must be replaced.

1. Check all parts for corrosion or rust. Check all machined surfaces for nicks, scratches, and cracks.

2. Check shaft (20) for smoothness, cracks, gouging, and wear. Check that packing groove is not damaged. Check splines for nicks and burrs.

3. Ensure that packings (12, 19, and 21) have been replaced.

4. Check bearings (13 and 23) for pits, scoring, and excessive wear.

3-387. ASSEMBLY. To assemble the damper, see figure 3-64 and proceed as follows:

Tools and Equipment List

Wrench, Torque (0-200 inch-pounds)	GGG-W-686, Type I, No. 6 (or equivalent)

Materials List

Fluid, Silicone 70,000 centistokes	510 Fluid (71984)
Lockwire (0.032-inch diameter steel)	MS20995F32
Lockwire (0.041-inch diameter steel)	MS20995F41
Packing	MS9021-043
Packing	MS28775-010
Packing	MS28775-012

Note

Assembly is to be filled with silicone fluid (510, 70,000 centistokes). Ensure that fluid does not contain air bubbles or contaminants.

1. Pack bearings (13 and 23) with silicone fluid (510). If new, press bearings (13 and 23) into position and stake as required.

2. Apply heavy coat (approximately 1/4 inch) of silicone fluid (510) to both surfaces of stator (22).

3. Insert shaft (20) into stator (22). Ensure that shaft (21) flange is flush with stator bearing (23). Place rotor (16) on flange end of shaft (20). Install rotor (17) on splined end of shaft (20). The raised bosses of the rotors (16 and 17) must face each other.

CAUTION

In the following step, exercise extreme care to ensure that lockwire does not protrude above heads of screws (14).

4. Align holes in rotor (16), shaft (20) flange, and rotor (17). Secure with screws (14) and washers (15). Insert screws (14) from rotor (16) end. Using a torque wrench (GGG-W-686, Type I, No. 6), torque screws (14) 9 inch-pounds, using the alternating method. Safety screws with lockwire (MS20995F32).

Note

See figure 3-64. Components numbered (14) through (23), when assembled, make up the stator assembly referred to in the following steps.

5. Install packings [19 (MS28775-012) and 21 (MS9021-043)] on stator assembly.

6. Apply a heavy coat (approximately 1/4 inch) of silicone fluid (510) to stator assembly shaft (20), hub and inside of housing (10).

7. Fill cavity in cover (8) half full of silicone fluid (510). Align mounting holes and insert stator assembly into cover (8). Allow air to slowly bleed out and seat stator assembly in cover (8).

8. With bleed port open (plug 11 and packing 12 removed), install housing (10) over stator assembly.

Note

In the following step, fluid will squeeze from seams and drain from bleed port. Clean excess fluid from bleed port and exterior of damper with clean, lint-free cloth.

9. Place bracket (7) over splined end of stator assembly shaft (20). Align holes in cover (8), stator (22), housing (10), and bracket (7). Install bolts (5) and washers (6). Using a torque wrench (GGG-W-686, type I, No. 6), torque bolts (5) 12 inch-pounds using the alternating method. Safety bolts with lockwire (MS20995F41).

10. Install packing [12 (MS28775-010)] on plug (11) and screw plug (11) into housing (10). Safety plug (11) to housing (10) with lockwire (MS20995F41).

Note

In the following step, install arm (4) on shaft (20) so that "dog leg" of arm is toward bracket (7).

11. Position and install arm (4) so that bolt hole in arm (4) is aligned with groove in shaft (20). Install bolt (3), washers (2), and locknut (1). Using a torque wrench (GGG-W-686, type I, No. 6), tighten locknut 50 to 75 inch-pounds.

3-388. TESTING. To test the damper, see figure 3-65 and proceed as follows:

Note

If damper will not conform to test requirements, it indicates that unit contains air, it is not completely filled with fluid, or it contains contaminants. If after step 5, unit does not conform to test requirements, complete disassembly, cleaning, inspection, assembly, and testing must be performed.

Tools and Equipment List

Scale, Spring	S131 (0–50 pounds capacity in increments of not more than 0.5 pound)
Drive Assembly Variable Speed	(0–50 rpm capability)

Note

Damper assembly to be mounted with arm (4) away from drive assembly.

Center of hole in arm (4) is to be 2.75 inches from center of rotation.

1. Attach damper assembly to a suitable variable speed drive assembly capable of maintaining 5, 10, 20, and 30 rpm's.

2. Insert 1/4-inch bolt through armhole, opposite countersink.

3. Attach a spring scale to the damper arm (4) by means of bolt inserted in step 2. Attach opposite end of scale to nonmoving rigid surface. Scale must be installed opposite direction of rotation and in line parallel with damper assembly arm (4). **See figure 3-65.**

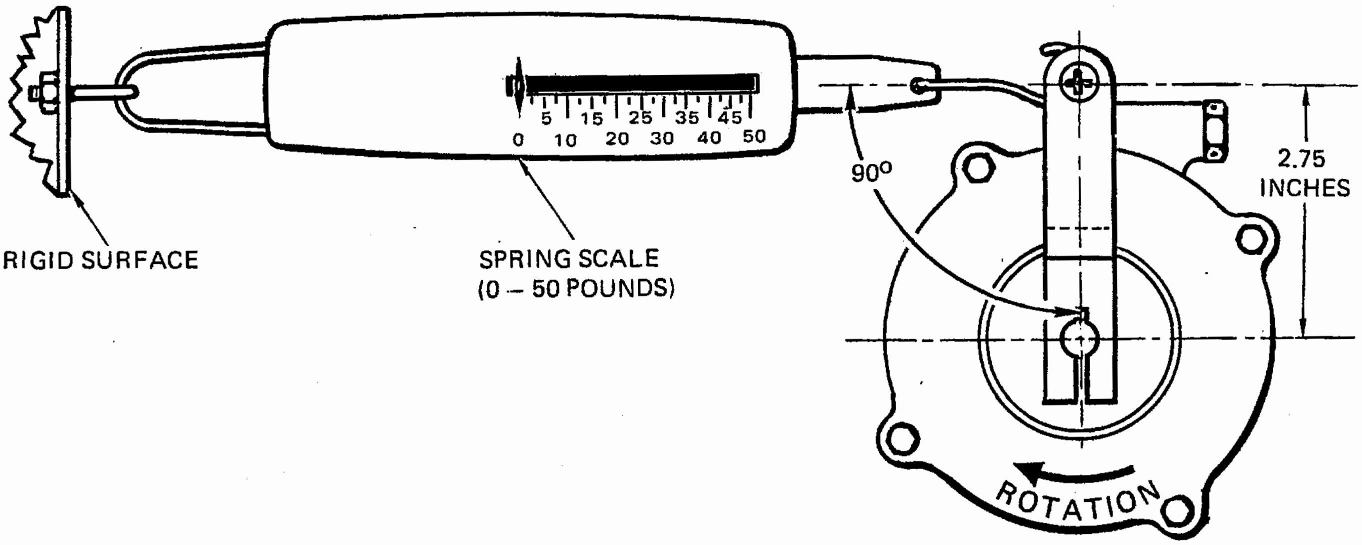


Figure 3-65. Longitudinal Viscous Damper Test Setup

4. Activate the variable speed drive and rotate damper assembly through several revolutions. Check scale readings at 5, 10, 20 and 30 rpm's. Scale readings are to be within the minimum and maximum listed in table 3-26.

5. If unit does not conform to test requirements, remove assembly from variable drive, remove plug (11) from bleed port; rotate arm (4) several times. Reinstall plug (11), tighten, and safety plug (11) to housing (10) with lockwire (MS20995F41). Repeat steps 1 through 4.

Table 3-26. Longitudinal Viscous Damper Test Data - RPM vs. Load

RPM	SCALE READING	
	MINIMUM	MAXIMUM
5	10	12
10	16	20
20	26	32
30	34	41

3-389. DIRECTIONAL CONTROL SYSTEM.

3-390. Depot maintenance of components of the directional control system consists of checkout, disassembly, cleaning, inspection, repair, tolerance limits, assembly, adjustment, calibration, preservation, and shipment. In some instances, depot maintenance may include manufacture of parts, modification, testing, and reclamation of assemblies or subassemblies of the directional control system components.

3-391. RUDDER PEDAL ADJUST SCREW-JACK ASSEMBLY (300-524113).

3-392. The pilot's rudder pedal adjustable screw jacks provide a means for the pilot to adjust the rudder pedals fore and aft to accommodate the pilot's leg length. The assemblies are attached to the rudder pedals and controlled evenly by a central gearbox. Fore and aft movement is attained by rotating a rudder pedal adjust crank located on the pilot's center console. The crank, gearbox, and screw jacks are connected through teleflex tubing. Depot maintenance for the screw-jack assembly consists of checkout, disassembly, cleaning, inspection, tolerance limits, assembly, testing, trouble shooting, preservations, and preservation for shipment.

3-393. CHECKOUT. To check out the screw-jack assembly, proceed as follows:

1. Visually inspect screw jack for obvious distortion or damage and replace defective parts prior to operational check.

2. Install screw jack in a suitable fixture and attach input shafts. Operate unit to full extend length and measure stroke from centerline of rod end bearings. Normal stroke shall be 5.225 inches. Refer to table 3-27 for actuating lengths and tolerances. Check operation of unit for roughness, binding, and excessive end play prior to disassembly.

3-394. DISASSEMBLY. To disassemble the screw-jack assembly, see figure 3-66 and proceed as follows:

Disassemble according to the sequence of index numbers assigned in figure 3-66, observing the following:

1. Note manner of lockwiring and duplicate during reassembly.

2. Do not remove bearings (5) and (21) from rod end (4) or output screw (20) unless replacement is required.

Table 3-27. Rudder Pedal Screw-Jack General Characteristics

Load (tension)	616 pounds
Actuating length:	
Extend*	32.525 (±0.03) inches
Retract*	27.30 (±0.03) inches
Stroke*	5.225 (±0.03) inches
Gear ratio	1:1
Rating	50 inch-pounds at 60 rpm
Weight	1 pound 13.5 ounces (approximate)
Maximum service temperature	121.1°C (+250°F)

*Measured from centerline of rod end bearings

1 SCREW
2 NAMEPLATE
3 RIVET
4 ROD END
5 BEARING
6 BOLTS
7 BOLTS
8 WASHERS
9 NUT
10 TUBE ASSEMBLY
11 RIVET
12 PLUG
13 TUBE
14 ADAPTER
15 SHIMS
16 CLINCHING STRAPS
17 NUT
18 WASHER
19 EXTEND STOP
20 OUTPUT SCREW
21 BEARING
22 BELLOWS
23 RIVET
24 RETURN STOP
25 SCREW
26 TAB
37 WASHER
28 ADAPTER
29 SHIM
30 BEARINGS
31 OUTPUT GEAR
32 BEARINGS
33 INPUT GEAR
34 HOUSING
35 INSERT
36 INSERT

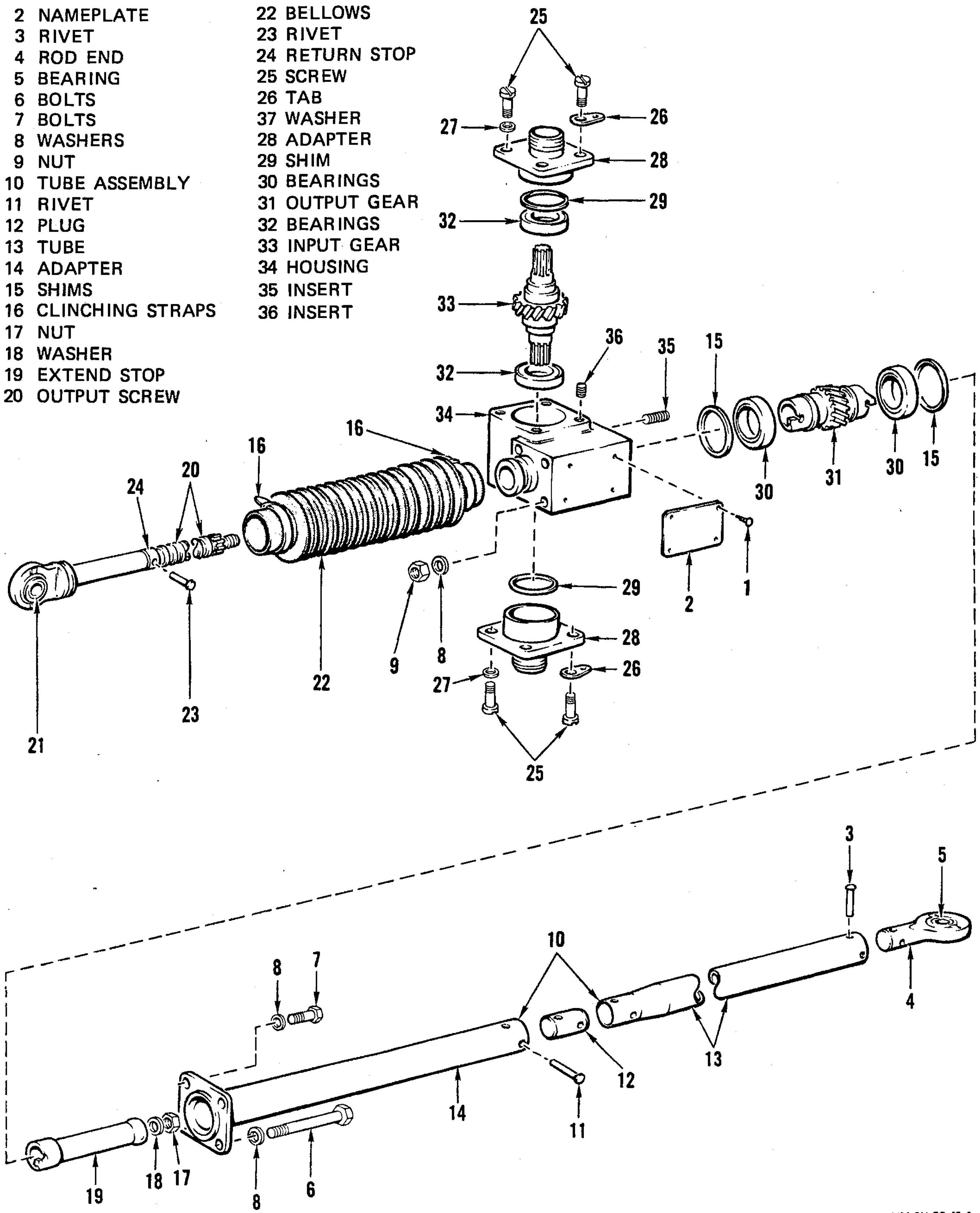


Figure 3-66. Rudder Pedal Adjust Screw-jack Assembly - Exploded View

3. Note number of shims (15) and (29) removed from housing (34), as an aid in reassembly.

4. Do not remove screws (1) or nameplate (2) unless replacement is required.

3-395. CLEANING. To clean the screw-jack assembly, proceed as follows:

Materials List

Solvent, Dry-cleaning	P-D-680, Type II

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

1. Clean all metallic parts of the screw-jack assembly by washing in dry-cleaning solvent (P-D-680, Type II).

2. When all parts are thoroughly clean, dry with moisture-free, filtered compressed air or use a clean, lint-free cloth.

3-396. INSPECTION. To inspect the components of the screw-jack assembly, see figure 3-66, refer to table 3-28, and proceed as follows:

1. Inspect bellows (22) for cracking, checking, deterioration, and brittleness. Reject bellows (22) when serviceability is in doubt.

2. Inspect all parts under a strong light and preferably under magnification for cracks, corrosion, scoring, nicks, stripped or cross threads, damage, distortion, and excessive wear.

3. Perform magnetic inspection of all metallic parts as required by MIL-I-6870.

4. Refer to table 3-28 for acceptable wear dimensions. Inspect bearings (30, 32, 5, and 21) for radial smoothness and loose or binding races.

5. See figure 3-67 for acceptable wear dimensions. Inspect gears (31 and 33) and output screw (20) for visible damage to teeth.

3-397. REPAIR. To repair the screw-jack assembly, see figure 3-66 and proceed as follows:

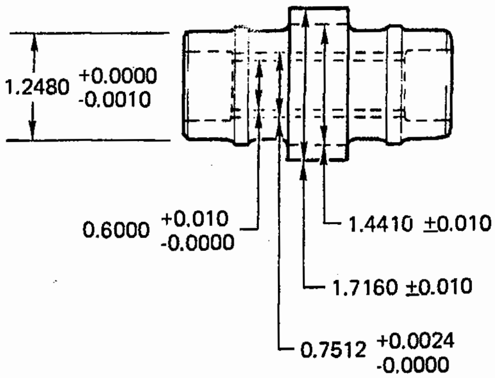
Materials List

Cloth, Crocus	P-C-458
Cloth, Abrasive Aluminum Oxide (No. 600-800 grade)	P-C-451

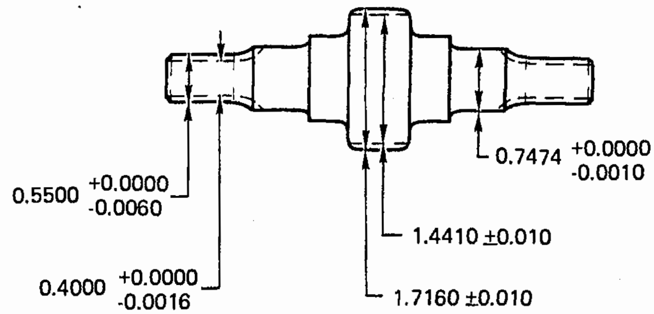
1. Replace bellows (22) and clinching straps (16) at each overhaul.

Table 3-28. Wear Tolerances for Bearings

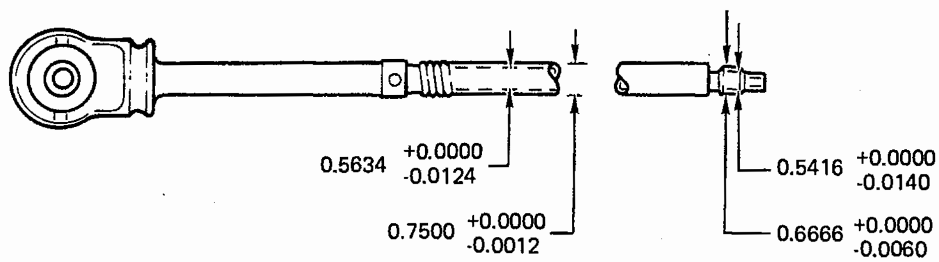
INDEX NO.	NOMENCLATURE	MATERIAL	DIMENSION (INCHES)	TOLERANCE
30	Bearing	Steel	ID 0.6250 OD 1.0625	±0.007 +0.0000/−0.0010
32	Bearing	Steel	ID 0.3750 OD 0.8750	+0.0000/−0.0005 +0.0000/−0.0005
5	Bearing	Steel	ID 0.2500 OD 0.9014	+0.0000/−0.0005 +0.0000/−0.0005
21	Bearing	Steel	ID 0.2500 OD 0.7500	+0.0000/−0.0005 +0.0000/−0.0005



WEAR TOLERANCES FOR OUTPUT GEAR (31)



WEAR TOLERANCES FOR INPUT GEAR (33)



WEAR TOLERANCES FOR OUTPUT SCREW (20)

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Figure 3-67. Wear Tolerances for Input Gear (33), Output Gear (31), and Output Screw (20)

2. Replace damaged bearings (5 and 21) by pressing into place and then staking on both sides.

3. Replace all parts not meeting inspection requirements or damaged beyond minor repair.

4. Remove minor nicks or scratches from non-ferrous parts by polishing with No. 600 to 800 grade aluminum oxide abrasive cloth (P-C-451); for ferrous parts use crocus abrasive cloth (P-C-458). Refer to paragraph 3-395 for cleaning instructions.

3-398. TOLERANCES AND LIMITS. Refer to table 3-28 and see figure 3-67 for acceptable tolerances and limits.

3-399. ASSEMBLY. Reassembly of the screw-jack assembly is accomplished by following the index numbers of figure 3-66 in reverse order while performing the following steps.

Tools and Equipment List

Wrench, Torque (0-200 inch-pounds capacity)	GGG-W-686, No. 6 (or equivalent)

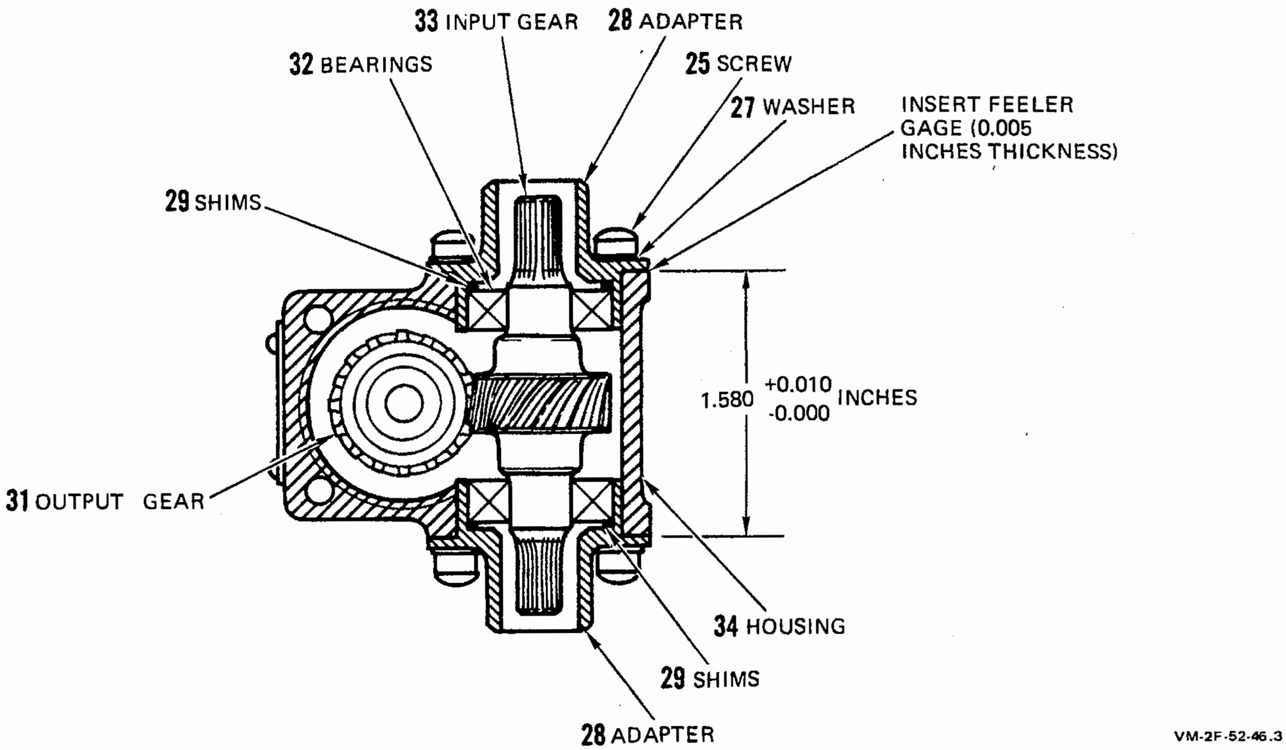


Figure 3-68. Assembly and Installation of Input Gear (33)

Materials List

Grease, Aircraft and Instrument, Gear and Actuator Screw	MIL-G-23827
Lockwire (0.032-inch diameter steel)	MS20995F32

Note

Pack gears and center section of housing with grease (MIL-G-23827) during assembly sequence after desired measurements are obtained.

1. See figure 3-68. Assemble input gear (33) and bearings (32). Add shims (29) and adapters (28) to obtain 1.580 (+0.010/−0.000)-inch dimension between adapter flanges. Install assembly in housing (34). Do not install screws (25).

2. See figure 3-69. Install output gear (31) and bearings (30). Add shims (15) as required to center gears.

3. See figure 3-68. Install screws (25) in adapter (28) and tighten. Insert feeler gage (0.005 inch) between housing (34) and adapter flanges (28) to prevent end play of input gear (33).

4. See figure 3-69. Slip return stop (24) over output screw (20) and install in output gear (31). Do not install rivet (23). Return stop (24) should be assembled on output screw (20) so that return stop (24) and stop boss of output gear (31) clear each other by 0.010 - 0.023 inch at last revolution before contact is made. Return stop (24) contact engagement with stop boss of output gear (31) must be 0.060 inch minimum. Install rivet (23), flush both sides.

5. See figure 3-69. Remove output screw (20) and install one end of bellows (22) over housing (34) port. Reinstall output screw (20) through bellows (22).

6. See figure 3-69. Rotate extend stop (19) on spline of output screw (20) until the stop boss of output gear (31) and extend stop (19) clear each

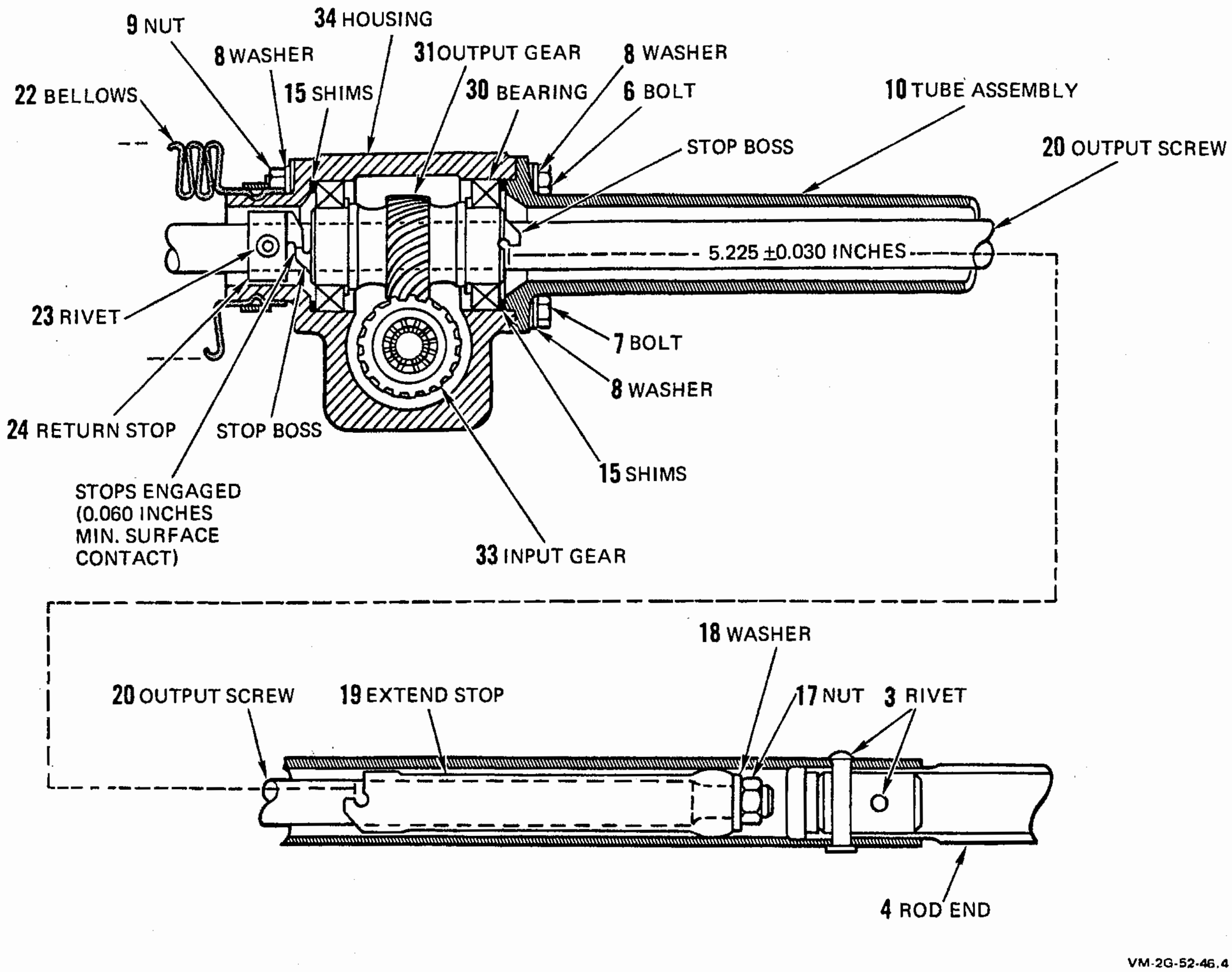


Figure 3-69. Assembly and Installation of Output Gear (31) with Output Screw (20) - Extended Position

other by 0.010 - 0.023 inch at last revolution and total stroke, stop-to-stop, measures 5.225 (±0.030) inches. Install washer (18) and locknut (17).

7. With bearing ends of output screw (20) and rod end (4) within 90 degrees of each other, secure bellows (22) with clinching straps (16) to output screw (20) and housing (34).

8. See figure 3-61. Install tube assembly (10) with shims (15) as required to prevent end play of output gear (31). Using a torque wrench (GGG-W-686, No. 6), tighten bolts (6) and (7) 25 to 35 inch-pounds.

9. With output screw (20) fully retracted, assemble rod end (4) with rivet (3) in tube assembly (10) to obtain 27.30 (±0.030) inches between centerlines of rod end bearings (5 and 21).

10. Secure screws and bolts with lockwire (MS20995F32).

3-400. TESTING. To test the screw-jack assembly, see figure 3-70 and proceed as follows:

1. Install assembled screw jack in suitable fixture and attach input shafts. With screw jack fully re-

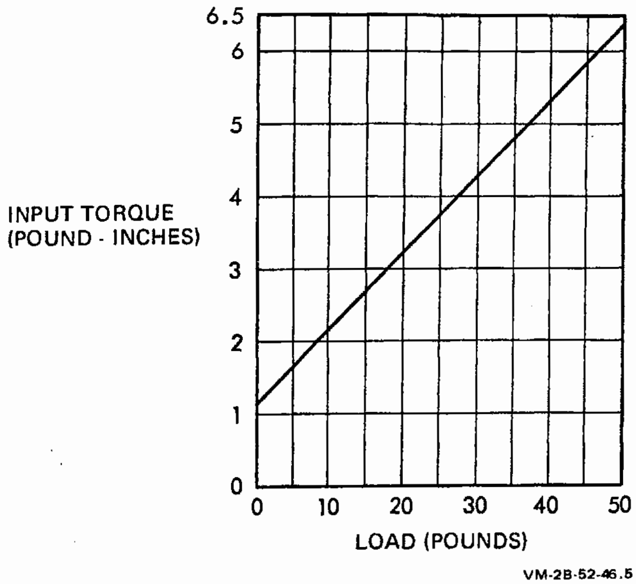


Figure 3-70. Screw-jack Input Torque Efficiency

tracted, apply a 616-pound tension load to unrestrained input shafts; screw jack should not reverse.

2. Operate screw jack several times at 60 rpm and check efficiency. Input torque required to operate screw jack must be below curve shown in figure 3-70. Unit may be operated manually to check efficiency.

3. Measure actuating lengths for required dimensions listed in table 3-27.

3-401. TROUBLESHOOTING. To troubleshoot the screw-jack assembly, see figure 3-66 and refer to table 3-29 for instructions.

3-402. PRESERVATION. To preserve the screw-jack assembly, see figure 3-66 and proceed as follows:

Materials List

Grease, Aircraft and Instrument, Gear and Actuator Screw	MIL-G-23827

1. Brush light coating of grease (MIL-G-23827) on bearings (5 and 21) surfaces and seal with protective cover.

2. Pack adapters (28) with grease (MIL-G-23827) and seal with approved cap.

3-403. PREPARATION FOR SHIPMENT. Accomplish preservative procedure by referring to paragraph 3-400. Pack screw-jack assembly with desiccant in approved shipping container after wrapping in moisture-proof material.

3-404. YAW DAMPER RATE GYROSCOPE (10700).

3-405. Instructions necessary to overhaul the yaw damper rate gyroscope are not provided in this manual. Refer to Technical Manual—Depot Maintenance Instructions (NAVAIR 05-45-116) for overhaul instructions. Refer to Technical Manual—Illustrated Parts Breakdown (NAVAIR 05-45-117) for information on replacement parts.

3-406. YAW DAMPER SERVO ACTUATOR (56021-001).

3-407. The yaw damper servo actuator consists of a dc motor, two magnetic clutches, an adjustable slip clutch, and a gear box. The actuator output is a bidirectional shaft torque proportionate to the differential current in the two magnetic clutch coils. The slip clutch provides a means of overriding the actuator output. The output shaft torque is amplified and transmitted to the directional control system for corrective rudder movement. Refer to table 3-30 for a list of general characteristics. Depot maintenance consists of check out, disassembly, cleaning, inspection, repair, tolerance limits, assembly, adjustment, and testing.

3-408. CHECKOUT. The servo actuator shall be subjected to complete testing as outlined in paragraph 3-419 at each scheduled overhaul. If unit is received from intermediate maintenance facilities because of failure in service, proper notation shall be made of the inspection record to determine extent of necessary repairs. Refer to the troubleshooting procedures in table 3-31 to determine probable cause and remedy of indicated troubles during testing.

Table 3-29. Troubleshooting Screw-jack Assembly

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: EXCESSIVE END PLAY OF INPUT GEAR (33).		
Worn bearings (32).		Replace bearings.
Worn Shims (29).		Replace/add shims.
TROUBLE: INPUT GEAR (33) BINDING.		
Excess shims (29) installed		Remove excess shims.
TROUBLE: EXCESSIVE END PLAY OF OUTPUT GEAR (31).		
Worn bearings (30).		Replace bearings.
Worn shims (15).		Replace/add shims.
TROUBLE: OUTPUT GEAR (31) BINDING.		
Excess shims (15) installed.		Remove excess shims.
TROUBLE: SCREW-JACK ASSEMBLY BINDING.		
Bearings (32) frozen.		Replace bearings.
Bearings (30) frozen.		Replace bearings.
TROUBLE: SCREW-JACK ASSEMBLY DOES NOT EXTEND OR RETRACT TO SPECIFIED REQUIREMENTS.		
Defective return stop (24), output gear (31), or extend stop (19).		Inspect per paragraph 3-396.
Rod end (4), return stop (24), or extend stop (19) not properly installed.		Reassemble per paragraph 3-399.

3-409. DISASSEMBLY. Disassembly of the servo actuator assembly is divided into the following parts: actuator disassembly, friction clutch disassembly, and motor disassembly. An exploded view is provided for each part. To disassemble the servo actuator proceed as follows:

Note

The motor may be removed for individual testing to determine its performance as a unit. This is accomplished by removing the motor mounting screws (36, figure 3-71). Remove screws (8, figure 3-71) to gain access and disconnect the wiring. Carefully withdraw motor with spline drive for contact with actuator gearing.

Table 3-30. Yaw Damper Servo Actuator-General Characteristics

Power source	28 (±0.5) volts dc
Power gear ratios	
Motor to clutch	10.5:1
Clutch to output	138:1
Overall	1450:1
Load data	
Torque—	
normal operating	120 inch-pounds
maximum operating	700 inch-pounds
Speed—	
normal operating	7.5 rpm
maximum operating	6.7 rpm
Clutch data	
Type	Rotating coil
Resistance (nominal)	110 ohms
Maximum current	65 milliamperes

Table 3-30. Yaw Damper Servo Actuator-General Characteristics (Cont)

Motor data	
Output	0.0625 hp
Speed	10,500 rpm (±10%)
Torque at rated speed	0.33 inch-pounds
Maximum current (at rated load and voltage)	4.1 amperes
Output rotation	Clockwise and counterclockwise
Output spline data	Male, 15 teeth, 32/64 diametral pitch, 45-degree pressure angle
Electrical connector	MS3116P16-8P
Weight	9.0 pounds

Table 3-31. Troubleshooting Yaw Damper Servo Actuator

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: ACTUATOR SPEED LOW OR ERRATIC.		
Defective motor.	**Test actuator assembly (paragraph 3-422).**	Repair/replace motor.
TROUBLE: EXCESSIVE MOTOR CURRENT.		
Defective brushes.	**Inspect brushes (paragraph 3-414).**	**Replace brushes (36, figure 3-72).**
TROUBLE: OUTPUT SHAFT ROTATES IN WRONG DIRECTION WITH PROPER CLUTCH ENERGIZED.		
Faulty wiring.	**Check wiring (figure 3-74).**	Correct wiring.
TROUBLE: ACTUATOR WILL NOT FUNCTION (NO SHAFT ROTATION).		
Defective motor.	Connect 28 (±0.5) volts d-c to pins E (+) and F (–); check motor operation.	Repair motor.
Open circuits.	**Check wiring (figure 3-74).**	Repair/replace defective wiring.

Table 3-31. Troubleshooting Yaw Damper Servo Actuator (Cont)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: LOW TORQUE OUTPUT.		
Improperly adjusted or defective friction clutch.	Check clutch slippage (paragraph 3-422).	Repair and adjust (paragraph 3-421).
Defective magnetic clutch(es).	Perform rotation and output torque test (paragraph 3-422).	Replace defective magnetic clutch.
TROUBLE: EXCESSIVE MOTOR CURRENT: LOW OUTPUT SPEED.		
Excessive lubrication.	Remove motor, inspect intermediate gear (42, figure 3-71).	Remove excessive lubrication from intermediate gear.
Shimming too tight.	Check rotor shaft for freedom of rotation (37, figure 3-72).	Check shims (31, figure 3-72).
Defective motor bearings.	Check rotor shaft for freedom of rotation and minimum side play.	Replace bearings (30 and 4 figure 3-72).
Defective housing bearing (43, figure 3-71).	Verify output shaft breakaway torque (paragraph 3-419).	Replace bearing.
Gear teeth worn, burred, or improperly meshed.	Inspect gears.	Realign or replace.
TROUBLE: EXCESSIVE STATIC DRAG.		
Defective intermediate gear (42, figure 3-71).	Verify output shaft breakaway torque (paragraph 3-422).	Replace bearing.
Defective magnetic clutch (11, figure 3-71).		Replace magnetic clutch, repair wiring.
Improper shimming.		Shim as required (paragraph 3-417).
Defective housing bearing (53, figure 3-71).		Replace defective bearing.

Table 3-31. Troubleshooting Yaw Damper Servo Actuator (Cont)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: GEARING NOISY WHILE IN OPERATION.		
Insufficient lubrication.	Disassemble and inspect actuator assembly (paragraphs 3-409 thru 3-414).	Reassemble and lubricate (paragraph 3-417).
Shimming too loose.		Reassemble and shim as instructed.
Defective bearings.		Replace defective bearings.
Gear teeth worn, burred, or improperly meshed.		Realign or replace defective gears.

Tools and Equipment List

Spanner Wrench	19-049675-1 FSCM 31435
Adapter, Clutch	19-049675-3, FSCM 31435

3-410. ACTUATOR DISASSEMBLY.

1. Observe the following and disassemble actuator in order of the index numbers assigned in figure 3-71.

a. Cut lockwire as necessary to accomplish the disassembly.

b. Make note of the location, thickness, and quantity of shims removed.

c. Do not disassemble housing assemblies or gear assemblies unless detail parts require replacing.

3-411. MOTOR DISASSEMBLY.

1. Remove motor (34, figure 3-71) from actuator assembly.

2. Observe the following and disassemble motor in order of the index numbers assigned in figure 3-72.

a. Do not disassemble motor wiring or unsolder connections any more than necessary to service the motor.

b. Record leadwire locations, lengths, color coding, and insulation requirements.

c. Record locations, thickness, and quantity of shims removed.

3-412. FRICTION CLUTCH DISASSEMBLY.

1. Remove friction clutch (51, figure 3-71) from actuator assembly.

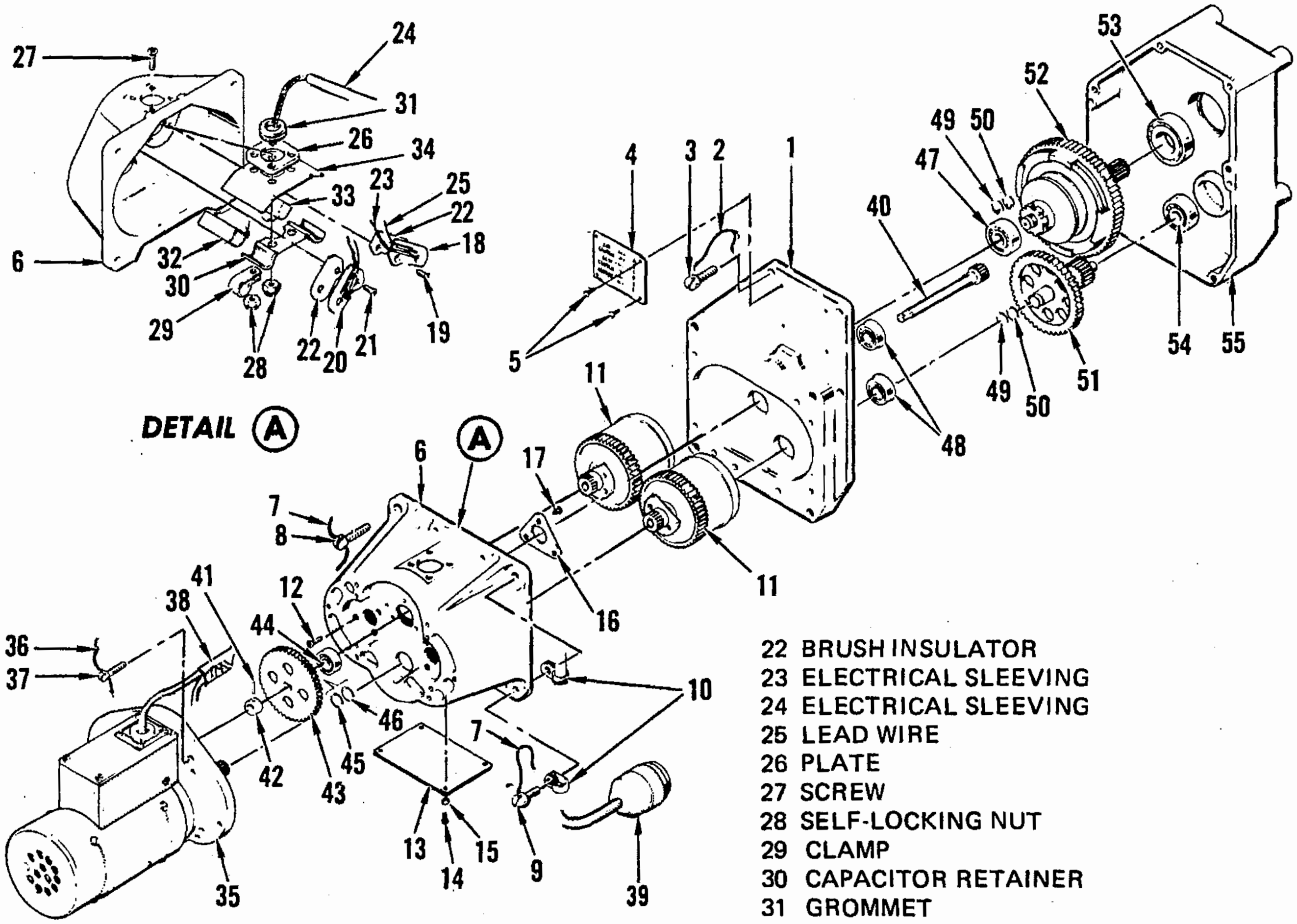
Note

Use spanner wrench (19-049675-1) when removing nut (1, figure 3-73).

2. Mount clutch on clutch adapter (19-049675-3) and position in suitable holding fixture.

3. Disassemble clutch in order of index numbers assigned in figure 3-73.

3-413. CLEANING. To clean components of the servo actuator assembly, proceed as follows:



1 HOUSING COVER
2 LOCKWIRE
3 SCREW
4 WIRING DIAGRAM PLATE
5 SCREW
6 SERVO HOUSING
7 LOCKWIRE
8 SCREW
9 SCREW
10 CLAMP
11 MAGNETIC PARTICLE CLUTCH
12 SCREW
13 IDENTIFICATION PLATE
14 SCREW
15 LOCKWASHER
16 BEARING RETAINER PLATE
17 SCREW
18 RIGHT HAND BRUSH ASSY
19 SCREW
20 LEFT HAND BRUSH ASSY
21 SCREW
22 BRUSH INSULATOR
23 ELECTRICAL SLEEVING
24 ELECTRICAL SLEEVING
25 LEAD WIRE
26 PLATE
27 SCREW
28 SELF-LOCKING NUT
29 CLAMP
30 CAPACITOR RETAINER
31 GROMMET
32 FILTER
33 FILTER
34 INSULATOR
35 DC MOTOR
36 LOCKWIRE
37 SCREW
38 ELECTRICAL SLEEVING
39 ELECTRICAL CONNECTOR
40 SPUR GEARSHAFT
41 RIVET
42 SLEEVE
43 INTERMEDIATE GEAR
44 BALL BEARING
45 SHIM
46 SHIM
47 BALL BEARING
48 BALL BEARING
49 SHIM
50 SHIM
51 SPUR GEARSHAFT
52 CLUTCH ASSY
53 BALL BEARING
54 BALL BEARING
55 MACHINING HOUSING

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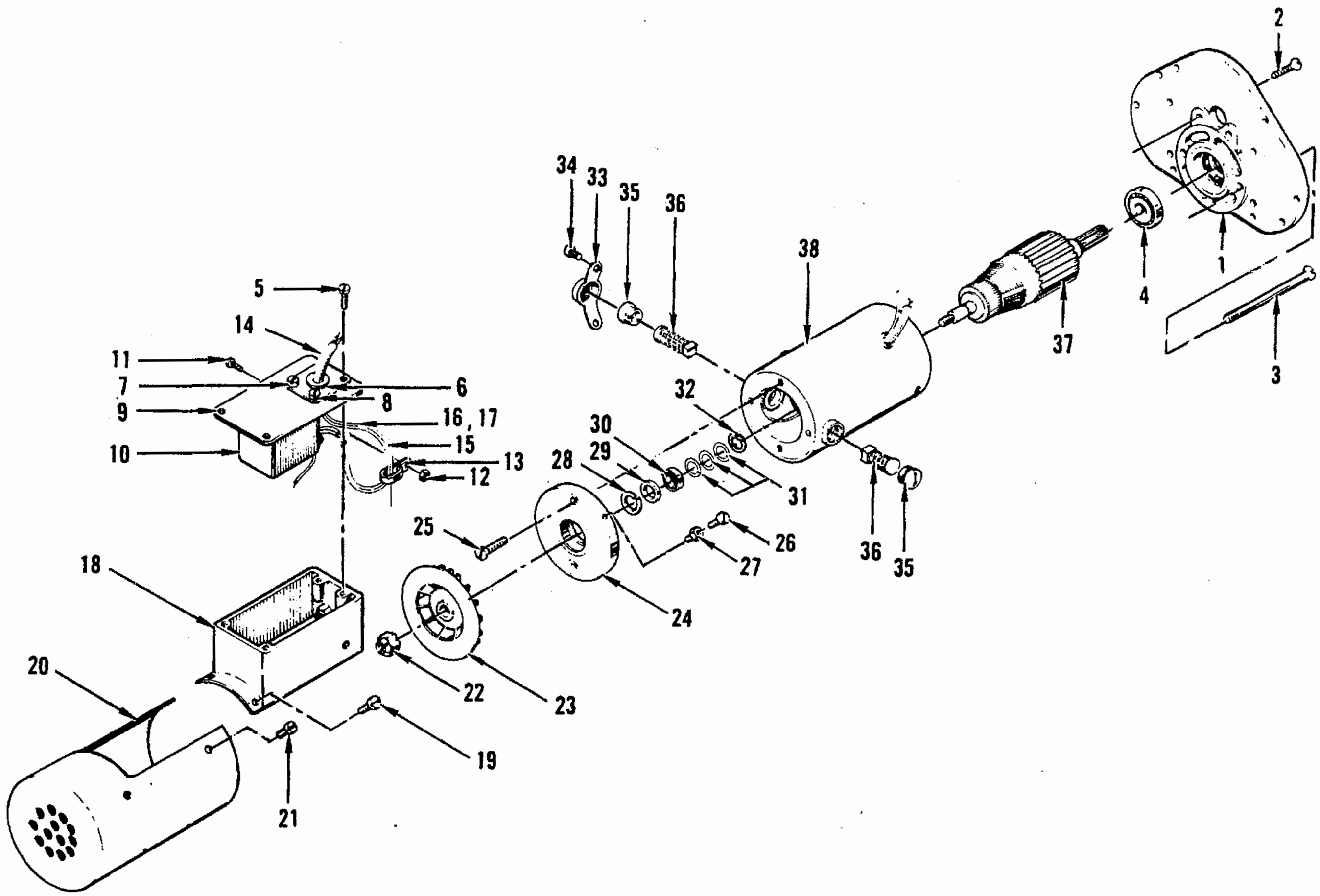
Figure 3-71. Yaw Damper Servo Actuator (56021-001) - Exploded View



1 END BELL ASSEMBLY	20 NUT
2 SCREW	21 SCREW
3 SCREW	22 NUT
4 BALL BEARING	23 FAN
5 SCREW	24 BELL ASSEMBLY (COMMUTATOR END)
6 GROMMET	25 SCREW
7 PLATE ASSEMBLY	26 SCREW
8 SCREW	27 STUD
9 COVER	28 WASHER
10 CAPACITOR ASSEMBLY	29 SHIM
11 SCREW	30 BALL BEARING
12 NUT	31 SHIM
13 CLAMP	32 RING
14 ELECTRICAL SLEEVING	33 CAP SHIELD
15 ELECTRICAL SLEEVING	34 SCREW
16 WIRE	35 BRUSH CAP
17 WIRE	36 BRUSH
18 CAPACITOR HOUSING ASSEMBLY	37 ROTOR ASSEMBLY
19 SCREW	38 STATOR ASSEMBLY

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Figure 3-72. Yaw Damper Servo Actuator DC Motor Assembly - Exploded View

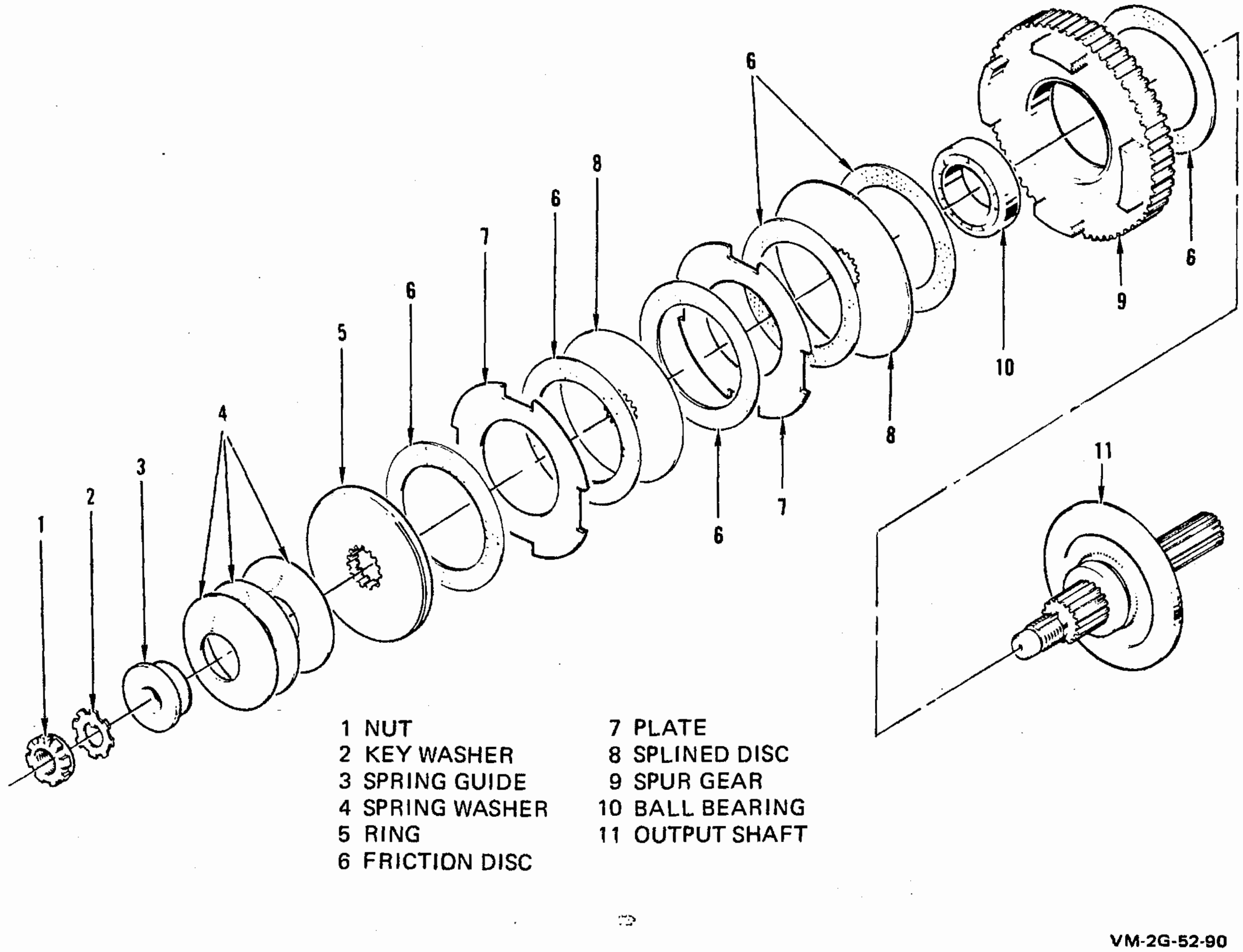


Figure 3-73. Yaw Damper Servo Actuator Friction Clutch - Exploded View

Tools and Equipment List

Cleaner, Ultrasonic	UCW-200

Materials List

Solvent, Trichloroethane	MIL-T-81533

CAUTION

Chlorinated solvents such as trichloroethane, MIL-T-81533; and trichlorotrifluoroethane (freon 113), MIL-C-81320, may be hydrolyzed in contact with free water and form highly corrosive acids. Free water is often found in hydraulic systems, therefore the use of chlorinated solvents should be restricted to external surfaces of hydraulic systems. Chlorinated solvents may be applied to internal surfaces of disassembled hydraulic components for cleaning purposes provided none of the liquid solvent is allowed to remain in the component after cleaning.

Table 3-32. Wear Limits of Servo Actuator Gear Parts (56021-001)

NOMENCLATURE	INDEX	FIGURE	TOOTH THICKNESS (INCHES) MAX.	TOOTH THICKNESS (INCHES) MIN.	OUTSIDE DIAMETER (INCHES) MAX.	OUTSIDE DIAMETER (INCHES) MIN.	BACKLASH (INCHES) MAX.
Spur gear shaft	40	3-71	0.0337	0.0317	0.45933	0.45733	0.0019
Intermediate gear	43	3-71	0.03372	0.03172	2.14683	2.14483	0.0032
Spur gear shaft	51	3-71	0.0337	0.0317	2.2302	2.2282	0.0082
			0.0501	0.0481	0.6885	0.6865	0.0019
Spur gear	9	3-73	0.0501	0.0481	3.3135	3.3115	0.0023

CAUTION

Do not use cleaning solvent of any kind to clean electrical components.

1. Clean all electrical parts and nonmetallic parts using a stiff, nonwire brush. Blow the loose particles from the part using dry, filtered, low-pressure compressed air. Wipe the parts with a dry, lint-free cloth.

WARNING

If trichloroethane is used with a vapor degreaser, ensure that there is adequate ventilation. Avoid prolonged breathing of vapor, spilling, and contact with skin.

2. Clean housings, gears, and other nonelectric parts, using an ultrasonic cleaner or vapor liquid degreaser. If ultrasonic cleaner is used, use cleaning solvent approved by manufacturer. If vapor liquid degreaser is used, use trichloroethane (MIL-T-81533).

3. Dry parts with dry, filtered, low-pressure compressed air.

Note

Cleaning of housings may be facilitated by blowing out recesses with dry filtered, low-pressure compressed air and wiping accessible surfaces with a dry, lint-free cloth.

3-414. INSPECTION. To inspect components of the servo actuator, proceed as follows:

1. Inspect electrical connector (38, figure 3-71) for bent or broken pins and thread condition.

2. Examine all parts for damage or corrosion.

3. Inspect all gears for chipped or worn teeth. Refer to table 3-32 for wear limits.

4. Examine cast parts for signs of wear, cracks, elongated holes, stripped or crossed threads.

CAUTION

Do not attempt to test or repair the magnetic particle clutches (11, figure 3-71) Replace them with new or factory reworked clutches at each scheduled overhaul of the rotary actuator.

5. Inspect friction clutch assembly (51, figure 3-71) per paragraph 3-419. Adjust clutch if the breakaway torque setting is other than 900 (±50) inch-pounds.

6. Inspect brush assemblies (18, and 20, figure 3-71) for cracks, deformed contact springs, and cracked or broken contact brushes or excessive wear.

7. Place brush assemblies (18 and 20, figure 3-71) on a flat surface, with the contacts facing upward. Find the free height dimension by mea-

suring the vertical distance between the surface table and the tip of each contact. This measurement should be 0.330 to 0.360 inch.

8. Using a suitable spring tester, measure force required to compress spring to 0.265 inch. The force required to compress spring should be 15 to 30 grams for the short leaf contact and 12 to 30 grams for the long leaf contact.

9. Inspect the rotor assembly (37, figure 3-71) armature for evidence of burning or pitting, and surface smoothness. The minimum permissible diameter of the commutator is 2.135 inches and the undercut of the mica should be 0.032 inch wide by 0.020 inch deep.

3-415. REPAIR. **To repair the servo actuator assembly, proceed as follows:**

1. Repair armature commutator. If inspection reveals that commutator is rough, pitted, scored or burned, refinish in a lathe that is accurately set up and adjusted. Remove only the material necessary to clean and true-up the commutator surface. Replace armature that necessitates turning of commutator to less than a minimum diameter of 2.135 inches. Hold commutator diameter concentric with bearing journals within 0.005 inch TIR.

2. Undercut mica. If depth of undercut remaining after the turning operation has been completed is less than 0.02 inch, the mica between the commutator bars should be reundercut to 0.032 inch, maximum, by 0.02 inch deep. Use a triangular scraper to remove all excess mica, sharp edges, and burrs from between the commutator bars. Use a soft-bristle brush to remove metal chips and mica particles from the slots between the commutator bars.

CAUTION

Do not use emery cloth to polish commutator.

3. Polish commutator. Mount armature in a lathe and operate at a speed of 500 to 600 rpm. Polish commutator by applying 5/0 sandpaper backed up by an accurately cut block of rigid material that will fit the commutator over its entire length and for at least one-third of its periphery.

4. Balance armature. After the commutator refinishing, the armature should be checked for proper balance. Balance within 2 grain-inches at each end. If a balance correction is required, mill the stainless steel retaining bands at each end of the lamination stack until the proper degree of balance is obtained.

3-416. TOLERANCE LIMITS. **Refer to table 3-32 for wear limits of the servo actuator gear parts and table 3-33 for acceptable operating limits.**

3-417. ASSEMBLY. **Reassembly of the servo** actuator is divided into the following parts: motor assembly, clutch assembly, and actuator assembly. To reassemble the servo actuator, proceed as follows:

Tools and Equipment List

Adapter, Clutch	19-049675-2, FSCM 31435
Adapter, Torque Wrench	19-049675-2, FSCM 31435
Stand, Clutch Run-in	19-049675-4, FSCM 31435
Wrench, Torque	GGG-W-686, Type I (0–1800 inch-pounds)
Wrench, Spanner	19-049675-1, FSCM 31435

Materials List

Lubricant, Special	JH11695, FSCM 31435
Varnish	MIL-V-173
Chromate Paste	MIL-P-8585
Sealant, Vulcabond (Blue)	V114, FSCM 83040
Sealant, Vulcabond (Blue), or Sealant	V114, FSCM 83040 DC92-018 (Dow Corning Corporation, Midland, Michigan)
Grease, Low-temperature	MIL-G-23827
Epoxy	Epon 828 Resin MIL-R-9300

Materials List (Cont)

Catalyst	Versamid 125
Filler	Cobosil
Filler	Magnesium, Silicate

3-418. MOTOR ASSEMBLY.

1. Observe the following and assemble motor in the reverse sequence of index numbers assigned in figure 3-72.

a. When installing shims (31), check for minimum end-play of armature.

b. Carefully reinstall wiring harness (14), making connections as shown in wiring diagram (figure 3-74).

c. After installing self-locking nut (22), tighten sufficiently to completely compress split lockwasher (28).

3-419. CLUTCH ASSEMBLY.

1. To facilitate reassembly, mount clutch on clutch run-in stand (19-049675-4) using adapter (19-049675-3).

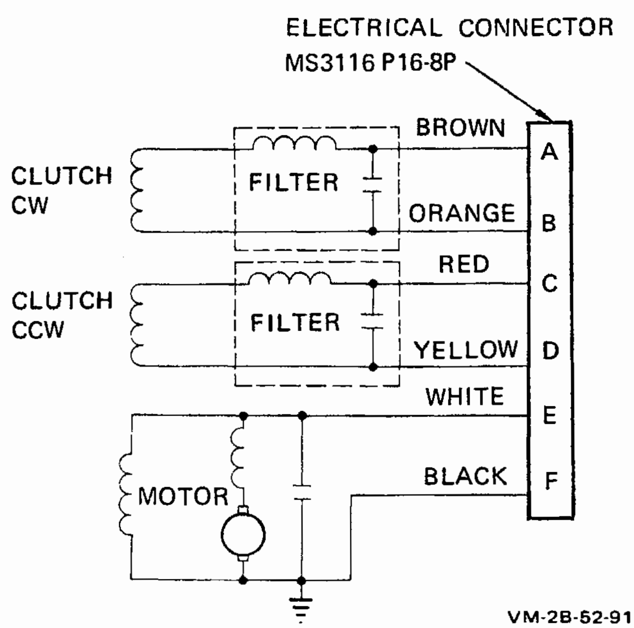


Figure 3-74. Yaw Damper Servo Actuator Wiring Diagram

2. Observe the following and assemble clutch in order indicated in figure 3-73.

Note

Use spanner wrench (19-049675-1) when installing nut (1, figure 3-73)

3. Apply a light coating of lubricant (JH11695) to outward surfaces of the six friction discs (6).

Note

For all bonding, mix equal amounts of part A and part B adhesive as follows:

MATERIAL	PART A WEIGHT	PART B WEIGHT
Epon 828	100 percent	
Versamid 125		100 percent
Cobosil filler		6 percent
Magnesium silicate	45 percent	60 percent

4. Apply adhesive and bond the two plates (7) to the mating friction discs (6), bond the one spur gear (9) to the mating friction disc (6).

5. After completing assembly of clutch assembly, run-in clutch and adjust breakaway torque as necessary as outlined in paragraph 3-421.

3-420. SERVO ACTUATOR ASSEMBLY.

1. Observe the following and assemble servo actuator in the reverse sequence of index numbers assigned in figure 3-71.

Note

Refer to table 3-32 for wear limits of the servo actuator gear parts. Ensure the gear measurements are as specified prior to reassembly.

2. Apply varnish (MIL-V-173) to all electrical connections.

3. Shim between clutch assembly (52) and ball bearing (47), using shims (49 and 50) for 0.001 to 0.006-inch end play of the clutch assembly.

4. Shim between spur gearshaft (51) and ball bearing (48), using shims (49 and 50) for 0.001 to 0.006-inch end play of the spur gearshaft.

5. Shim between ball bearing (44) and intermediate gear (43), using shims (45 and 46) for 0.001 to 0.006-inch end play of the spur gearshaft (40). Then, add the sleeve (42) with rivet (41).

Note

The clutch face and pinion must be free of sealant.

6. The threads of screws (12) should be completely covered with sealant (V114) or sealant (DC92-018) prior to assembly. After assembly, the screws (12) should be staked and the entire screw head covered with the sealant.

7. Remove rust preventive coating from all surfaces of intermediate gear (43), spur gearshaft (40), and spur gearshaft (51), if present, prior to assembly. Coat all their surfaces with lubricant (MIL-G-23827).

Note

Slip rings of clutches (11) must be free of lubricant.

8. Adjust the brush contacts to radial dimensions of 0.844 (±0.015) inch and 0.563 (±0.015) inch from the centerline of the clutch mounting bores to the centerline of the outer and inner contacts, respectively.

9. Cement the brush insulators (22) on the servo housing (6) with varnish (MIL-V-173). Cement the right- and left-hand brush assemblies (18 and 20) on the brush insulators (22) with varnish (MIL-V-173).

10. Coat radio interference filters (32 and 33) with varnish (MIL-V-173).

11. After mounting the wiring diagram (4) and the identification plates (13), coat them with varnish (MIL-V-173).

3-421. ADJUSTMENT. The following adjustments should be accomplished whenever necessary to correct the breakaway torque setting of the friction clutch and when run-in is performed on a reassembled clutch.

Tools and Equipment List

Wrench, Torque	GGG-W-686, Type I (0-1800 inch-pounds)
Adapter, Torque Wrench	19-049675-2, FSCM 31435
Stand, Clutch Run-in	19-049675-4, FSCM 31435
Wrench, Spanner	19-049675-1, FSCM 31435
Adapter, Clutch	19-049675-3, FSCM 31435

Note

Use torque-wrench adapter (19-049675-2) for adapting torque wrench to clutch. The torque may be measured by using a 1/2-inch square-drive torque wrench with an appropriate range, or, by some other means of precise measurement.

1. With friction clutch mounted in clutch run-in stand (19-049675-4), and using a torque-wrench, check clutch for slippage at 900 (±50) inch-pounds.

2. If clutch slippage does not occur at 900 (±50) inch-pounds, adjust spanner bearing retainer nut (1, figure 3-73) by turning clockwise to increase breakaway point, or counterclockwise to decrease, using spanner wrench (19-049675-1). Bend the tab of key washer (2, figure 3-73) to lock the adjustment.

3. When a clutch has been reassembled, accomplish a run-in as follows:

a. Mount the clutch in clutch run-in stand (19-049675-4) and perform run-in by "slipping" 60 revolutions in each direction before final adjustment.

b. Readjust the torque to 900 (±50) inch-pounds, as described in step 2, after each 15 revolutions in each direction.

3-422. TESTING. All tests for this rotary actuator shall be conducted at an atmospheric pressure of 28 to 32 in. Hg, a temperature range of 15 to 35°C (59 to 95°F) and a relative humidity of 80 percent or less. If tests are made with atmospheric pressure or temperature different from the preceding values, proper allowance shall be made for the **change in instrument reading. Table 3-33 pro**vides a tabulation of operating limits to be obtained during the testing procedure.

Tools and Equipment List

Stand, Test	LT1044B,
Dynamometer	19-110051, FSCM 31435
Adapter, Mounting	19-049675-7, FSCM 31435
Coupling	19-049675-6 FSCM 31435
Power Supply	**E601869 (0-30 volts dc) FSCM 08783**
Tester, Dielectric	**Model 411, FSCM 91692**

Table 3-33. Yaw Damper Servo Actuator Operating Limits

TEST	LIMITS
Output torque	**Refer to figure 3-75.**
Output shaft speed	5.9 to 7.9 rpm
Slip torque	700 to 950 inch-pounds
Bias torque	0 to 50 inch-pounds
Breakaway torque	0 to 20 inch-pounds

1. Mount servo actuator onto test stand (LT1044B) using mounting adapter (19-049675-7). Connect the actuator output shaft to dynamometer (19-110051), using coupling (19-049675-6).

2. Connect 28 (±0.5) volts dc to pins E(+) and F (–) of actuator electrical connector. See figure **3-74.**

3. With pins A, B, C, and D jumpered together, apply a potential of 500 volts rms, 60 Hz between the jumpered pins and exposed metal parts for 5 seconds. Ensure leakage current is less than 500 microamperes.

4. Test rotation. With the actuator connected as instructed in step 2, perform rotation test as follows:

a. Apply 20 milliamperes (approximately 2.2 volts dc) excitation on pins A and B. Shaft rotation must be clockwise as viewed from the shaft end.

b. Apply 20 milliamperes (approximately 2.2 volts dc) excitation on pins C and D. Shaft rotation must be counterclockwise as viewed from the shaft end.

5. Test output torque. With the actuator connected as instructed in step 2 and the output shaft locked, perform output torque test as follows:

Note

Before performing torque tests, excite each **clutch (figure 3-74) with 90 (± 5) milli**amperes (approximately 10 volts dc) for 1 to 3 seconds.

a. Apply 20 milliamperes (approximately 2.2 volts dc) to pins A and B, then to pins C and D. Measure and record output torque. The peak output torque in each direction must be within the **limits shown on figure 3-75.**

b. Apply 50 milliamperes (approximately 5.5 volts dc) to pins A and B, then to pins C and D. Measure and record the output torque. The peak output torque in each direction must be within the **limits shown on figure 3-75.**

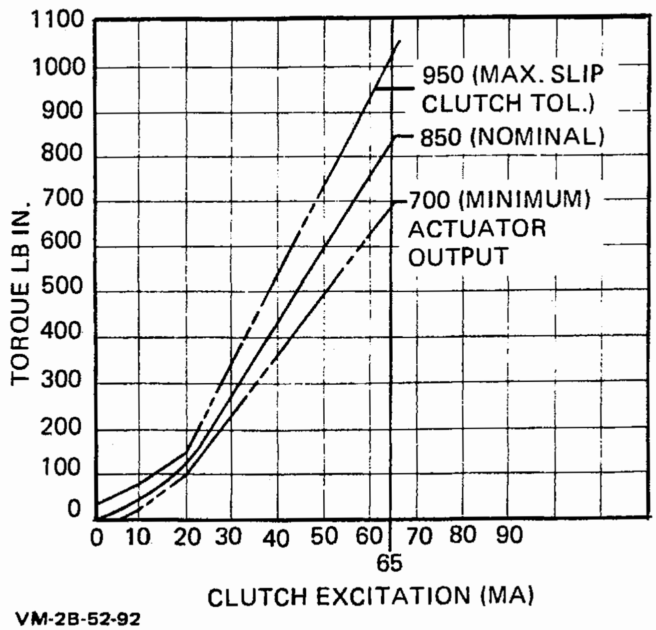


Figure 3-75. Yaw Damper Servo Actuator - Clutch Excitation vs Shaft Torque

6. Test output shaft speed. With actuator connected as instructed in step 2, perform shaft speed test as follows:

a. Apply 90 (±5) milliamperes (approximately 10 volts dc) to pins A and B. Adjust output load to 700 (±25) inch-pounds. Measure and record output shaft speed. The speed should be 6.9 (±1) rpm.

b. Apply 90 (±5) milliamperes (approximately 10 volts dc) to pins C and D. Adjust output load to 700 (±25) inch-pounds. Measure and record output shaft speed. The speed should be 6.9 (±1) rpm.

7. Test slip torque. With actuator connected as instructed in step 2, perform slip torque test as follows:

a. Apply 90 (±5) milliamperes (approximately 10 volts dc) to pins A and B. Adjust the load to stall output shaft. Measure and record the stall torque and motor current; the stall torque must be between 700 and 950 inch-pounds. The motor current must not exceed 10 amperes.

b. Apply 90 (±5) milliamperes (approximately 10 volts dc) to pins C and D. Adjust load to stall the output shaft. Measure and record the stall torque and motor current. The stall torque must be between 700 and 950 inch-pounds. The motor current must not exceed 10 amperes.

8. Test bias torque. With actuator connected as instructed in step 2, and the output shaft locked, jumper pins B and C together. Apply 17 milliamperes (approximately 1.9 volts dc) between pins A and D. The output torque should be between 0 and 50 inch-pounds.

9. Test breakaway torque.

Note

Perform breakaway torque test at three points of shaft rotation approximately 120 degrees apart.

a. With actuator connected as instructed in step 2, rotate the output shaft both clockwise and counterclockwise. The breakaway torque shall not exceed 10 inch-pounds.

b. With all electrical power removed, rotate the output shaft both clockwise and counterclockwise. The breakaway torque shall not exceed 20 inch-pounds.

3-423. DIRECTIONAL SYSTEM FORCE TRIM BUNGEE (300-524088).

3-424. For depot maintenance of the directional system force trim bungee, refer to paragraph 3-267.

3-425. YAW DAMPER AMPLIFIER (1806-2000).

3-426. For depot maintenance of the yaw damper amplifier, refer to paragraph 3-284.

3-427. WING FLAP SYSTEM.

3-428. Depot maintenance for components of the wing flap system consists of checkout, disassembly, cleaning, inspection, repair, tolerance limits, assembly, adjustment, calibration, preservation, and shipment. In some instances, depot maintenance may include manufacture of parts, modification, testing, and reclamation of assemblies or subassemblies of the hydraulic system components.

3-429. WING FLAP SELECTOR VALVE [HYDRAULIC SOLENOID CONTROL VALVE (HP848430-620)].

3-430. Refer to paragraph 7-55 for instructions to perform depot maintenance on the wing flap selector valve (hydraulic soleniod control valve).

3-431. WING FLAP ACTUATOR (67701-2).

3-432. Torque transmitted from the flap system motor gearbox drives a ball bearing (1) supported worm shaft (2) in the flap actuator (figure 3-76). The worm shaft meshes with a worm wheel gear (3) inside the actuator housing (4), transmitting torque at right angles. The worm wheel gear (3) has an integral self-locking nut (5) on the protruding end. An acme screw (6) is threaded into the worm wheel gear (3). Rotation of the worm wheel gear (3) causes the acme screw (6) to move axially. One end of the acme screw (6) is externally splined and engages in an internally splined antirotational tube (7) secured to the actuator housing (4); this arrangement of sliding splines restrains the screw (6) from rotating about its axis. An impact plate (8) located between the antirotational tube (7) and the actuator housing (4) provides a nonjamming screw stop for the retracted position. For the extended position, an arrangement of plain, dimpled, and solid-impact washers (9) is used to provide a compressible nonjamming stop. The worm wheel gear (3) shaft is mounted on two tapered roller bearings (10) in the actuator housing (4) which allows supported rotational motion of the shaft. A spherical, self-aligning bearing (11) mounted at the rear of the actuator housing attaches to the wing structure. A spherical self-aligning rod end bearing (12) attached to the acme screw (6) connects to the flap linkage. Telescoping shields (13) attached to the housing (4) and enclosing the acme screw (6) protect the threads from damage or contamination and retain the grease lubricant.

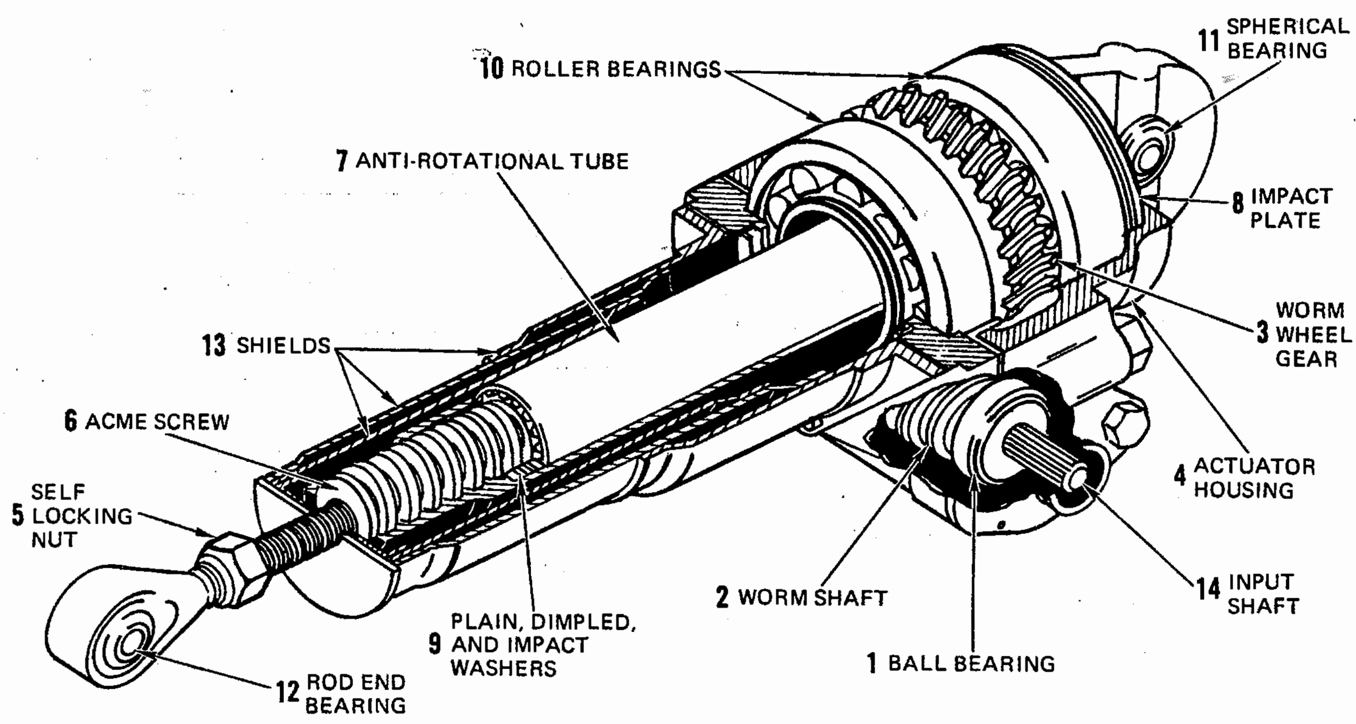


Figure 3-76. Wing Flap Actuator - Cutaway View

3-433. CHECKOUT. To check out the wing flap actuator, see figure 3-78 and proceed as follows:

Tools and Equipment List

Shaft Adapter, Spline	T105344
Wrench, Torque (0-100 inch-pounds capacity)	GGG-W-686, No. 6 (or equivalent)

1. Install spline shaft adapter (T105344) on input shaft (14). Manually rotate the input shaft clockwise and counterclockwise to the limits of extension and retraction of the acme screw (6). Rotation must be smooth and free from binding. See figure 3-77.

2. Measure actuator operating stroke from full retract to full extend. While operating actuator, check for binding. If unit binds, determine first if the screw is at either extreme of its travel. Screw should be approximately 1/2 inch from either extreme of travel for the check. See figure 3-77.

3. Attach torque wrench to spline shaft adapter (T105344) to check break-out force of actuator. No more than 2.0 inch-pounds of torque should be required on input shaft (14) to move acme screw (6). See figure 3-78.

3-434. DISASSEMBLY. To disassemble the actuator, see figure 3-77 for relationship of parts and proceed as follows:

1. Loosen nut (2) and unscrew rod end bearing (1) from acme screw (30).

2. Remove nut (2) and retainer (3) from rod end bearing (1).

3. Cut and discard lockwire from heads of machine screws (7). Remove screws (7) and flat washers (8). Remove outer shield assembly (6) and gasket (9) from cover (24). Discard gasket (9).

4. Slide center shield (4) out of outer shield assembly (6). Remove inner shield assembly (5) from center shield (4).

5. Cut and discard lockwire from heads of bolts (11). Remove bolts (11) and flat washers (12). Pull caps (10) free from machined housing (47).

6. Extract shims (13, 14, and 15) from recesses in machined housing (47). Remove gaskets (16) and bearings (17) from housing. Discard gaskets (16).

7. Twist worm shaft (18) free from worm wheel gear (28).

8. Remove hex nuts (20) and flat washers (21 and 22) from bolts (19). Pull bolts out of cover (24), and remove cover (24).

Note

In the following step, do not remove screw thread inserts (23) from cover (24) unless replacement of inserts is required.

9. Pull seal (25) out of recess in cover (24). Remove roller bearing outer race cup (29) from cover (24). Remove shims (26 and 27). Slide worm wheel gear (28) with roller bearing inner race cones (29) and acme screw (30) from machined housing (47).

10. Remove roller bearing inner race cones (29) from worm wheel gear (28).

11. Rotate acme screw (30) so that acme screw threads disengage from threads in worm wheel gear (28). Remove acme screw (30) from bore in worm wheel gear (28).

12. Remove washers (31, 32, and 33) from bore in worm wheel gear (28). Keep washers together as a set for re-use during reassembly.

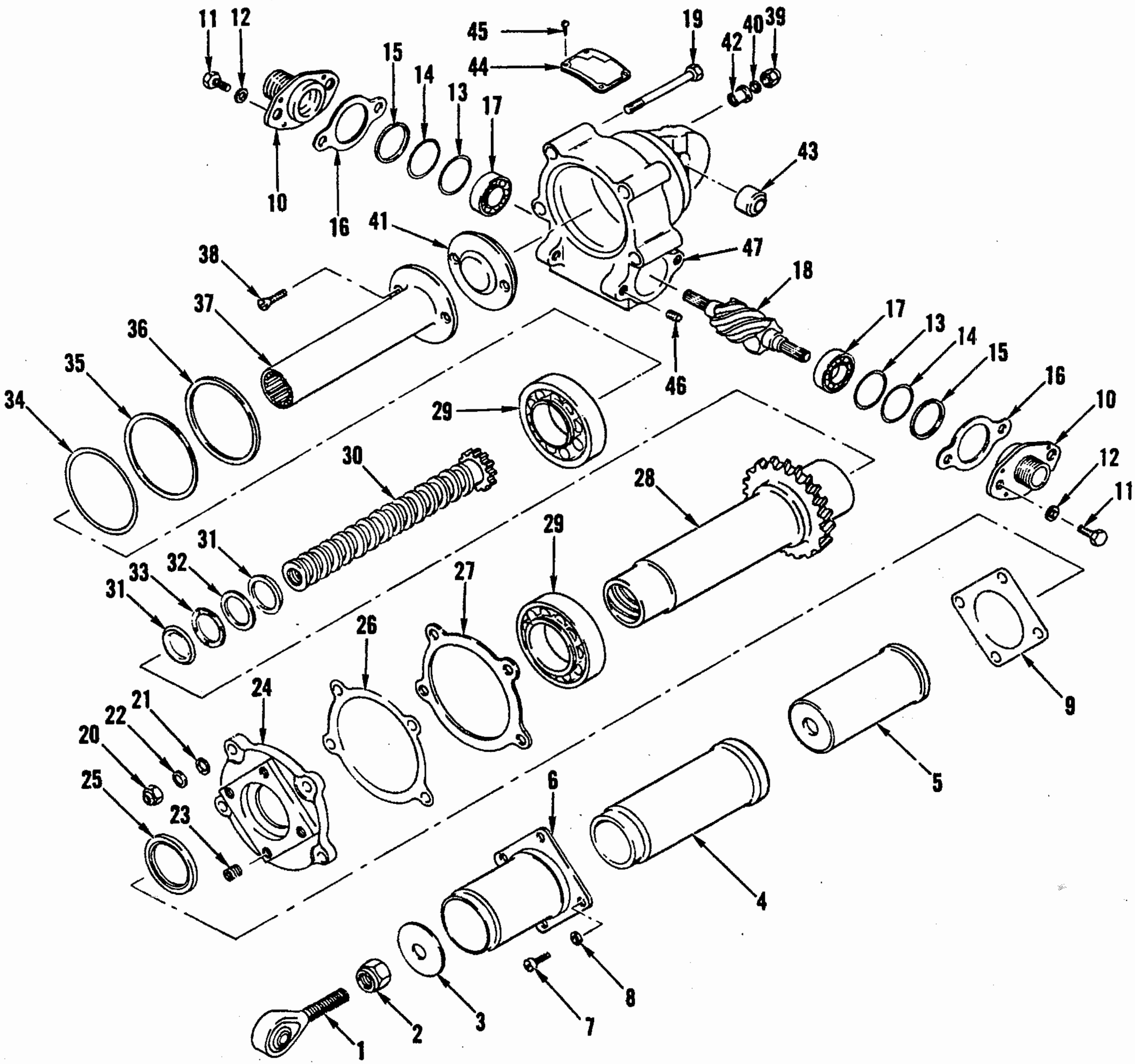
13. Remove roller bearing outer race cup (29) and shims (34, 35, and 36) from bearing bore in housing (47). Retain shims as a set for re-use during reassembly.

14. Remove nuts (39), screws (38), and antirotational tube (37) from housing (47).

15. Separate impact plate (41) from housing (47), and observe the following:

a. Bushing (42) are press fit into housing (47). Do not remove bushing unless replacement of part is required.

b. Do not remove screw thread inserts (46) from housing (47) unless replacement is required.



1 BEARING
2 NUT
3 RETAINER
4 SHIELD, CENTER
5 SHIELD ASSEMBLY, INNER
6 SHIELD ASSEMBLY, OUTER
7 SCREW
8 WASHER
9 GASKET
10 CAP
11 BOLT
12 WASHER
13 SHIM, INPUT (0.002 THK.)
14 SHIM, INPUT (0.005 THK.)
15 SHIM, INPUT (0.010 THK.)
16 GASKET
17 BEARING, BALL
18 WORM SHAFT
19 BOLT
20 NUT
21 WASHER
22 WASHER
23 INSERT
24 COVER
25 SEAL
26 SHIM, HOUSING (0.002 THK.)
27 SHIM, HOUSING (0.010 THK.)
28 GEAR, WORM WHEEL
29 BEARING, ROLLER TAPERED
30 SCREW, ACME
31 WASHER, IMPACT
32 WASHER, PLAIN
33 WASHER, DIMPLED
34 SHIM, BEARING (0.002 THK.)
35 SHIM, BEARING (0.005 THK.)
36 SHIM, BEARING (0.010 THK.)
37 TUBE, ANTI-ROTATIONAL
38 BOLT OR SCREW
39 NUT
40 WASHER
41 PLATE, IMPACT
42 BUSHING
43 BEARING, PLAIN
44 NAMEPLATE
45 SCREW
46 INSERT
47 HOUSING

Figure 3-77. Wing Flap Actuator — Exploded View

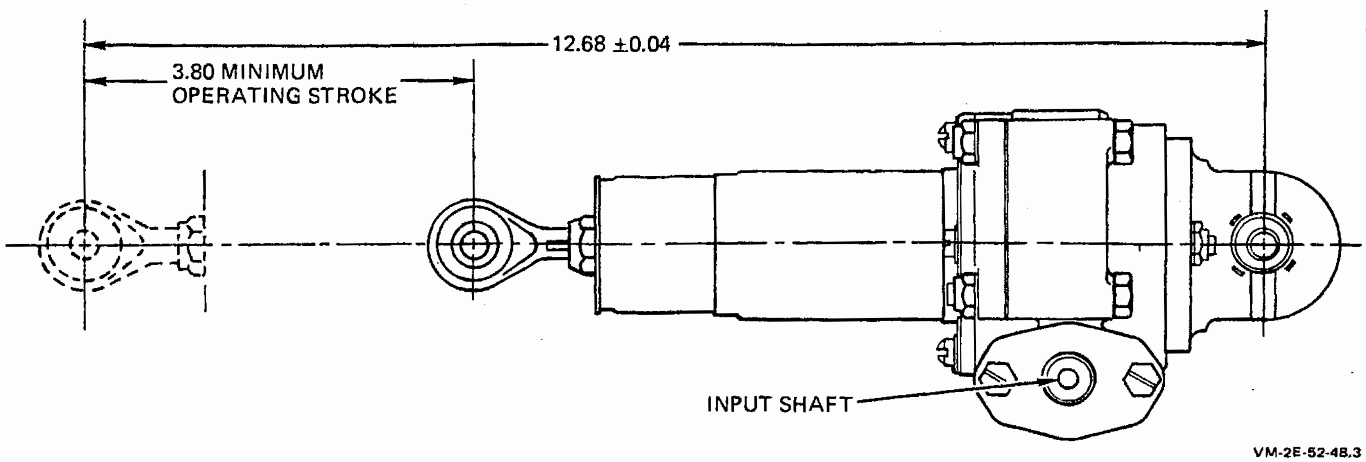


Figure 3-78. Operating Stroke Measurements

c. Bearing (43) has been staked in housing (47). Do not remove bearing unless replacement is required.

d. Do not remove nameplate (44) from housing (47) unless replacement is required.

3-435. CLEANING. To clean the components of the actuator, proceed as follows:

Materials List

Solvent, Dry-cleaning	**P-D-680, Type II**

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

1. Soak all metallic parts in dry-cleaning solvent P-D-680, Type II).

2. Use a stiff-bristled brush to remove foreign matter.

3. Dry all parts with clean, filtered compressed air under moderate pressure.

3-436. INSPECTION. To inspect the components of the actuator, proceed as follows:

1. Inspect rod end bearing (1) for excessive looseness of inner bearing race.

2. Check all nuts, screws, and tapped holes for stripped threads.

3. Inspect shields (4, 5, and 6) for cracks, dents, and/or distortion of parts. Examine welds for separation, and examine interior of shields for excessive wear and/or scorings.

4. Inspect bearing mounting surfaces on worm shaft (18) and on worm wheel gear (28) and inspect bearing recesses in housing (47) for scoring or other damage as a result of bearing failure.

5. Inspect housing (47) for cracks, dents, and deformations. Check screw thread inserts for stripping of threads.

6. Check worm wheel gear (28) for chipped, worn, or missing teeth.

7. Check for broken and/or missing teeth of splined section of acme screw (30). Examine thread for wear or other damage.

8. Examine interior of antirotational tube (37) for damage to the splines.

9. Check that spherical bearing (43) in housing (47) is securely staked in place and for excessive looseness of inner race.

3-437. REPAIR AND REPLACEMENT. To repair or replace the components of the actuator, see figure 3-77 and proceed as follows:

Materials List

Cloth, Abrasive, Crocus	P-C-458 (or equivalent)

Note

No repair of parts by remachining or reworking is recommended. Parts having minor surface defects such as nicks, burrs, minor corrosions, or light pitting may be polished with crocus cloth (P-C-458, or equivalent).

Replace gaskets (9 and 16), seal (25), and ball bearings (17). Replace all parts found to be defective or worn during disassembly and inspection.

3-438. ASSEMBLY. To assemble the actuator, proceed as follows:

Tools and Equipment List

Wrench, Torque (0-200 inch-pounds capacity)	GGG-W-686, No. 6 (or equivalent)
Tool, Staking	T105345

Materials List

Primer, Zinc-chromate	MIL-P-8585 or TT-P-1757
Grease, Aircraft and Instrument, Gear and Actuator Screw	MIL-G-23827
Grease, Plug Valve, Gasoline and Oil Resistant	MIL-G-6032
Paint, Red, Lead	(Obtain locally)
Lockwire (0.032-inch diameter steel)	MS20995F32

Note

During assembly, all 67701-2 actuators must be updated to the -3 configuration. To change configuration, replace machine screws (38, AN510-10R10) with 82-degree close-tolerance bolts (677038-1). See figure 3-77. Obtain four AN960-10L flat washers (40, figure 3-77) to be used in step 1 in the following procedure.

1. If bushings (42), screw thread inserts (46), bearing (43), or nameplate (44) and drive screws (45) have been removed, or if housing (47) has been replaced, install bushings, inserts, bearing, and nameplate and drive screws, using wet zinc-chromate primer (MIL-P-8585 or TT-P-1757). Stake bearing (43), on both sides, into housing (47), using staking tool (T105345). Install impact plate (41) and antirotational tube (37); and, secure with screws (38), washers (40), and nuts (39).

Note

Use washers (40) as required to obtain proper thread projection of screws (38) beyond self-locking nuts (39). Using a torque wrench (GGG-W-686, No. 6, or equivalent), tighten self-locking nuts (39) with 40 to 45 inch-pounds of torque.

2. Install shim set (34, 35, and 36) previously removed between housing (47) and roller bearing outer race cup (29).

Note

In step 2, use shims (34, 35, and 36) to center worm wheel gear (28) over worm thread centerline. Reshimming will not be be required unless housing (47) is replaced, worm wheel gear (28) is replaced, or inner roller bearing (29) is replaced.

Reshimming will involve patterning of the gear set under load to center the contact pattern on the drive side of the worm wheel gear teeth. Use red lead paint, applied sparingly, to act as a lubricant and to visually observe pattern location. Operate unit manually under load, for eight to 10 revolutions of the input shaft. Wash all parts as specified in paragraph 3-435 and prepare for reassembly per the following steps.

3. Grease worm wheel gear (28) with grease (MIL-G-23827). Install washer set (31, 32, and 33) into bore of worm wheel gear (28).

Note

In step 3, the number of washers (32 and 33) in the preceding washer set should not be changed unless extended length requirement cannot be met by adjusting rod end bearing (1) per paragraph **3-441,** worm wheel gear (28) is replaced, antirotational tube (37) is replaced, impact plate (41) is replaced, or machined housing (47) is replaced.

Number of washers (32 and 33) must be selected by trial as described by subsequent steps. Each pair of dimpled washers (33) must be separated by a thin flat washer (32). Washers must be added or removed in pairs [one (33) and one (32)], to meet the extended length requirement (figure **3-78)** with 70.0 inch-pounds maximum torque on input shaft.

4. Coat acme screw (30) with grease (MIL-G-23827) and insert into bore of worm wheel gear (28). Rotate acme screw threads so threads of acme screw (30) engage threads in worm wheel gear (28).

5. Install roller bearing inner race cones (29) onto worm wheel gear (28). Pack roller bearing cones with grease (MIL-G-23827).

6. Install seal (25), roller bearing outer race cup (29), screw thread inserts (23) (if removed at disassembly) into cover (24), using wet zinc-chromate **primer (MIL-P-8585 or TT-P-1757).**

7. Apply grease (MIL-G-6032) to fillet radius (approximately 1/8 inch by 45 degrees), at pilot diameter of cover (24). Install cover on housing (47), using required shims (26 and 27) to obtain 0.001-inch tight to 0.001-inch loose end play in bearings (29). Secure cover with hex nuts (20), washers (21 and 22), and bolts (19).

Note

In step 7, use washers (21) and/or (22) as required to obtain proper thread projection of bolts (19) beyond self-locking nuts (20). Using a torque wrench (GGG-W-686, No. 6 or equivalent), tighten nuts 70 to 80 inch-pounds of torque.

8. Insert worm shaft (18) into housing (47) with twisting motion to engage threads of worm shaft (18). Pack cavity around worm shaft (18) with grease (MIL-G-23827).

9. Place ball bearings (17) in housing (47). Install shims (13, 14, and 15), gaskets (16), and bearing caps (10). Secure caps to housing with bolts (11) and washers (12). Using a torque wrench (GGG-W-686, No. 6 or equivalent), tighten bolts (11) 30 to 40 inch-pounds. Check end play of worm shaft. End play must be from 0.001-inch tight to 0.002-inch loose. Readjust shims (13, 14, and 15) to obtain proper end play.

Note

In step 9, total shims (13, 14, and 15) may be used at one side of worm shaft (18) or divided between both sides.

10. Assemble inner shield (5) and center shield (4), and assemble center shield in outer shield assembly (6). Place shields over worm wheel gear (28) and secure to housing with screws (7) and washers (8), including gasket (9) between flange of outer shield assembly (6) and housing (47).

Note

Before installing inner shield (5), pack closed end with approximately 1/2-ounce grease (MIL-G-23827).

11. Place nut (2) on rod end bearing (1). Place retainer (3) on outer end of inner shield assembly (5), and screw rod end bearing (1) into end of acme screw (30). Align face of rod end bearing (1) parallel with the face of bearing (43), staked into the housing (47). Safety machine screws (7) and bolts (11) with lockwire (MS20995F32).

12. After steps 1 through 11 have been completed, restamp nameplate to read as follows: N.A.A. NO. HE 140-5004-00079 F.B. NO. 67701-23.

3-439. TESTING. To test the wing flap actuator, see figures 3-79 and 3-80 and proceed as follows:

Tools and Equipment List

Fixture, Test	T105767
Adapter, Splined Shaft	T105344
Test Stand, Load	T105349
Wrench, Torque (0-200 inch-pounds capacity)	GGG-W-686, No. 6 (or equivalent)

3-440. PRELIMINARY OPERATION TEST. Rotate input shaft by hand to check for "rough roll" or binding. Rotation of input shaft in clockwise and counterclockwise directions must be smooth and free from binding.

3-441. ADJUSTING ACTUATOR RETRACT AND EXTEND LENGTH.

1. See figure 3-79. Mount actuator, extended to mechanical stops, on test fixture (T105767) in position A.

2. If locking pin cannot be inserted through spherical rod bearing and into one of the nine holes of the gage block, loosen locknut on threads of spherical rod end bearing and rotate bearing until bearing bore aligns with one of the nine holes in the gage block. Nominal position is with rod end bearing adjusted so that pin can be inserted through bearing bore and engage center hole of gage block.

3. Back-off torque test may be performed at this time; refer to paragraph 3-433.

4. Retract actuator and install on locking pin shown as position B. Secure locking pin, and tighten locknut on rod end bearing. Acceptable retract length is indicated by being able to insert locking pin.

Note

After rod end final adjustment, check for minimum thread engagement. Drilled hole (located on keyway in thread shank) must not be visible. Use bearing thread gage to check for proper thread adjustment.

3-442. STATIC TORQUE TEST.

1. Mount actuator on test fixture (T105767) in position C.

2. Restrain rod end with locking pin.

3. Using splined shaft adapter (T105344) and torque wrench (GGG-W-686, No. 6, or equivalent), apply a minimum of 85.0 inch-pounds of torque to the opposite end of the input shaft.

4. Torque must be applied in both clockwise and counterclockwise directions.

5. There must be no evidence of malfunction. Actuator must meet all specification requirements after static torque test.

3-443. BACK-OFF TORQUE TEST.

1. Extend actuator up to mechanical stops by rotating the input shaft.

2. See figure 3-79. Place actuator in test fixture (T105767) in position A, but do not insert L-pin through spherical rod end bearing.

3. Using a splined shaft adapter (T105344) and torque wrench (GGG-W-686, No. 6, or equivalent), apply 70.0 inch-pounds torque to input shaft.

4. Using torque wrench (GGG-W-686, No. 6, or equivalent) determine maximum torque required to cause input shaft to start rotating in retract direction.

5. Maximum allowable back-off torque is 40.0 inch-pounds.

3-444. BACKLASH TEST.

1. See figure 3-79. Place actuator in test fixture (T105767), position C.

2. Screw transparent protractor disk onto input cap.

3. Attach backlash pointer onto splined shaft adapter (T105344) and engage splined shaft adapter with input shaft.

4. Apply 1.0 inch-pound torque clockwise. Set backlash pointer to 0, then, apply 1.0 inch-pound torque counterclockwise and note reading on transparent protractor disk.

5. Backlash must not exceed 250 degrees.

3-445. END PLAY TEST.

1. See figure 3-79. Place actuator in test fixture (T105767) position D by inserting L-pin through yoke, spherical rod end bearing, and slots in support block.

2. Insert standard torque wrench (GGG-W-686, No. 6, or equivalent) in torque wrench adapter (T105344) at dial indicator end of fixture. Apply 65 inch-pounds torque counterclockwise to produce 100-pound tension on actuator.

3. Set end play dial indicator to 0. Apply 65 inch-pounds torque clockwise to produce 100-pounds compression and note reading on end play indicator.

4. End play must not exceed 0.015 inch.

3-446. IRREVERSIBILITY TEST.

1. See figure 3-80. Install actuator in test stand (T105349).

2. Turn LOAD handle counterclockwise completely; then, toggle MAIN AC POWER SWITCH to NORMAL position.

3. Operate DRIVE MOTOR switch to EXTEND position and allow actuator to fully extend [up to 9 seconds for motor output speed of 1290 (±50) rpm as indicated on TACHOMETER].

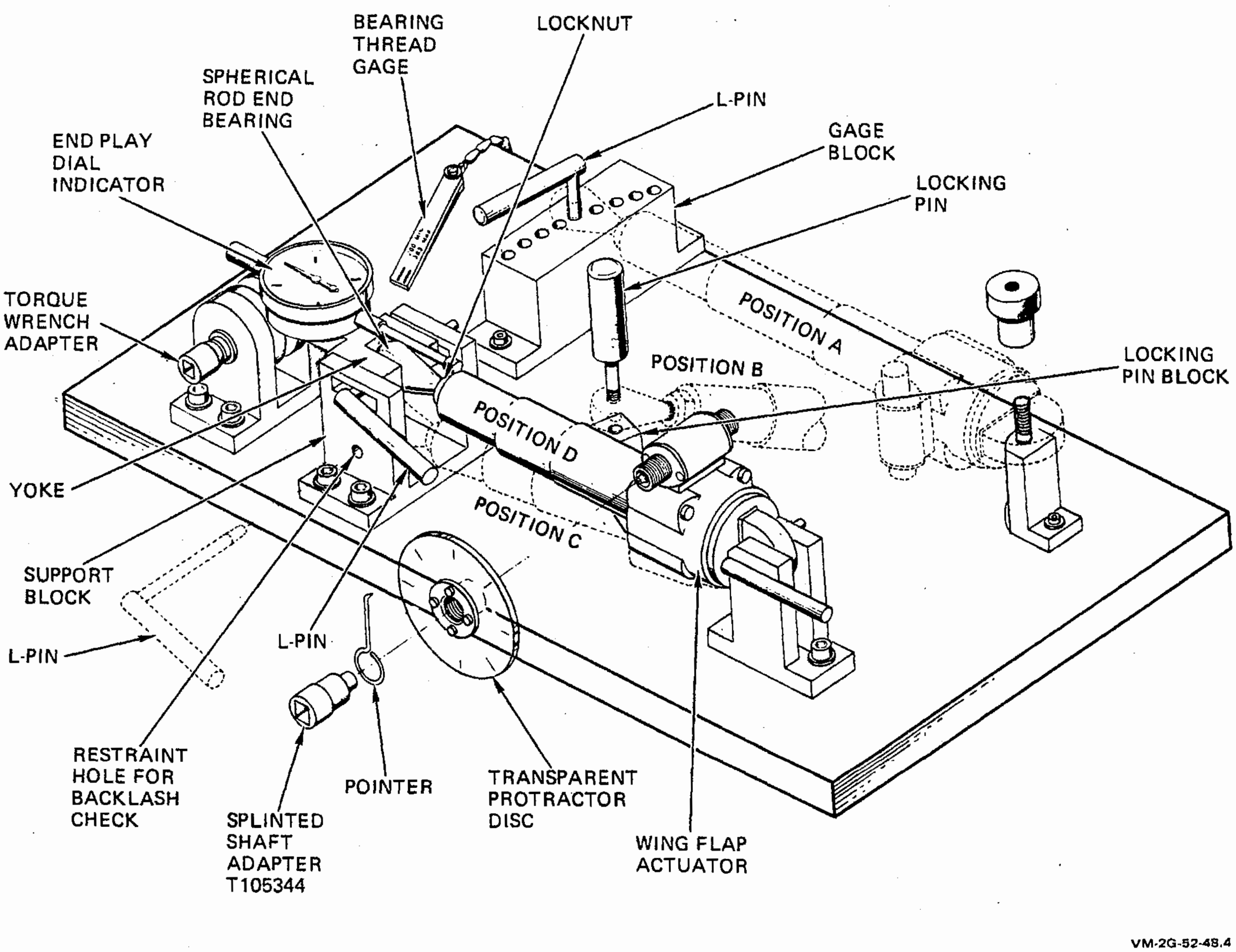


Figure 3-79. Flap Actuator Installed on T105767 Test Fixture

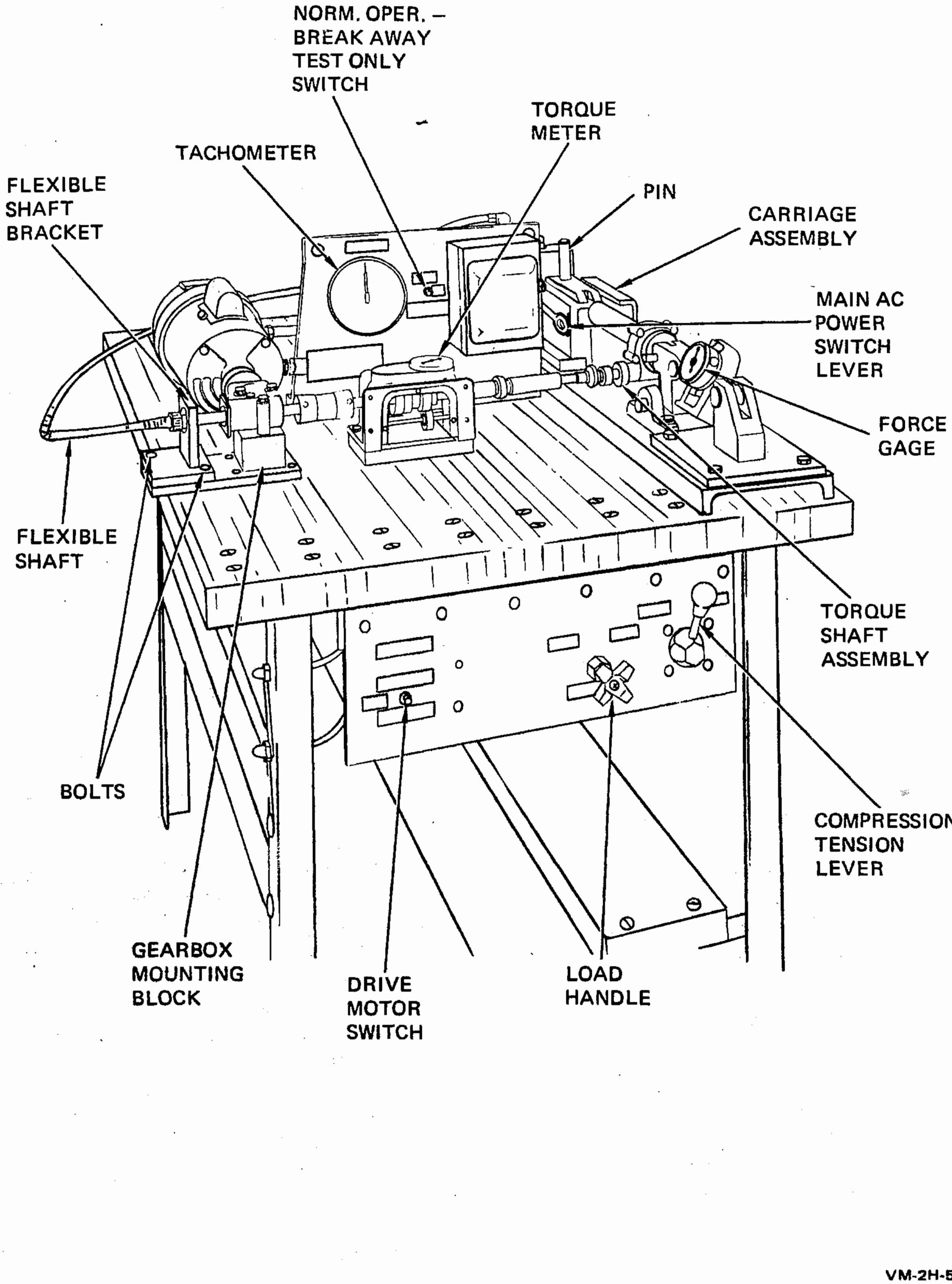


Figure 3-80. Flap Actuator Installed on T105349 Load Test Stand

4. Disconnect torque shaft assembly from actuator.

5. Rotate COMPRESSION-TENSION selector control valve lever to COMPRESSION position and adjust LOAD handle for approximately 1000-pound compression force (as indicated on force gage).

6. Observe output shaft for possible rotation. There must be no evidence of any rotation.

7. Turn LOAD handle counterclockwise completely and reconnect power shaft assembly to actuator.

8. Operate DRIVE MOTOR switch to RETRACT position and allow actuator to fully retract.

9. Operate DRIVE MOTOR switch to OFF position; then, disconnect torque shaft assembly from actuator.

10. Rotate COMPRESSION-TENSION lever to TENSION position.

11. Adjust LOAD handle for approximately 2500 pound tension and observe input shaft for possible rotation.

12. There must be no evidence of rotation.

13. Turn LOAD handle in DECREASE direction to the limit of travel.

3-447. BREAKOUT TEST.

Note

Just prior to breakout, test, loosen two bolts that secure flexible shaft bracket to gearbox mounting block; then, slide flexible shaft bracket away from test stand. Insert breakaway input connector into gearbox mounted on block.

1. See figure 3-80. With actuator mounted in test stand (T105349), turn LOAD handle completely counterclockwise.

2. Operate NORM. OPER.—BREAK AWAY TEST ONLY switch to NORM. OPER. position.

3. Operate DRIVE MOTOR switch to RETRACT position.

4. Operate DRIVE MOTOR switch to OFF position and turn LOAD handle counterclockwise.

5. Rotate COMPRESSION-TENSION lever to TENSION position.

6. Adjust LOAD handle for 1300 pounds of tension during retract stroke of operation as indicated on force gage.

7. Operate NORM. OPER.—BREAK AWAY TEST ONLY switch to BREAK AWAY TEST ONLY position. Rotate breakaway input counterclockwise and note maximum reading on torquemeter just prior to rotation. Torquemeter must not register more than 26.0 inch-pounds.

8. Operate NORM. OPER.—BREAK AWAY TEST ONLY switch to NORM. OPER. position; then, operate DRIVE MOTOR switch to RETRACT position.

9. Check that running torque does not exceed 18.0 inch-pounds.

10. Operate actuator for two complete cycles (extend-retract-extend-retract), with load handle adjusted for 1300 pounds of tension, as indicated on force gage, during retract stroke of operation. During retract, stroke load is resisting (1300-pound tension). During extend, stroke load is assisting (1300-pound to 0.0-pound tension). Running torque must not exceed 18.0 inch-pounds.

11. Turn LOAD handle counterclockwise completely and rotate COMPRESSION-TENSION lever to center, or neutral position.

12. Operate DRIVE MOTOR switch to OFF position. Finally, operate lever on MAIN AC POWER SWITCH to OFF position and remove actuator from test stand.

3-448. TROUBLESHOOTING. See figure 3-77 and refer to table 3-34 for instructions to troubleshoot the wing flap actuator.

3-449. PRESERVATION. For short-term preservation wrap actuator in moisture-proof paper and store in a dry location. For long-term preservation

Table 3-34. Troubleshooting Wing Flap Actuator

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: INPUT SHAFT (18) DOES NOT ROTATE SMOOTHLY.		
Internal jamming.	Check condition of worm shaft (18), worm wheel gear (28), acme screw (30), and antirotational tube (37).	Refer to paragraph 3-434. Disassemble to extent required to replace defective part(s).
Excessive bearing preload.	Check shimming of bearings.	Refer to paragraph 3-438. Re-shim in accordance with assembly instructions.
TROUBLE: ACTUATOR EXTEND LENGTH DOES NOT MEASURE 12.68 (+0.04) INCHES.		
Possible jamming of shields (4, 5, and 6) due to distortion.	Check condition of shields (4, 5, and 6).	Replace damaged shields (4, 5, and 6).
Improper shimming.	Check shimming.	Refer to paragraph 3-438 and re-shim in accordance with assembly instructions.
TROUBLE: ACTUATOR OPERATING STROKE DOES NOT MEASURE 3.80 INCHES MINIMUM.		
Excessive number of stop washers (31, 32, and 33).	Check number of stop washers (31, 32, and 33).	Reduce number of stop washers (31, 32, and 33).
TROUBLE: BACKLASH EXCEEDS 250 DEGREES.		
Worn thread on worm shaft (18) and/or teeth on worm wheel gear (28).	Check condition of worm shaft (18) and worm wheel gear (28).	Replace worn or damaged part(s).
TROUBLE: END PLAY EXCEEDS 0.015 INCH.		
Worn acme screw (30) threads.	Check condition of acme screw (30) threads.	Replace worm wheel gear (28) and acme screw (30).
TROUBLE: OUTPUT SHAFT ROTATES UNDER COMPRESSION OR TENSION OF ACME SCREW (30).		
Screws (38) have been sheared off, permitting antirotational tube (37) to rotate.	Check condition of screws (38).	Replace screws (38), if necessary.

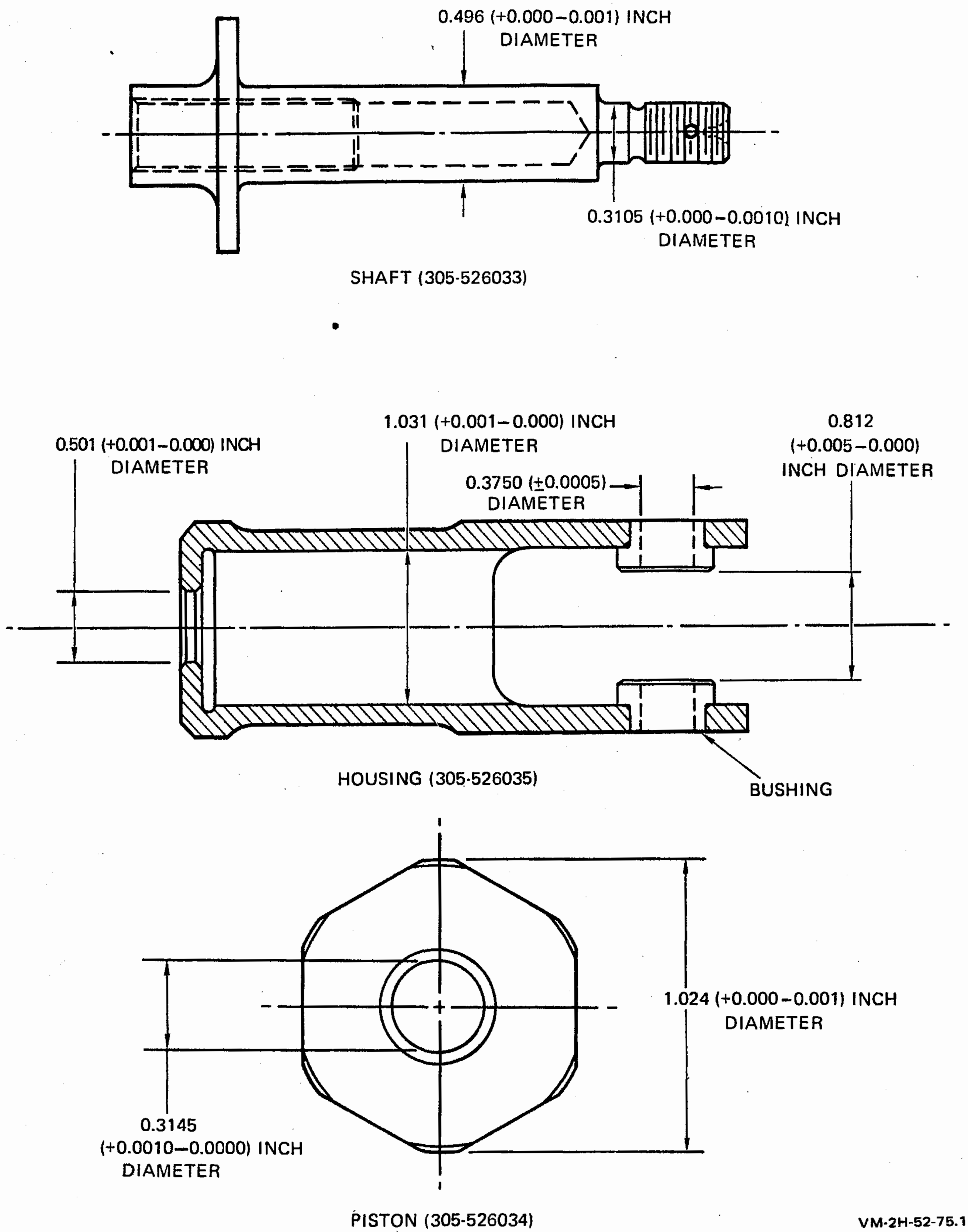


Figure 3-81. Flap Control Preload Bungee - Wear Limits

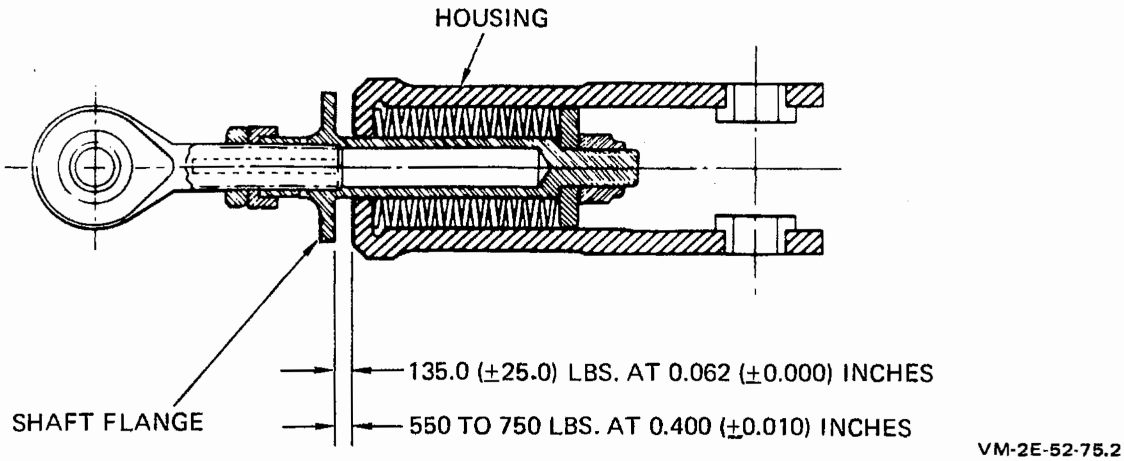


Figure 3-82. Flap Preload Bungee Force Checks

wrap actuator in moisture-proof paper, seal in either a corrugated paper box or wooden crate, and store in a dry location.

3-450. PREPARATION FOR SHIPMENT. Use any standard method of packing to prepare actuator for shipment and to prevent damage to the unit. No special equipment or special handling requirements are necessary.

3-451. FLAP CONTROL SYSTEM SURFACE PRELOAD BUNGEE (305-526032).

3-452. The flap control system surface preload bungee is installed between the flap and flap actuator bell crank. Its function is to maintain a preload force against the flap up travel stop by the use of internal spring washers. Depot maintenance for the bungee consists of disassembly, cleaning, inspection, repair, assembly, testing, and preservation.

3-453. DISASSEMBLY. Refer to paragraph 3-310 for instructions to disassemble the bungee.

3-454. CLEANING. Refer to paragraph 3-311 for instructions to clean the bungee.

3-455. INSPECTION. To inspect the components of the bungee, see figures 3-51 and 3-81 and proceed as follows:

Tools and Equipment List

Tester, Spring Resiliency	Type PB4-D, (or equivalent)

Note

See figure 3-51. If the gungee shaft (4) and housing (5) do not meet the conditions in the following steps, discard the entire bungee.

1. Check general condition of shaft. Inspect shaft for wear limits (figure 3-81). Examine for worn or damaged threads. Check shaft for cracks, nicks, and deep scratches.

2. Check general condition of housing. Inspect for wear limits. Examine exterior of housing for cracks, nicks, and deep scratches. Inspect bore for smoothness and cracks.

3. Check general condition of piston. Inspect for wear limits.

4. Inspect disc springs for general condition.

3-456. REPAIR. To repair the bungee, see figure 3-51 and proceed as follows:

Materials List

Cloth, Abrasive, Aluminum Oxide	P-C-451, No. 600-800 Grade
Primer, Zinc-chromate	MIL-P-8585 or TT-P-1757

1. Refer to Illustrated Parts Breakdown (NAVAIR-01-60GCB-4) and replace all worn, distorted, and damaged components which do not meet the inspection requirements in paragraph 3-455.

2. Using abrasive cloth (P-C-451, No. 600-800 grade), polish out all nicks, scratches, and abrasions on all nonmachined and noncritical surfaces. Apply zinc-chromate primer (MIL-P-8585 or TT-P-1757) to all polished areas.

3. Replace rod end bearing (1, figure 3-51). If bushings in housing are worn, manufacture and install new bushings. If piston is worn, manufacture new piston.

3-457. ASSEMBLY. Refer to paragraph 3-311 for instructions to assemble the bungee.

3-458. ADJUSTMENT. To adjust the bungee, see figure 3-51 and proceed as follows:

1. Loosen check nut (2). Slide lock washer (3) off of shaft (4). Adjust rod end bearing (1) to obtain a dimension of 5.35 inches from center of housing (5) mounting bolt holes to center of rod end bearing (1) bolt hole. Slide lock washer (3) over end of shaft (4) and tighten check nut (2) against lock washer (3).

3-459. TESTING. To test the bungee, see figure 3-82 and proceed as follows:

Tools and Equipment List

Stand, Test, Linear Actuator	Model NY200, FSCM 26337 (or equivalent)

1. Install bungee on linear actuator test stand (Model NY200). Apply force to bungee and record minimum force required to move bungee shaft from rest position. Breakout force must be 65.0 (±25.0) pounds.

2. Extend bungee shaft until there is a 0.062 (±0.0)-inch clearance between shaft flange and end of housing. Force required to extend bungee 0.062 (±0.000) inch must be 135.0 (±25.0) pounds.

3. Extend bungee shaft until there is a 0.400 (±0.010) inch clearance between bungee shaft flange and end of housing. Force required to extend bungee 0.400 (±0.010) inch must be 550 to 750 pounds.

3-460. PRESERVATION. To preserve the bungee, proceed as follows:

Materials List

Barrier Material, Waterproofed, Flexible	MIL-B-121, Grade A

1. Check that bungee is thoroughly clean.

2. Wrap bungee in moistureproof paper (MIL-B-121, Grade A).

3. Pack bungee in a suitable container and store in a cool, dry, place.

CHAPTER 4
HYDRAULIC POWER SYSTEM

SECTION I
DESCRIPTION AND OPERATION

4-1. DESCRIPTION.

4-2. The hydraulic operations of the OV-10A are divided into two independent systems: the utility system operates the landing gear, flaps, and nose wheel steering and the brake system operates the main landing gear wheel brakes. The utility hydraulic system (figure 4-1) is a 1500-psi, closed-center, intermittent-duty type system. It consists of units necessary to supply, control, and maintain a flow of hydraulic fluid to the landing gear system, nose wheel steering system, and the flap system. It functions on demand to perform the following operations:

1. Position the nose wheel for ground steering.
2. Lower and retract landing gear.
3. Release downlock mechanisms.
4. Raise or lower wing flaps.

The utility hydraulic system consists of the following: motor-pump, reservoir, pressure filter, pressure relief valve, pressure switch, and necessary plumbing. Hydraulic fluid is stored in the reservoir which includes provisions for fluid level indication and system filling and draining. The system routes this fluid under pressure upon demand to systems requiring it at a rate of 4.0 gpm (maximum) and provides flow return to the reservoir. The system also includes provisions for filtering pressure fluid, controlling fluid pressure, and providing pressure indication to pilot. The wheel brake system receives hydraulic fluid by gravity-flow to the master cylinders to assist in aircraft ground control. Refer to Section V for information on the main landing gear system and components, the nose wheel steering system and components, and the wheel brake system and components. Refer to Chapter 3 for information on the wing flap system and its components.

4-3. OPERATION.

4-4. The hydraulic system fluid is stored in a reservoir mounted on a movable rack in the upper portion of the aft cargo compartment between fuselage bulkheads at fuselage stations 224.88 and 233.50. This reservoir supplies fluid directly to the hydraulic pump and to the wheel brake system. Filling provisions on the reservoir include a removable cap and a screen to prevent foreign material from entering the supply system. Utility hydraulic power is provided by an intermittent-duty, electrically driven, variable-displacement pump. This pump motor receives power from the aircraft 28-volt d-c electrical system and operates only on demand from one of the subsystems. When one of these systems requires hydraulic power, an electrical ground is provided to energize the HYD PUMP POWER relay, permitting current flow to the pump motor (figure 4-2). When activated, the hydraulic pump draws fluid from the reservoir and provides a 4.0-gpm flow at 850 psi and no flow at 1700 psi (maximum). Internal pump leakage is routed back to the reservoir through the return line network. Hydraulic fluid from the pump is routed through a 10-micron filter to the selector valves in the various subsystems. From these subsystems, fluid is routed through a return line to the reservoir, completing the hydraulic cycle. A spring-loaded relief valve downstream of the pressure line filter prevents subsystem overpressurization. Hydraulic system pressure is monitored by a pressure switch which closes at 100 psi and opens at 200 psi to give pressure warnings by a light in the pilot's cockpit. See figure 4-3.

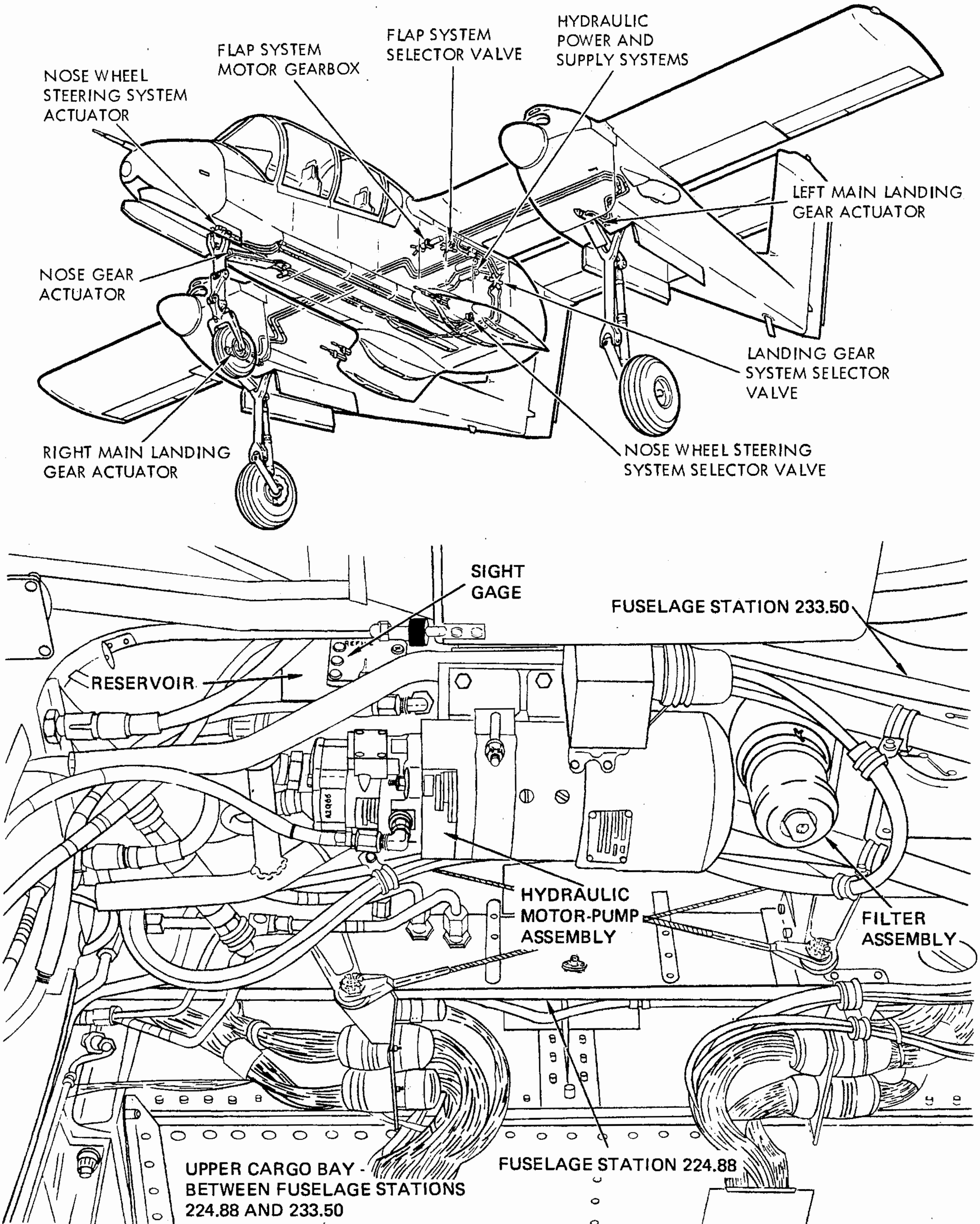


Figure 4-1. Hydraulic System Unit Locator

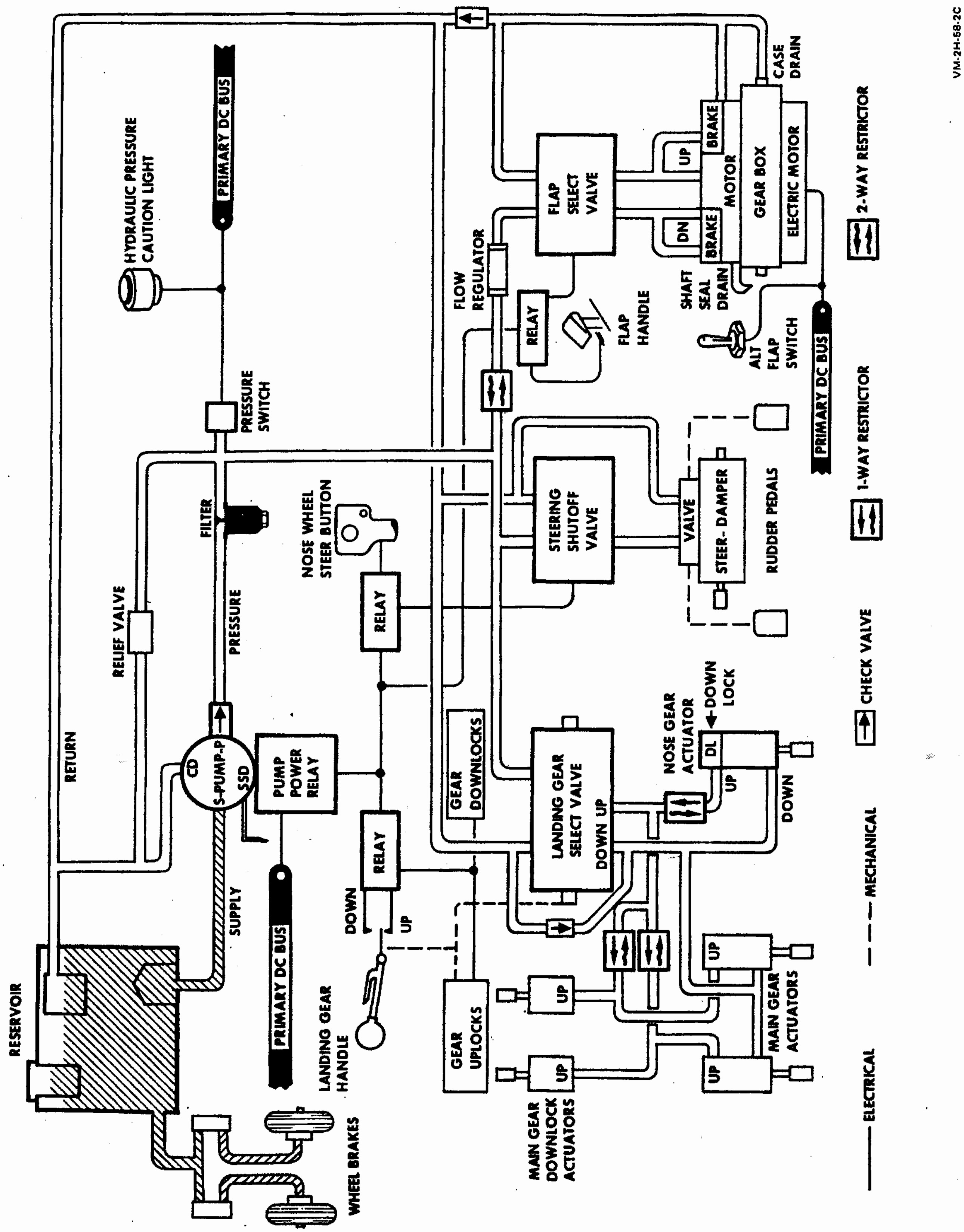


Figure 4-2. Hydraulic System Schematic

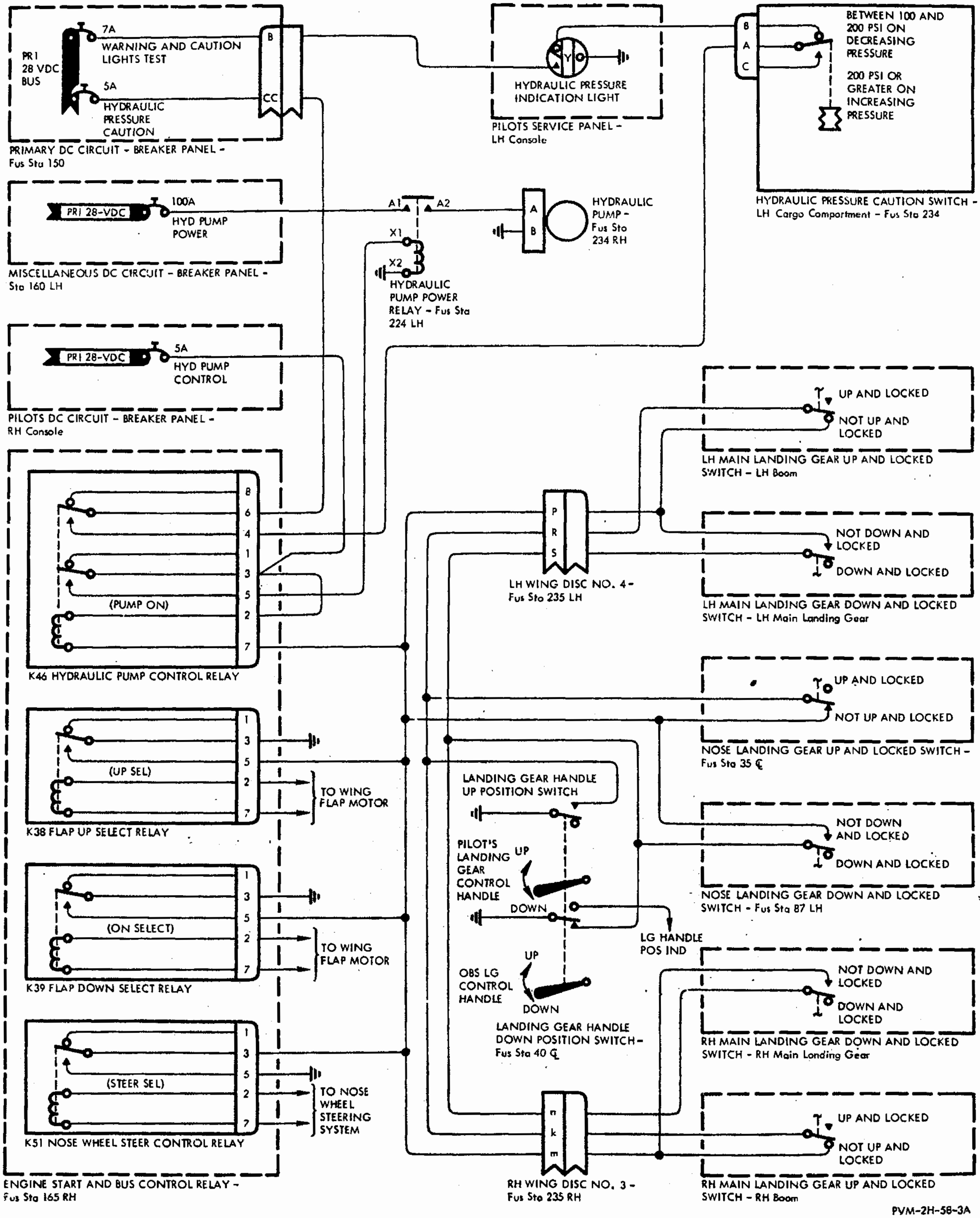


Figure 4-3. Hydraulic System Electrical Schematic

SECTION II
ORGANIZATIONAL MAINTENANCE

4-5. GENERAL.

4-6. Organizational maintenance for the hydraulic system includes system troubleshooting, servicing, operational check procedures, contamination control and component removal and installation. These procedures provide all the instructions necessary to maintain the hydraulic system within the limits of organizational level tools and facilities. Each procedure will include lists of tools and materials, and illustrations to clarify instructions and locate components.

Note

Aviation Hydraulics Manual, General Instructions (NAVAIR 01-1A-17) is applicable to all naval aircraft hydraulic systems and related hydraulic servicing and test equipment.

4-7. SERVICING.

4-8. The servicing procedures provide integrated instructions for filling, bleeding, and checkout of the hydraulic system. This procedure must be performed whenever maintenance or parts replacement is performed, in which the hydraulic system is drained or system plumbing is disconnected, or any of the plumbing or components of the nose wheel steering subsystem, landing gear subsystem, or wing flap subsystem are removed. General servicing procedures are provided in the General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

Tools and Equipment List

Adapter Bundle, Jacking and Mooring	E13710
Jack, Hydraulic Tripod	556
Jack, Hydraulic Tripod, 10-ton	50J25178
External Power Unit	NC-5

1. Jack the aircraft as described in General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) to permit operation of landing gear system.

2. Ensure that hydraulic reservoir is filled with MIL-H-5606 hydraulic fluid. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

3. Connect 28-volt dc external power source to aircraft.

4-9. FILLING.

1. Ensure that all hydraulic components of the main landing gear system, nose landing gear system, nose wheel steering system, flap system and the hydraulic power and return system are filled with fluid.

2. When installing a new component, fill component with hydraulic fluid prior to installation, cap ports, and install component. Remove caps and install pressure and/or return lines on component, keeping fluid leakage to a minimum.

3. Ensure that all hydraulic lines are properly installed and tight.

4-10. BLEEDING.

CAUTION

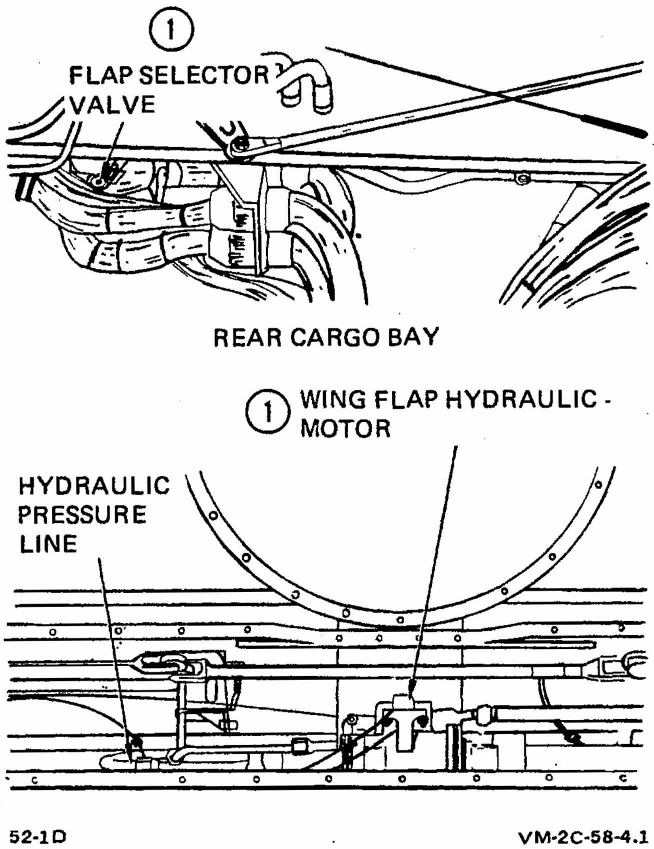
The hydraulic motor pump requires a 3-minute rest after the following operations:

Five minutes of nose wheel steering.
Three flap cycles.
Three landing gear cycles.

CAUTION

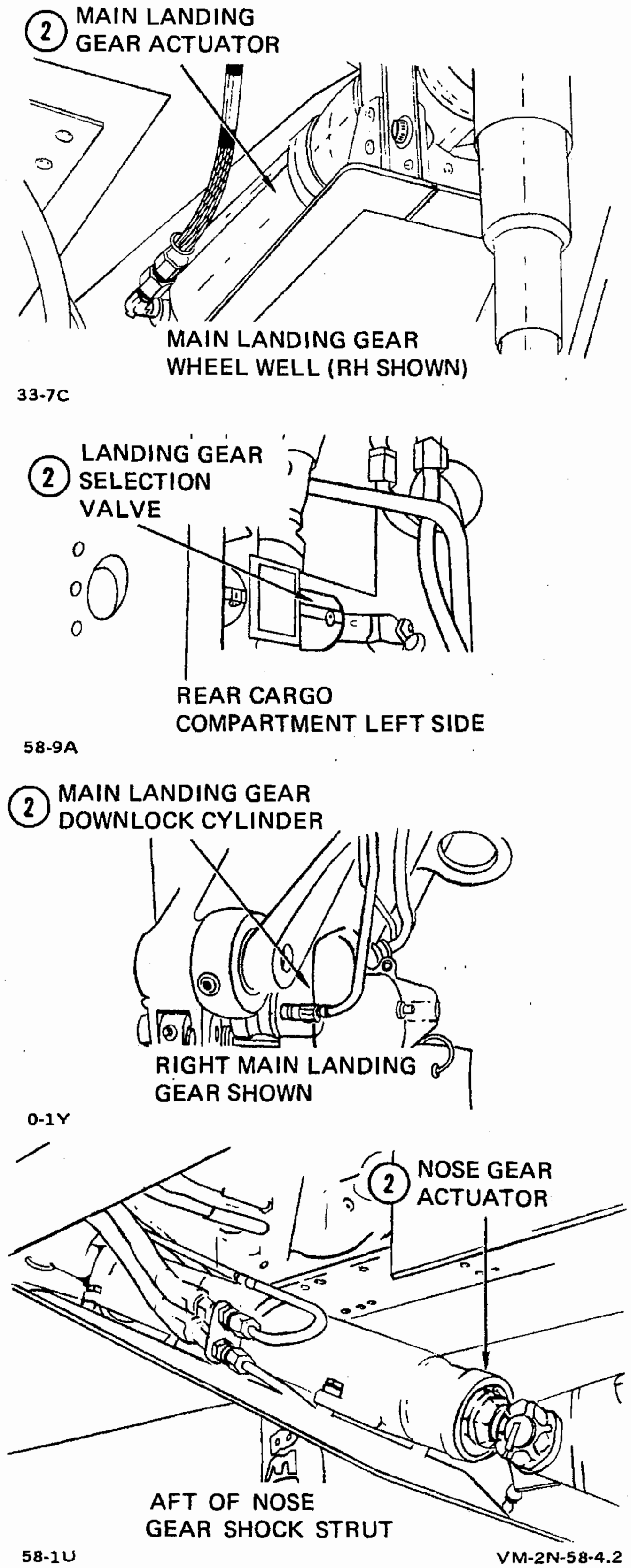
Cargo access door must be positioned to prevent damage during wing flap operation.

1. Cycle the flap system from full up to full down at least through 10 complete cycles. Ensure reservoir is full. Check for fluid leakage at flap selector valve and hydraulic motor fittings.



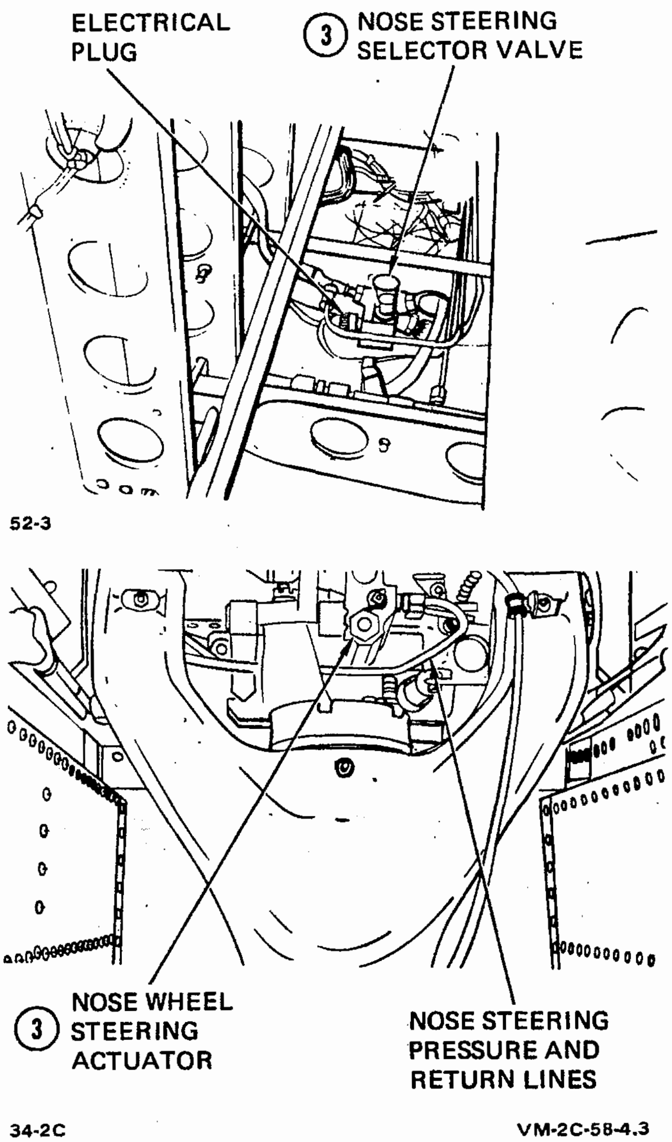
Step 1—Para. 4-10

2. Operate landing gear system through at least 10 complete cycles from full up to full down. Check for fluid leakage at selector valve in rear cargo bay and at nose and main landing actuators, and downlock cylinders at each main landing gear. Ensure reservoir is full.



Step 2—Para. 4-10

3. Cycle the nose wheel steering system from full right to full left a minimum of 10 times. Check for fluid leakage at selector valve in rear cargo bay under floor and at actuator.

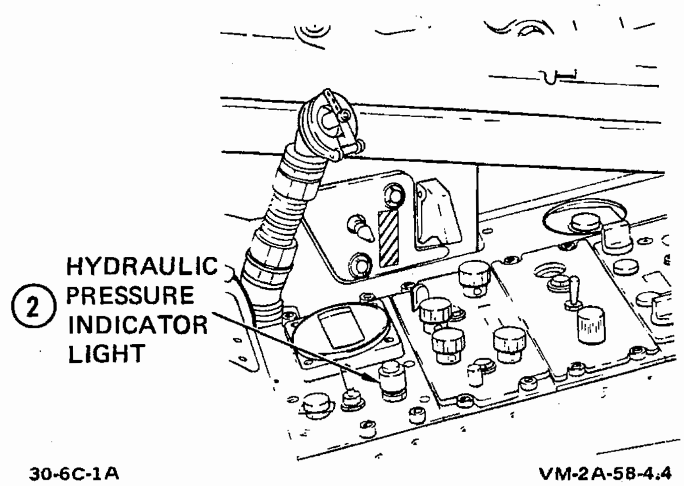


Step 3—Para. 4-10

4-11. CHECKOUT.

1. Check hydraulic reservoir to ensure that it is filled.

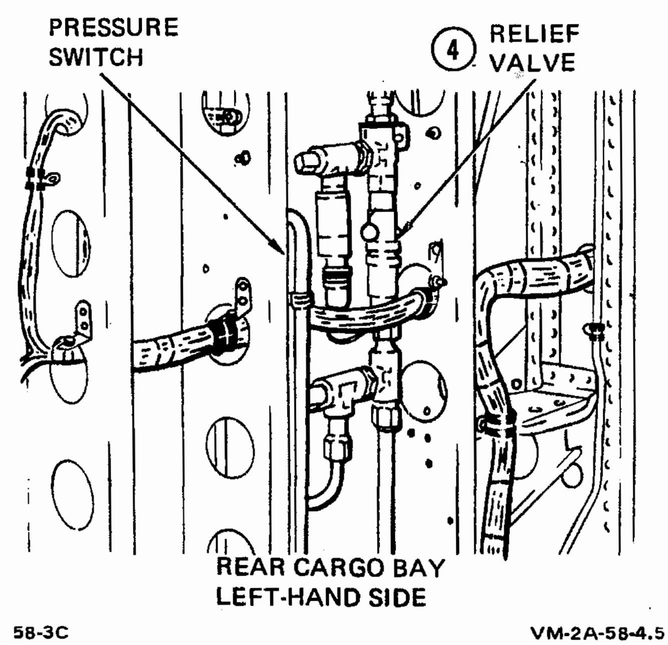
2. Check system pressure switch by pulling HYD PUMP PWR circuit breaker on miscellaneous circuit-breaker panel (fuselage station 160) and operate flaps until HYD PRESS light illuminates on pilot's left-hand console.



Step 2—Para. 4-11

3. Reset circuit breaker and operate flaps. Caution light should go out as pressure increases.

4. Install 0 to 2000-psi pressure gage in line below the relief valve in rear cargo bay.



Step 4—Para. 4-11

5. Operate nose wheel steering and check that pressure does not exceed 1630 (+270/-0) psi.

6. Disconnect pressure gage and connect piping.

7. Operate each system through its complete cycle of operation at least 10 times and check for fluid leakage and operational response.

8. Reinstall all access covers, disconnect electrical power, and remove jacks.

4-12. OPERATIONAL CHECK.

4-13. To perform an operational check of the hydraulic system, proceed as follows:

Tools and Equipment List

Mobile Power Unit	NC-5
Jack, Hydraulic Tripod, 10-ton	50J25178
Jack, Hydraulic Tripod	996

1. Fill reservoir in accordance with instructions in General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

2. Connect 28-volts dc external power source to aircraft.

3. Ensure that pump motor circuit breaker is engaged.

CAUTION

Operate hydraulic system only when pump reservoir package is in its stowed position. When reservoir package is lowered to vertical position, disengage HYD PUMP CONT circuit breaker. Motor pump operation should be limited as follows:

Three minutes rest after 5 minutes of operating nose wheel steering system.

Three minutes rest after three flap cycles of operation.

Three minutes rest after three landing gear cycles of operation.

4. Depress nose wheel STEER button on pilot's stick grip. The hydraulic pump should operate while button is depressed and stop when button is released.

5. With nose wheel centered, depress and hold nose wheel STEER button and ensure that hydraulic pressure warning light is not on.

6. Operate nose wheel steering for five cycles or 2 minutes.

7. Operate FLAPS handle on left console. Each time handle position is changed, the hydraulic pump should operate until the flaps have reached position selected. The pump should then stop.

8. Return flaps to normal.

9. Jack the aircraft in accordance with instructions in the General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

10. Operate landing gear handle and cycle landing gear twice.

WARNING

Continuous operation of the hydraulic pump will result in overheating of the hydraulic fluid, thus softening the reservoir acrylic sight gage causing loss of system fluid and possible hydraulic pump failure. To ensure that the pump shuts off following gear and/or flap retraction, the pilot should depress the nose wheel steering button and check the ammeter gage for a "jump" indicating that the pump did shut off. If the ammeter needle does not change when the nose wheel steering button is depressed and released, pull the hydraulic pump circuit breaker and check for trouble. The circuit breaker may be reset long enough to lower gear and flaps and then pulled again. In no case should the motor be allowed to run continuously.

Note

Check that hydraulic pump overboard drain leakage rate does not exceed two drops per minute. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for drain location.

11. Remove jacks and disconnect external electrical power source.

4-14. TROUBLESHOOTING HYDRAULIC POWER SYSTEM.

4-15. Troubleshooting procedure for the hydraulic power system is provided in table 4-1.

Materials List

Multimeter	AN/PSM-4C

4-16. HYDRAULIC SYSTEM CONTAMINATION CONTROL.

4-17. Hydraulic system contamination control consists of fluid sampling, fluid analysis, and decontamination procedures.

4-18. DESCRIPTION. The quality of performance of the aircraft hydraulic systems and components depends to a large degree on the contamination level of the aircraft hydraulic system fluid. The requirements and procedures contained in this section provides the minimum basic guidelines for aircraft hydraulic fluid sampling, fluid analysis, and system decontamination commensurate with the latest Navy requirement for controlling contamination in aircraft hydraulic systems. Hydraulic system fluid sampling and analysis is required at specified intervals and when excessive system contamination is suspected or metal generating type failure occurs. System decontamination is required when the system fluid analysis indicates that the system contamination is greater than the Navy Standard Class 5 contamination level, or when foreign fluid is visibly evident.

Note

Aviation Hydraulics Manual, NAVAIR 01-1A-17, provides general requirements for maintenance of Naval Aircraft Hydraulic Systems and related ground support equipment and takes precedence over other NAVAIR directives, engineering directives and maintenance instructions when a conflict exists.

WARNING

Trichlorotrifluoroethane is toxic and must be used in a well ventilated area. Avoid prolonged inhalation of fumes.

CAUTION

Chlorinated solvents such as trichloroethylene, O-T-634, trichloroethane, O-T-620; and trichlorotrifluoroethane (freon 113), MIL-C-81302, may be hydrolyzed in contact with free water and form highly corrosive acids. Free water is often found in hydraulic systems, therefore the use of chlorinated solvents shall be restricted to external surfaces of hydraulic systems.

4-19. HYDRAULIC GROUND SUPPORT EQUIPMENT (GSE). All hydraulic GSE (Hydraulic Test Stand or Ground Service Cart; Hydraulic Check/Fill Stand) used to service, fill, operate, test, and decontaminate aircraft hydraulic systems, subsystems, components, fluid lines, filter bowls, and filter elements shall be equipped with adequate three micron absolute filters and shall meet all applicable requirements of NAVAIR 01-1A-17.

4-20. QUALITY ASSURANCE. Quality assurance verifications are required at time of system fluid sampling, analysis, decontamination, and as required to assure integrity of the aircraft.

Table 4-1. Troubleshooting Hydraulic Power System

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: HYDRAULIC PUMP WILL NOT RUN.		
Hydraulic pump power circuit defective.	Check that circuit breaker CB34 and CB38 are engaged.	Engage circuit breakers.
	With electrical power applied, depress nose wheel steer button (switch S93) and check for 28 volts dc between test point CMA and CMB. If 28 volts dc is present, hydraulic motor pump is defective. If 28 volts is not present, relays K81 and K116 are defective.	Replace hydraulic motor pump or defective relays.
TROUBLE: SYSTEM WILL NOT BUILD UP PRESSURE.		
Insufficient hydraulic fluid.	Check reservoir fluid level. CAUTION If reservoir is empty, hydraulic pump may be damaged.	Fill and bleed hydraulic system. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).
Faulty hydraulic pump.	Check reservoir fluid level. If reservoir is full, disconnect the IN fitting at the filter on the hydraulic unit and insert a flow meter and pressure gage. Operate pump, noting pressure gage and flow meter for proper readings.	Replace faulty hydraulic pump.
Faulty relief valve.	Check relief valve.	Replace faulty relief valve.
TROUBLE: SYSTEM WILL NOT BUILD UP SUFFICIENT PRESSURE.		
Faulty relief valve.	Check relief valve.	Replace faulty relief valve.
TROUBLE: HYDRAULIC PRESSURE WARNING LIGHT DOES NOT OPERATE PROPERLY.		
Pressure switch faulty.	Check pressure switch.	Replace faulty switch. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).
TROUBLE: LOSS OF FLUID IN SYSTEM.		
Leakage of subsystem hydraulic components.	Check reservoir fluid level. If reservoir has enough fluid, cycle subsystem. Check for leakage at all units.	Repair or replace leaking unit.
TROUBLE: HYDRAULIC PUMP RUNS CONTINUOUSLY.		
Faulty hydraulic pump power relay.	With electrical power removed from aircraft, check for continuity between test points CMD and CME.	If continuity exists, replace hydraulic pump power relay.

4-21. FLUID SAMPLING.

Tools and Equipment List

Hydraulic Power Supply	S-610 (or equivalent)
Electrical Power Supply	NC-8A (or equivalent)
Filter Element	AN6235-3A
Packing	AN6230-4
Gasket	AN6244-4
Contamination Analysis Kit	57L414

1. Obtain a 4-ounce sample of hydraulic fluid from the reservoir drain plug on the hydraulic power unit. If at all possible, the sample should be obtained immediately after postflight engine shutdown in order to ensure uniform distribution of contaminants within the system. Should this not be practical, however, a sample may be taken after sequentially operating flaps a minimum of nine cycles while powered by an external electrical source. Allow required 3-minute pump rest period after every three flap cycles. Obtain samples as follows:

Note

Disengage the hydraulic pump power circuit breaker.

a. Lower the hydraulic unit to servicing position. Remove dirt and other visible contaminants from reservoir drain plug and adjacent area by wiping with a clean disposable cloth. Using the plastic wash bottle provided with contamination analysis kit (57L414), rinse the hydraulic reservoir drain plug and adjacent areas with clean, filtered freon (MIL-C-81302) or trichloroethane (MIL-T-81533) solvent until all visible contaminants have been removed.

b. Remove reservoir fill cap and loosen the hydraulic reservoir drain plug a sufficient amount to permit a small stream of hydraulic fluid to flow. Allow approximately 4 ounces of fluid to flow directly into a waste container. With fluid still flowing, permit 4 ounces of hydraulic fluid to flow directly into a known clean 4-ounce polyethylene sample bottle as provided with kit (57L414). Remove sample bottle prior to tightening drain plug. Label sample bottle to indicate source of the sample. Install reservoir fill cap, service reservoir, and return hydraulic unit to horizontal position.

Note

Use of sample bottles which have not been properly cleaned in accordance with instructions provided with kit (57L414), failure to adequately clean the external surfaces of the hydraulic sampling point and adjacent areas, or failure to collect the fluid sample directly into the sample bottle can cause erroneous indication of excessive contamination and needless rejection of the hydraulic system under test.

c. Analyze reservoir fluid sample for evidence of foreign fluid and particulate contamination in accordance with the requirements of paragraph 4-22.

4-22. FLUID ANALYSIS.

1. A reservoir sample shall be analyzed for evidence of foreign fluid contamination and for particulate contamination. The analysis shall be accomplished as follows:

a. Fluid sample shall be allowed to stand undisturbed for 15 minutes minimum.

b. Visually examine fluid sample for visible evidence of water, gelatinous-type matter, unblended fluids, or other indications of foreign fluid contamination.

c. If the fluid sample does not exhibit visible evidence of foreign fluid contamination, it shall be analyzed for particulate contamination utilizing the equipment and instructions contained in the contamination analysis kit P/N (97057) 57L414. Comparison of the resultant patches with the standard patch test guides will enable a determination of the particulate contamination class level.

Note

When automatic particle counting equipment is available, it may be used in lieu of the patch test method provided by kit 576414.

d. Hydraulic systems which contain particulate contamination in excess of a Class 5 contamination level but do not contain foreign fluid or other abnormal contaminants, as evidenced by fluid analysis, shall be decontaminated by recirculation cleaning in accordance with paragraph 4-26.

e. Hydraulic systems which contain water, gelatinous-type matter, unblended fluids, or indications of foreign fluid or other abnormal contamination shall be decontaminated by flushing or purging in accordance with paragraph 4-27 or 4-28.

4-23. DECONTAMINATION PROCEDURES.

4-24. Decontamination consists of three basic methods: recirculation cleaning, flushing, and purging, as defined in NAVAIR 01-1A-17. The methods consist of specific requirements and related sequential procedures. Each method is best suited for removal of a particular type contamination. Recirculation cleaning is applicable to removal of particulate contaminants. Flushing is applicable to removal of abnormal contaminants such as water, rust, gelatinous-type matter, cleaning fluids and other foreign fluids. Purging is applicable to removal of gross foreign fluids and gross gelatinous-type matter which cannot be effectively removed by flushing.

4-25. PREPARATION FOR DECONTAMINATION. Prepare for decontamination as follows:

1. Jack aircraft. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

2. Drain the hydraulic system reservoir of all fluid. If the reservoir sample taken in paragraph 4-16 showed extreme contamination, the reservoir should be additionally flushed by half-filling with clean hydraulic fluid, agitating, and once again draining. Agitation may be accomplished by pivoting the hydraulic power unit between the service and operating positions.

Note

This method of cleaning the reservoir is necessary since the reservoir is by-passed during cleaning operations with GSE.

4-26. RECIRCULATION CLEANING. This method of decontamination is intended to be used for removal of particulate contamination and is accomplished by recirculating as much of the affected hydraulic system fluid as possible through the system filter elements and the external connected hydraulic GSE three micron absolute filter element. The degree of recirculation required is dependent upon the quantity of particulate contaminants contained in the system.

1. Recirculation-clean the aircraft hydraulic circuits as follows:

a. Disconnect the pressure and return line flex hoses at the hydraulic power unit. Using adapters and quick-disconnect couplings, as required, connect the aircraft hoses to an appropriate hydraulic test stand or cart.

b. Adjust the hydraulic support equipment to provide 1500 psig operating pressure and a flow of 4 gallons per minute. Activate all hydraulically operated systems a minimum of 15 cycles each so as to pass as much fluid as possible through the 3-micron filter on the hydraulic support equipment.

c. Reduce support equipment pressure to zero. Power source may be turned off, if desired, but leave hoses connected.

2. Resample aircraft hydraulic fluid as follows:

a. Position the support equipment and aircraft hydraulic system return hoses in such a manner that the quick disconnect coupling is in a low position that will provide a drain point for direct fluid sampling.

b. Thoroughly clean the return hose coupling. Refer to paragraph 4-21, step 1a.

c. Loosen the return hose coupling sufficiently to permit a small stream of fluid to flow, directly into a known clean 4-ounce polyethylene sample bottle as provided with kit (57L414). Remove the sample bottle, tighten coupling, and label sample bottle to indicate source of sample.

Note

It may be necessary to pressurize the aircraft hydraulic system to provide adequate fluid flow.

3. Visually check and analyze the fluid samples obtained. Refer to paragraph 4-22.

4. Repeat the decontamination and resampling process if the sample indicates contamination is still above the acceptable limit of SAE Class 5. Replace components as required.

5. When fluid samples from the affected system are determined to be acceptable, the decontamination process may be terminated.

6. Disconnect hydraulic support equipment and reconnect aircraft pressure and return line hoses to the hydraulic power unit. Service and bleed the aircraft hydraulic system (paragraph 4-8). Ensure that fill equipment is equipped with 3-micron absolute filtration.

7. Bleed aircraft brakes. Refer to paragraph 5-370. Ensure a minimum of 1/2 pint of fluid is bled from each brake, and that the hydraulic system reservoir level is maintained during bleeding operation to prevent air induction in the brake system.

8. Perform operational check of systems (paragraph 4-12).

9. Remove jacks from aircraft.

4-27. FLUSHING. This method of decontamination is intended to be used for removal of water, gelatinous-type matter and other type foreign fluid contamination. This method may also be used for removal of gross particulate contamination which can not be effectively removed by the recirculation cleaning method. Flushing is accomplished by draining the reservoir, reservicing the reservoir with clean hydraulic fluid MIL-H-5606 and flushing the contaminated fluid from the system, utilizing externally connected hydraulic GSE. Recirculation cleaning is required after flushing. When the flushing is being accomplished to remove particulate contamination, perform the flushing operation as follows:

1. Disconnect the pressure and return line flex hoses at the hydraulic power unit. Using adapters and quick-disconnect couplings, as required, connect aircraft pressure hose to appropriate hydraulic test stand or cart. Return line from hydraulic power unit should be routed to a waste receptacle with a minimum capacity of 6.5 gallons.

2. Adjust the hydraulic support equipment to provide 1500 psig operating pressure and a flow of 4 gallons per minute.

CAUTION

Depletion of the GSE reservoir fluid may result in cavitation or failure of the test stand or cart pump.

3. Monitor the GSE reservoir level continuously during the flushing operation. Replenish the reservoir using approved fluid dispensing equipment before the level decreases to the half-full point.

4. Actuate all hydraulically operated systems until the amount of fluid collected from the aircraft return line is equivalent to approximately three times the fluid capacity of the system. Fluid capacity of the system is 2.1 gallons including the reservoir.

5. Resample aircraft hydraulic fluid.

6. Visually check and analyze fluid samples. See paragraph 4-22.

7. Repeat the flushing and resampling process if the sample indicates contamination is still above

the acceptable limit of SAE Class 5. Replace components as required.

8. When fluid samples from the affected system are determined to be acceptable, the flushing process may be terminated.

9. Disconnect hydraulic support equipment and reconnect aircraft pressure and return line hoses to the hydraulic power unit. Service and bleed the aircraft hydraulic system (paragraph 4-7). Ensure that fill equipment is equipped with three micron absolute filtration.

10. Bleed aircraft brakes. See paragraph 6-11. Ensure a minimum of 1/2 pint of fluid is bled from each brake, and that the hydraulic system reservoir level is maintained during bleeding operation to prevent air induction into the brake system.

11. Perform operational check of systems. See paragraph 4-12.

12. Remove jacks from aircraft.

4-28. PURGING. This method of decontamination is intended to be used only when foreign fluid introduced into the aircraft hydraulic system has resulted in gross gelatinous-type contamination which cannot be effectively removed by the flushing method. Purging is accomplished by draining the affected system and applicable reservoir to the maximum extend practical and removed fluid discarded. A suitable cleaning agent is then introduced into the system and circulated as effectively as possible so as to dislodge and facilitate removal of the contaminants. The cleaning agent is then removed from the affected system by draining. The operation is completed by flushing the affected system with clean hydraulic fluid, MIL-H-5606, followed by recirculation cleaning.

Note

Certain types of foreign fluid contamination can cause deterioration of O-rings and other packings, necessitating removal and overhaul of numerous components in addition to purging the affected system.

1. Due to the necessity for special instructions, special cleaning materials, and special equipment suitable for utilizing the special cleaning materials, purging shall be accomplished only at the depot level when authorized by the cognizant engineering activity.

4-29. HYDRAULIC EQUIPMENT POWER UNIT REMOVAL AND INSTALLATION.

4-30. To remove and install the hydraulic equipment power unit, proceed as follows:

Note

Most of the units of the hydraulic system are located on a removable rack in the aft upper cargo compartment. This rack may be removed for ease of maintenance and component removal and installation.

When the hydraulic equipment power unit is being lowered or raised for removal and installation or servicing, it will be necessary to apply a small amount of force toward the pivot hooks and move the support from side to side a small amount.

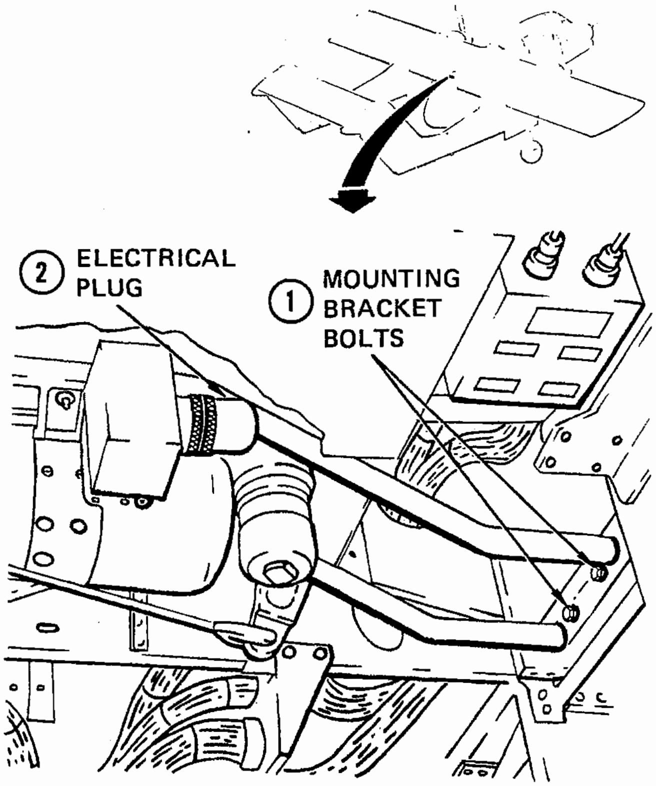
4-31. REMOVING HYDRAULIC EQUIPMENT POWER UNIT.

CAUTION

Before removing hydraulic power unit or moving it to the vertical position, ensure that the HYD PUMP PWR circuit breaker is disengaged. The circuit breaker is located behind the observer's seat on the dc circuit-breaker panel. This will prevent inadvertent operation of hydraulic motor-pump during removal procedures.

1. Remove the two mounting-bracket bolts on right side of upper cargo compartment and swing assembly to vertical position.

2. Disconnect electrical plug from hydraulic motor-pump receptacle.



Steps 1 and 2—Para. 4-31

3. Using adequate container, remove drain plug and drain all hydraulic fluid.

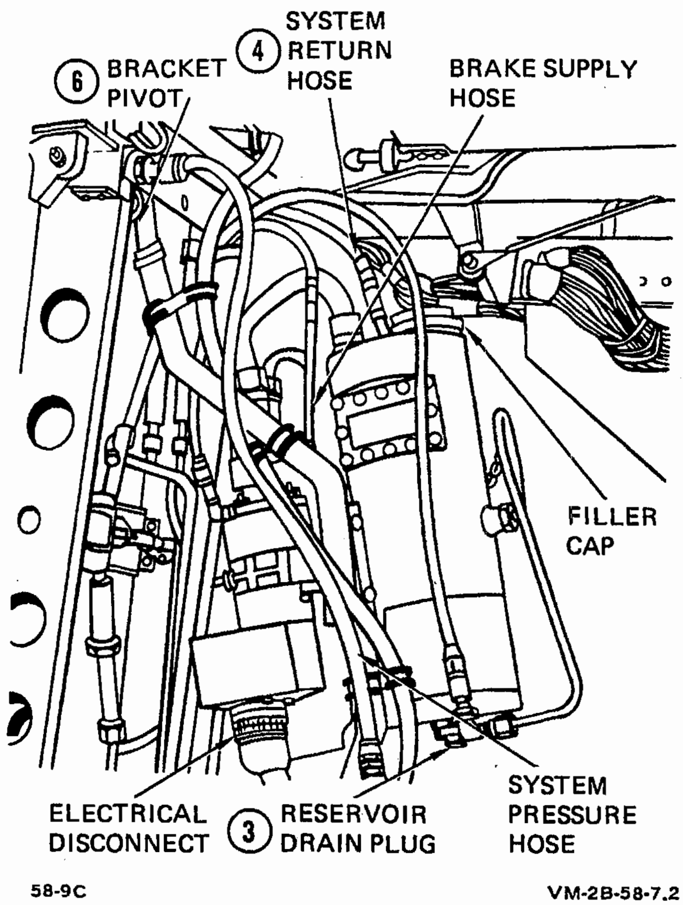
4. Remove system return, system pressure, system drain, system vent, and brake supply hoses at bulkhead fitting above bracket pivot.

5. Plug all open fittings and hoses against leakage.

6. Lift up bracket and components and move off of mounting brackets on left side of cargo compartment.

Note

Use care so that power unit and components are not damaged.



Steps 3, 4, and 6—Para. 4-31

4-32. INSTALLING HYDRAULIC EQUIPMENT POWER UNIT.

Materials List

Lockwire (0.041-inch diameter steel)	MS20995F41
Fluid, Hydraulic	MIL-H-5606

1. Lift hydraulic equipment power unit up vertically and hook bracket pivots over supporting structure.

2. Remove caps and plugs and install system pressure, return, drain, vent, and brake supply hoses.

3. Connect electrical plug at hydraulic motor-pump receptacle and safety with 0.032-inch diameter steel lockwire (MS20995F32).

4. Install drain plug.

5. Fill the hydraulic reservoir with hydraulic fluid (MIL-H-5606). Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

6. Swing unit up to horizontal position and install two bolts through mounting bracket.

7. Engage HYD PUMP PWR circuit breaker on d-c circuit-breaker panel.

8. Perform servicing of hydraulic system (paragraph 4-7).

9. Check that hydraulic reservoir is full.

4-33. HYDRAULIC RESERVOIR ASSEMBLY REMOVAL AND INSTALLATION.

4-34. To remove and install the hydraulic reservoir assembly, proceed as follows:

4-35. REMOVING HYDRAULIC RESERVOIR ASSEMBLY.

1. With hydraulic equipment power unit removed, remove four retaining bolts from reservoir.

Note

Properly support hydraulic motor-pump since retaining bolts are common to reservoir and pump.

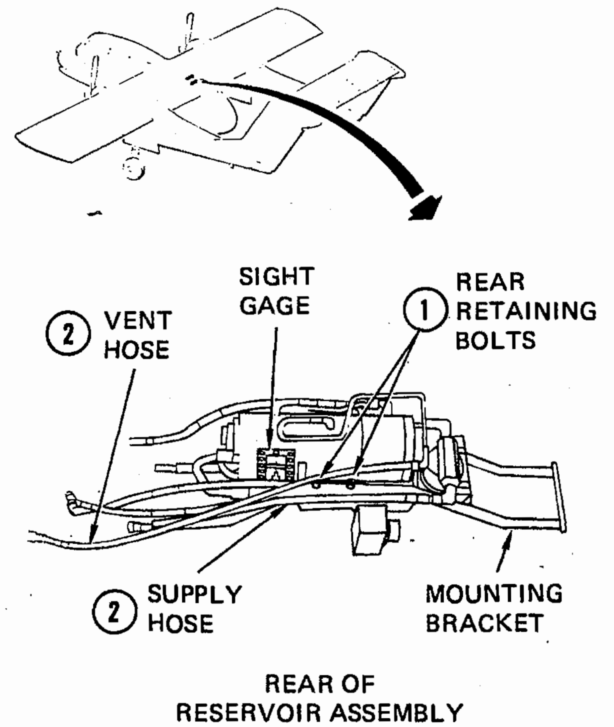
2. Disconnect the brake supply, return, and vent hoses and pump suction line.

3. Cap all fittings.

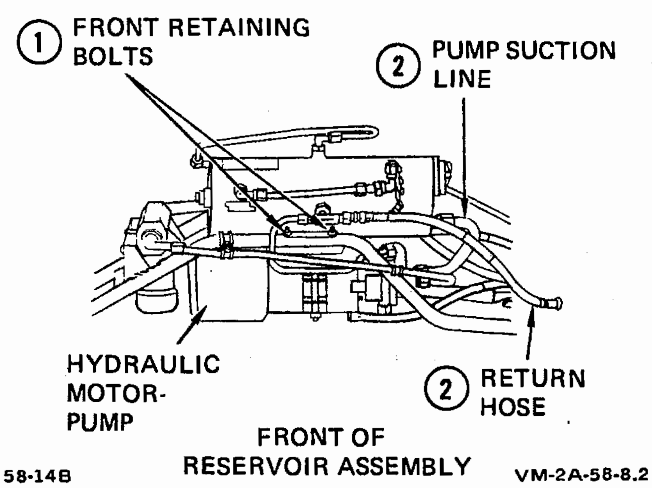
4. Remove reservoir from mounting bracket.

Note

Use care in handling reservoir so that sight gage will not be damaged.



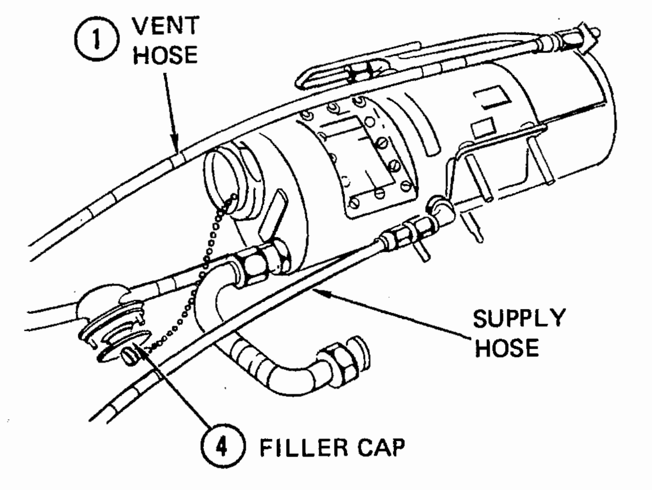
Steps 1 and 2—Para. 4-35

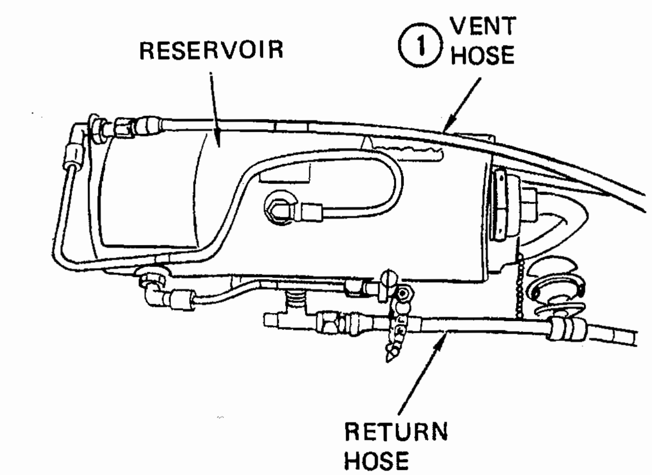


Steps 1 and 2—Para. 4-35

4-36. INSTALLING HYDRAULIC RESERVOIR ASSEMBLY.

1. Remove caps from fittings and install hoses.





Steps 1 and 4—Para. 4-36

2. Position reservoir on hydraulic equipment power unit bracket and install four mounting bolts through the mounting bracket and the motor-pump.

3. Attach pump suction line from reservoir assembly to pump inlet.

4. Check that filler cap adapter is properly safetied with 0.041-inch diameter steel (MS20995F41) lockwire.

5. Install hydraulic equipment power unit in aircraft in accordance with paragraph 4-29.

Note

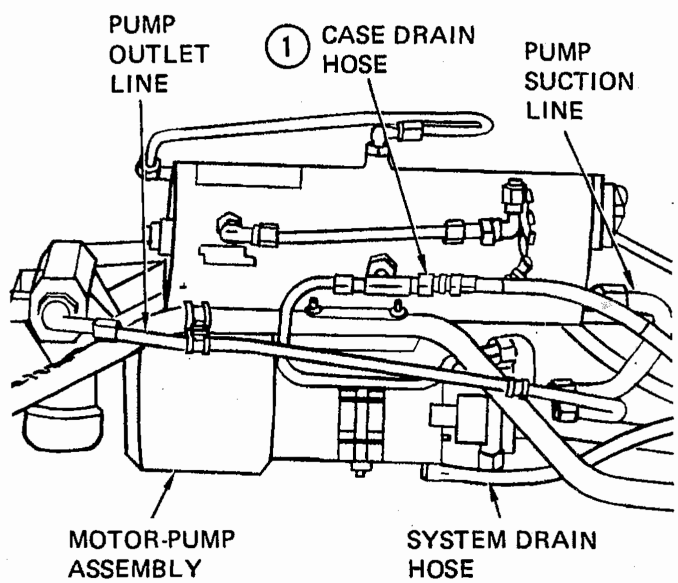
Use care in handling the reservoir to prevent breakage of the sight gage.

4-37. HYDRAULIC MOTOR-PUMP ASSEMBLY REMOVAL AND INSTALLATION.

4-38. To remove and install the hydraulic motor-pump assembly, proceed as follows:

4-39. REMOVING HYDRAULIC MOTOR PUMP ASSEMBLY.

1. With hydraulic equipment power unit removed, disconnect the case drain hose, the pump suction line, pump outlet line, and the system drain hose. Cap all fittings and lines against leakage.

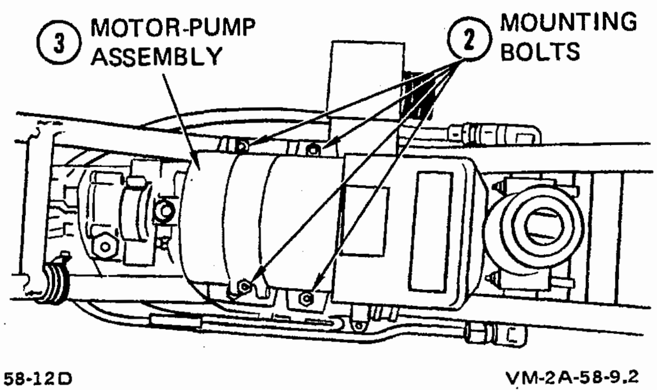


Step 1—Para. 4-39

2. Remove four mounting bolts.

Note

Provide support for hydraulic reservoir assembly since the mounting bolts are common to both components.



Steps 2 and 3—Para. 4-39

3. Remove motor-pump assembly from support.

4. Remove four fittings, packings, and backup rings.

4-40. INSTALLING HYDRAULIC MOTOR PUMP ASSEMBLY.

Materials List

Backup Ring	MS9058-04 (two required)
Packing	MS28778-4 (three required)
Packing	MS28778-6
Packing	MS28778-8

1. Install new fittings, packings, and backup rings.

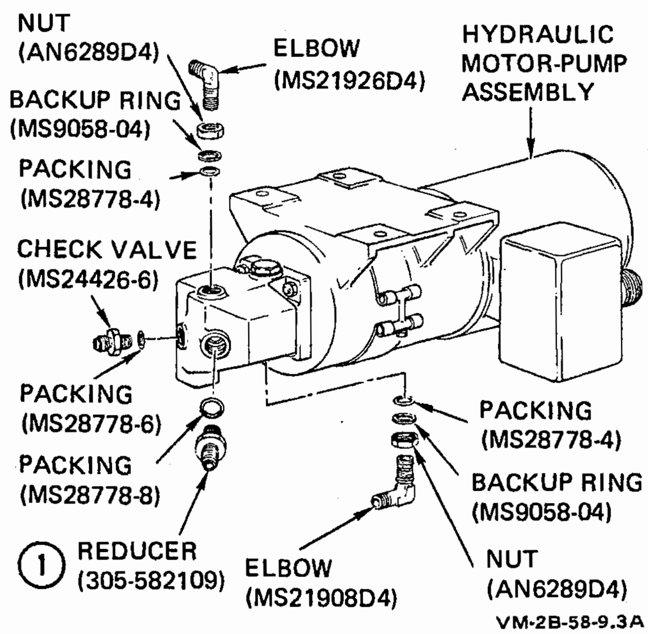
2. Install motor-pump assembly on support using four bolts. Torque bolts to 30 inch-pounds.

3. Check that pump outlet line is 0.375-inch diameter, 0.035-inch wall thickness corrosion-resistant steel tubing. If line is aluminum, corrosion-resistant steel line must be constructed in accordance with paragraph 4-59, using aluminum line as a template.

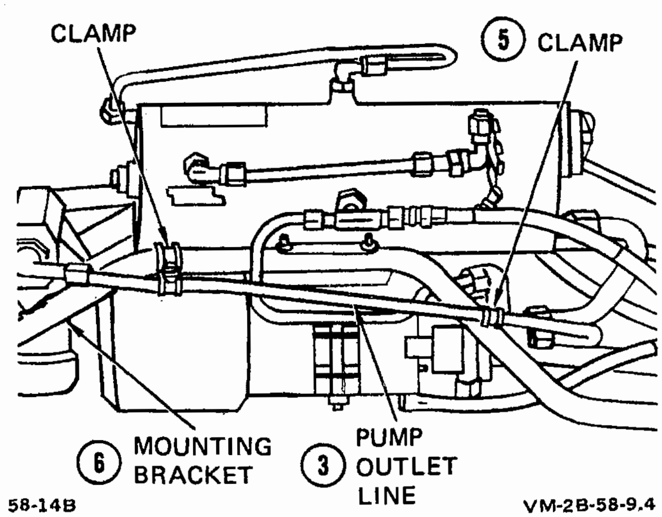
4. Remove all caps and plugs and connect the case drain hose, pump suction line, pump outlet line, and system drain hose to their respective fittings.

Note

If pump outlet line will not fit properly, loosen the four attach bolts, reposition pump so that lines will fit and torque bolts to 30 inch-pounds. It may be necessary to reposition pump by loosening band clamp and moving motor-pump assembly relative to mounting foot. Retorque band clamp to 40-45 inch-pounds.



Step 1—Para. 4-40



Steps 3, 5, and 6—Para. 4-40

5. Clamp pump outlet line to mounting bracket at pump end of line, using a 13/16-inch clamp (MS21919DG-13) on mounting bracket, a 3/8-inch clamp (MS21919DG-6) on pump suction line, and a screw (MS35207-265), nut (MS21042L3), and two washers (AN960D10L or equivalent), in securing the two clamps.

6. Using identical clamps and attaching hardware and a 1/4-inch spacer (NAS43DD3-16) between the two clamps, clamp pump outlet line to mounting bracket at filter end of line.

7. Install hydraulic equipment power unit in aircraft. Refer to paragraph 4-29.

8. Connect electrical plug to pump receptacle.

4-41. HYDRAULIC PRESSURE FILTER ASSEMBLY AND ELEMENT REMOVAL AND INSTALLATION.

4-42. To remove and install the hydraulic pressure filter assembly and element, proceed as follows:

4-43. REMOVING FILTER ELEMENT.

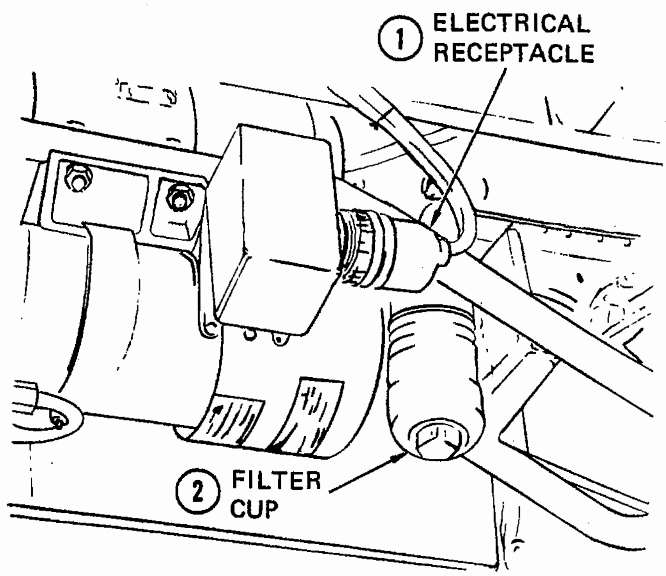
1. Disconnect electrical plug from hydraulic motor-pump to ensure pump is not started while maintenance is being performed.

2. Remove filter cup. Catch trapped fluid in appropriate container.

3. Remove backup rings and O-ring from filter body.

4. Discard used filter element.

5. Wash filter cup in clean fluid (MIL-H-5606).

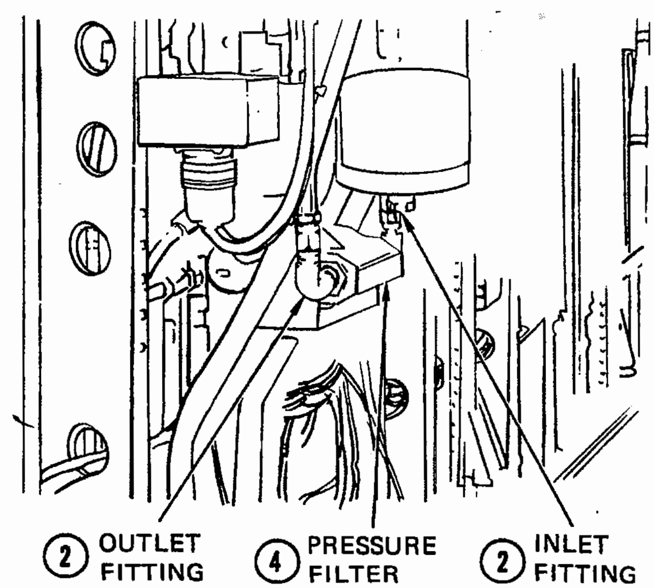


Steps 1 and 2—Para. 4-43

4-44. REMOVING PRESSURE FILTER ASSEMBLY.

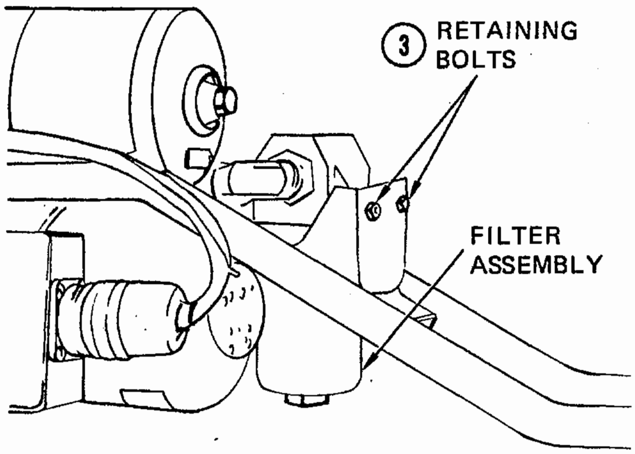
1. Swing hydraulic equipment unit to vertical position and disconnect electrical plug from hydraulic motor pump.

2. Disconnect inlet and outlet lines at elbow fittings and cap against leakage.



Steps 2 and 4—Para. 4-44

3. Remove two retaining bolts from filter assembly and remove filter assembly.



58-12F VM-2A-58-10.3

Step 3—Para. 4-44

4. Remove fittings and filter element.

4-45. INSTALLING FILTER ELEMENT.

Materials List

Element	AN6235-3A
Lockwire (0.032-inch diameter steel)	MS20995F32
Backup Ring	AN6244-4
O-ring	AN6230-4

1. Install new filter (AN6235-3A) element in clean cup.

2. Install backup ring (AN6244-4), O-ring (AN6230-4) and backup ring (AN6244-4) in groove of filter body.

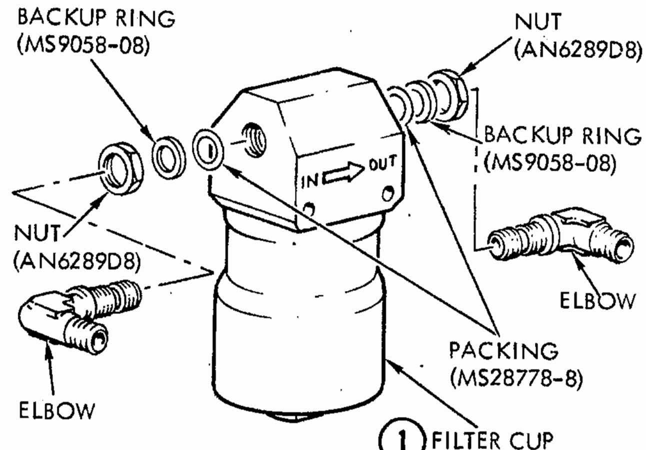
3. Install cup hand-tight and safety with 0.032-inch diameter steel lockwire (MS20995F32).

4-46. INSTALLING PRESSURE FILTER ASSEMBLY.

Materials List

Backup Ring	MS9058-08 (two required)
Packing	MS28778-8
Fluid, Hydraulic	MIL-H-5606

1. With new filter element installed, install hydraulic fittings in filter ports, using new packings and backup rings.



VM-2A-58-10.4

Step 1—Para. 4-46

2. Install filter on hydraulic equipment power unit, using two retaining bolts.

3. Remove plugs and connect inlet and outlet lines to respective hoses.

Note

An arrow on the side of the filter indicates the direction of flow through the filter.

4. Reconnect electrical plug to hydraulic motor-pump assembly.

5. After installation, perform servicing of the hydraulic system (paragraph 4-7).

4-47. RELIEF VALVE AND PRESSURE SWITCH ASSEMBLY REMOVAL AND INSTALLATION.

4-48. To remove and install the relief valve and pressure switch assembly, proceed as follows:

4-49. REMOVING RELIEF VALVE AND PRESSURE SWITCH ASSEMBLY.

CAUTION

Disconnect electrical plug on motor-pump assembly to prevent inadvertent operation during removal of components.

Note

The relief valve or pressure switch may be removed individually by disconnecting them at the junction of the pressure switch and the relief valve tee fittings.

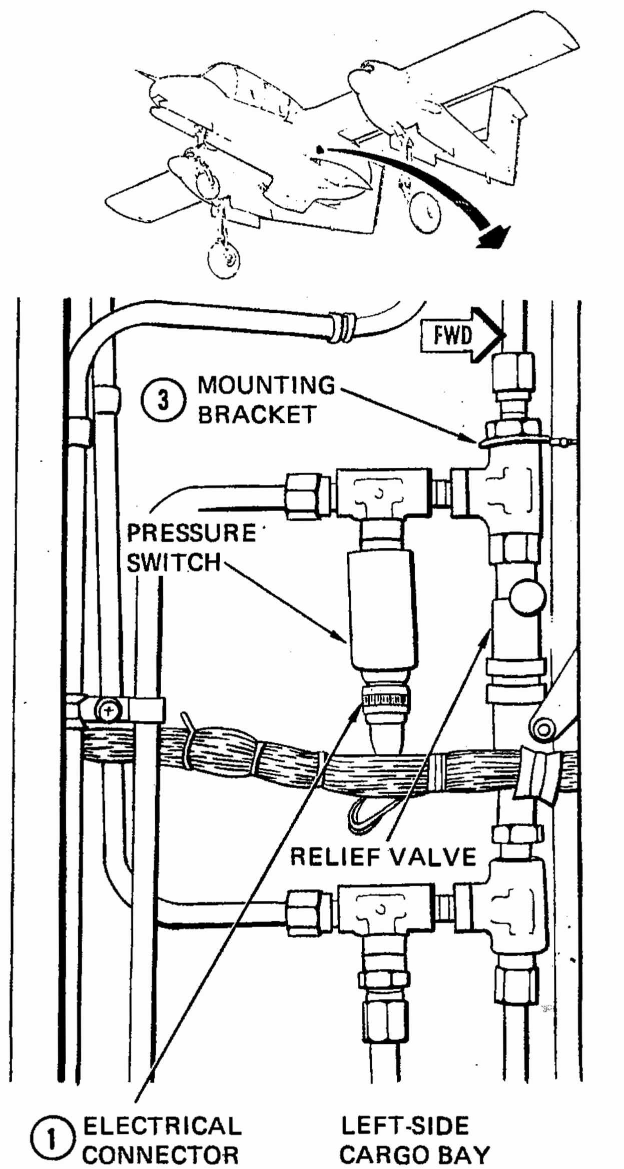
Remove the rear left-hand side panel in cargo compartment to gain access to components.

1. Disconnect the electrical connector from the pressure switch just aft of fuselage station 224.8 on the left side of the cargo compartment.

2. Remove the five hydraulic lines from the valve and switch; cap to prevent leakage.

3. Remove nut from mounting bracket and remove relief valve and pressure switch assembly from aircraft.

4. Remove pressure switch, tee fittings, and check valve from relief valve.

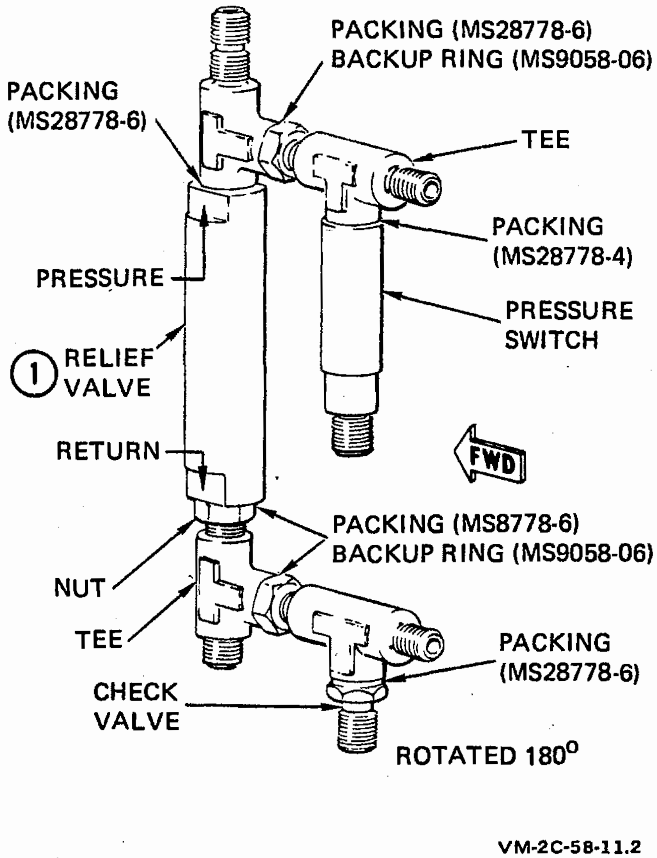


Steps 1 and 3—Para. 4-49

4-50. INSTALLING RELIEF VALVE AND PRESSURE SWITCH ASSEMBLY.

Materials List

Backup Ring	MS9058-06 (three required)
Packing	MS28778-6 (five required)
Packing	MS28778-4
Lockwire (0.041-inch diameter steel)	MS20995F41



Step 1—Para. 4-50

1. Install pressure switch, tees, and check valve on the relief valve with appropriate packings and backup rings.

2. Install assembly through the bracket mounted on the aft side of the bulkhead at fuselage station 224.8 on the left side and torque nut with pressure switch hydraulic line and fitting aligned.

3. Remove the caps and install hydraulic lines on pressure switch and relief valve.

4. Install electrical connector and safety with 0.041-inch diameter steel lockwire (MS20995F41).

5. Reconnect plug to motor-pump.

6. After installation, perform servicing of the hydraulic system (paragraph 4-7).

4-51. ACTUATORS AND SELECTOR VALVES REMOVAL AND INSTALLATION.

4-52. Maintenance procedures for the actuators and selector valves are included in the applicable sections applying to those subsystems in this volume.

SECTION III
INTERMEDIATE MAINTENANCE

4-53. GENERAL.

4-54. Intermediate maintenance pertaining to the hydraulic utility system is contained in this section. Materials, special tools, and specifications for performing these maintenance procedures are listed as necessary. Repair of components at this level of maintenance generally includes the installation of items contained in provisioned repair kits, along with standard supply items.

4-55. HANDLING HYDRAULIC SYSTEM COMPONENTS.

4-56. Cleanliness is extremely important when handling hydraulic components since the hydraulic system operates on close tolerances. When hydraulic lines or units are removed, clean caps and plugs should be installed as soon as possible to prevent dirt from entering the openings. When handling and installing O-rings and gaskets, the port should be kept free of dirt and foreign matter and should not be subjected to extreme weather conditions. The following general rules should be observed when replacing O-rings and gaskets.

1. Prepare a clean working area and provide all necessary tools and equipment.

2. Take necessary precautions for type of unit involved, and disassembly unit sufficiently to replace O-ring or gasket.

3. Check Illustrated Parts Breakdown (NAVAIR 01-60GCB-4) for correct sizes and part numbers.

4. Closely examine new O-ring for any defects such as creases, nicks, cuts, etc.

5. Immerse O-ring in same type of hydraulic fluid as used in the system and install the O-ring while it is wet.

6. Avoid stretching the O-ring or gasket any more than is necessary.

CAUTION

Do not use any sharp tools when removing or installing O-rings or gaskets.

7. After O-ring is installed, work out any twist existing on the O-ring.

4-57. FABRICATION OF HYDRAULIC SYSTEM FLEX HOSE ASSEMBLIES.

4-58. Table 4-2 provides all basic information for the fabrication of flex hose assemblies used throughout the hydraulic systems. Refer to Aircraft Structural Hardware (NAVAIR 01-1A-8) for flex hose fabrication and test information and refer to Illustrated Parts Breakdown (NAVAIR 01-60GCB-4) for location and identification of hose by basic part and dash number.

4-59. FABRICATION OF HYDRAULIC SYSTEM RIGID-TUBE LINE ASSEMBLIES.

4-60. All hydraulic system line assemblies made from rigid tubing material are listed in table 4-3. This table provides the necessary specific information to make replacement parts. For fabrication methods and additional information relative to manufacture and identification of line assemblies, refer to Aircraft Structural Hardware (NAVAIR 01-1A-8). For location of tube assemblies, refer to Illustrated Parts Breakdown (NAVAIR 01-60GCB-4). Finish all lines with two coats of zinc-chromate primer MIL-P-8585 or TT-P-1757.

Table 4-2. Material Requirements - Hydraulic Hose Assembly

HOSE NOMENCLATURE	ASSEMBLY DASH NO.	TUBE MATERIAL	MATERIAL SPEC	HOSE SIZE	HOSE ASSEMBLY (INCHES)	TYPE OF FITTINGS NOMENCLATURE	TYPE OF FITTINGS NUMBER
HYDRAULIC SYSTEM HOSE ASSEMBLY (305-588001)							
Brake Supply	-3	Tetrafluoro-ethylene	MIL-H-27267	1/4	15-7/8	Flareless straight adapter (two)	F66840-4
Brake Pressure	-7	Tetrafluoro-ethylene	MIL-H-27267	1/4	12.0	Flareless straight adapter (two)	F66840-4
Brake Pressure	-9	Tetrafluoro-ethylene	MIL-H-27267	1/4	18-3/4	Flareless straight adapter (two)	F66840-4
Landing Gear Down Unlock	-13 *	Tetrafluoro-ethylene	MIL-H-27267	1/4	30.0	Flareless straight adapter (two)	F66840-4
Main Landing Up	-15 **	Tetrafluoro-ethylene	MIL-H-27267	1/4	26-3/4	Flareless straight adapter (two)	F66840-4
Nose Gear Down	-21 ***	Tetrafluoro-ethylene	MIL-H-27267	1/4	14-3/4	Flareless straight adapter (two)	F66840-4
Nose Gear Steer Pressure	-25	Tetrafluoro-ethylene	MIL-H-27267	1/4	19-1/4	Flareless straight adapter (two)	F66840-4
Drain and Vent	-27	Tetrafluoro-ethylene	MIL-H-27267	1/4	17-1/4	Flareless straight adapter (two)	F66840-4
Utility System Pressure	-29	Tetrafluoro-ethylene	MIL-H-27267	3/8	23-1/2	Flareless straight adapter (two)	F66840-6
Utility System Return	-31	Tetrafluoro-ethylene	MIL-H-27267	3/8	15-3/8	Flareless straight adapter (two)	F66840-6
Utility System Vent	-33	Tetrafluoro-ethylene	MIL-H-27267	1/4	28.0	Flareless straight adapter (two)	F66840-4
Brake Supply	-35	Tetrafluoro-ethylene	MIL-H-27267	1/4	17-5/8	45-degree hose elbow and flareless straight adapter	F66555-4 F66840-4
Brake Pressure	-37 †	Tetrafluoro-ethylene	MIL-H-27267	1/4	28-5/8	Hose adapter and 45-degree hose elbow	F66826-4 F66555-4
Main Landing Down	-39 ‡	Tetrafluoro-ethylene	MIL-H-27267	1/4	19-1/4	Hose adapter	F66826-4
Nose Gear Up	-41 ***	Tetrafluoro-ethylene	MIL-H-27267	1/4	14-1/2	Hose adapter	F66826-4
Nose Gear Steer Return	-43	Tetrafluoro-ethylene	MIL-H-27267	1/4	19.0	Hose adapter	F66826-4

NOTES:

* Install HD591-0001-0926 heat shrinking flexible tubing after assembly
** Install HD591-0001-0923 heat shrinking flexible tubing after assembly
*** Install HD591-0001-0911 heat shrinking flexible tubing after assembly
† Install HD591-0001-0924 heat shrinking flexible tubing after assembly
‡ Install HD591-0001-0915 heat shrinking flexible tubing after assembly

Table 4-3. Fabrication of Hydraulic System Tube Assemblies

LINE NOMENCLATURE	ASSEMBLY PART NO.	TUBE MATERIAL	MATERIAL SPEC	TUBE DIA (INCHES)	GAGE (INCHES)	CUT LENGTH (INCHES)	TYPE OF END	TYPE OF FITTING
HYDRAULIC EQUIPMENT POWER UNIT								
Hydraulic Vent Reservoir	305-588501-7	Al Alloy 6061-T6	MIL-T-7081	.250	.035	22-9/16	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Hydraulic Pump to Reservoir	305-588502-3	Al Alloy 5052-0	WW-T-787	.625	.049	8.0	Flareless	MS21921-D10 (nut) MS21922-4 (sleeve)
Hydraulic Pressure Pump to Filter	305-588503-5	Corrosion-resistant Steel	MIL-T-6485	.375	.035	18-9/16	Flareless	MS21921-6J (nut) MS21922-6 (sleeve)
Hydraulic Case Drain Return Pump to Reservoir	305-588504-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	12-3/8	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
BRAKE SYSTEM								
L. H. Brake Pressure, Union in Upper Deck to Nacelle Hose Bracket	305-588301-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	12-5/16	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
	305-588301-7	Al Alloy 6061-T6	MIL-T-7081	.250	.035	24-3/4	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
R. H. Brake Pressure. Union in Upper Deck to Nacelle Hose Bracket	305-588302-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	22-1/2	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
	305-588302-7	Al Alloy 6061-T6	MIL-T-7081	.250	.035	24-9/16	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Hydraulic Brake Supply Hose Bracket to Union	305-588303-5	Al Alloy 6061-T6	MIL-T-7081	.250	.035	54.0	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Brake Supply, Union F. S. 226.0 to Union, F. S. 143.0	305-588304-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	87-5/8	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Brake Supply, Union F. S. 143 to Tee, Union F. S. 92	305-588305-7	Al Alloy 6061-T6	MIL-T-7081	.250	.035	49-3/4	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Brake Supply, L. H. Tee to R. H. Elbow at F. S. 92	305-588306-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	11-5/16	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Brake Supply, Tee, F. S. 92 to Union, F. S. 59 L. H.	305-588307-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	18-13/16	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)

Table 4-3. Fabrication of Hydraulic System Tube Assemblies (Cont)

LINE NOMENCLATURE	ASSEMBLY PART NO.	TUBE MATERIAL	MATERIAL SPEC	TUBE DIA (INCHES)	GAGE (INCHES)	CUT LENGTH (INCHES)	TYPE OF END	TYPE OF FITTING
BRAKE SYSTEM (Cont)								
Brake Supply, Elbow F. S. 92 to Union, F. S. 59 R. H.	305-588308-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	17-15/16	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Brake Supply, Union F. S. 59 L. H. to Hose Attach Bracket	305-588309-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	21-3/4	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Brake Supply, Union F. S. 59 R. H. to Hose Attach Bracket	305-588310-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	21-13/16	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Brake Pressure, Bulkhead Elbow to Union F. S. 59 L. H.	305-588311-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	49-3/4	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Brake Pressure, Bulkhead Elbow to Union, F. S. 59 R. H.	305-588312-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	22-1/8	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Brake Pressure, Union, F. S. 59 to Bulkhead Union L. H.	305-588313-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	18-1/2	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Brake Pressure, Union F. S. 59 to Bulkhead Union R. H.	305-588314-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	20-3/8	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Brake Pressure, Bulkhead Union L. H. to Union, F. S. 143 L. H.	305-588315-7	Al Alloy 6061-T6	MIL-T-7081	.250	.035	52-7/16	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Brake Pressure, Bulkhead Union R. H. to Union F. S. 143 R. H.	305-588316-5	Al Alloy 6061-T6	MIL-T-7081	.250	.035	50-5/8	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Brake Pressure, F. S. 143 L. H. to Union F. S. 215 L. H.	305-588317-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	74-3/4	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Brake Pressure, Union F. S. 143 R. H. to Union F. S. 215 R. H.	305-588318-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	77-5/16	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Brake Pressure, Union F. S. 215 L. H. to Union at W. P. 24 L. H.	305-588319-5	Al Alloy 6061-T6	MIL-T-7081	.250	.035	52.0	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Brake Pressure, L. H. Side Hose Bracket to F. S. 53.5	300-588319-7	Al Alloy 6061-T6	MIL-T-7081	.250	.035	12-15/16	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)

Table 4-3. Fabrication of Hydraulic System Tube Assemblies (Cont)

LINE NOMENCLATURE	ASSEMBLY PART NO.	TUBE MATERIAL	MATERIAL SPEC	TUBE DIA (INCHES)	GAGE (INCHES)	CUT LENGTH (INCHES)	TYPE OF	
							END	FITTING
			BRAKE SYSTEM (Cont)					
Brake Pressure, Union F. S. 215 R. H. to Union at W. P. 24 R. H.	305-588320-5	Al Alloy 6061-T6	MIL-T-7081	.250	.035	51-11/16	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Brake Pressure, R. H. Side Hose Bracket to F. S. 53.5	300-588320-7	Al Alloy 6061-T6	MIL-T-7081	.250	.035	12-1/8	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Brake Pressure, Union at W. P. 24 to Bulkhead Union L. H. Nacelle	300-588321-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	8-13/16	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Brake Pressure, Union W. P. 24 R. H. to Bulkhead Union R. H. Nacelle	305-588322-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	8-3/4	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Brake Supply, BHD Elbow to Hose Bracket L. H.	305-588323-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	11-3/8	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Brake Supply, BHD Elbow to Hose Bracket R. H.	305-588324-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	10-7/8	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
L. H. Wing Hydraulic Brake Pressure	305-588325-5	Al Alloy 6061-T6	MIL-T-7081	.250	.035	17-1/8	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
	305-588325-9	Al Alloy 6061-T6	MIL-T-7081	.250	.035	49-7/8	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
R. H. Wing Hydraulic Brake Pressure	305-588326-5	Al Alloy 6061-T6	MIL-T-7081	.250	.035	17-5/16	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
	305-588326-9	Al Alloy 6061-T6	MIL-T-7081	.250	.035	49-7/16	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Brake Pressure, L. H. Side L. G. Post	305-588327-3	304 CRES	MIL-T-6845	.250	.020	38-3/16	Flareless	MS21921-4D MS21922-4 MS21922-4 (sleeve)
Brake Pressure, R. H. Side LG Post	305-588328-3	304 CRES	MIL-T-6845	.250	.020	37-1/8	Flareless	MS21921-4J (nut) MS21922-4 (sleeve)
Brake Pressure, Union to BHD Union, L. H. Nacelle	305-588329-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	22.0	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)

Table 4-3. Fabrication of Hydraulic System Tube Assemblies (Cont)

LINE NOMENCLATURE	ASSEMBLY PART NO.	TUBE MATERIAL	MATERIAL SPEC	TUBE DIA (INCHES)	GAGE (INCHES)	CUT LENGTH (INCHES)	TYPE OF END	FITTING
BRAKE SYSTEM (Cont)								
Brake Pressure, Union to BHD Union R. H. Nacelle	305-588330-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	18-11/16	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
WING FLAP SYSTEM								
Flaps Up, Flap Control Valve to Hydraulic Motor	305-588400-3	Al Alloy 6061-T6	MIL-T-7081	.375	.049	25-7/8	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
Flaps Up Unlock, Tee to Elbow	305-588401-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	8.0	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Flaps Down, Flap Control Valve to Hydraulic Motor	305-588402-3	Al Alloy 6061-T6	MIL-T-7081	.375	.049	28-5/16	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
Flaps Down Unlock, Tee to Elbow	305-588403-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	6-3/16	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Case Drain, Flap Motor to Flap Control Valve	305-588404-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	24-7/16	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Shaft Seal Drain Flap Motor to Union at F. S. 224.8	305-588405-5	Al Alloy 6061-T6	MIL-T-7081	.250	.035	13-1/8	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
MAIN LANDING GEAR SYSTEM								
L. H. Gear Up, Bulkhead Union in Top Deck to Resistor in Mid-nacelle	305-588101-3	Al Alloy 6061-T6	MIL-T-7081	.375	.049	29-3/16	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
R.H. Gear Up, Bulkhead Union in Top Deck to Restrictor in Mid-nacelle	305-588102-3	Al Alloy 6061-T6	MIL-T-7081	.375	.049	30-1/4	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
L.H. Gear Up, Restrictor in Mid-nacelle to Reducer Tee in Lower Nacelle	305-588103-3	Al Alloy 6061-T6	MIL-T-7081	.375	.049	14-1/2	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
R.H. Gear Up, Restrictor in Mid-nacelle to Reducer Tee in Lower Nacelle	305-588104-3	Al Alloy 6061-T6	MIL-T-7081	.375	.049	14-3/8	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)

Table 4-3. Fabrication of Hydraulic System Tube Assemblies (Cont)

LINE NOMENCLATURE	ASSEMBLY PART NO.	TUBE MATERIAL	MATERIAL SPEC	TUBE DIA (INCHES)	GAGE (INCHES)	CUT LENGTH (INCHES)	TYPE OF END	FITTING
MAIN LANDING GEAR SYSTEM (Cont)								
L.H. Gear Down, Bulkhead Union in Top Deck to Actuator Hose Bracket in Lower Nacelle	305-588105-3	Al Alloy 6061-T6	MIL-T-7081	.375	.049	28-7/8	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
	305-588105-5	Al Alloy 6061-T6	MIL-T-7081	.375	.049	35-5/8	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
R.H. Gear Down, Bulkhead Union in Top Deck Actuator Hose Bracket in Lower Nacelle	305-588106-3	Al Alloy 6061-T6	MIL-T-7081	.375	.049	29-1/8	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
	305-588106-5	Al Alloy 6061-T6	MIL-T-7081	.375	.049	35-3/16	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
L.H. Gear Up, Reducer Tee in Lower Nacelle to Actuator Hose Bracket	305-588107-3	Al Alloy 6061-T6	MIL-T-7081	.375	.049	17-1/2	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
R.H. Gear Up, Reducer Tee in Lower Nacelle to Actuator Hose Bracket	305-588108-3	Al Alloy 6061-T6	MIL-T-7081	.375	.049	17-1/2	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
L.H. Gear Down Lock Unlock, Reducer Tee in Lower Nacelle to Hose Bracket	305-588109-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	12-1/2	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
R.H. Gear Down Lock Unlock, Reducer Tee in Lower Nacelle to Hose Bracket	305-588110-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	12-15/16	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Hydraulic Main Landing Gear Up Landing Gear Valve to Tee	305-588111-5	Al Alloy 6061-T6	MIL-T-7081	.375	.049	21-5/8	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
Hydraulic Main Landing Gear Down Landing Gear Valve to Tee	305-588112-5	Al-Alloy 6061-T6	MIL-T-7081	.375	.049	28-3/8	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
L.H. Landing Gear Down, Tee to Union Wing Station 25	305-588120-5	Al Alloy 6061-T6	MIL-T-7081	.375	.049	12-15/16	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
L.H. Landing Gear Up, Tee to Union, Wing Station 25	305-588121-5	Al Alloy 6061-T6	MIL-T-7081	.375	.049	13-1/16	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
L.H. Landing Gear Down, Union, Wing Station 25 to Nacelle	305-588122-3	Al Alloy 6061-T6	MIL-T-7081	.375	.049	39-3/8	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
	305-588122-5	Al Alloy 6061-T6	MIL-T-7081	.375	.049	19-1/2	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)

Table 4-3. Fabrication of Hydraulic System Tube Assemblies (Cont)

LINE NOMENCLATURE	ASSEMBLY PART NO.	TUBE MATERIAL	MATERIAL SPEC	TUBE DIA (INCHES)	GAGE (INCHES)	CUT LENGTH (INCHES)	TYPE OF END	TYPE OF FITTING
			MAIN LANDING GEAR SYSTEM (Cont)					
L.H. Landing Gear Up, Union, Wing Station 25 to Nacelle	305-588123-3	Al Alloy 6061-T6	MIL-T-7081	.375	.049	39-3/8	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
	305-588123-5	Al Alloy 6061-T6	MIL-T-7081	.375	.049	20-3/16	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
R.H. Landing Gear Down, Tee to Union, Wing Station 25	305-588124-5	Al Alloy 6061-T6	MIL-T-7081	.375	.049	29-15/16	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
	305-588124-7	Al Alloy 6061-T6	MIL-T-7081	.375	.049	8-7/16	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
	305-588124-9	Al Alloy 6061-T6	MIL-T-7081	.375	.049	5-13/16	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
R.H. Landing Gear Up, Tee to Union, Wing Station 25	305-588125-5	Al Alloy 6061-T6	MIL-T-7081	.375	.049	30-5/16	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
	305-588125-7	Al Alloy 6061-T6	MIL-T-7081	.375	.049	12	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
	305-588125-9	Al Alloy 6061-T6	MIL-T-7081	.375	.049	3-7/16	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
R.H. Landing Gear Down, Union, Wing Station 25 to Nacelle	305-588126-3	Al Alloy 6061-T6	MIL-T-7081	.375	.049	45-9/16	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
	305-588126-5	Al Alloy 6061-T6	MIL-T-7081	.375	.049	20-1/8	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
R.H. Landing Gear Up, Wing Station 25 to Nacelle	305-588127-3	Al Alloy 6061-T6	MIL-T-7081	.357	.049	44-1/4	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
	305-588127-5	Al Alloy 6061-T6	MIL-T-7081	.375	.049	20-15/16	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
			NOSE WHEEL STEERING SYSTEM					
Nose Gear Steer Pressure, Control Valve to Union, Fuselage Station 143.0	305-588200-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	87-7/16	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Nose Gear Steer Pressure Union, Fuselage Station 143.0 to Bulkhead Union Fuselage Station 92.0	305-588201-7	Al Alloy 6061-T6	MIL-T-7081	.250	.035	50-7/16	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)

Table 4-3. Fabrication of Hydraulic System Tube Assemblies (Cont)

LINE NOMENCLATURE	ASSEMBLY PART NO.	TUBE MATERIAL	MATERIAL SPEC	TUBE DIA (INCHES)	GAGE (INCHES)	CUT LENGTH (INCHES)	TYPE OF END	TYPE OF FITTING
NOSE WHEEL STEERING SYSTEM (Cont)								
Nose Gear Steer Pressure, Bulkhead Union, Fuselage Station 92.0 to Hose Attach Bracket	305-588202-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	6-13/16	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Nose Gear Steer Return, Hose Attach Bracket to Bulkhead Union, Fuselage Station 92.0	305-588203-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	6-1/8	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Nose Gear Steer Return, Bulkhead Union, Fuselage Station 92.0 to Union, Fuselage Station 143.0	305-588204-7	Al Alloy 6061-T6	MIL-T-7081	.250	.035	51-3/4	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
Nose Gear Steer Return, Union, Fuselage Station 143.0 to Control Valve	305-588205-3	Al Alloy 6061-T6	MIL-T-7081	.250	.035	91-5/8	Flareless	MS21921-4D (nut) MS21922-4 (sleeve)
NOSE LANDING GEAR SYSTEM								
Hydraulic Nose Gear Down Landing Gear Valve to Tee	305-588113-5	Al Alloy 6061-T6	MIL-T-7081	.375	.049	20.0	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
Hydraulic Nose Gear Up Landing Gear Valve to Union	305-588114-3	Al Alloy 6061-T6	MIL-T-7081	.375	.049	30-15/16	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
	305-588114-5	Al Alloy 6061-T6	MIL-T-7081	.375	.049	12-1/4	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
Nose Gear Down, Tee to Union, Fuselage Station 233.5	305-588115-3	Al Alloy 6061-T6	MIL-T-7081	.375	.049	27-3/16	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
Nose Gear Down, Fuselage Stations 233.5 to 140.0	305-588116-3	Al Alloy 6061-T6	MIL-T-7081	.375	.049	94-3/8	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
Nose Gear Up, Fuselage Stations 233.5 to 140.0	305-588117-3	Al Alloy 6061-T6	MIL-T-7081	.375	.049	94-3/8	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
Nose Gear Down, Fuselage Stations 140.0 to 92.0	305-588118-5	Al Alloy 6061-T6	MIL-T-7081	.375	.049	50-7/8	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)
Nose Gear Up, Fuselage Stations 140.0 to 92.0	305-588119-5	Al Alloy 6061-T6	MIL-T-7081	.375	.049	51-3/4	Flareless	MS21921-6D (nut) MS21922-6 (sleeve)

4-61. HYDRAULIC POWER UNIT BRACKET ASSEMBLY (305-582105) REPAIR.

4-62. There are two configurations for the hydraulic power unit bracket assembly. The superseded assembly incorporates end support, (305-582105-11) and angle, (305-582105-5) and the superseding assembly incorporates improved end support, (305-582105-15) and replaces angle, (305-582105-5) with tube, (305-582-105-13). The following repair procedure is for those bracket assemblies with cracked angle, (305-582105-5) and end support, (305-582105-11) and any bracket assembly with cracks which can be repaired by welding damaged area.

4-63. REPAIR. To repair cracks in weld areas, end support, and support angle see figures 4-4 through 4-6 and proceed as follows:

Tools and Equipment List

Tungsten Inert Gas Welding Equipment
Rotary Disk Grinder

Materials List

Welding Rod	QQ-R-566, CL4043
Aluminum Alloy Sheet	QQ-A-150/11, 6061-T6 CL TOL 0.125 x 1.075 x 4.755 and 0.050 x 0.980 x 4.75
Zinc Chromate Primer	MIL-P-8585 or TT-P-1757
Paint Remover	TT-R-248
Chromate Conversion Coating	MIL-C-5541
Solvent, Dry-cleaning	P-D-680, Type II

1. If weld joint connecting end support to tubes, or end support itself is cracked, grind both weld joints flush with surface. If weld joints connecting support angle to tubes, or support angle itself is cracked, grind both weld joints with surface.

2. Remove paint from and adjacent to areas to be welded, using paint remover, Specification TT-R-248.

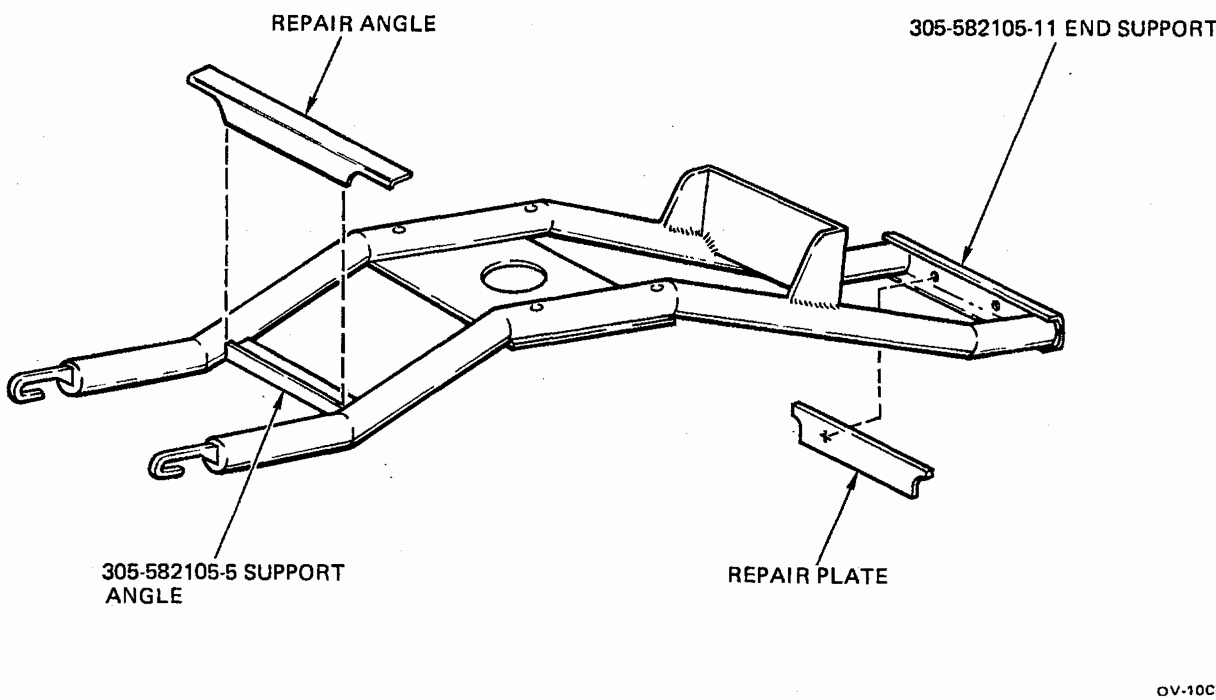
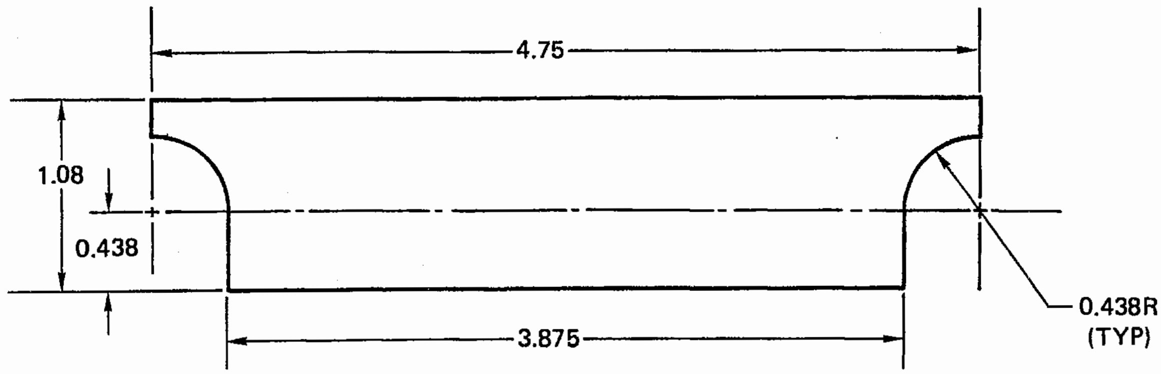


Figure 4-4. Hydraulic Power Unit Bracket Assembly Repair



NOTES:

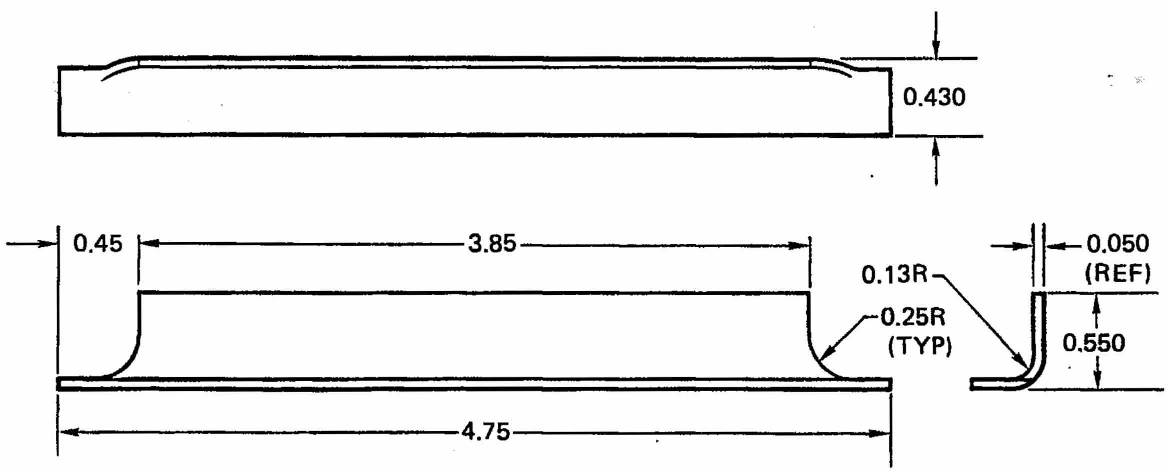
1. BREAK SHARP EDGES

MATERIAL: 0.125, 6061-T6 AL ALY,
QQ-A-250/11

TOLERANCE: .XX = ± 0.01
.XXX = ± 0.005

OV-10CP-00-3

Figure 4-5. Hydraulic Power Unit Bracket Assembly End Support Repair Plate



NOTES:

1. BREAK SHARP EDGES

MATERIAL: 0.050, 6061-T6 AL ALY,
QQ-A-250/11

TOLERANCE: .XX = ± 0.01
.XXX = ± 0.005

OV-10CP-00-4

Figure 4-6. Hydraulic Power Unit Bracket Assembly Support Repair Angle

3. Weld repair cracks in end support and support angle if any, using welding rod Specification QQ-R-566, Class 4043, utilizing tungsten inert gas welding process. Take care to avoid distortion due to local overheating.

4. Grind all welds made in end support or support angle flush with surface.

5. Fabricate a repair plate for the end support and a repair angle for the support angle in accordance with figures 4-5 and 4-6 respectively.

6. Install repair plate to inside surface of end support and repair angle to support angle and position as shown in figure 4-4. Repair plate and repair may have to be trimmed to fit.

7. Weld repair plate to end support and around connecting tubes and weld repair angle to support angle using process and welding rod specified in step 3.

8. Drill two holes (0.257 diameter) through repair plate in line with existing holes in end support.

9. Inspect all parts and weld areas for cracks in accordance with Specification MIL-I-25135, Group VII inspection procedure. No cracks are acceptable.

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

10. Clean bracket using a soft-bristled brush and dry-cleaning solvent (P-D-680, Type II).

11. Apply chromate conversion coating (Alodine etc, MIL-C-5541) using MIL-C-81706, Class 1A materials in accordance with NAVAIR 01-1A-509.

12. Apply two coats of zinc chromate primer (MIL-P-8585 or TT-P-1757) to all affected areas.

4-64. HYDRAULIC RESERVOIR ASSEMBLY (305-586315).

4-65. The hydraulic reservoir assembly (figure 4-7) consists of a union (1) and packing (2) at the pump suction outlet. A cap assembly (3) is lockwired to the union. A vent cap assembly (4) incorporates a chain and chain retaining ring. This cap assembly screws onto an elbow (8) mounted on the hydraulic reservoir vent line assembly (5) with a nut (6) and gasket (7). The vent line assembly is mounted on an elbow (10) and fits into the reservoir vent port; it utilizes a packing (11), backup ring (12), and a nut (13) to prevent leakage. A flareless tube tee fitting (14) screws into the return port of the reservoir shell and uses a packing (15), backup ring (16), and check nut (13) for leakage prevention. A packing (18) and plug (17) fit into the drain hole of the shell. The brake supply port of the shell receives an elbow (20), packing (21), and backup ring (22). The elbow has a check nut (19) which screws onto it. Twelve screws (23) retain the acrylic sight gage (24) and rubber packing (23) behind it. Each screw has an individual seal on it. The aluminum shell (25) has seven nameplates tack-welded onto it along with the mounting plate.

4-66. DISASSEMBLY. To disassemble the hydraulic reservoir, proceed as follows:

1. Cut the lockwire and remove the union (1) and packing (2) from the pump suction outlet.

2. Unscrew the cap assembly (3) from the shell.

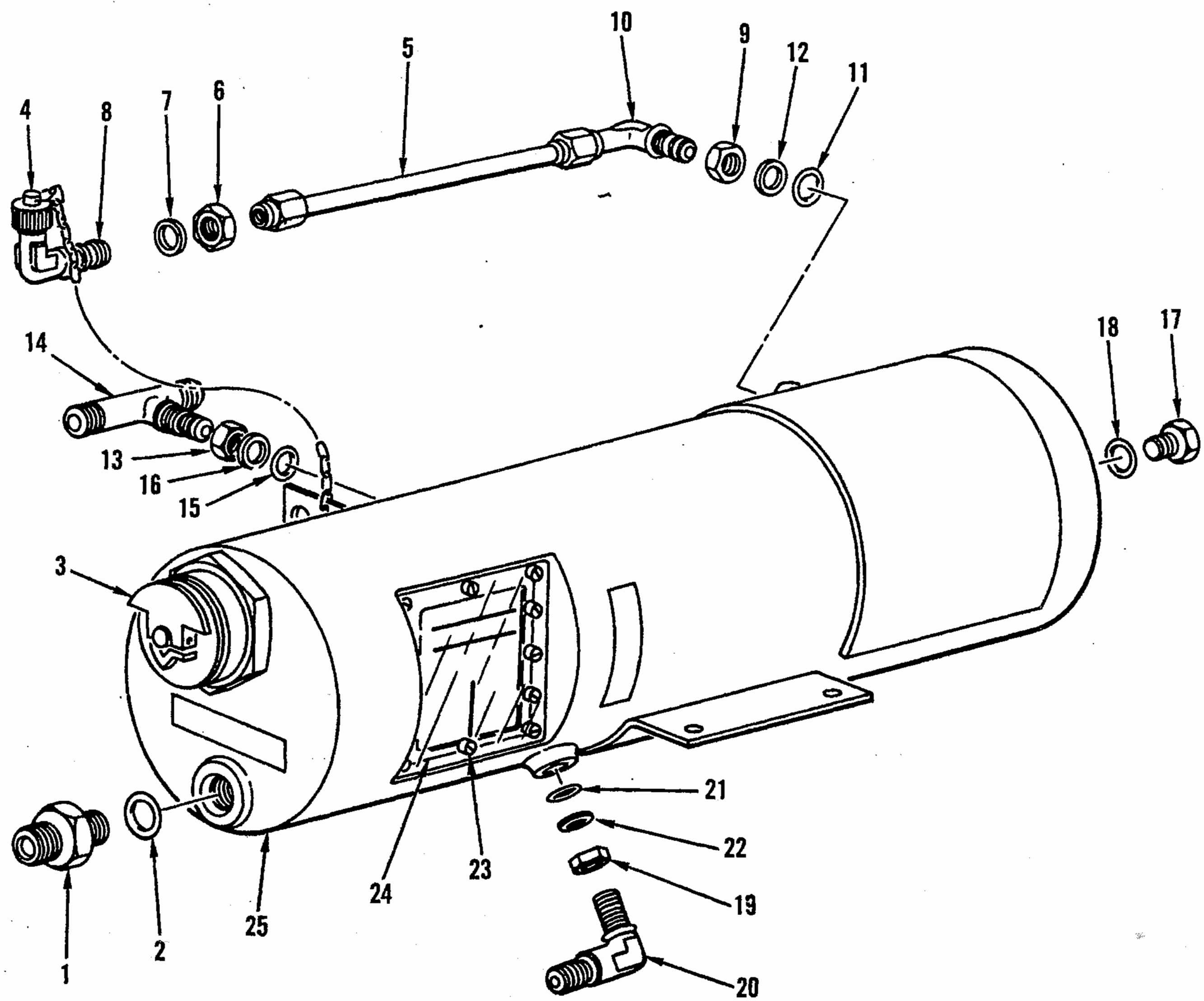
3. Remove the vent cap (4) and reservoir vent line assembly (5).

4. Remove the check nut (6), gasket (7), and elbow (8) from the vent line assembly (5).

5. Back off the check nut (9) and remove elbow (10), packing (11), and backup ring (12).

6. Back off check nut (13) and remove flareless tube tee fitting (14) from shell return port.

7. Remove packing (15) and backup ring (16) from shell return port.



1 UNION
2 PACKING
3 CAP ASSEMBLY
4 CAP
5 RESERVIOR VENT LINE ASSEMBLY
6 NUT
7 GASKET
8 ELBOW
9 NUT
10 ELBOW
11 PACKING
12 BACKUP RING
13 NUT
14 FLARELESS TUBE TEE
15 PACKING
16 BACKUP RING
17 PLUG
18 PACKING
19 NUT
20 ELBOW
21 PACKING
22 BACKUP RING
23 SCREWS
24 SIGHT GATE
25 SHELL

VM-2H-58-14

Figure 4-7. Hydraulic Reservoir Assembly

8. Remove drain plug (17) and packing (18).

9. Back off check nut (19) and remove elbow (20) from brake supply port on shell.

10. Remove packing (21) and backup ring (22) from brake supply port.

11. Remove the 12 screws (23) and their packings.

12. Remove sight gage (24) and its gasket from reservoir shell (25).

13. Plug all ports.

4-67. CLEANING.

Materials List

Fluid, Hydraulic	MIL-H-5606
Solvent, Dry-cleaning	P-D-680, Type II

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

1. Clean all reservoir assembly components except the sight gage (24) and its gasket in dry-cleaning solvent (P-D-680, Type II).

Note

Remove and clean screen at filler opening.

2. Clean the sight gage (24) and gasket with clean hydraulic fluid (MIL-H-5606) and a soft cloth.

Note

Use care not to scratch, mar, or damage the sight gage.

4-68. INSPECTION. For inspection procedures, refer to table 4-4.

4-69. ASSEMBLY. Assemble the hydraulic reservoir assembly, using new packings and backup rings in the following manner:

Materials List

Packing	MS28778-4
Packing	MS28778-6
Packing	MS28778-10
Packing	MS28778-24
Backup Ring	MS9058-04
Backup Ring	MS9058-06
Fluid, Hydraulic	MIL-H-5606
Lockwire (0.041-inch diameter steel)	MS20995F41

Note

Lightly coat all packings and backup rings with MIL-H-5606 fluid.

1. Properly support the reservoir shell (25).

2. Install sight gage (24), using gasket between gage and shell and using 12 screws (23).

3. With nut (19) installed on elbow (20), install backup ring (22) and packing (21).

4. Install elbow (20) in brake supply port.

5. Fit packing (18) on drain plug (17) and install plug in drain hole.

6. With nut (13) installed on tee fitting (14), install backup ring (16) and packing (15).

7. Install tee fitting (14) in return port.

8. Install nut (9) on elbow (10) and install backup ring (12) and packing (11).

9. Install elbow (10) in vent port of shell.

10. Install packing (7) on elbow (8).

11. Install nut (6) on elbow (8) and install elbow on line assembly (5).

Table 4-4. Hydraulic Reservoir Assembly Inspection

COMPONENT	TYPE OF INSPECTION	PROCEDURE	ACCEPTABLE DEFECTS
Cap Assembly (3)	Visual	Check that lid properly seats.	None
		Check that spring on lid returns lock properly.	None
		Check that retaining spring is not broken.	None
Cap and Chain (4)	Visual	Check condition and security of retaining chain.	
Sight Gage and Gasket (24)	Visual	Check sight gage for legibility and crazing.	None. If damaged, return assembly to supply system.
		Check gasket for general condition.	None. If damaged, return assembly to supply system.
Shell (25)	Visual	Check all welds for cracks.	None
		Check name plates for security and legibility.	None
		Check mounting bracket for cracks.	None
		Check all ports for thread condition.	None

12. Install vent line assembly (5) on elbow (10).

13. Install cap (4) on elbow (8).

14. Install cap assembly (3) in shell cap port.

15. Install packing (2) on union (1) and install union in pump suction port.

16. Safety cap adapter (3) to union (1), using lockwire (MS20995F41).

17. Install caps at all open fittings.

4-70. **TESTING.** Test the hydraulic reservoir assembly in the following manner:

Materials List

Clean, Dry air Source

1. With caps at all fittings except the pump suction port, hook up an air hose on the union at the pump suction port.

2. Pressurize the hydraulic reservoir assembly to 5 psi with clean, dry air and check for leaks by submerging unit in water and watching for bubbles.

3. Tighten or replace any leaking components.

4-71. MOTOR-DRIVEN HYDRAULIC PUMP ASSEMBLY (53003).

4-72. The motor-driven hydraulic pump assembly consists of 1500-psig hydraulic pump and a 28-volt dc electric motor. The two units are joined together by four studs and incorporate a gasket between the bearing surfaces of the components.

4-73. CHECKOUT. To perform an operational checkout of the motor-driven hydraulic pump assembly, proceed as follows:

Tools and Equipment List

Power Supply	0 to 28 volts dc
Hydraulic Supply	MIL-H-5606

CAUTION

Do not attempt to verify the hydraulic pump's discrepancies by operating it before it has been disassembled and inspected. Operating a malfunctioning pump before the cause has been determined and corrected could cause further damage to it.

1. Fill pump with hydraulic fluid.

2. Connect hydraulic supply to the inlet port of pump.

3. Connect return line to pump.

4. Connect 26 volts dc (pin A negative, pin B positive) to motor.

5. Run pump only long enough to ensure proper operation.

4-74. DISASSEMBLY. To disassemble the motor-driven hydraulic pump assembly, see figure 4-8 and proceed as follows:

1. Cut lockwire and remove nuts (1) and washers (2).

2. Remove pump (3) from motor (5).

3. Strip gasket (6) from mounting pad of motor (5) or pump (3).

4. Remove cap screws (6) and seal retainer (7) from housing of pumps (3).

5. Pull shaft seal (8) and packing (9) from retainer (7) and discard.

4-75. CLEANING. Clean mating surfaces with clean hydraulic fluid (MIL-H-5606) and a lint-free cloth.

Materials List

Fluid, Hydraulic	MIL-H-5606

4-76. ASSEMBLY. Assemble the pump and motor assembly, using a new gasket, new packing and new shaft seal. See figure 4-8 and proceed as follows:

Materials List

Gasket	AN4045-1
Shaft Seal	56613 (75250)
Packing	56733 (75250)
Petrolatum	VV-P-236
Lockwire (0.032-inch diameter steel)	MS20995F32

Note

Before installing motor to pump, ensure the motor turns freely by hand, and operates so as to rotate the pump in a clockwise direction when viewed from the shaft end. Observe pin A negative and pin B positive polarity.

1. Lightly lubricate shaft seal (8) and packing (9) with petrolatum (VV-P-236).

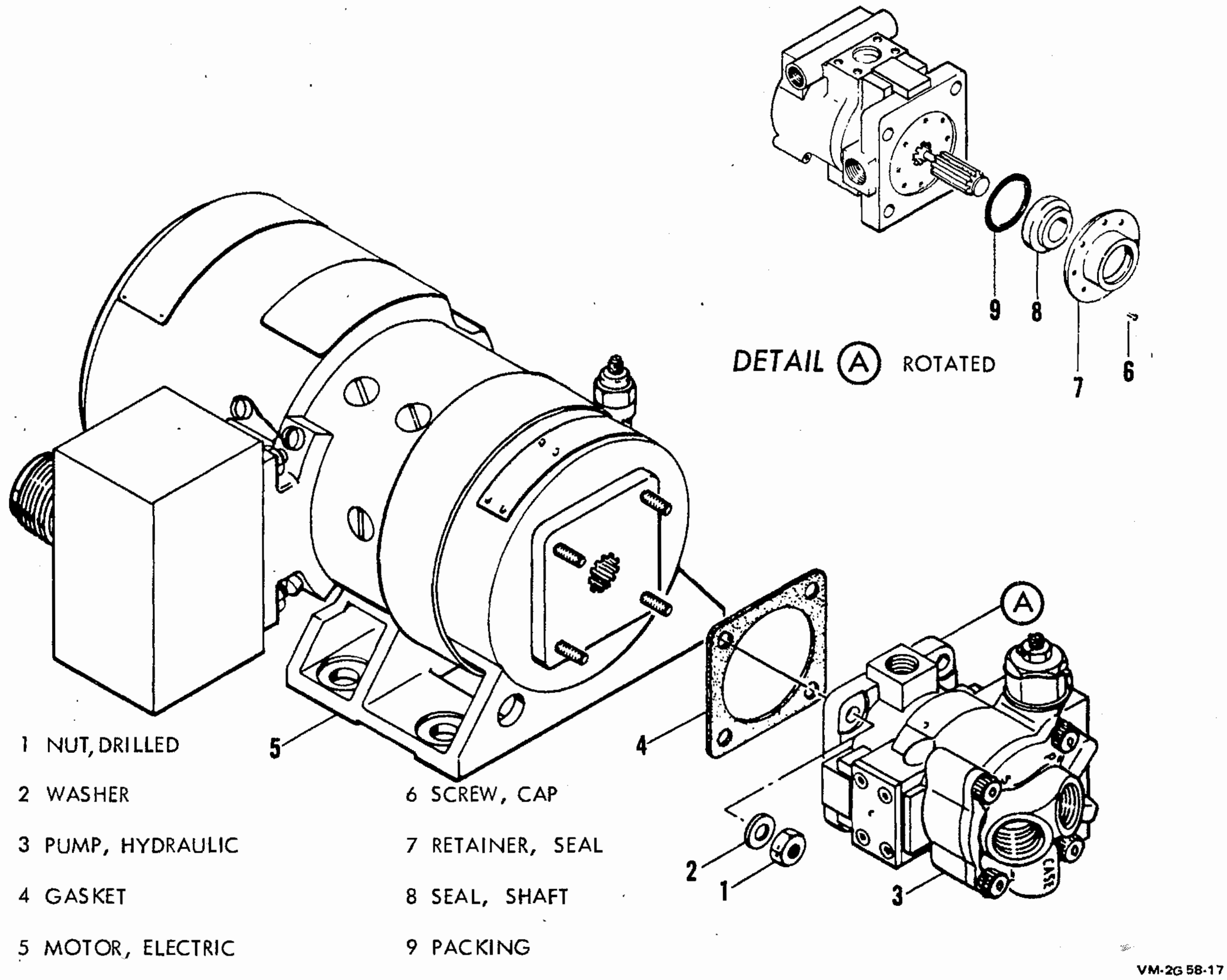


Figure 4-8. Motor-driven Hydraulic Pump Assembly

2. Insert shaft seal (8) and packing (9) in seal retainer (7) and install subassembly on housing of pump (3), using cap screws (6).

3. Install new gasket (AN4045-1) on studs on motor (5).

4. Install pump (3) on motor (5) with washers (2) and nuts (1). Torque nuts to 120 to 125 inch-pounds.

5. Secure nuts, using lockwire (MS20995F32).

6. Perform an operational check. Refer to **paragraph 4-73.**

SECTION IV
DEPOT MAINTENANCE

4-77. GENERAL.

4-78. Depot maintenance of components of the hydraulic system consists of checkout, disassembly, cleaning, inspection, repair, tolerance limits, assembly, adjustment, calibration, preservation, and shipment. In some instances, depot maintenance may include manufacture of parts, modification, testing, and reclamation of assemblies or subassemblies of the hydraulic system components.

4-79. FABRICATION OF HYDRAULIC RESERVOIR SIGHT GAGE GASKET (305-581305).

4-80. To fabricate a new hydraulic reservoir sight gage gasket, see figure 4-9 for fabrication details.

Materials List

Rubber, Hydraulic Oil-resistant, (0.063-inch thick)	AMS3200

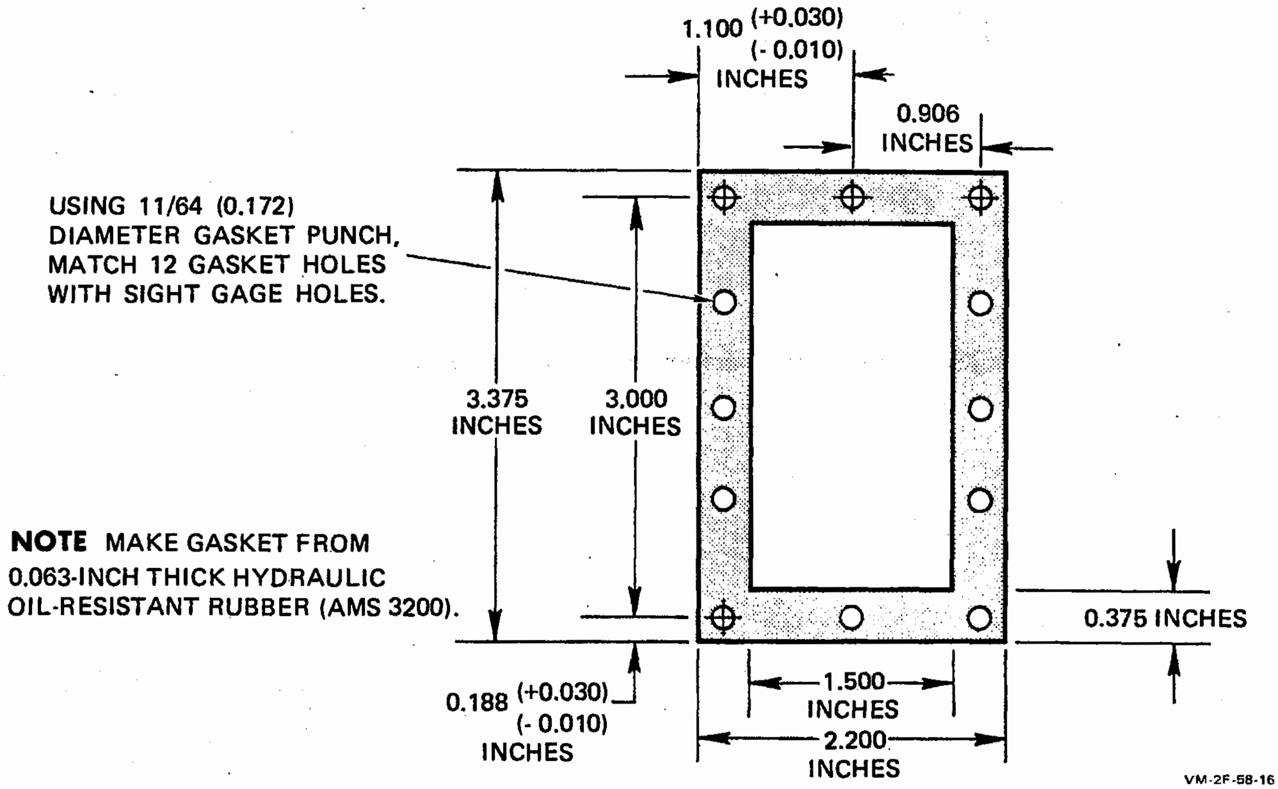


Figure 4-9. Fabrication of Hydraulic Reservoir Sight Gage Gasket

CHAPTER 5
LANDING GEAR SYSTEM

SECTION I
DESCRIPTION AND OPERATION

5-1. GENERAL

5-2. The OV-10A aircraft is equipped with a hydraulically-operated, tricycle-type landing gear (figures 5-1 and 5-2) consisting of two main gear in the nacelles and one steerable nose gear in the nose of the fuselage. When retracted, all three gear are completely faired with the aircraft by doors and fairings that open or close in response to gear actuation. Should the system malfunction, the landing gear will free-fall to a down-and-locked position by moving the landing gear control handle down. Independent braking for each main gear, and nose wheel steering is incorporated into the system to provide ground maneuverability. The landing gear system is divided into subsystems according to functions. These subsystems are the landing gear, the wheel brakes, and the nose wheel steering which are described in detail in the following sections.

5-3. DESCRIPTION AND OPERATION.

5-4. The basic landing gear system (figures 5-1 and 5-2) includes two main landing gear assemblies, and nose landing gear assembly, landing gear doors and associated linkage, provisions for normal extension and retraction, provisions for free-fall extension, uplock and downlock mechanisms, and gear position indication and warning systems. See figure 5-3. The two main landing gear and nose landing gear assemblies are ruggedly constructed to enable the aircraft to operate from unimproved areas. Each main landing gear assembly incorporates a 29 x 11-10 wheel-tire assembly, a brake assembly, a heavy-duty shock strut, an axle beam, a post, and a drag brace. The nose landing gear assembly includes a shock strut assembly, a fork assembly, a trunnion assembly, and a 7.50-10 wheel-tire assembly. Normal operation of the landing gear system involves two primary cycles: extension and retraction. With the landing gear control handle down and the gear down, a selector valve located in the aft cargo compartment is positioned through mechanical linkage so that hydraulic pressure is applied to the gear-down side of all of the landing gear actuating cylinders. The uplock, wheel doors, and fairings are operated by means of mechanical linkage. Concurrently an electrical circuit is made to the landing gear position indicator on the pilot's instrument panel. The indicating system is described in detail in the Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

5-5. NORMAL RETRACTION.

5-6. When the landing gear control is moved to the up position (by squeezing a separate grip on the pilot's control handle) after take-off, three paralleled electrical circuits are completed to indicate to the pilot that the gear is up. The pilot's landing gear handle incorporates a gear-unsafe caution light which comes on when the landing gear is not locked in the position required by the gear handles. At the same time these electrical circuits are completed, hydraulic pressure is routed

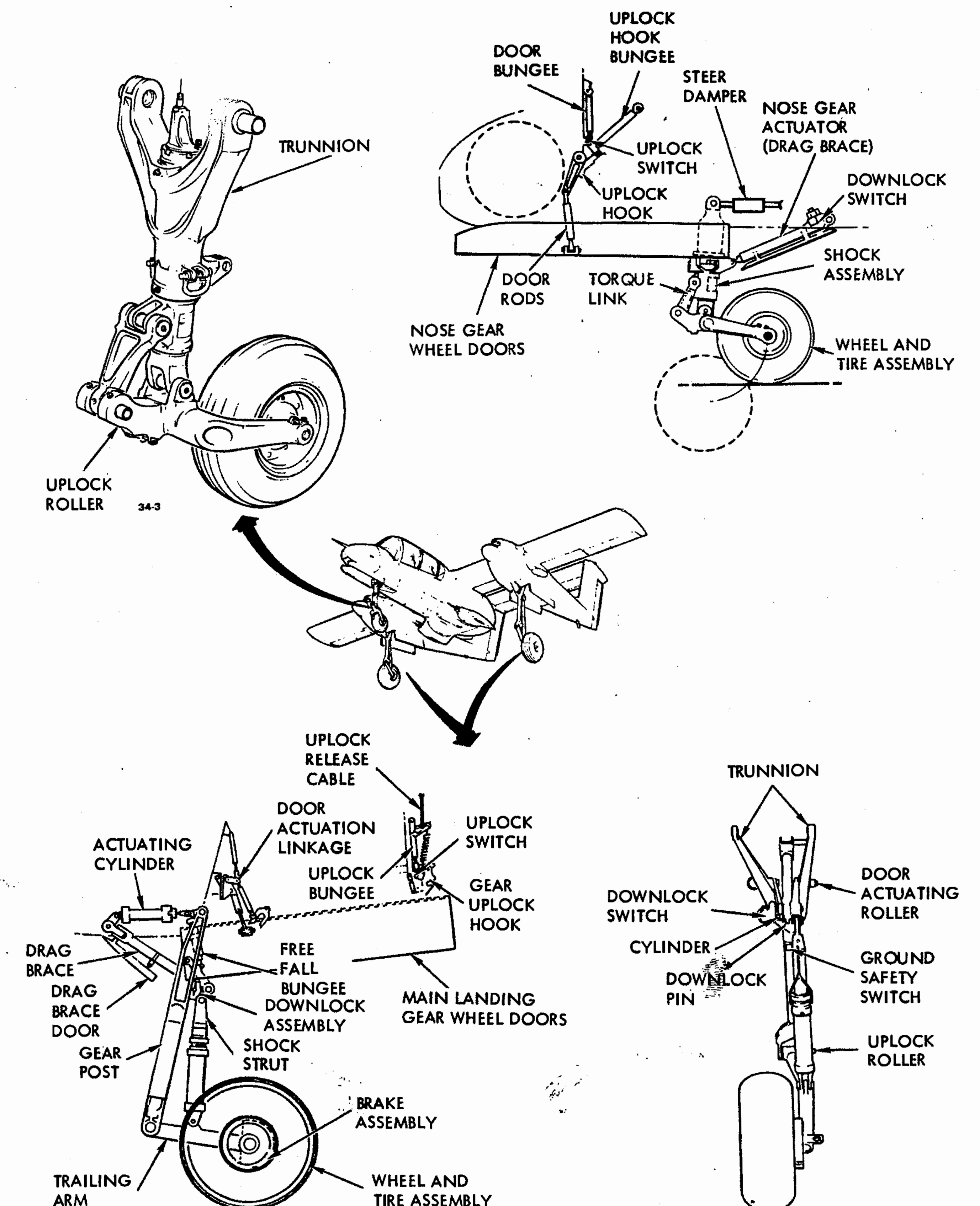


Figure 5-1. Landing Gear System Unit Locator

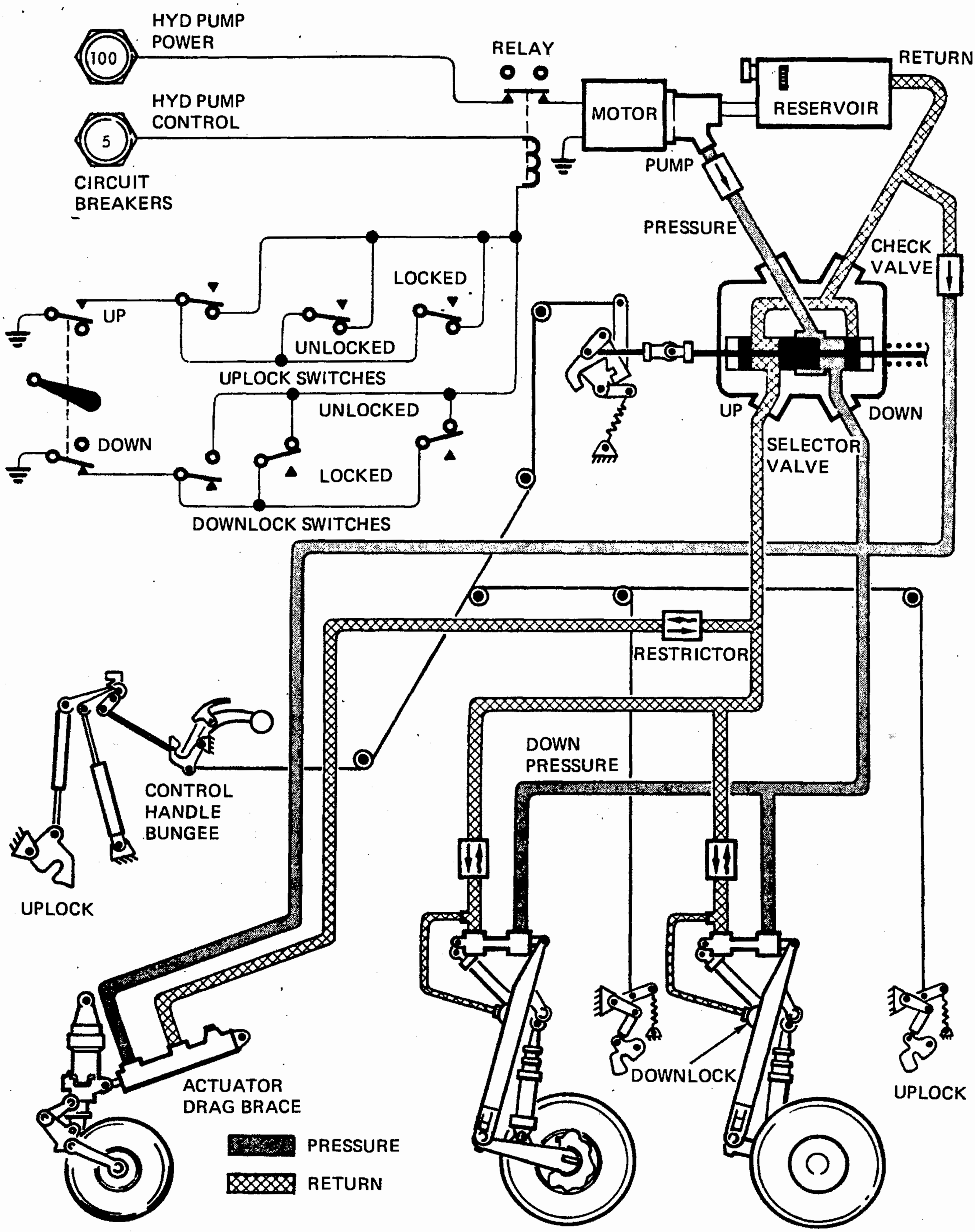


Figure 5-2. Landing Gear Schematic

through the selector valve to the retract side of the actuating cylinders and begins moving the gear up. When the gear handle is moved to the up position hydraulic pressure releases the downlock on the landing gear. The gear-unsafe indication will be received on the pilot's landing gear control handle and the landing gear position indicator for all three gear will show intermediate (barber-pole) positions until all the gear are locked up. As the nose gear nears the up position, mechanical linkage acts on the nose gear wheel door bungee to close the wheel door. Near the fully retracted position, the nose gear uplock roller moves into the throat of the uplock hook. As soon as the roller passes the lip of the hook, the bungee returns the hook to the locked position to hold the gear up and the oil cooler door is closed. With the nose gear fully retracted, the nose wheel doors and the nose gear actuator door are pulled closed, and faired with the airframe. On the main gear, the uplock roller cams the main gear uplock hook forward then the uplock bungee to rotate the hook to the locked position.

5-7. The main landing gear wheel doors are mechanically connected to the cam so that they will be closed and faired with the nacelles, and the drag brace door is attached directly to the drag brace and will be faired with the lower nacelle also. With all of the gear locked up, the landing gear indicator in the pilot's cockpit will indicate UP. The gear-unsafe indicator light will remain on until all three gear reach the locked up position.

5-8. NORMAL EXTENSION.

5-9. When the gear control handle is moved to "down," the valve spool in the landing gear position selector valve is repositioned through mechanical linkages attached to the landing gear handles. Also, these handles are connected through cables and linkage to the landing gear uplocks which are released when the gear-down position is selected. With the uplocks released, hydraulic pressure is routed to the extension side of all gear actuating cylinders. The landing gear doors and fairings will open as the gear extends along with the oil cooler doors. This permits all of the gear to be actuated to the full down and locked positions. Landing gear position will be reflected on the pilot's instrument panel by electrical circuits. In addition to this, WHEELS warning lights located on the pilot's instrument panel and observer's instrument panel will come on when any one of the three landing gear is not down and locked and the following conditions prevail:

1. Flaps lower than 30 degrees and either condition lever at T.O./Land.

2. Both power levers are retarded to 50 percent or less and either condition lever at T.O./LAND.

These lights will flash intermittently during these conditions and are controlled by downlock switches on the landing gear, separate condition lever sensing switch, and a separate power switch. In case of hydraulic failure, free-fall bungees are incorporated into the main landing gear linkage system and are loaded against the gear-up position to assist free fall of the landing gear in emergency situations.

SECTION II
ORGANIZATIONAL MAINTENANCE

5-10. GENERAL.

5-11. Organizational maintenance on the landing gear includes operational checkout procedures, system trouble shooting, servicing, rigging, adjusting, and component removal and installation. These procedures provide all necessary information required to maintain the landing gear within the limits of organizational level tools and facilities.

5-12. OPERATIONAL CHECK.

5-13. The following paragraphs provide instructions necessary to accomplish operational check of the landing gear system. Preflight or quick check of the landing gear may be accomplished as described in paragraph 5-14. Refer to paragraph 5-15 for vertification of gear extension and retraction capability.

5-14. PREFLIGHT OPERATIONAL CHECK. To perform a preflight check of the landing gear system, see figures 5-1 and 5-3 and proceed as follows:

Note

An external power source must be connected to the aircraft or the engines must be operating before the following procedures can be accomplished.

These procedures are limited to verification of conditions existing with the gear down and locked. It will be necessary to refer to paragraph 5-15 to accomplish a complete checkout of the system.

1. Check the landing gear position indicator on the pilot's instrument panel for a gear-down indication.

2. Check GEAR UNSAFE light on pilot's landing gear control handle. This light should not be on.

CAUTION

It is important that the cargo door be positioned to avoid possible damage to the door or flap during this check.

3. Lower wing flaps below 30-degree deflection and observe WHEELS warning light on the pilot's and the observer's instrument panels. Neither of these lights should come on.

5-15. RETRACTION AND EXTENSION CHECK. To check retraction and extension capability of the landing gear system, see figures 5-1 and 5-3 and proceed as follows:

CAUTION

Pull ANGLE OF ATTACK HEATER circuit breaker on PRIMARY BUS circuit-breaker panel and ensure the PITOT HEATER switch is in the OFF position before applying electrical power.

Note

The following procedures must be performed with the aircraft jacked and external power applied as described in General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

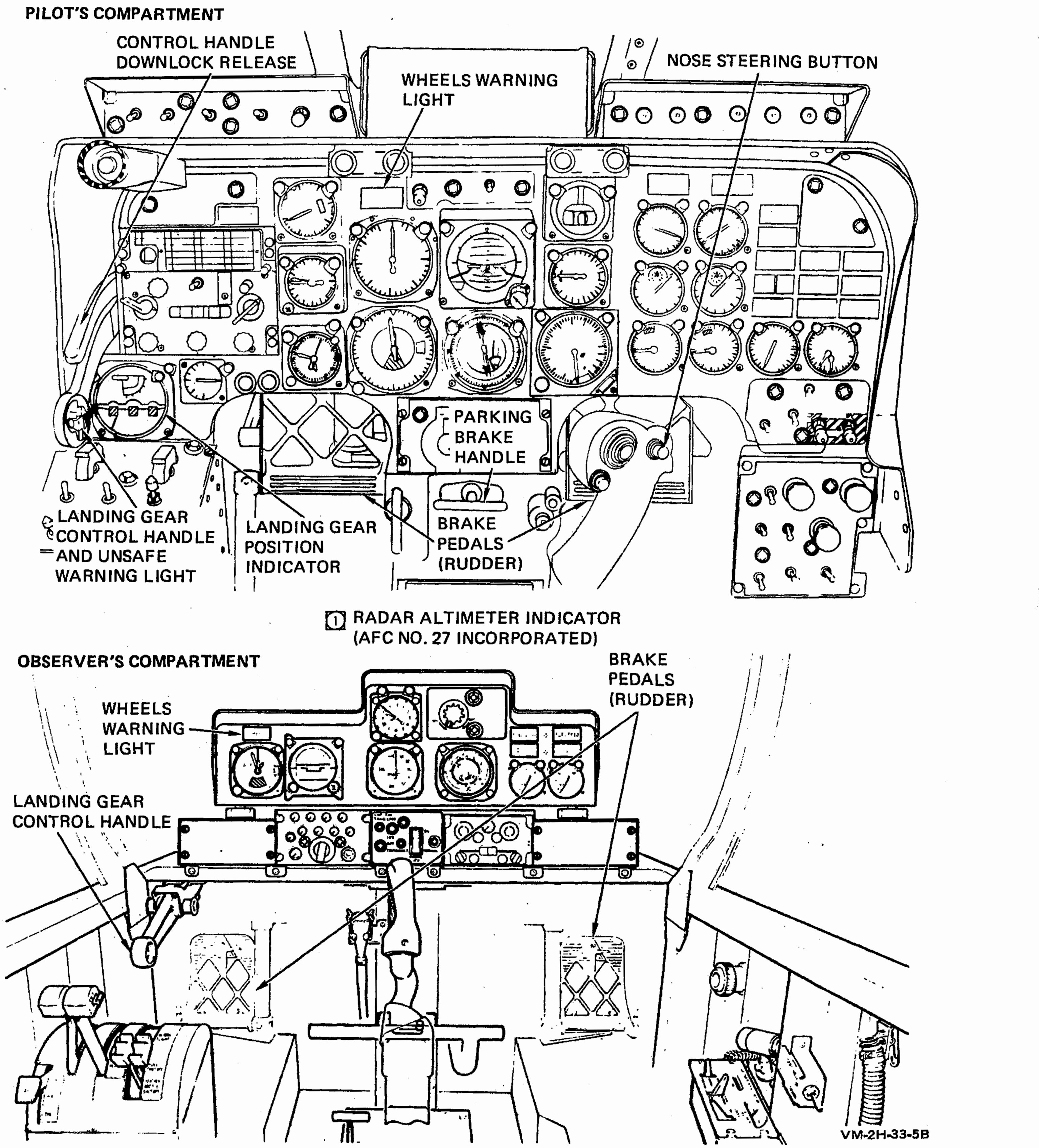


Figure 5-3. Landing Gear System Controls and Indicators

1. Check control handle downlock mechanism by attempting to raise handle from down and locked position without squeezing release grip. The handle should not move, the gear should remain down and locked, and oil cooler door should remain open.

2. With gear down and locked, check landing gear position indicator on pilot's instrument panel. A gear-down position should be indicated.

3. Check GEAR UNSAFE caution light on pilot's landing gear control handle. This light should not be on.

CAUTION

When operating the wing flaps, ensure that cargo door is positioned to prevent possible interference with flaps.

4. With gear down and locked and either condition lever at T.O./LAND, operate wing flaps and observe WHEELS warning light on the instrument panel. This light should not come on throughout the full cycle of flap operation.

5. Move control handle to gear-up position and observe the GEAR UNSAFE caution light and landing gear. The caution light should remain on until the gear reaches the up and locked position and then go off. The gear should fully retract within the aircraft and all wheel doors should close.

6. With gear up and locked, check position indicator on the instrument panel. A gear-up position should be indicated.

7. With gear up and locked and either condition lever at T.O./LAND, operate wing flaps and observe WHEELS warning light on instrument panel. The light should come on when flap deflection exceeds 30 degrees and remain on until flaps are returned above 30 degrees.

8. With gear up and locked and either condition lever at T.O./LAND, place flaps UP and retard both power levers to less than 50 percent. Wheels warning light should come on.

9. With gear up and locked, check wheel drag brace doors and oil cooler door for a proper faired condition with boom and fuselage mold lines.

10. Move control handle to a gear-down position and observe GEAR UNSAFE condition light and landing gear. The caution light should remain on until the gear reaches a down and locked position and then go off. The gear should fully extend to a down and locked position.

11. Check gear position indicator for proper indication.

12. Return landing gear to the up and locked position and remove electrical power from the aircraft.

13. Move control handle to the gear-down position and observe landing gear. The main gear should free-fall to a down and locked position and the nose gear should free-fall to a down position and lock with exertion of not more than 120 pounds of force at the axle.

14. Ensure that a straightedge laid across the nose gear tire ridges will not touch the center depression on tire. Also, ensure that tire has not worn to red cord at any point on tire.

15. Reconnect electrical power to the aircraft and check GEAR UNSAFE caution light. The light should not be on.

16. Depress STEER button on pilot's stick grip and operate rudder pedals. The hydraulic system should operate but the nose steering system should not function.

17. With gear down and locked, remove aircraft jacks.

18. Depress STEER button and operate rudder pedals. The nose steering system should function normally.

Note

Steer damper will not rotate wheel to full 55-degree position while in static position.

19. Remove external electrical power from the aircraft.

5-16. NOSE LANDING GEAR ACTUATOR LEAKAGE TEST. To perform the leakage test, proceed as follows:

1. Operating condition (dynamic seals):

   a. Wipe component clean prior to cycling. Do not clean by blowing with an air hose.

   b. Cycle the component 10 or more times and observe the rate of leakage.

   c. After any drop is observed, immediately start a 25-cycle test. Do not wipe the unit.

   d. If, in the 25 cycles of operation, leakage does not exceed 0.05 cc (1 drop) the seal is satisfactory.

2. Static condition (dynamic seals):

   a. Without wiping the component dry, allow it to set, with no pressure applied, for 10 minutes.

   b. Wait a maximum of 15 minutes until the next drop falls.

   c. During the next 15 minutes the maximum allowable leakage is 0.05 cc (1 drop).

5-17. TROUBLESHOOTING.

5-18. Troubleshooting procedures (table 5-1) are arranged to assist maintenance personnel in locating, isolating, and remedying difficulties in the landing gear system. See figure 5-3 for aid in the isolation of specific problems. If a system component is replaced, repaired, or adjusted, an operational check of the system should be performed.

Note

The aircraft must be on jacks and external electrical power applied to perform trouble shooting procedures.

5-19. SERVICING.

5-20. The landing gear hydraulic system should be bled whenever any component is removed and replaced, or disconnected, and air is permitted to enter the system. Refer to paragraph 4-7. Air in the landing gear system may be removed by cycling the complete system a minimum of five complete cycles. The nose gear lower bearing should be lubricated in accordance with paragraph 5-21 whenever a squeaky gear condition exists. General servicing instructions are provided in General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

5-21. NOSE LANDING GEAR LOWER BEARING LUBRICATION. In the event of a squeaky nose gear, lubricate the nose gear lower bearing and piston as follows:

Materials List

Petrolatum	VV-P-236
Lockwire (0.032-inch diameter steel)	MS20995F32

1. Jack nose of aircraft in accordance with General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

2. With nose landing gear extended, bleed air from strut assembly. Refer to servicing procedures contained in General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

Table 5-1. Troubleshooting Landing Gear System

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: LANDING GEAR CONTROL HANDLE UP - GEAR WILL NOT RETRACT.		
No hydraulic pressure to actuators.	Check hydraulic power to system by depressing nose wheel steer button and listening for pump operation. If hydraulic system operates, landing gear handle up position switch faulty.	Replace landing gear handle up position switch.
	If hydraulic pump runs with handle up, landing gear control system is not properly rigged.	Rig landing gear control system.
TROUBLE: EXCESSIVE PRESSURE REQUIRED TO MOVE LANDING GEAR CONTROL HANDLES.		
Maladjusted, binding, or improperly lubricated landing gear control system.	Visually inspect linkage and control system to check for binding and check rigging of control system.	Rig and adjust landing gear control system.
Faulty balance bungee.	Remove pilot's instrument panel shroud and check balance bungee.	Replace landing gear balance bungee.
TROUBLE: MAIN GEAR DOORS AND FAIRINGS WILL NOT FAIR.		
Linkage out of adjustment.	Check linkage adjustment.	Readjust door linkage.
TROUBLE: NOSE GEAR DOORS WILL NOT CLOSE WITH LANDING GEAR CONTROL HANDLE UP AND GEAR UP.		
Nose gear linkage bent or out of adjustment.	Check linkage adjustment and condition.	Replace and/or readjust linkage.
TROUBLE: LANDING GEAR CONTROL HANDLE DOWN - NOSE GEAR NOT DOWN AND LOCKED.		
Binding or incorrectly adjusted nose gear actuating cylinder.	Disconnect nose gear drag brace at nose gear with gear handle up. Check drag brace for binding and adjustment.	Replace or adjust nose gear drag brace.
TROUBLE: LANDING GEAR CONTROL HANDLE DOWN - DOORS OPEN - MAIN GEAR NOT DOWN AND LOCKED.		
Binding or improperly adjusted main gear actuating cylinder.	Disconnect electrical power to hydraulic pump; disconnect main landing actuator and check for binding and adjustment.	Replace or adjust main landing gear actuator and connect electrical power to hydraulic pump.
Binding downlock switch plunger.	Remove plastic switch cover and observe switch mechanism. Check switch plunger contact with landing gear surface.	Clean switch plunger and guide hole. Do not lubricate.

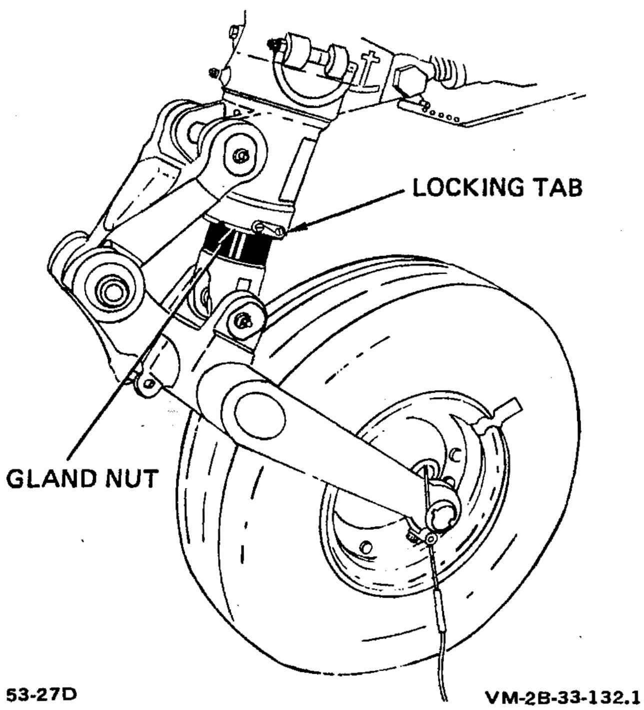
Table 5-1. Troubleshooting Landing Gear System (Cont)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: LANDING GEAR CONTROL HANDLE DOWN - DOORS OPEN - MAIN GEAR NOT DOWN AND LOCKED (CONT).		
Inoperative downlock assembly.	Check to determine if rust, foreign material, or grease is present on downlock pin or if downlock assembly is faulty.	Clean downlock assembly or replace.
Gears do not swing freely.	Check trunnion bearings for Teflon insert condition.	Replace bearings.
TROUBLE: MAIN LANDING WILL NOT FREE-FALL TO THE DOWN-AND-LOCKED POSITION.		
Faulty or improperly adjusted free-fall bungee.	Check free-fall bungee adjustment. If adjusted properly, bungee is faulty.	Adjust or replace free-fall bungee.
Downlock pin retraction retainer assembly faulty.	Check general condition and observe operation of assembly during free-fall operation, noting that assembly must hold downlock pin at retracted position until main landing gear is at the down-and-locked position.	Replace downlock pin retraction retainer assembly.
TROUBLE: LANDING GEAR HANDLE DOWN - POSITION INDICATOR SHOWS ALL GEARS NOT DOWN AND LOCKED.		
WHEEL & FLAP IND circuit breaker out on d-c circuit-breaker panel.	Check position of circuit breaker at fuselage station 150.0.	Push in (close) circuit breaker.
TROUBLE: LANDING GEAR CONTROL HANDLE DOWN - ALL GEAR DOWN - POSITION INDICATOR SHOWS ONE OF THREE GEAR NOT DOWN AND LOCKED.		
Downlock switch incorrectly adjusted or faulty.	Check operation of nose or main gear downlock switches and adjustment.	Replace or adjust downlock switch.
TROUBLE: NOSE GEAR DOORS DAMAGED AS A RESULT OF EXCESSIVE TRAVEL.		
Nose gear uplock hook improperly adjusted.	Check nose gear uplock hook mechanism adjustment.	Adjust nose gear uplock mechanism.
TROUBLE: SPINNING NOSE WHEEL VIBRATES DURING RETRACTION.		
Nose wheel retaining nut improperly installed.	Check nose wheel retaining nut installation.	Properly install nose wheel retaining nut.
TROUBLE: NOSE LANDING GEAR DRAG BRACE (ACTUATOR) LEAKS HYDRAULIC FLUID AT ROD.		
Faulty packings and wiper ring.	With all safety pins in place and aircraft electrical power on, push nose wheel steering button to pressurize down side of nose gear actuator. If leakage increases, packings are faulty.	A slight static leakage is permissible; if leakage increases under pressure, replace packings and wiper ring.

Table 5-1. Troubleshooting Landing Gear System (Cont)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: NOSE GEAR SHOCK STRUT SQUEAKS.		
Lower bearing and piston needs lubrication	Check lower bearing and piston for presence of lubricant.	Lubricate lower bearing and piston.
TROUBLE: NOSE GEAR WILL NOT RETRACT TO FULL UP AND LOCKED POSITION.		
Mooring rings not retracting.	Actuate mooring rings to ensure positive retraction action.	Remove, clean, and lubricate nose gear mooring rings (paragraph 5-102).

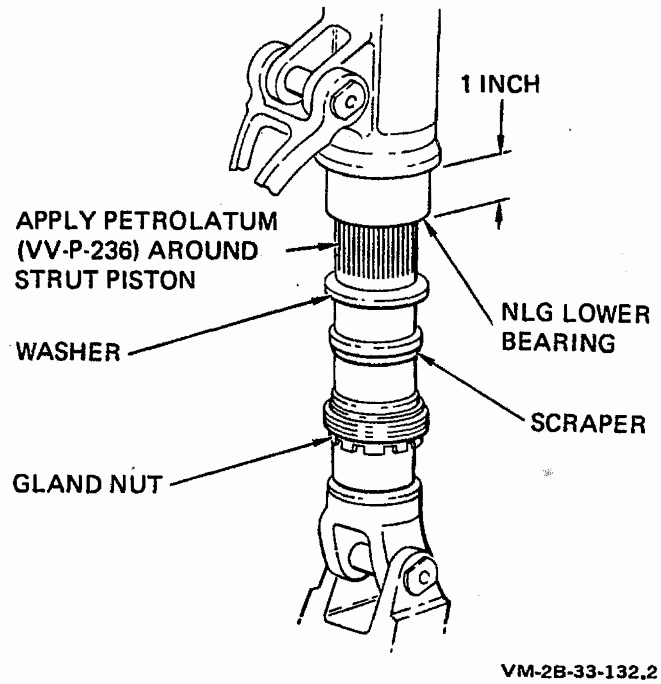
3. Remove the gland nut locking tab and loosen gland nut.



Step 3—Para. 5-21

4. Using spanner wrench, back off gland nut, scraper, and washer.

5. Slide strut piston down until the phenolic lower bearing is visible (approximately 1 inch).



Steps 4 through 9—Para. 5-21

Note

Hydraulic fluid may leak out of strut if phenolic bearing is lowered more than 1 inch.

6. Apply petrolatum (VV-P-236) around the outside diameter of strut piston directly below the bearing.

7. Slide piston and bearing into strut assembly to lubricate the inside surface of bearing.

8. Reassemble the washer, scraper, and gland nut. Using spanner wrench, tighten gland nut until it bottoms on rod scraper.

9. Install the gland nut locking tab and safety with lockwire (MS20995F32).

10. Service the strut assembly with air (hydraulic fluid if required). Refer to servicing procedures contained in General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

5-22. LANDING GEAR HANDLE UP AND DOWN POSITION SWITCHES REMOVAL AND INSTALLATION.

5-23. The landing gear handle up and down position switches are double-pole, double-throw switches mounted on a bracket just forward of the pilot's instrument panel and to the left of the landing gear release system bungee. The switches are actuated by a cam arm mounted on the landing gear handle torque tube.

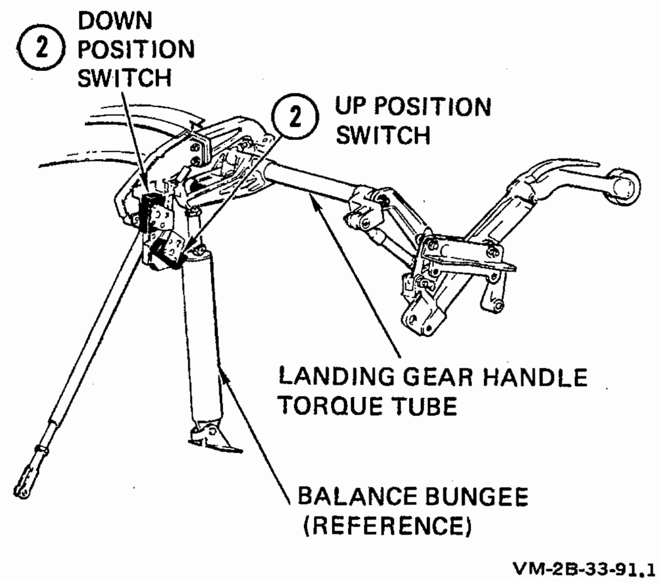
5-24. REMOVING LANDING GEAR HANDLE UP OR DOWN POSITION SWITCH.

CAUTION

Ensure that all landing safety pins are properly installed, both batteries are disconnected, and external electrical power is disconnected.

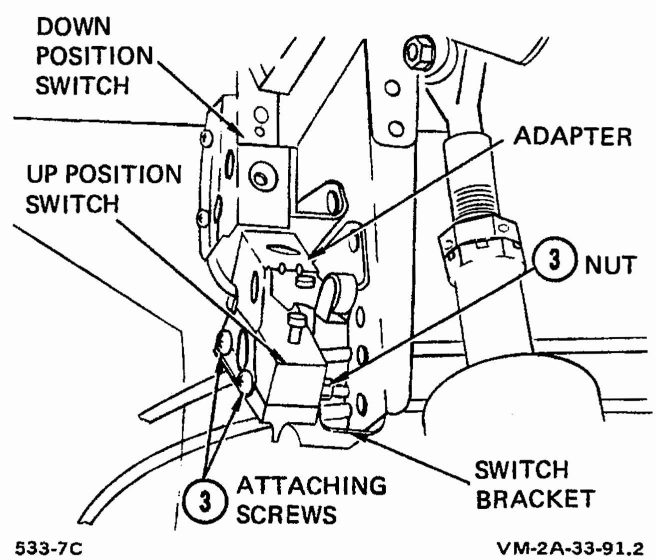
1. Remove pilot's instrument panel shroud and radio set control, C-6476/ARC-51A. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

2. Locate the position "up" switch and position "down" switch, just forward of the landing gear handle torque tube, near the balance bungee.



Step 2—Para. 5-24

3. While holding nut on the right side of the switch mounting bracket, remove the two screws attaching the switch adapter and switch to the mounting bracket.



Step 3—Para. 5-24

4. Carefully remove the faulty switch and adapter from the bracket.

Note

Whenever switch removal is necessary; examine the support bracket for bends, cracks, and other obvious damage that could cause misalignment between the switch roller and operating cam. For support bracket repair procedure, refer to Structural Repair Manual (NAVAIR 01-60GCB-3).

5. Remove the wires from the switch, noting the position of wires on the switch.

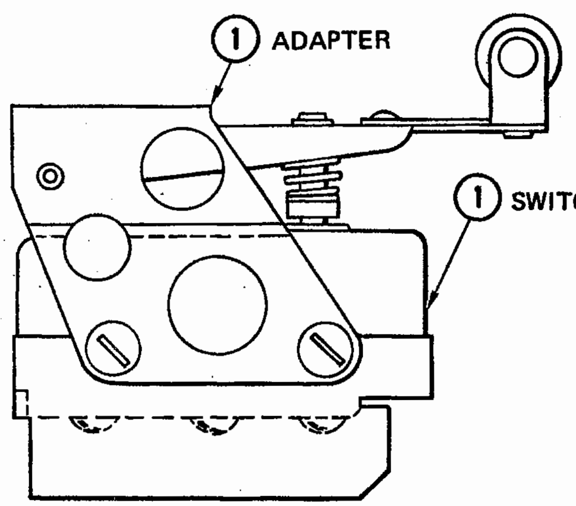
5-25. INSTALLING LANDING GEAR HANDLE UP OR DOWN POSITION SWITCH.

Note

A new adapter assembly should be installed when switch is replaced.

Since the adapter assembly has approximately 0.375-inch overtravel no adjustment is provided for the up or down position switch.

1. Install adapter on switch so that switch will actuate as roller arm is depressed.



Step 1—Para. 5-25

2. Connect appropriate wires to terminals on switch. Refer to Wiring Data Manual (NAVAIR 01-60GCB-2-7).

3. Position the adapter and switch assembly on bracket and install nuts.

4. Move the landing gear handle to the up and down positions. Note that the torque tube cam arm strikes the respective adapter roller evenly and that an audible "click" is heard as the switch actuates and deactuates.

5. Install the pilot's instrument panel shroud and radio set control, C-6476/ARC-51A. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

6. Perform an operational check of the d-c power distribution system. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

5-26. MAIN LANDING GEAR SELECTOR VALVE REMOVAL AND INSTALLATION.

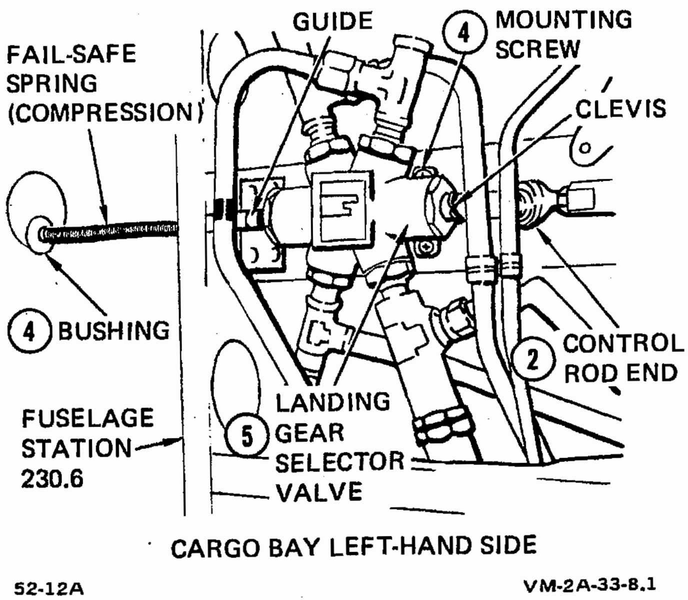
5-27. The main landing gear selector valve is located on the left-hand side of the cargo bay between fuselage stations 233.5 and 224.8 and incorporates an external fail-safe spring. To remove and install the landing gear selector valve, proceed as follows:

5-28. REMOVING MAIN LANDING GEAR SELECTOR VALVE.

1. If installed, remove cargo compartment left-hand rear side panel to gain access to valve.

2. Disconnect control rod by removing bolt at rod end and clevis.

3. Disconnect hydraulic lines from valve fitting and cap to prevent leakage.



Steps 2, 4, and 5—Para. 5-28

4. Remove four mounting screws.

Note

Prior to removing all mounting screws, compress fail-safe spring and be prepared to retrieve bushing, spring, and guide when screws are removed.

5. Remove valve from aircraft with fittings installed.

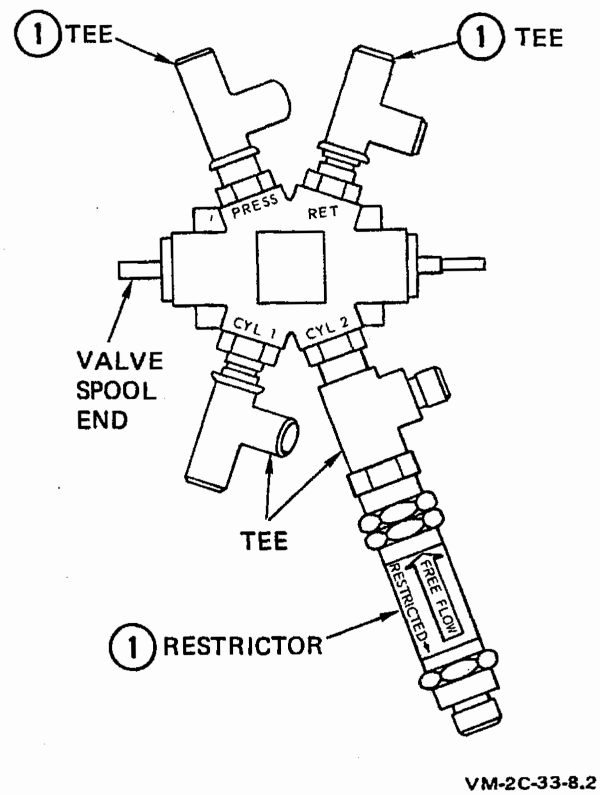
6. Remove fittings from valve.

5-29. INSTALLING MAIN LANDING GEAR SELECTOR VALVE.

Materials List

Pin, Cotter	MS24665-134
O-Ring	MS9058-06
Gasket	MS28778-6

1. Install four tee fittings and restrictor on valve ports, using new gaskets (MS28778-6) and O-rings (MS9058-06) at each fitting.



Step 1—Para. 5-29

Note

If restrictor was removed from tee fitting, ensure that FREE FLOW arrow on side of valve points toward tee when installed.

2. Fill valve with hydraulic fluid (MIL-H-5606) and cap to prevent leakage.

3. Install bushing on frame at fuselage station 239.2, and install compression spring and guide through fuselage station 233.5 and into bushing.

4. Install valve assembly with four retaining screws, and position guide on valve spool end.

5. Install clevis on valve control rod and install cotter pin (MS24665-134).

6. Install control rod end in clevis with bolt, and safety with cotter pin (MS24665-134).

7. Remove caps from fittings and lines and connect lines to respective fittings.

8. Service landing gear system. Refer to paragraph 4-7.

9. Reinstall cargo bay side panel, if required.

5-30. LANDING GEAR RELEASE SYSTEM BALANCE BUNGEE REMOVAL AND INSTALLATION.

5-31. The landing gear release system balance bungee is located behind the pilot's instrument panel and balances landing gear control system forces. To remove and install the landing gear release system balance bungee, proceed as follows:

WARNING

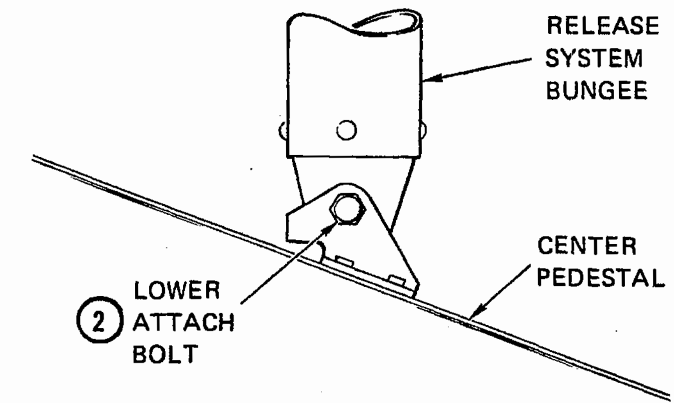
The landing gear release system has a preload and care must be used during removal and installation.

5-32. REMOVING RELEASE SYSTEM BALANCE BUNGEE.

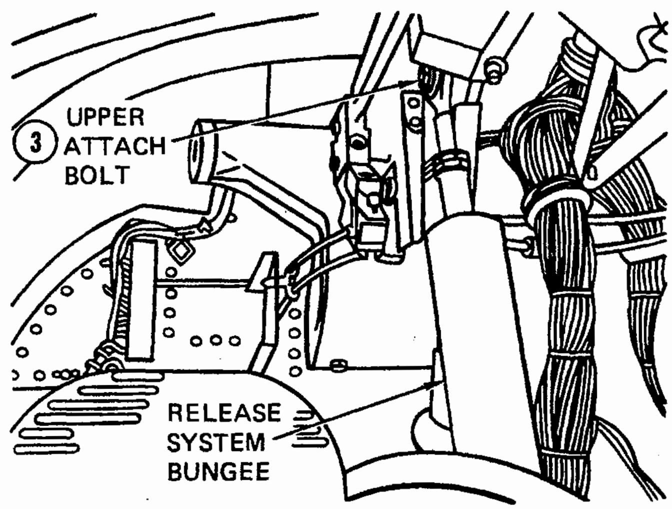
1. With safety pins installed and landing gear handle down, remove pilot's instrument panel shroud. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

2. Remove lower attaching bolt while holding pressure upward on the bungee body to counteract preload pressure. After bolt has been removed, allow bungee to extend slowly.

3. Remove cotter pin, washer, and upper attach bolt through linkage to the landing gear control handle torque tube.



Step 2—Para. 5-32



Step 3—Para. 5-32

5-33. INSTALLING RELEASE SYSTEM BALANCE BUNGEE.

Materials List

Pins, Cotter	MS24665-134

1. Position rod end in clevis fitting on control handle torque tube, install bolt, washers, and nut. Safety with cotter pin (MS24665-134).

WARNING

Care must be used during installation to prevent injury as a result of bungee preload.

2. While holding upward pressure on the bungee, position bungee body end in mounting bracket on center pedestal, install bolt, washers, and nut and safety with cotter pin (MS24665-134).

Note

The release system bungee length is adjusted during assembly and does not require readjustment.

3. Install pilot's instrument panel shroud. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

4. Perform an operational check of the landing gear system. Refer to paragraph 5-15.

5-34. MAIN LANDING GEAR ACTUATING CYLINDER REMOVAL AND INSTALLATION.

5-35. To remove and install the main landing gear actuating cylinder, proceed as follows:

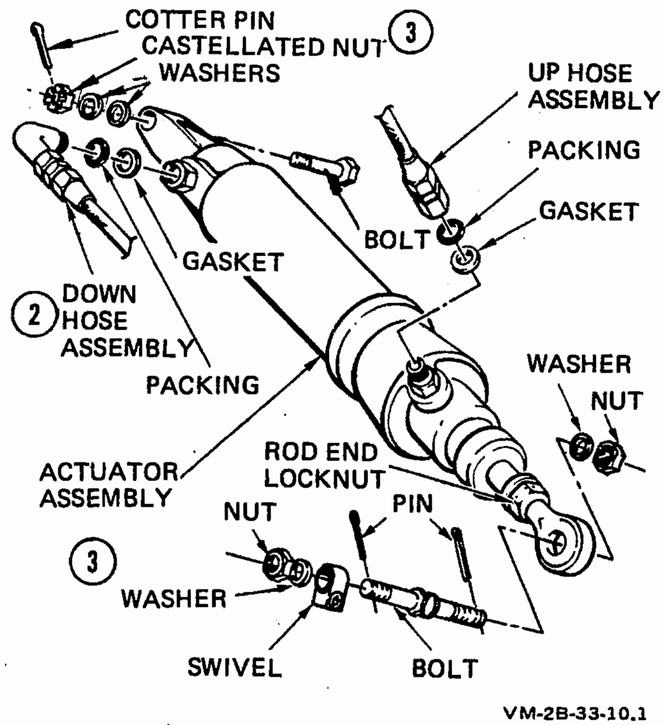
Tools and Equipment List

Adapter Bundle, Jacking and Mooring	E13710
Jack, Hydraulic Tripod, 10-ton	50J25178
Jack, Hydraulic Tripod	996

5-36. REMOVING MAIN LANDING GEAR ACTUATING CYLINDER.

1. Jack the aircraft in accordance with instructions in General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

2. Disconnect the two hydraulic hose assemblies at the actuator and cap hoses to prevent leakage.



Steps 2 and 3—Para. 5-36

3. Remove the retaining bolts, nuts, pins and washers at each end of actuator and remove actuator with tubing and fittings installed.

4. Remove hydraulic tubing, retaining bracket, and fittings from the actuator.

5-37. INSTALLING MAIN LANDING GEAR ACTUATING CYLINDER.

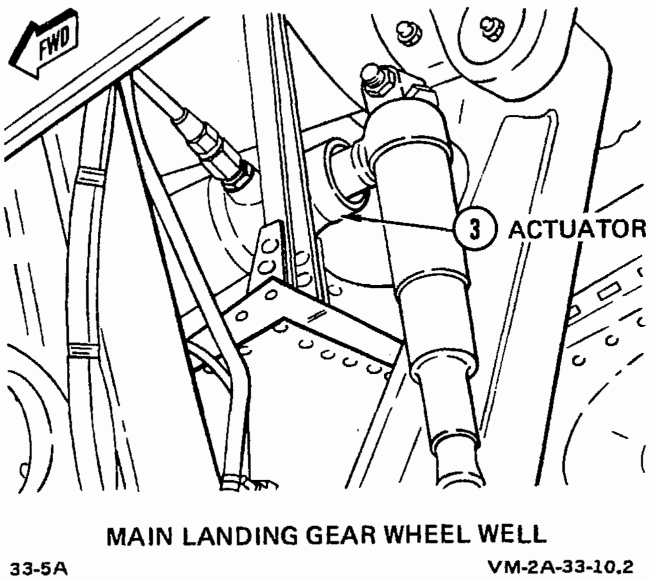
Materials List

Gasket	MS9058-04
Packing	MS28778-4
Pins, Cotter	MS24665-285
Lockwire (0.032-inch diameter steel)	MS20995F32

1. Install hydraulic fittings and hardware on actuator, using a new gasket (MS9058-04) and packing (MS28778-4) at each fitting.

2. Manually fill cylinder with hydraulic fluid (MIL-H-5606) and cap to prevent leakage.

3. Position actuator in aircraft main gear wheel well and install forward retaining hardware. Secure with cotter pins (MS24665-285).



Step 3—Para. 5-37

4. With landing gear down and locked, adjust actuator rod end to fit; shorten two full turns, install bolt and safety rod end locknut with lockwire (MS20995F32).

5. Remove plugs and connect hydraulic hose assemblies to actuator.

6. Service the hydraulic system. Refer to paragraph 4-7.

7. Lower aircraft and remove jacking equipment.

5-38. MAIN LANDING GEAR CHASSIS ASSEMBLY REMOVAL AND INSTALLATION.

5-39. To remove and install the complete main landing gear chassis assembly, proceed as follows:

Tools and Equipment List

Adapter Bundle, Jacking and Mooring	E13730
Jack, Hydraulic Tripod	996
Jack, Hydraulic Tripod, 10-ton	50J25178

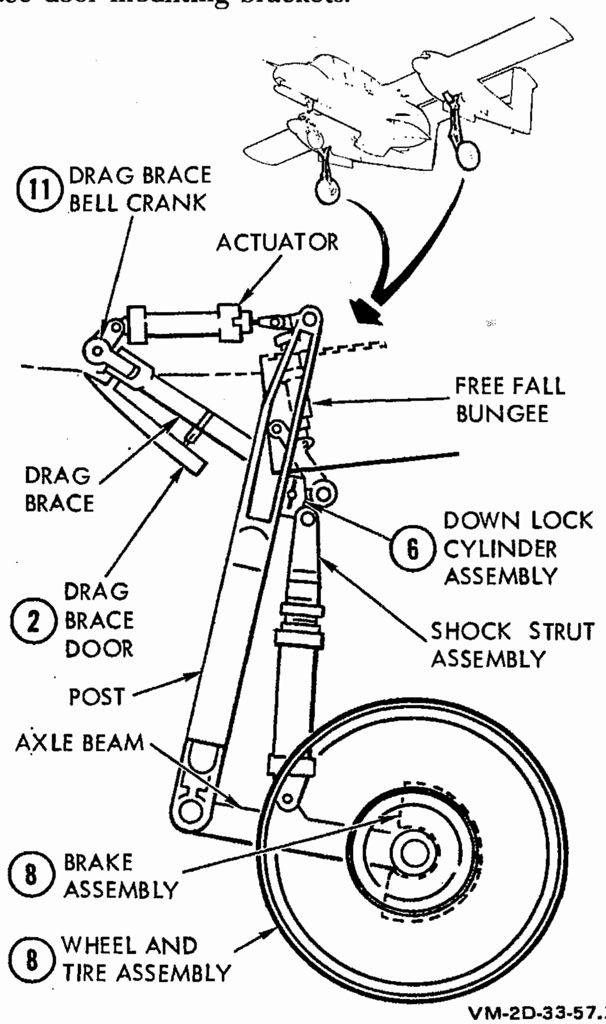
Note

The following procedures apply to either main landing gear assembly, except where noted.

5-40. REMOVING MAIN LANDING GEAR CHASSIS ASSEMBLY.

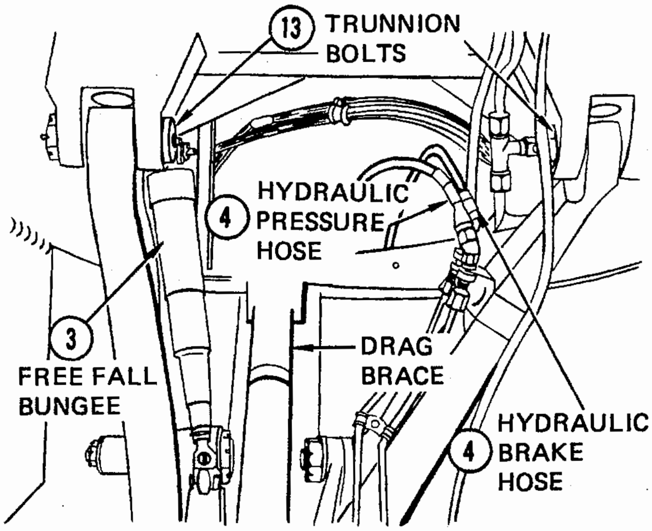
1. Jack the aircraft. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for jacking procedure.

2. Disconnect drag brace door and remove drag brace door mounting brackets.



Steps 2, 6, 8, and 11—Para. 5-40

3. Remove free-fall bungee. Refer to paragraph 5-58.



Steps 3, 4, and 13—Para. 5-40

4. Remove hydraulic brake hose and pressure hose on outboard chassis arm. Cap fittings and lines to prevent leakage.

5. Remove all hydraulic lines and hoses and their attaching hardware from the main landing gear chassis assembly. Plug and cap all lines and hoses.

6. Remove downlock cylinder and downlock switch assembly (with wiring attached) and tie in wheel well.

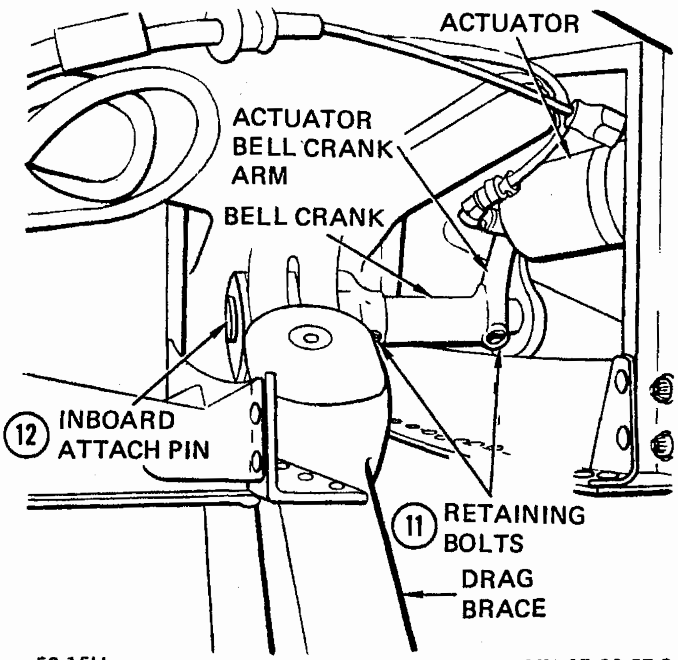
7. On left-hand gear, remove ground safety switch upper and lower clamps. Remove all wiring clamps and tie switch assembly in wheel well.

8. Remove wheel and brake assembly. Refer to paragraph 5-82.

9. Wrap axle for protection from marring, nicking, or scratching.

10. Snap out access plug on exterior skin on inboard side of nacelle, just behind cowling.

11. Remove two retaining bolts from drag brace bell crank.



Steps 11 and 12—Para. 5-40

12. Remove inboard and outboard attach pins.

Note

It will be necessary to insert a socket and extension through the access hole in the exterior skin to remove the outboard attach pins.

13. While applying upward pressure on the landing gear chassis, remove trunnion cotter pins, nuts, bolts, and shims.

14. Remove landing gear assembly and lay assembly horizontally on a padded surface.

5-41. INSTALLING MAIN LANDING GEAR CHASSIS ASSEMBLY.

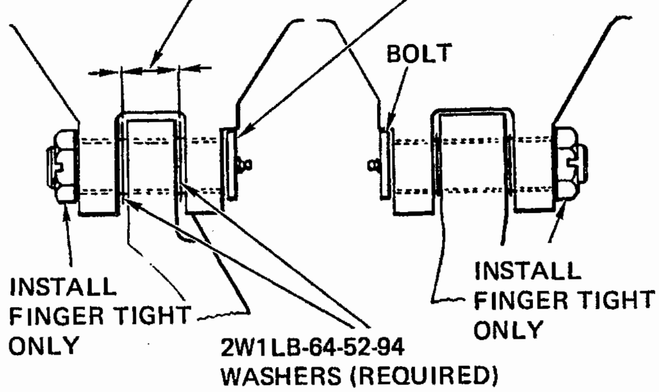
Materials List

Pins, Cotter	MS24665-285
	MS24665-300
	MS24665-374
Washers, Laminated	2W1LB-64-52-94

1. Raise main landing gear assembly to vertical position, align trunnion bolt holes, and install laminated washers (2W1LB-64-52-94) on each side of fork arm at trunnion.

Note

Peel washer laminations off to permit a maximum gap of 0.010 inch between fork and fitting on each side of fork.



Steps 1 and 2—Para. 5-41

2. Install trunnion bolts finger-tight and safety with cotter pins (MS24665-374).

Note

Install nut on trunnion bolts finger-tight only. This will permit free rotation of the landing gear.

3. Install drag brace in bulkhead fitting (fuselage station 181.6), using inboard attach pin. See figure 5-4.

4. Install outboard attach pin through access hole in exterior nacelle skin; tighten until head of bolt bottoms on flange and back off bolt until retaining bolt hole in bell crank and bolt are aligned. Install bolt, washer, and nut and torque to 22 (±2) inch-pounds.

5. Tighten inboard attach pin until bolt bottoms out, back off to align bolt hole in bell crank with hole in pin; install retaining bolt, washer, and nut and torque to 22 (±2) inch-pounds.

CAUTION

When installing AN177-15 bolt, install with head inboard and no washers under bolt head and two washers under nut.

6. Install actuator on bell crank arm, using AN177 bolt, washers and nut and torque to 475 (plus or minus 25) inch-pounds. Safety with cotter pin (MS24665-300).

7. Install drag brace door and check adjustment in accordance with paragraph 5-129.

8. Install downlock assembly and ground safety switch. Refer to paragraph 5-50 and 5-54.

9. Adjust downlock assembly. Refer to paragraph 5-132.

10. Adjust ground safety switch. Refer to paragraph 5-135.

11. Install hydraulic lines and electrical wire bundles on landing gear chassis and clamp in place.

12. Install free-fall bungee. Refer to paragraph 5-58.

13. Install hydraulic hoses on brake and pressure lines on landing gear chassis.

14. Install wheel brake assembly. Refer to paragraph 6-20.

15. Install main landing gear wheel assembly. Refer to paragraph 5-82.

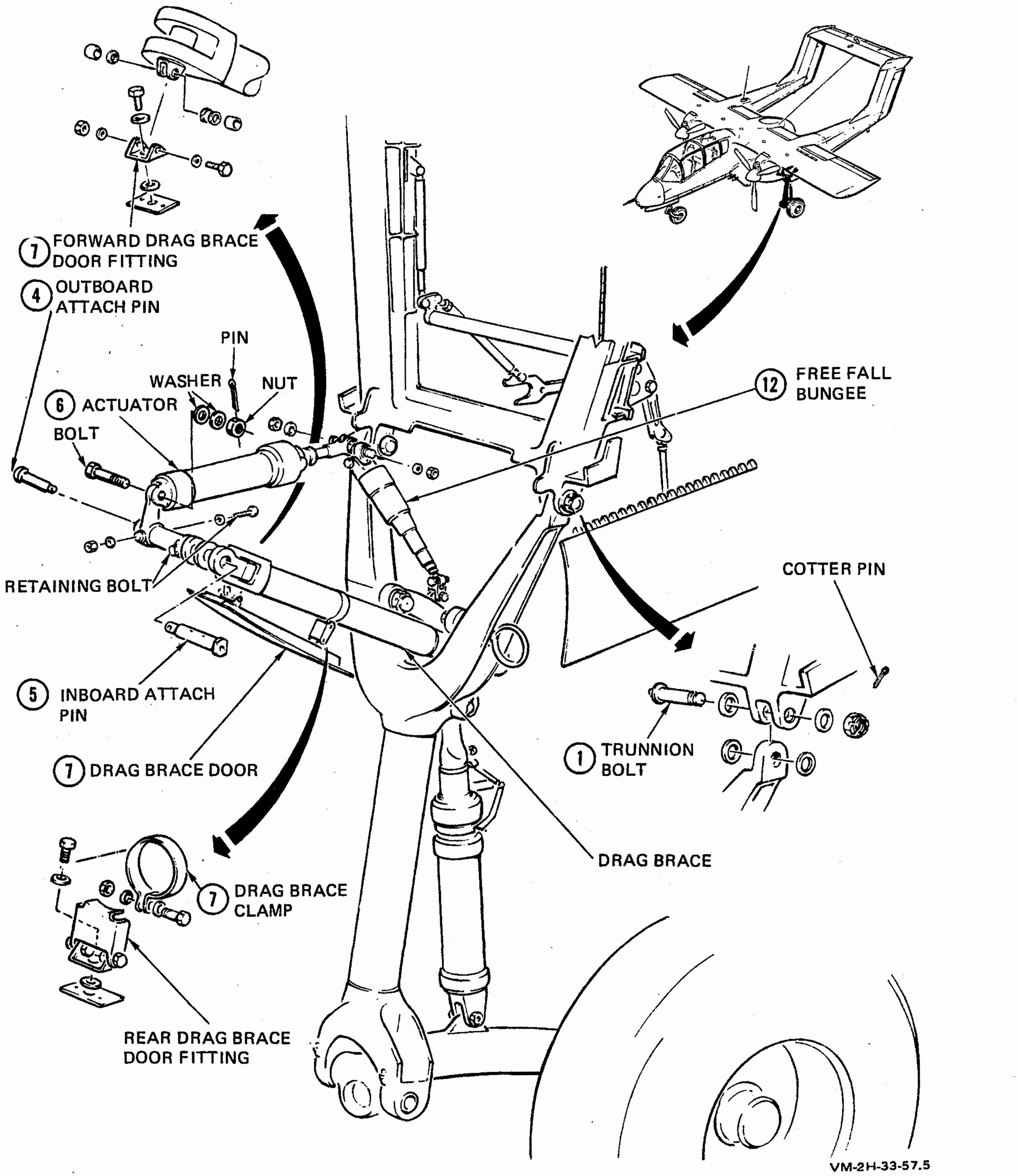


Figure 5-4. Main Landing Gear Chassis Assembly Installation

16. Fill and bleed the landing gear system. Refer to paragraph 4-7.

17. Bleed the brake system. Refer to paragraph 6-10.

18. Perform an operational check of the landing gear system and brake system. Refer to paragraphs 5-12 and 6-4.

19. Remove jacks.

5-42. MAIN LANDING GEAR STRUT ASSEMBLY REMOVAL AND INSTALLATION.

5-43. Removal and installation procedures for the right- and left-hand strut assemblies are the same except where noted in the following procedures.

Tools and Equipment List

Adapter Bundle, Jacking and Mooring	E13710
Jack, Hydraulic Tripod	996
Jack, Hydraulic Tripod, 10-ton	50J25178

5-44. REMOVING MAIN LANDING GEAR STRUT ASSEMBLY.

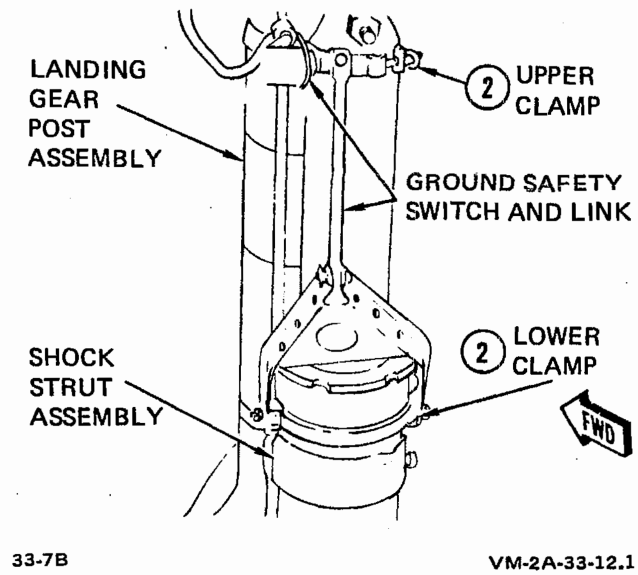
1. Jack the aircraft as described in General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

2. Remove the two clamps holding the ground safety switch and link on left-hand gear.

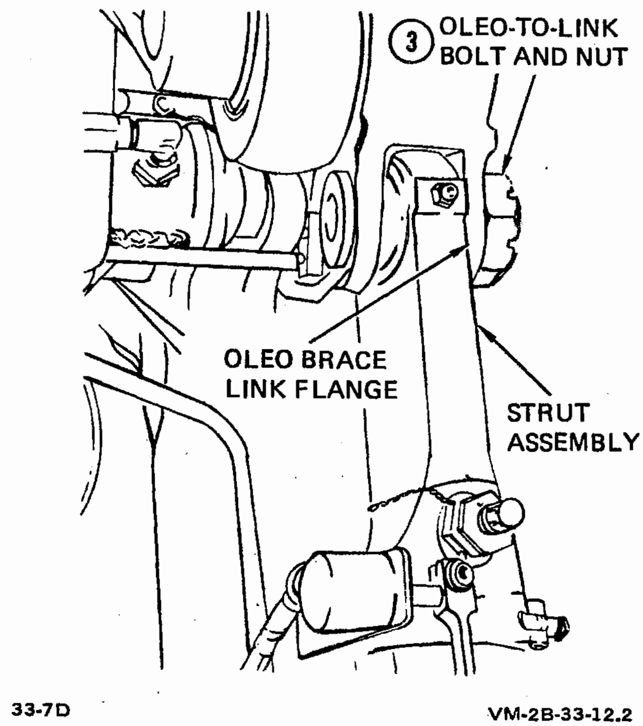
3. Remove cotter pin and oleo-to-link bolt at upper end of strut.

Note

Retain spacers with bolt after removal.

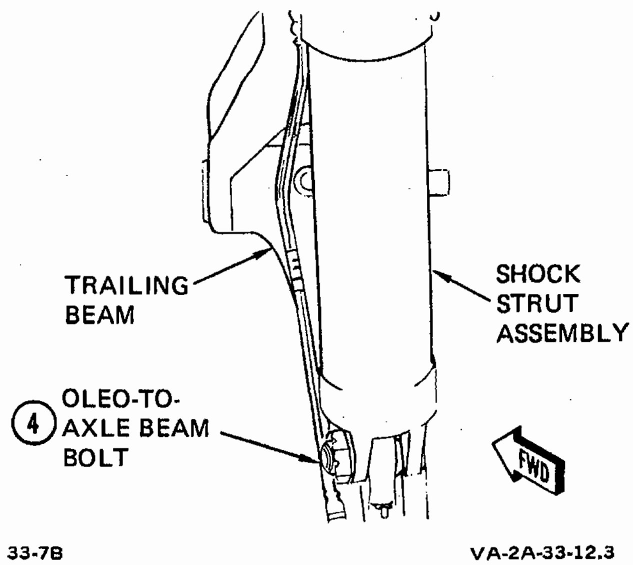


Step 2—Para. 5-44



Step 3—Para. 5-44

4. Remove cotter pin, nut, and oleo-to-axle beam bolt.



Step 4-Para. 5-44

5. Remove strut, using care not to mar, scratch, or nick the exposed portion of pistons.

Note

Wrap machined surface of strut with rags or cardboard to prevent damage during storage.

5-45. INSTALLING MAIN LANDING GEAR STRUT ASSEMBLY.

Materials List

Pins, Cotter	MS24665-374
	MS24665-377
Fluid, Hydraulic	MIL-H-5606
Lockwire (0.041-inch diameter steel)	MS20995F41
Primer, Zinc-chromate	MIL-P-8585 or TT-P-1757

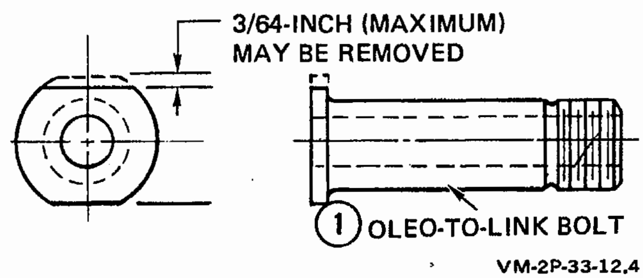
CAUTION

Ensure that the shock strut assembly is properly installed. The grease fitting and strut air fitting must be facing rearward.

1. Position shock strut in upper end of landing gear post and install oleo-to-link bolt and nut with spacer on each side of strut. Nut should be finger-tight.

Note

If oleo-to-link bolthead interferes with drag brace, 3/64 inch may be removed from the bolthead, using a file or stone. Do not allow bolt to heat during material removal. Brush-cadmium-plate reworked area of bolthead; apply zinc-chromate primer (MIL-P-8585 or TT-P-1757) and repaint.



Step 1—Para. 5-45

2. Torque oleo-to-link nut to 200 to 400 inch-pounds, back off to align cotter pin holes, and install cotter pin (MS24665-377).

3. Install oleo-to-axle beam bolt, spacers, and nut on trailing beam, and torque nut to 200 to 400 inch-pounds. Back off nut to align cotter pin hole, and install cotter pin (MS24665-374).

4. On left-hand gear, install two clamps for ground safety switch and link.

5. Adjust ground safety switch. Refer to paragraph 5-135.

6. Service shock strut assembly with air and hydraulic fluid. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

7. Remove aircraft jacks.

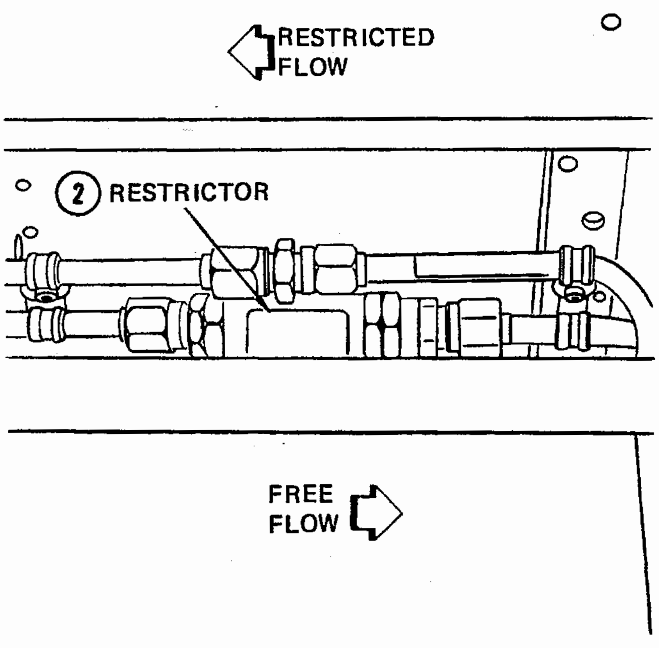
5-46. MAIN LANDING GEAR RESTRICTOR ASSEMBLY REMOVAL AND INSTALLATION.

5-47. To remove and install either main landing gear restrictor assembly, proceed as follows:

5-48. REMOVING MAIN LANDING GEAR RESTRICTOR ASSEMBLY.

1. Disengage HYD PUMP PWR circuit breaker.

2. Disconnect hydraulic lines from restrictor assembly in forward main landing gear wheel well; remove restrictor assembly and cap all fittings.



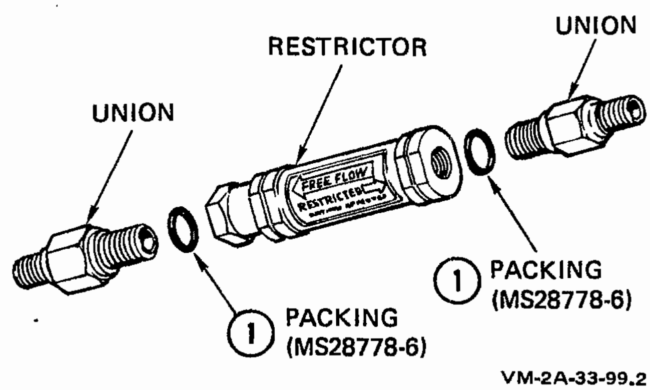
Step 2—Para. 5-48

5-49. INSTALLING MAIN LANDING GEAR RESTRICTOR ASSEMBLY.

Materials List

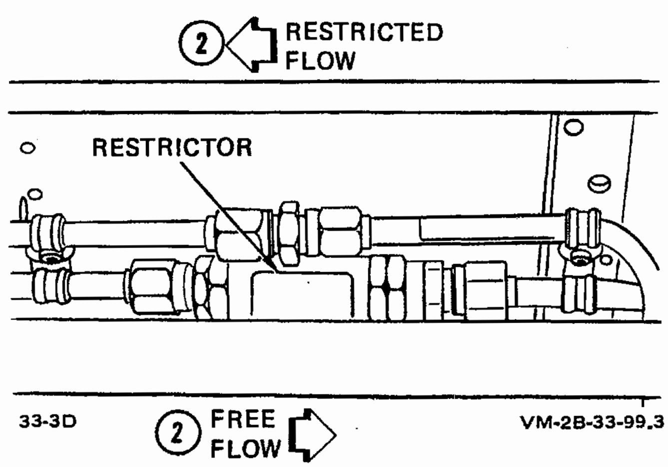
Packing	MS28778-6 (two required)
Gasket	AN6290-8
One-way Restrictor Valve (FSCM 4399)	2V12-29

1. Install new packings (MS28778-6) at each union.



Step 1—Para. 5-49

2. Position the restrictor assembly in the line with the free-flow arrow pointing toward the main landing gear actuator and the restricted flow toward the inboard side of nacelle and install lines.



Step 2—Para. 5-49

3. Fill and bleed system in accordance with paragraph 4-7.

4. Perform operational check of landing gear system. Refer to paragraph 5-12.

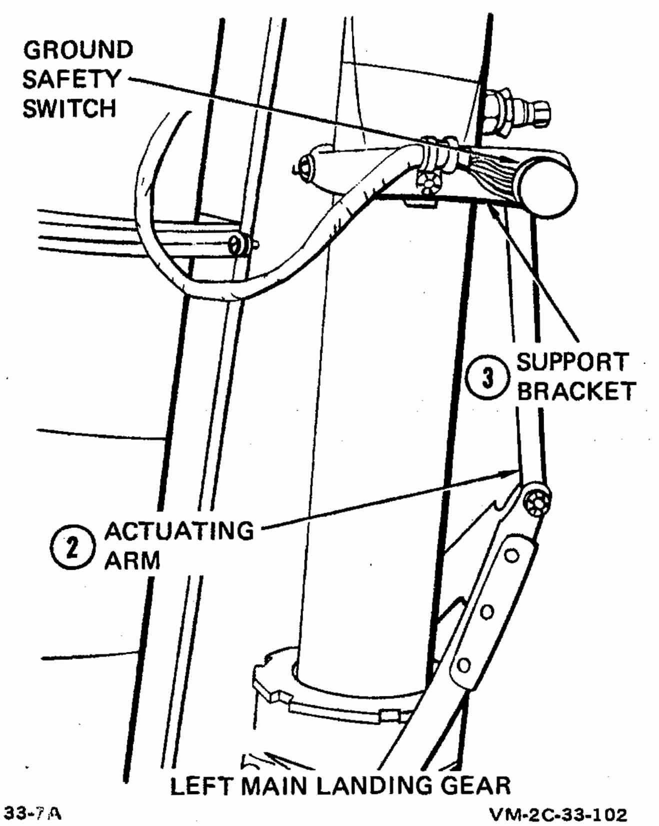
5-50. MAIN LANDING GEAR GROUND SAFETY SWITCH REMOVAL AND INSTALLATION.

5-51. To remove and install the main landing gear ground safety switch (left-hand main landing gear only), proceed as follows:

5-52. REMOVING MAIN LANDING GEAR GROUND SAFETY SWITCH.

1. Remove electrical power from aircraft.

2. Remove cotter pin and bolt and disconnect switch actuating arm.



Step 2—Para. 5-52

3. Remove two nuts from switch support bracket.

4. Remove wiring clamps so that wire bundle is free.

5. Remove cover on terminal strip 63 on outboard side of left-hand wheel well and disconnect all wires.

5-53. INSTALLING MAIN LANDING GEAR GROUND SAFETY SWITCH.

Materials List

Pins, Cotter	MS24665-132

1. Position switch assembly on strut clamp studs and install nuts. Safety with cotter pins (MS24665-132).

2. Route wire bundle through clamps to terminal strip 63; install wires on terminal strip. Refer to Wiring Data Manual (NAVAIR 01-60GCB-2-7) for wire installation.

Note

Allow a 6- to 8-inch loop of wire between the downlock wire clamp and the clamp on the switch support bracket.

3. Install the actuating arm and safety with cotter pin (MS24665-132).

4. Adjust the ground safety switch. Refer to paragraph 5-135.

5-54. MAIN LANDING GEAR DOWNLOCK ASSEMBLY REMOVAL AND INSTALLATION.

5-55. To remove and install either main landing gear downlock assemblies, proceed as follows:

Tools and Equipment List

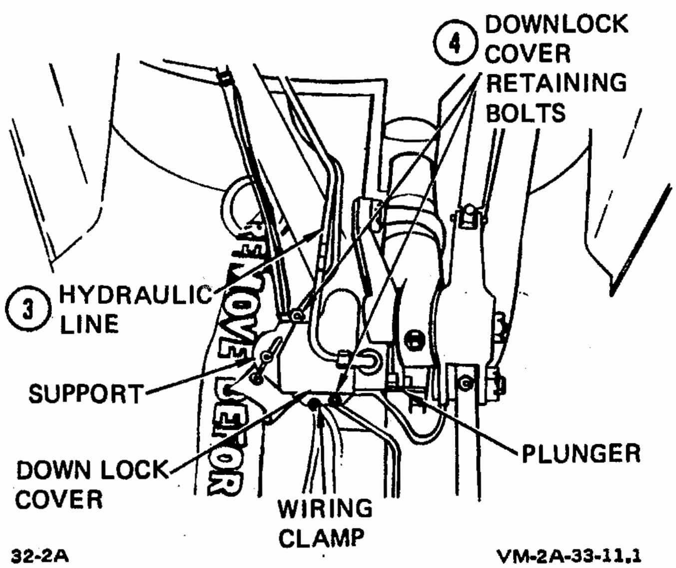
Adapter Bundle, Jacking and Mooring	E13710
Jack, Hydraulic Tripod	996
Jack, Hydraulic Tripod, 10-ton	50J25178

5-56. REMOVING MAIN LANDING GEAR DOWNLOCK ASSEMBLY.

1. Jack the aircraft in accordance with General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

2. Remove downlock safety pins.

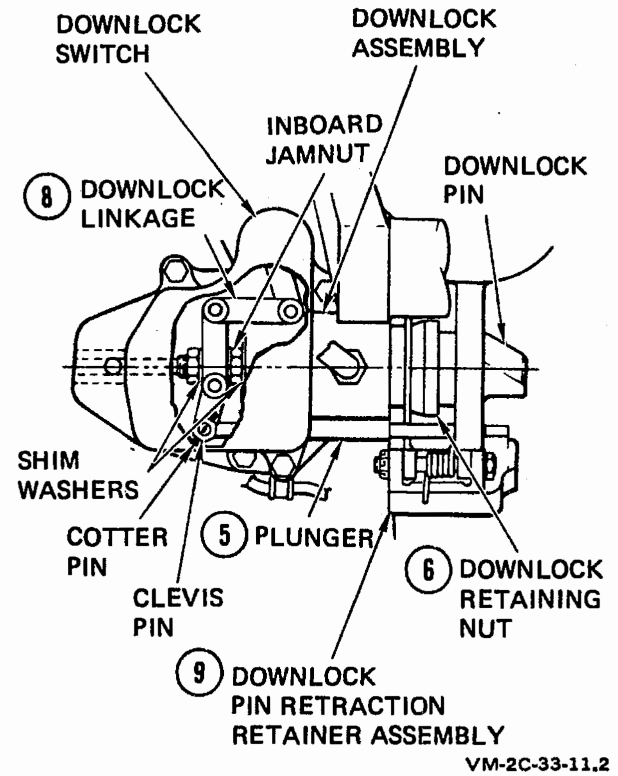
3. Disconnect hydraulic line from downlock assembly and cap to prevent leakage.



Steps 3 and 4—Para. 5-56

4. Remove two downlock cover retaining bolts and downlock cover.

5. Remove plunger by removing cotter pin, washer, and clevis pin.



Steps 5, 6, 8, and 9—Para. 5-56

6. Cut lockwire on downlock retaining nut.

7. Using a small, soft drift punch, tap downlock retaining nut until it is loose.

8. Remove two downlock switch retaining bolts and downlock linkage cotter pin, washer, and clevis pin. Tie downlock switch away from downlock.

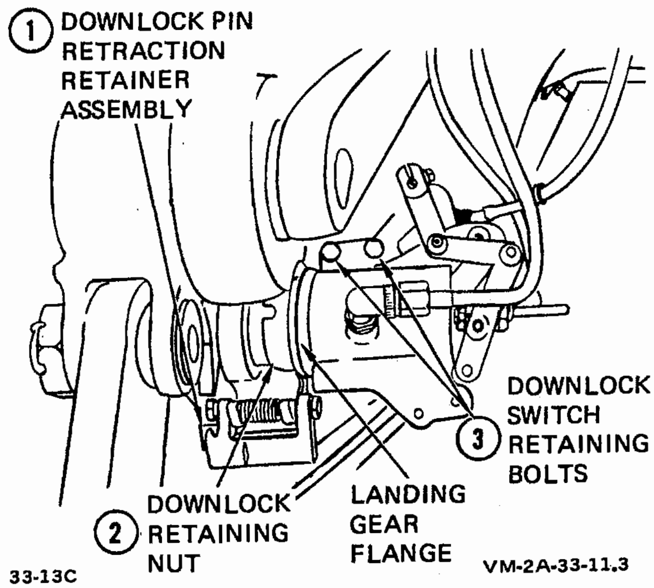
9. Remove downlock pin retraction retainer assembly and downlock cylinder simultaneously by backing off the downlock retainer nut.

5-57. INSTALLING MAIN LANDING GEAR DOWNLOCK ASSEMBLY.

Materials List

Pins, Cotter	MS24665-151
Fluid, Hydraulic	MIL-H-5606
Lockwire (0.041-inch diameter steel)	MS20995F41

1. Position downlock pin retraction retainer assembly on landing gear flange.



Steps 1 through 3—Para. 5-57.

2. Position downlock assembly on landing gear flange and install retaining nut, using small, soft drift punch until tight against retraction pin retainer assembly and landing gear flange. Safety with lockwire (MS20995F41).

3. Install downlock switch assembly, using two downlock switch retaining bolts.

4. Install switch clevis pin, washers, and safety with cotter pin (MS24665-151).

5. Insert plunger through downlock assembly housing and install linkage, using clevis pin, washer, and cotter pin (MS24665-151).

6. Adjust downlock assembly. Refer to paragraph 5-132.

7. Install downlock cover.

8. Manually fill downlock cylinder with hydraulic fluid (MIL-H-5606) and install hydraulic pressure line on downlock assembly.

9. Bleed the downlock cylinder. Refer to paragraph 4-8.

10. Perform an operational check of the downlock assembly. Refer to paragraph 5-15.

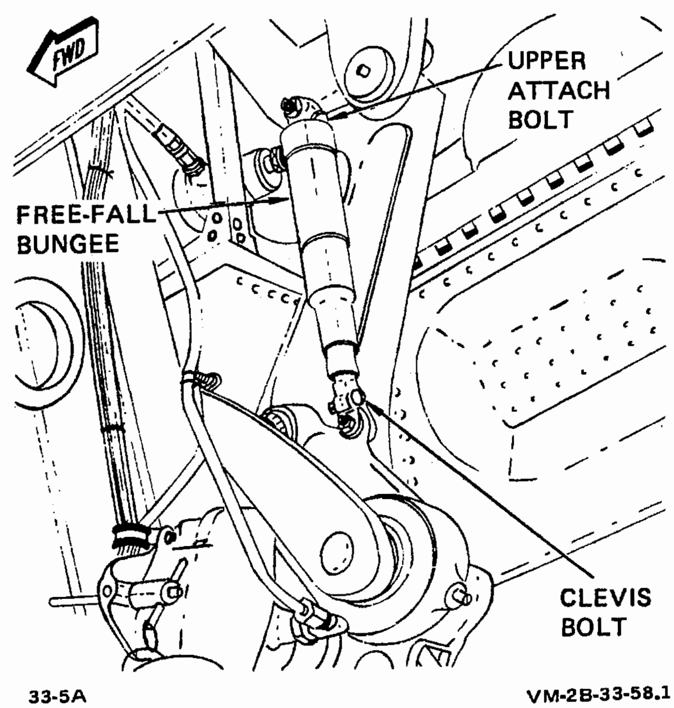
11. Remove aircraft jacks.

5-58. MAIN LANDING GEAR FREE-FALL BUNGEE REMOVAL AND INSTALLATION.

5-59. To remove and install the right or left main landing gear free-fall bungee, proceed as follows:

5-60. REMOVING MAIN LANDING GEAR FREE-FALL BUNGEE.

1. Remove cotter pin, nut, washers, and clevis bolt from lower rod end of free-fall bungee.



Steps 1 and 2—Para. 5-60

2. Remove cotter pin, nut, washers, and bolt from upper attach end and remove free-fall bungee.

5-61. INSTALLING MAIN LANDING GEAR FREE-FALL BUNGEE.

Materials List

Pins, Cotter	MS24665-151

1. Position main landing gear free-fall bungee on main landing gear chassis assembly with rod end down.

2. Install upper attach bolt, with washer on each side of attach fitting; install nut finger-tight to permit free rotation of joint and safety with cotter pin (MS24665-151).

3. With bungee rod end in free (extended) position, adjust rod end to fit; extend rod end two full turns, and tighten jamnut.

4. Install clevis bolt at lower attach point with washer under bolthead and nut; install nut finger-tight to permit free rotation of joint, and safety with cotter pin (MS24665-151).

5-62. MAIN LANDING GEAR UPLOCK MECHANISM ASSEMBLY REMOVAL AND INSTALLATION.

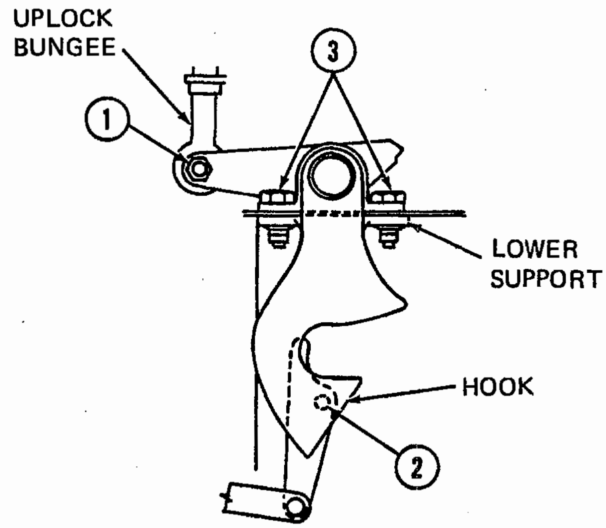
5-63. To remove and install the main landing gear uplock mechanism assembly, proceed as follows:

5-64. REMOVING MAIN LANDING GEAR UPLOCK MECHANISM ASSEMBLY.

1. With the landing gear down and locked, remove the cotter pin, nut, washer, and clevis bolt from the rod end of the main landing gear uplock bungee.

2. Detach trigger from uplock hook by removing cotter pin, two thin washers, and pin.

3. Remove outboard and inboard bolts, nuts, and washers and remove uplock mechanism and shim from lower support.



Steps 1 through 3—Para. 5-64

5-65. INSTALLING MAIN LANDING GEAR UPLOCK MECHANISM ASSEMBLY.

Materials List

Pins, Cotter	MS24665-151

1. Install shim and uplock mechanism on lower support (taper inboard) with inboard and outboard bolts, washers and nuts.

2. Attach trigger to uplock hook with pin, two thin washers and cotter pin.

3. Attach rod end of main landing gear uplock bungee with clevis bolt, washer, nut and cotter pin.

5-66. MAIN LANDING GEAR UPLOCK BUNGEE REMOVAL AND INSTALLATION.

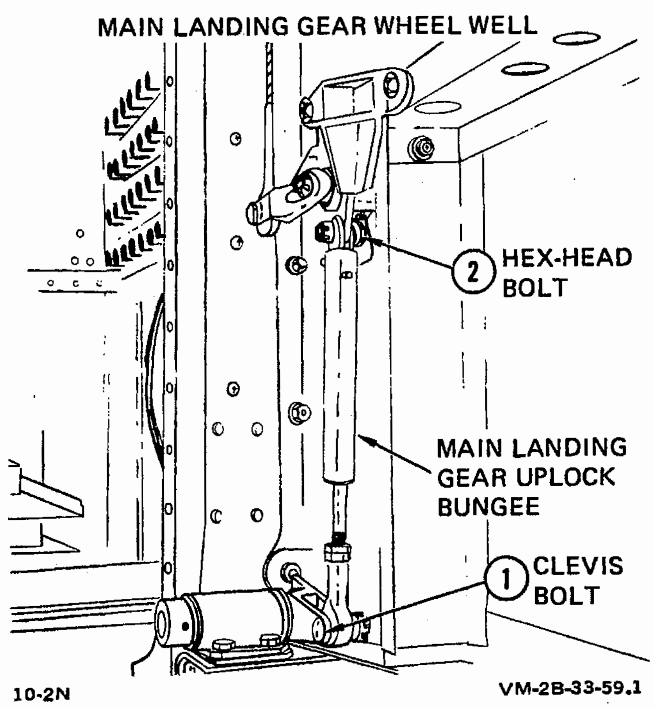
5-67. To remove and install the main landing gear uplock bungee, proceed as follows:

5-68. REMOVING MAIN LANDING GEAR UPLOCK BUNGEE.

Materials List

Pins, Cotter MS24665-151

1. With the landing gear down and locked, remove the cotter pin, nut, washer, and clevis bolt from the rod end of the bungee.



Steps 1 and 2—Para. 5-68

2. Remove cotter pin, nut, washer, and hex-head bolt from upper attach point and remove bungee.

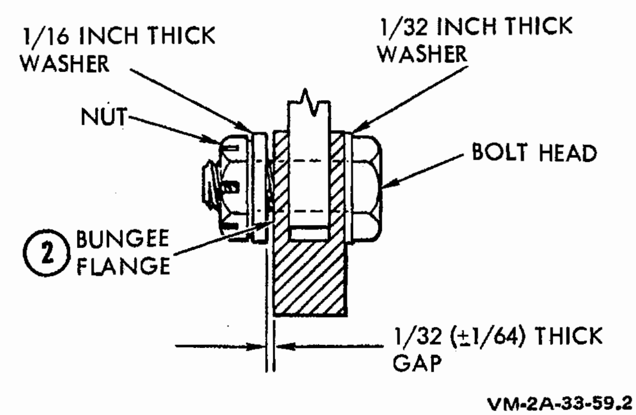
5-69. INSTALLING MAIN LANDING GEAR UPLOCK BUNGEE.

Materials List

Pins, Cotter MS24665-151

1. Position bungee in aircraft and install hex-head bolt with LD153-0011-0013 (1/32-inch thick) washer under bolthead and LD153-0011-0014 (1/16-inch thick) washer under nut. Install nut finger-tight and safety with cotter pin (MS24665-151). Ensure that bolt is free to turn.

2. Push bolthead toward centerline of wheel well and check that accumulative gap between washer under nut and bungee flange is 1/32 (±1/64) inch.



Step 2—Para. 5-69

3. Adjust bungee rod end. Refer to paragraph 5-124.

4. Install rod end clevis bolt with washers and nut. Install nut finger-tight and safety with cotter pin (MS24665-151).

5. Ensure that gear safety pins are installed, HYD PUMP PWR circuit breaker is disengaged; place landing gear handle to "up" position. Check bungee at both ends to ensure no binding exists as bungee moves. Reset HYD PUMP PWR circuit breaker.

5-70. MAIN LANDING GEAR CONTROL SYSTEM LATCH ASSEMBLY BELL CRANK REMOVAL AND INSTALLATION.

5-71. To remove and install the main landing gear control system latch assembly bell crank, proceed as follows:

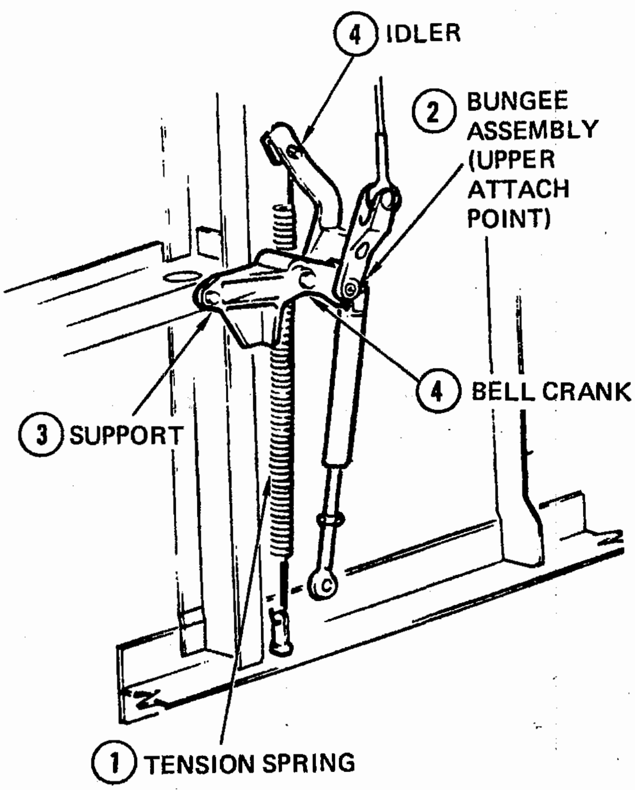
5-72. REMOVING MAIN LANDING GEAR CONTROL SYSTEM LATCH ASSEMBLY BELL CRANK.

1. Disconnect tension spring from bell crank idler.

2. Disconnect bungee assembly from upper attach point of bell crank assembly in accordance with paragraph 5-78.

3. Remove cotter pin, nut, washer and bolt attaching bell crank to support.

4. Remove cotter pin, nut, washers and bolt attaching bell crank to idler and remove bell crank.



Steps 1 through 4—Para. 5-72

5-73. INSTALLING MAIN LANDING GEAR CONTROL SYSTEM LATCH ASSEMBLY BELL CRANK.

Materials List

Pins, Cotter	MS24665-134

Note

When installing bell crank insure that the slotted portion is pointed down and the lug is off center more to the outboard side.

1. Position bell crank in idler and install screw (head outboard), washer and nut. Safety with cotter pin (MS24665-134).

2. Connect bell crank to support with bolt (head outboard), washer and nut. Safety with cotter pin (MS24665-134).

3. Connect bungee assembly to bell crank in accordance with paragraph 5-90.

4. Connect tension spring to idler.

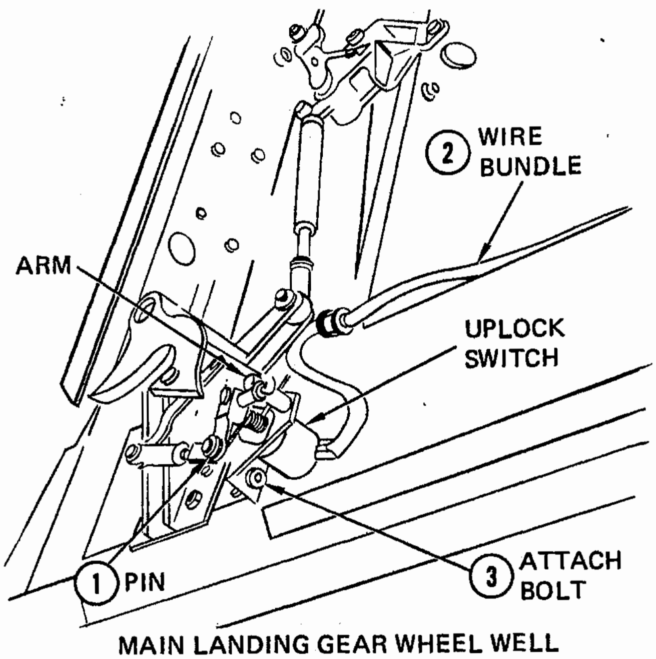
5. Perform an operational check of the landing gear in accordance with paragraph 5-15.

5-74. MAIN LANDING GEAR UPLOCK SWITCH ASSEMBLY REMOVAL AND INSTALLATION.

5-75. To remove and install the main landing gear uplock switch assembly, proceed as follows:

5-76. REMOVING MAIN LANDING GEAR UPLOCK SWITCH ASSEMBLY.

1. Remove cotter pin, pin, and (2) washers from arm.



Steps 1 through 3—Para. 5-76

2. Disconnect wire bundle clamps and wiring at terminal strip (terminal strip No. 81 for right-hand gear switch or terminal strip No. 62 for left-hand gear switch).

3. Remove upper and lower attach bolts from switch bracket and remove switch assembly.

5-77. INSTALLING MAIN LANDING GEAR UPLOCK SWITCH ASSEMBLY.

Materials List

Pins, Cotter	MS246675-149

1. Position switch assembly to aft side of attaching bracket in wheel well and install attach bolts. Torque bolts to 25 to 30 inch-pounds.

2. Route wire bundle through clamps and install on appropriate terminal strip (terminal strip No. 81 for right-hand gear switch or terminal strip No. 62 for left-hand gear switch). Refer to Wiring Data Manual (NAVAIR 01-60GCB-2-7) for wiring schematic.

3. Position switch arm to clevis rod and install pin, washers, and cotter pin (MS24665-149).

4. Adjust the main landing uplock switch. Refer to paragraph 5-131.

5. Perform an operational check of the landing gear system. Refer to paragraph 5-15.

5-78. MAIN LANDING GEAR WHEEL DOOR BUNGEE REMOVAL AND INSTALLATION.

5-79. To remove and install the main landing gear wheel door bungee, proceed as follows:

WARNING

Extreme care must be used during removal and installation to prevent injury as a result of bungee preload.

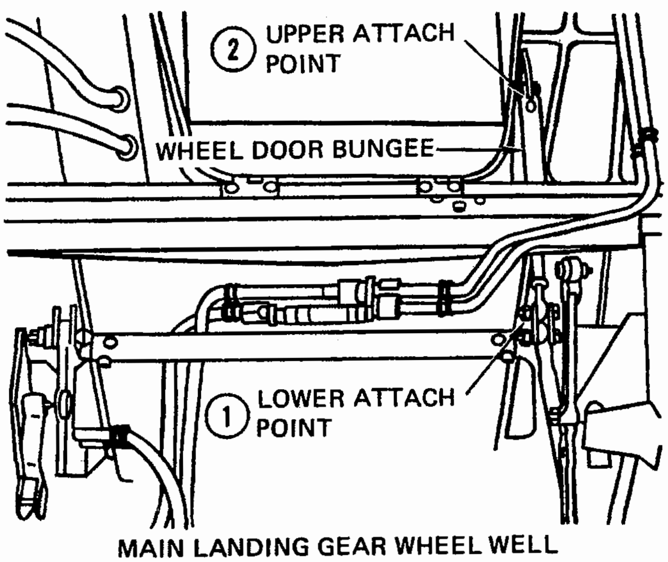
5-80. REMOVING MAIN LANDING GEAR WHEEL DOOR BUNGEE.

1. With landing gear down and locked, remove cotter pin, washer, nut, and bolt from lower attach point.

2. Remove cotter pin, washer, and clevis pin from upper attach point.

Note

To check the bungee breakout force, refer to paragraph 5-225.



Steps 1 and 2—Para. 5-80

5-81. INSTALLING MAIN LANDING GEAR WHEEL DOOR BUNGEE.

Materials List

Pins, Cotter	MS24665-151

1. Position bungee on upper nacelle bracket and install clevis pin, washer, and cotter pin (MS24665-151).

2. Adjust bungee rod end. Refer to paragraph 5-124.

3. Install rod end at lower attach point, using hex-head bolt, washer, nut, and cotter pin (MS24665-151).

4. Check door operation. Refer to paragraph 5-14.

5-82. MAIN LANDING GEAR WHEEL REMOVAL AND INSTALLATION.

5-83. Each main landing gear is equipped with a 29 x 11.00-10 split-type, cast wheel and bearing assembly and a 29 x 11.00-10, 8-ply rated tire and tube. To remove and install the main landing gear wheel assembly, proceed as follows:

Tools and Equipment List

Jack Pads	E13710
Jack, Hydraulic Hand	53D22020

5-84. REMOVING MAIN LANDING GEAR WHEEL.

1. Install axle jack under the jacking stub. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

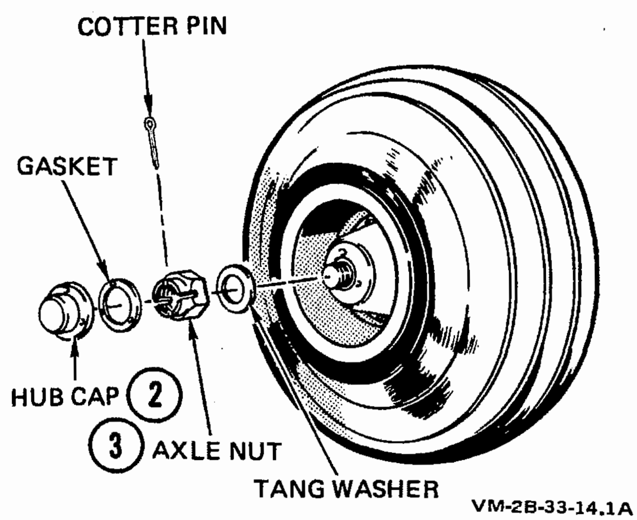
WARNING

Deflate tire before proceeding.

2. Remove three screws attaching hub cap to outer wheel-half. Remove hub cap and cap gasket.

Note

A plastic dust plug is inserted in the hollow axle and does not require removal.



Steps 2 and 3—Para. 5-84

3. Remove cotter pin, axle nut, and tanged washer from axle.

4. Slide wheel off of axle.

5. Protect center of wheel assembly and bearings from entry of foreign matter.

5-85. INSTALLING MAIN LANDING GEAR WHEEL.

Materials List

Grease, Aircraft Ball- and Roller-bearing	MIL-G-81322
Pins, Cotter	MS24665-379

Note

The main landing gear tires should be replaced when tread has worn to the bottom of the wear depth indicators or the bottom of the tread grooves, whichever occurs first, on any point on the tread, regardless of whether the wear is due to normal use or to skidding.

1. Inspect wheel bearings to ensure they are clean and properly lubricated with grease (MIL-G-81322).

CAUTION

Ensure that spacer is properly installed on axle before installing wheel.

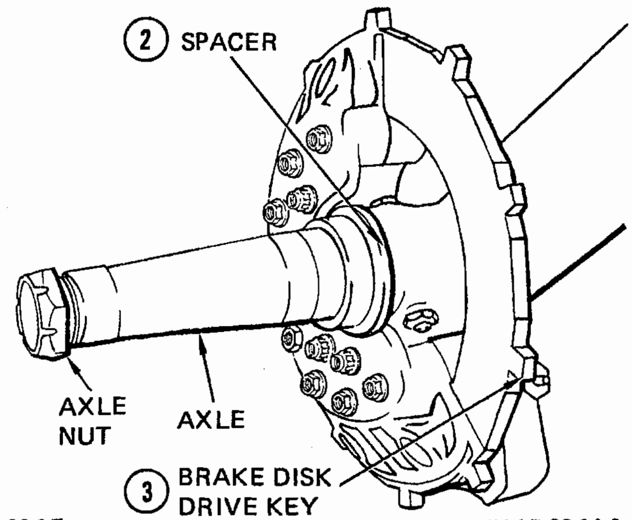
2. If installed, remove cotter pin, axle nut, and tanged washer from axle and lightly lubricate axle and spacer with grease (MIL-G-81322).

3. Slide wheel onto axle and rotate as necessary so that brake disk key slots (on wheel) will engage drive key (on brake disk).

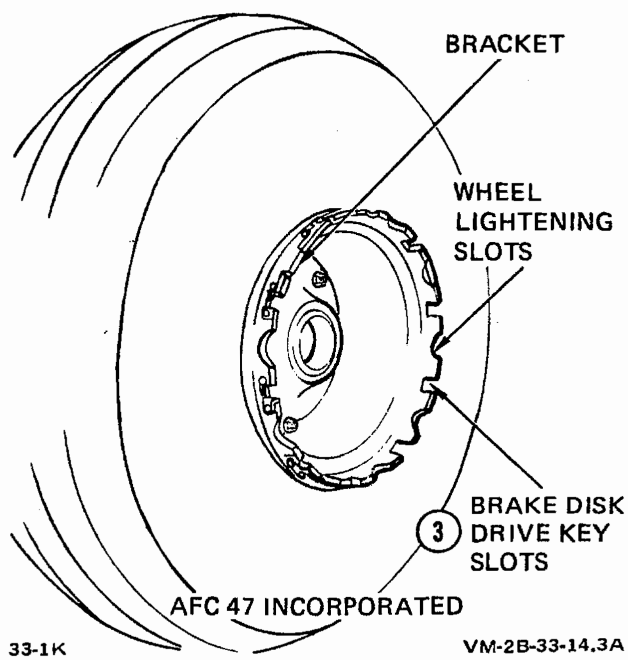
Note

The drive key slots on the wheel are the rectangular slots on the inner wheel-half; the circular slots or cutouts are wheel lightening slots.

Wheels having AFC 47 incorporated contain brackets installed over three of the circular slots to ensure proper installation.



Steps 2 and 3—Para. 5-85



Steps 3—Para. 5-85

4. Install tanged washer and axle nut.

5. Torque axle nut to 20 foot-pounds.

6. Back axle nut off to "0" torque.

7. Retorque axle nut to 10 foot-pounds. If castellation in nut and hole in axle are not aligned, continue tightening until cotter pin can be installed but do not exceed 20 foot-pounds torque. If when torque reaches 20 foot-pounds and cotter pin hole in axle is not aligned with castellation in nut, back nut off to nearest castellation and install cotter pin.

WARNING

Check wheel to ensure that there is no end play at wheel bearings,.

Note

To prevent damage to the hub cap, cut the cotter pin off approximately two threads from end of axle face and tap flat against axle.

8. Check that dust plug is in place in axle.

9. Install gasket and hub cap.

10. Inflate tire in accordance with instructions in General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

11. Remove axle jack.

5-86. NOSE LANDING GEAR CHASSIS ASSEMBLY REMOVAL AND INSTALLATION.

5-87. To remove and install the nose landing gear chassis assembly, proceed as follows:

Tools and Equipment List

Adapter Bundle, Jacking and Mooring	E13710

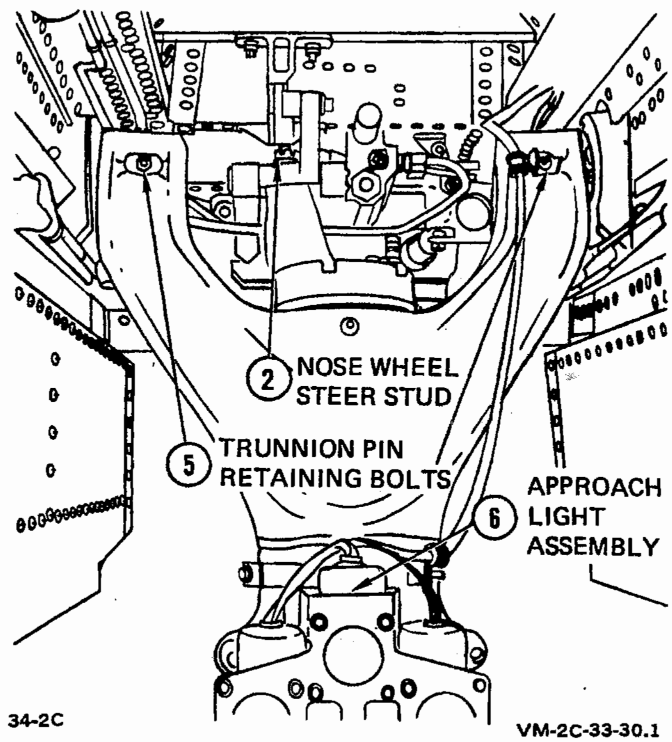
Tools and Equipment List (Cont)

Jack, Hydraulic Tripod	996
Jack, Hydraulic Tripod, 10-ton	50J25178

5-88. REMOVING NOSE LANDING GEAR CHASSIS ASSEMBLY.

1. Jack the aircraft. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

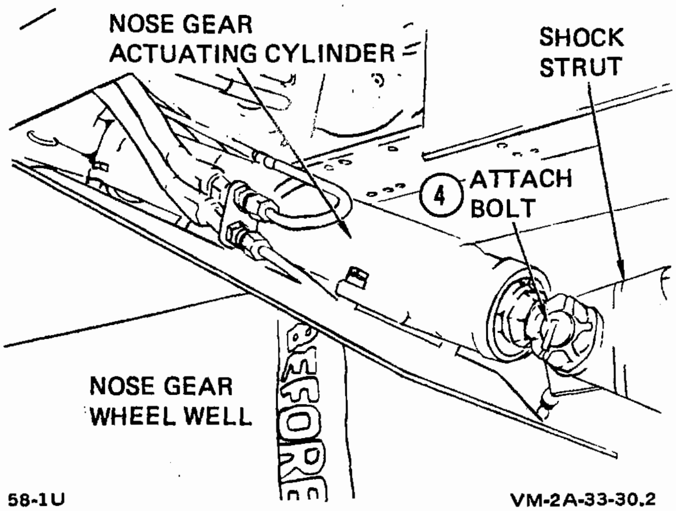
2. Remove cotter pin and nut from nose wheel steer stud retaining nose wheel steer damper arm at top of shock strut.



Steps 2 and 5—Para. 5-88

3. Pull steer damper up off of stud and wire it to top of wheel well.

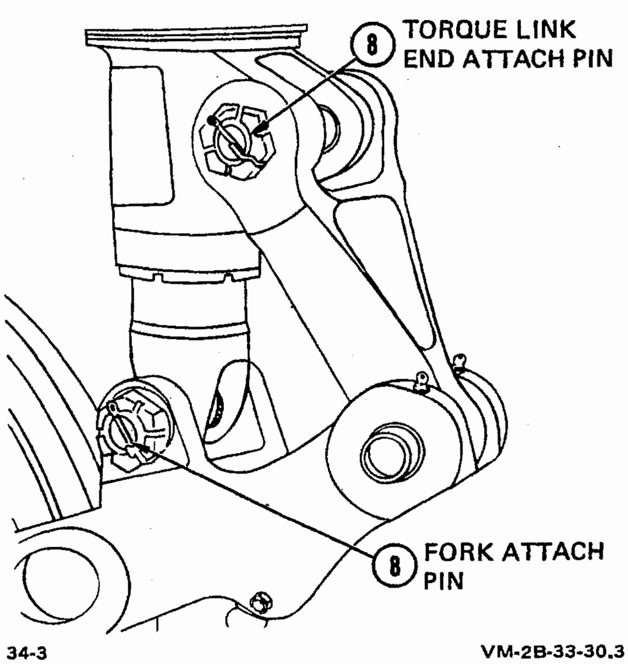
4. Disconnect nose gear actuating cylinder from rear side of shock strut by removing cotter pin, nut, and attach bolt.



Step 4—Para. 5-88

5. Remove trunnion pin retaining bolts.

6. Remove approach light assembly and tape it to side of forward nose wheel well. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5) for removal procedure.



Step 8—Para. 5-88

7. By placing an index finger in the trunnion pins, slide each pin in toward the fuselage centerline.

Note

It will probably be necessary to apply a small amount of upward pressure on the nose gear while both pins are removed.

8. Remove the cotter pins and remove attach pins from the torque link and fork.

5-89. INSTALLING NOSE LANDING GEAR CHASSIS ASSEMBLY.

Materials List

Pins, Cotter	MS24665-153
	MS24665-285
	MS24665-301
	MS24665-337
Washers, Shim	2W1LB-B4-58-062

1. Install torque link and fork with pins. Safety torque link end pin and fork attach pin with cotter pin (MS24665-337 and MS24665-153, respectively).

2. Position trunnions in wheel well and pull trunnion pins through shock strut bearing area. Shim with 2W1LB-B4-58-062 washers for 0.000 (+0.000/-0.003)-inch clearance on both sides.

Note

If necessary the right and left jowl doors may be opened to push pins through shock strut.

3. Align trunnion holes and pin holes and install bolt, bonding jumper, washer, and nut to retain pins. Torque to 22 (±2) inch-pounds and safety with cotter pins (MS24665-301).

4. Install nose gear actuating cylinder on fitting on rear side of shock strut. Tighten nut until it bottoms out on flange; back off to nearest cotter pin hole and install cotter pin (MS24665-360).

5. Install approach light assembly. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

6. Position nose steer damper on shock strut stud, install 2W1AL-32-26-90 and 2W1C-32-36-063 washers over steer damper arm on stud, and tighten nut until it bottoms out on washers. Back off nut to align cotter slots with hole in stud and install cotter pin (MS24665-285).

7. If a new shock strut has been installed, ensure that it has been properly serviced with air and hydraulic fluid. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

8. Perform an operational check of the nose wheel steering system and the landing gear system. Refer to paragraphs 7-4 and 5-15, respectively.

5-90. NOSE LANDING GEAR SHOCK STRUT REMOVAL AND INSTALLATION.

5-91. To remove and install the nose landing gear shock strut assembly, proceed as follows:

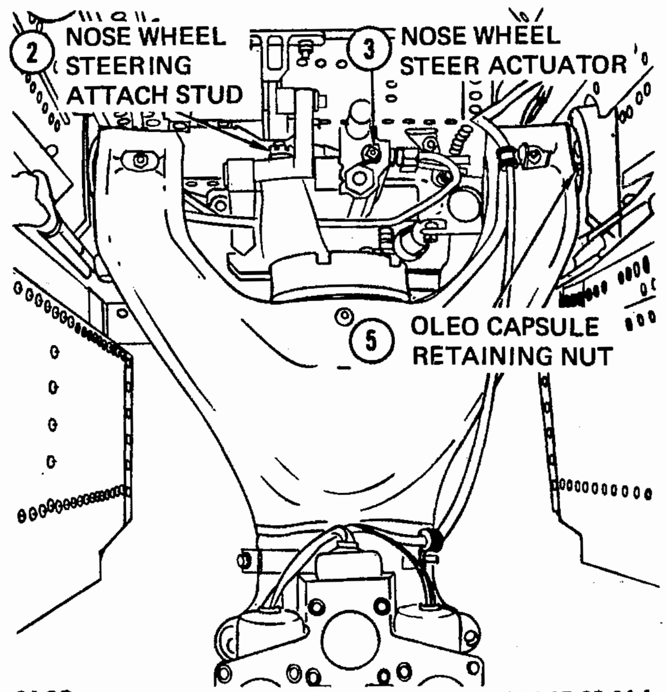
5-92. REMOVING NOSE LANDING GEAR SHOCK STRUT.

Tools and Equipment List

Jack Pads	E13710
Jack, Hydraulic, Tripod	996

1. Jack aircraft in accordance with General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

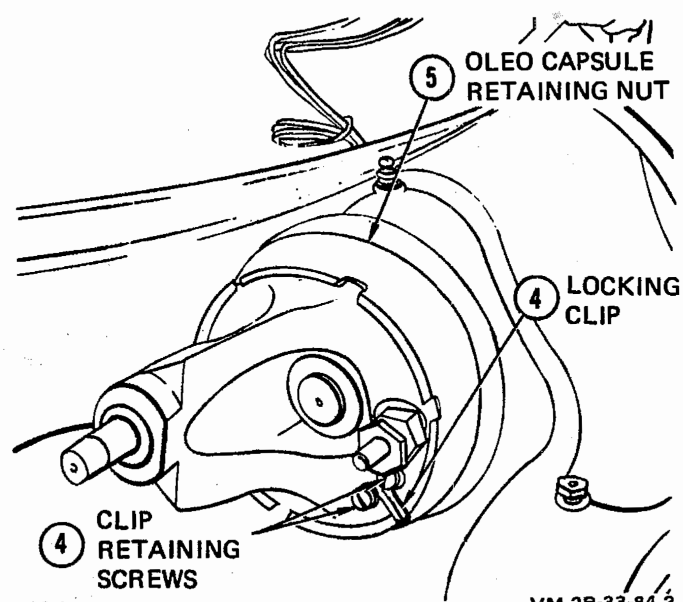
2. Remove nut attaching the nose wheel steering actuator to the attach stud at the top of the shock strut.



Steps 2, 3, and 5—Para. 5-92

3. Pull the steering actuator off attach stud and wire to the top of the wheel well.

4. Cut lockwire and remove two clip retaining screws and locking clip from top of shock strut.

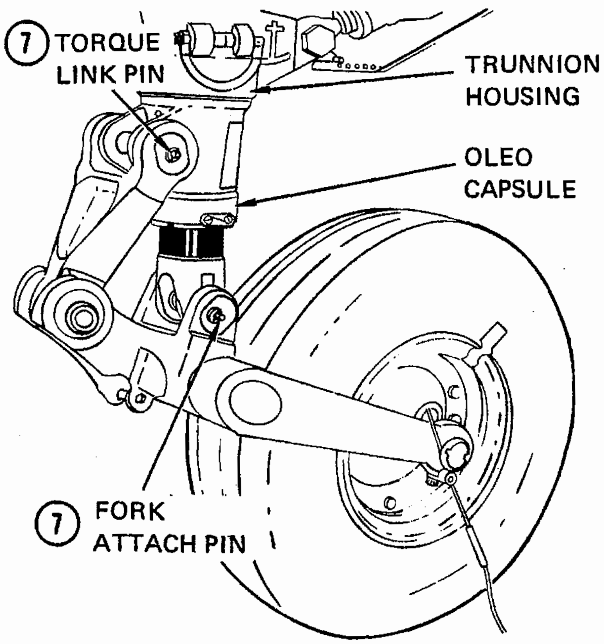


Steps 4 and 5—Para. 5-92

5. Using spanner wrench, remove oleo capsule retaining nut.

6. Slide oleo capsule from trunnion housing.

7. Remove cotter pins and remove attach pins from torque link and fork.



Step 7—Para. 5-92

5-93. INSTALLING NOSE LANDING GEAR SHOCK STRUT.

Materials List

Pins, Cotter	MS24665-153
	MS24665-285
	MS24665-337
Lockwire (0.032-inch diameter steel)	MS20995F32

1. Install torque link and fork with pins. Secure torque link end pin and fork attach pin with cotter pins (MS24665-337 and MS24665-153, respectively).

2. Slide oleo capsule into trunnion housing and install retaining nut.

Note

Using spanner wrench, install retaining nut as tight as possible and back off to the first slot which permits installation of locking clip.

3. Install locking clip and safety with lockwire (MS20995F32).

4. Install nose wheel steering actuator on stud. Safety with cotter pin (MS24665-285).

5. Check nose gear operation in accordance with paragraph 5-15.

5-94. NOSE GEAR ACTUATING CYLINDER (DRAG BRACE) REMOVAL AND INSTALLATION.

5-95. To remove and install the nose gear actuating cylinder, proceed as follows:

Tools and Equipment List

Adapter Bundle, Jacking and Mooring	E13710
Jack, Hydraulic Tripod	996

Materials List

Gasket	MS9058-04
O-Ring	MS28778-4
Pins, Cotter	MS24665-360
Lockwire (0.041-inch diameter steel)	MS20995F41

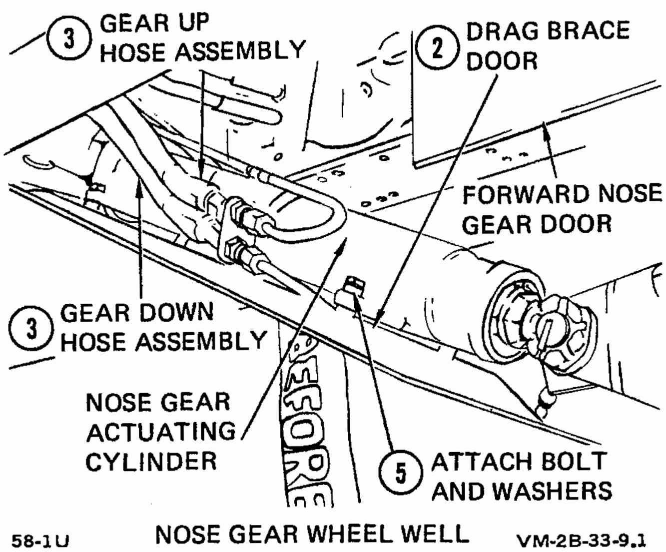
5-96. REMOVING NOSE GEAR ACTUATING CYLINDER.

1. Using adapter bundle (E13710) and hydraulic tripod jack (996), jack the nose of aircraft. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for jacking instructions.

2. Remove four bolts attaching drag brace door to actuating cylinder.

Note

The number of washers on each side of the actuating cylinder bolt flanges should be recorded for ease of installation.



Steps 2, 3, and 5—Para. 5-96

3. Disconnect the two hydraulic hose assemblies at the tubing bracket on the actuator and cap to prevent leakage.

4. Disconnect downlock switch wiring from terminal strip No. 2 at fuselage station 56 and remove wire clamps.

5. Remove forward and rear attach bolts, nuts, and cotter pins at each end of actuator and remove actuator with hydraulic fittings and tubing installed.

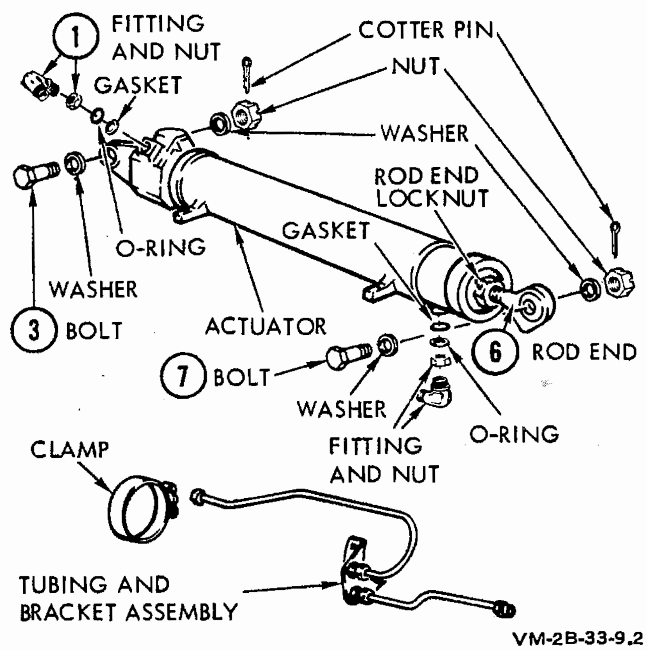
6. If a new actuator is to be installed, remove hydraulic tubing, downlock switch and tubing, retaining bracket, and fittings.

5-97. INSTALLING NOSE GEAR ACTUATING CYLINDER.

Materials List

Pins, Cotter	MS24665-360
Gasket	MS9058-04
Lockwire (0.041-inch diameter steel)	MS20995F41
Hydraulic Fluid	MIL-H-5606
Packing	MS28778-4

1. If new actuator is being installed, fully extend actuator piston and install hydraulic fittings, tubing, and retaining bracket on actuator. Use a new gasket and packing at each fitting (MS28778-4 and MS9058-04).



Steps 1, 3, 6, and 7—Para. 5-97

2. Manually fill the nose gear actuator with hydraulic fluid (MIL-H-5606) and cap to prevent leakage.

3. Position actuator in nose wheel well and install back retaining bolt. Tighten nut until it bottoms out and back off to nearest cotter pin hole. Install cotter pin (MS24665-360).

4. With downlock switch mounted on actuator cylinder, properly route wiring and install wiring on terminal strip No. 2 at fuselage station 56.0 (in nose wheel well, left-hand side) and wire bundle clamps.

Note

Wire numbers correspond to terminal strip numbers and should be installed accordingly.

5. Connect hydraulic hose assemblies to actuator fittings.

6. Adjust actuator as specified by paragraph 5-138, steps 2 through 4.

7. Install drag brace door and adjust as specified by paragraph 5-140, step 2.

8. Service the hydraulic system (paragraph 4-8) and check rod end adjustment as specified by paragraph 5-138.

9. Lower aircraft and remove jacking equipment.

5-98. NOSE LANDING GEAR WHEEL REMOVAL AND INSTALLATION.

5-99. The nose landing gear is equipped with a 7.50-10 wheel and tire assembly. To remove and install the nose landing gear wheel assembly, proceed as follows:

Tools and Equipment List

Jack Pad	E13710
Jack, Hydraulic Hand	53D22020

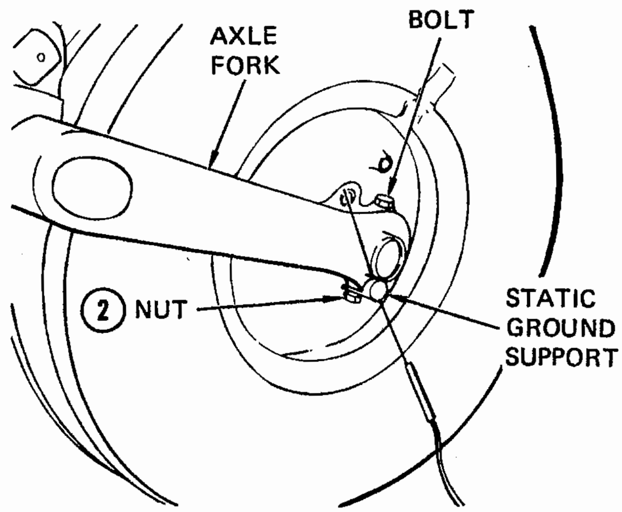
5-100. REMOVING NOSE LANDING GEAR WHEEL ASSEMBLY.

1. Install the axle jack under jacking pad. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for jacking instructions.

WARNING

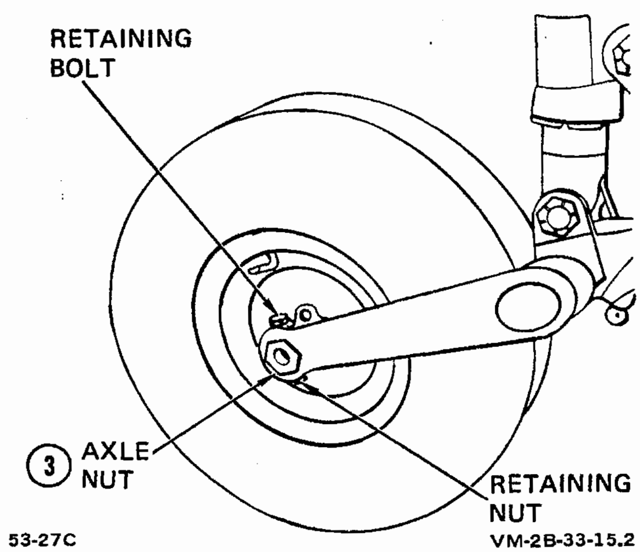
Deflate tire before proceeding.

2. Remove the nut, washer, and bolt from each side of the fork. This will permit static ground support to be removed from axle fork.



Step 2—Para. 5-100

3. Remove landing gear axle nut.



Step 3—Para. 5-100

4. Slowly remove the axle through axle nut side while holding the wheel up, and place all spacers, bushings, and bearings on a clean surface. The wheel will drop down.

5. Cover the axle fork holes and wheel axle holes with masking tape to prevent foreign material from entering.

5-101. INSTALLING NOSE LANDING GEAR WHEEL ASSEMBLY.

Materials List

Grease, Aircraft Ball- and Roller-bearing	MIL-G-81322

Note

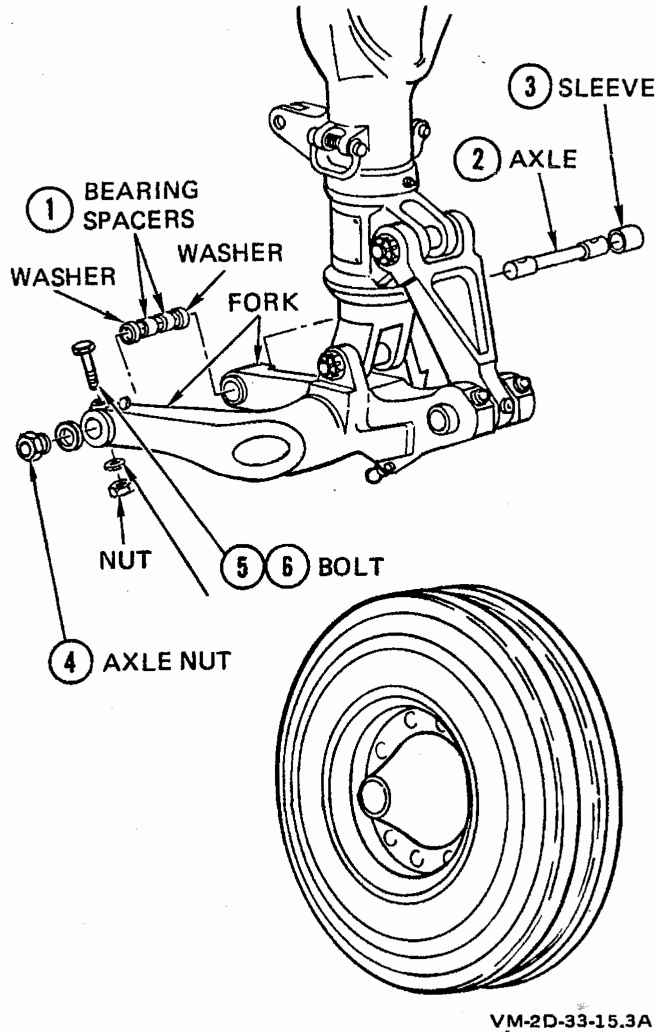
The nose wheel tire should be replaced when any portion of the area between the tire ridges makes contact with the runway or taxiway. Red core shall not be used as removal criteria.

1. With bearings and bushings cleaned, lubricated with grease (MIL-G-81322), and installed in wheel, hold wheel up in between fork, and slide bearing spacers and washers through fork and into wheel assembly.

2. Slide axle through both sides of fork and align vertical bolt holes with holes in axle fork. Install bolt through side of fork away from axle nut. Position static ground support, and install washer and nut.

3. Slide in axle sleeve and align slots with vertical holes in fork. Hold sleeve to prevent rotation when bearings are adjusted. Spin wheel by hand and tighten axle nut until wheel drag is felt. This will seat bearings and center wheel.

4. Back-off axle nut until no drag is felt while spinning wheel. Then tighten axle nut abruptly until substantial drag is felt.



Steps 1 through 6—Para. 5-101

5. Ensure that vertical bolt holes are aligned. If holes are aligned, install bolt and washer and secure nut.

6. If holes are not aligned, reduce axle nut torque until vertical holes are aligned. Install bolt, washer, and nut.

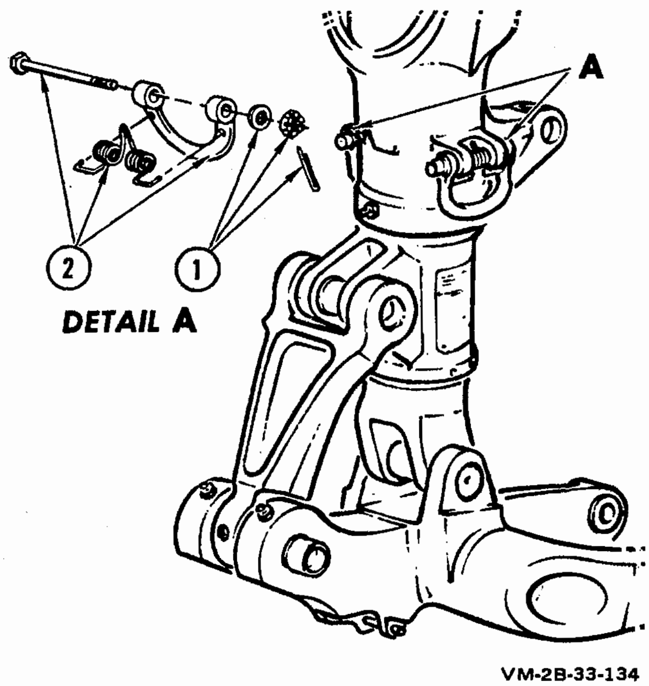
7. Inflate tire, remove jack, and check tire pressure. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

5-102. NOSE LANDING GEAR MOORING RINGS REMOVAL AND INSTALLATION.

5-103. The nose gear mooring rings are removed for cleaning, inspection, and lubrication to ensure proper ring retraction. Failure of rings to retract results in interference between ring and wheel-well structure with consequent failure of nose gear to retract to full up and locked position.

5-104. REMOVING NOSE LANDING GEAR MOORING RINGS.

1. Remove cotter pin, nut, and washer.



Steps 1 and 2—Para. 5-104

2. Slide bolt out of trunnion fitting. Retrieve spring and mooring ring.

5-105. INSTALLING NOSE LANDING GEAR MOORING RINGS.

Materials List

Petrolatum	VV-P-236
Pin, Cotter	MS24665-301

1. Remove all dirt, paint, corrosion, and foreign matter from mooring ring, bolt, and strut attachment surface bearing areas.

2. Lubricate bearing surfaces with petrolatum (VV-P-236).

3. Position spring and mooring ring and secure, using bolt, washers, and nut. Tighten nut hand-tight, so that mooring ring is free to move, and install cotter pin.

4. Actuate mooring rings three to five times to ensure positive retract action.

5-106. NOSE LANDING GEAR UPLOCK SWITCH REMOVAL AND INSTALLATION.

5-107. To remove and install the nose landing gear uplock switch, proceed as follows:

Tools and Equipment List

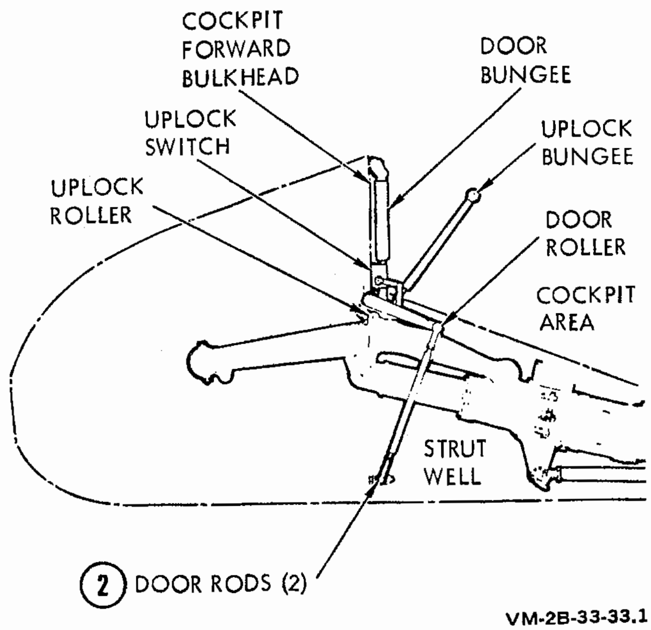
Jack Pad	E13710
Jack, Tripod	996
Mobile Power Unit	NC-8A

5-108. REMOVING NOSE LANDING GEAR UPLOCK SWITCH.

1. Install main landing safety pins and raise nose gear off of ground, using fuselage jack. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

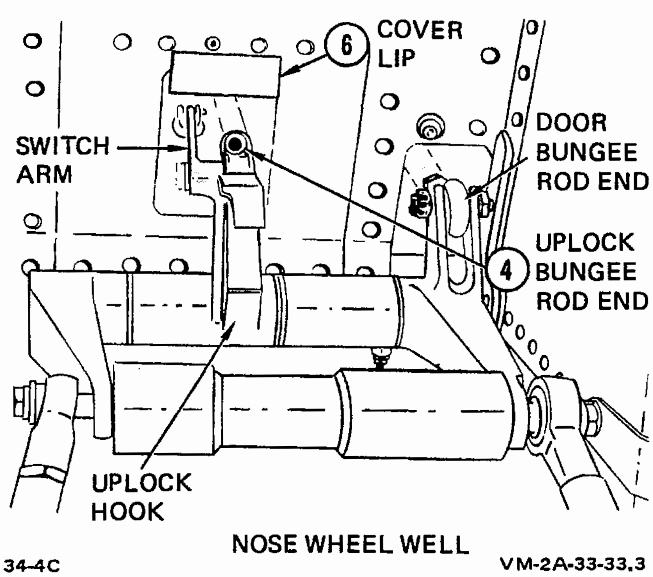
2. Remove door rods from both right- and left-hand nose gear wheel doors.

3. Remove pilot's instrument panel. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).



Step 2—Para. 5-108

4. Disconnect uplock bungee at lower rod end.



Steps 4 and 6—Para. 5-108

5. Remove right and left cover bolts holding switch cover.

Note

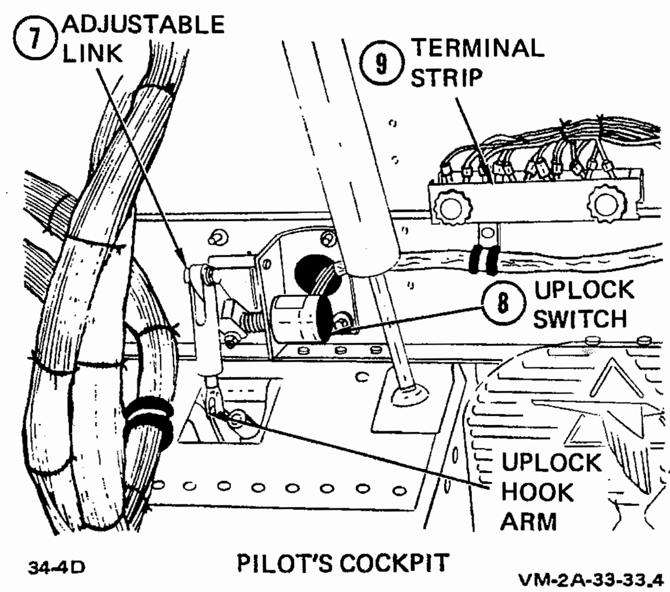
The switch cover bolts protrude through the forward bulkhead and the nuts must be held by a helper in the nose wheel well.

6. Remove switch cover by sliding and rotating it forward and upward at the same time.

Note

The boot on the uplock bungee must be slid down the bungee as the cover is being removed.

7. Disconnect adjustable link in uplock switch actuation linkage at uplock hook arm.



Steps 7 through 9—Para. 5-108

8. Remove switch and mounting bracket.

9. Remove one electrical wire at a time from terminal strip No. 1, cut corresponding wire on new switch to proper length and identify for proper installation on terminal strip. Repeat this process for each switch wire.

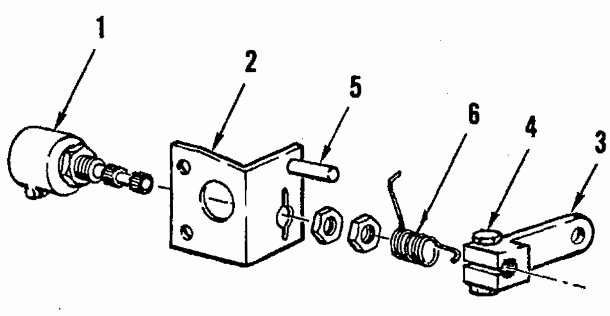
5-109. PREADJUSTING NOSE LANDING GEAR UPLOCK SWITCH. To preadjust switch in bracket, including attachment of actuating arm and adjustable link, on bench, proceed as follows:

1. Install switch (1) in bracket (2).

2. Preadjust switch by rotating switch shaft clockwise until circuits 1-3 and 4-6 just make closed contacts.

3. Place centerline of arm (3) on switch shaft at shaft position set in step 2, which is 8-1/2 degrees clockwise from the horizontal position.

4. Tighten arm (3) by tightening the arm bolt (4) to switch shaft without disturbing switch setting made in step 2.



Steps 1 through 3—Para. 5-109

5-110. INSTALLING NOSE LANDING GEAR UPLOCK SWITCH.

Materials List

Pins, Cotter	MS24665-132

1. Install new switch assembly (includes switch preadjusted, bracket, actuating arm, and adjustable link) on forward frame.

2. Connect switch wiring to proper studs on terminal strip No. 1, but do not install cover at this time.

3. Adjust nose landing gear uplock switch in accordance with paragraph 5-142.

Note

Since the nose gear uplock mechanism is located in a limited space, the nose landing gear may have to be lowered so that a helper from the wheel well can assist.

4. Install switch cover, remove gage taped to uplock hook, reconnect wheel door bungee and wheel door linkage.

5. Install pilot's instrument panel. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

6. Perform operational check of landing gear system. Refer to paragraph 5-15.

5-111. NOSE LANDING GEAR UPLOCK BUNGEE REMOVAL AND INSTALLATION.

5-112. To remove and install the nose landing gear uplock bungee, proceed as follows:

5-113. REMOVING NOSE LANDING GEAR UPLOCK BUNGEE.

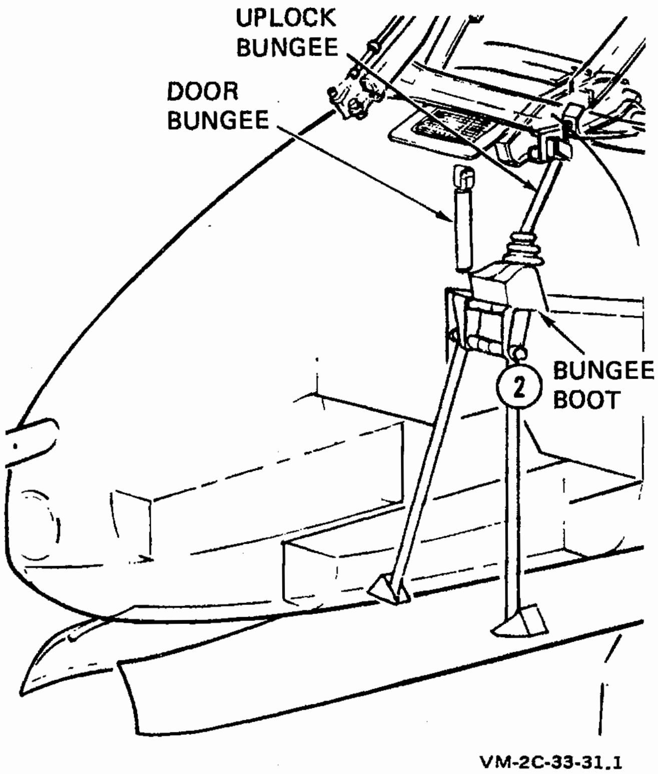
1. Remove pilot's instrument panel and shroud. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

2. Remove ratchet clamp at upper end of bungee boot.

3. Remove bungee upper attach bolt.

4. Unscrew bungee rod end from bungee rod.

5. Remove unlock switch bungee cover.



Step 2—Para. 5-113

6. Remove rod end attach pin and rod end.

5-114. INSTALLING NOSE LANDING GEAR UPLOCK BUNGEE.

Materials List

Pins, Cotter	MS24665-132

1. Install bungee upper attach bracket.

2. Slip bungee boot over bungee rod, adjust bungee rod end so that pin may be freely installed in uplock hook bracket, and lengthen one additional turn. Install pin and safety with cotter pin (MS24665-132).

3. Adjust nose landing gear uplock hook and uplock switch as specified by paragraphs 5-141 and 5-142.

4. Install bungee boot and ratchet clamp.

5. Install pilot's instrument panel and shroud. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

6. Perform operational check of landing gear system. Refer to paragraph 5-15.

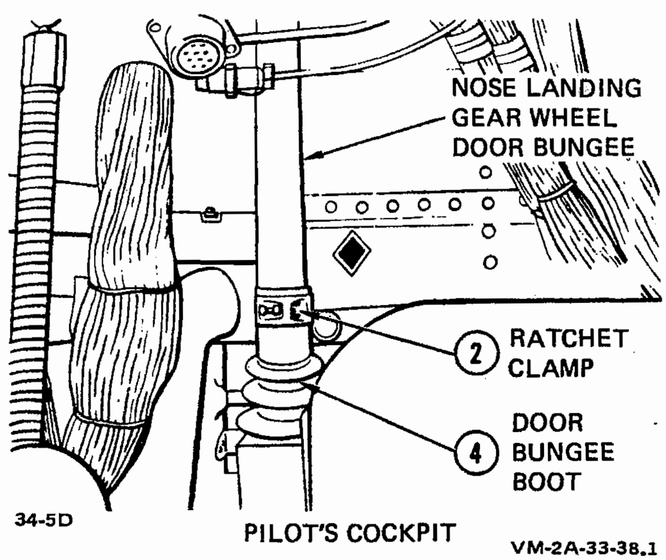
5-115. NOSE LANDING GEAR WHEEL DOOR BUNGEE REMOVAL AND INSTALLATION.

5-116. To remove and install the nose landing gear wheel door bungee, proceed as follows:

5-117. REMOVING NOSE LANDING GEAR WHEEL DOOR BUNGEE.

1. Remove pilot's instrument panel and shroud. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

2. Remove ratchet clamp at upper end of bungee boot.



Steps 2 and 4—Para. 5-117

3. Disconnect wheel door bungee at upper attach bracket.

4. Remove bungee boot.

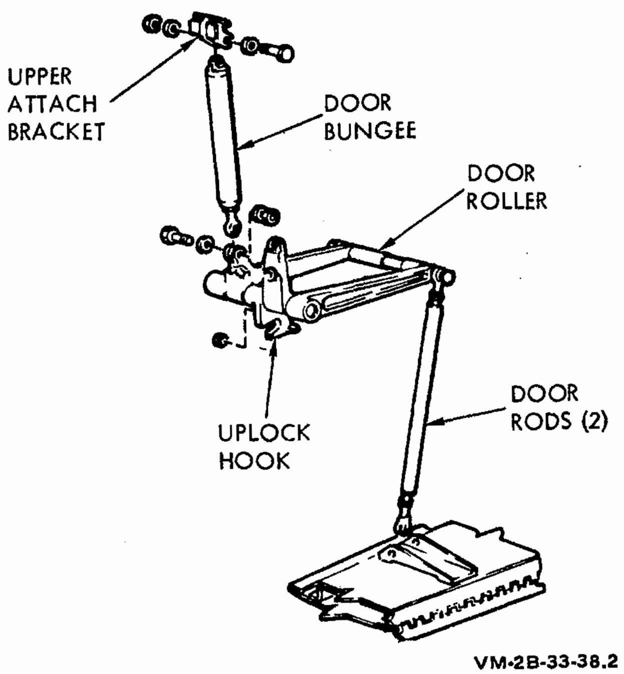
5. Remove lower attach bolt from uplock hook arm.

5-118. INSTALLING NOSE LANDING GEAR WHEEL DOOR BUNGEE.

Materials List

Pins, cotter	MS24665-134

1. Install wheel door bungee on upper attach bracket.



Step 1—Para. 5-118

2. Slide bungee boot up bungee rod, adjust rod end length for a free fit in uplock hook arm and lengthen for 0.06-inch overcenter on door rods. Refer to paragraph 5-137.

3. Install bolt finger-tight and safety with cotter pin (MS24665-134).

4. Install bungee boot and ratchet clamp.

5. Adjust nose landing gear wheel doors as specified by paragraph 5-143.

6. Install pilot's instrument panel and shroud. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

7. Perform an operational check of landing gear system. Refer to paragraph 5-15. Check that nose landing gear doors fair properly with mold line of fuselage.

5-119. RIGGING AND ADJUSTING LANDING GEAR SYSTEM.

5-120. Rigging and adjustment of the landing gear system may be accomplished as described in the following paragraphs. The procedures provide instructions for rigging the control system, adjusting the main landing gear and doors, adjusting the nose landing gear and doors, and adjusting the main and nose landing gear switches. A rig pin bundle (T3382) is required to rig portions of the control system and nose gear steering. Other than this special item, only standard tools and equipment are needed.

5-121. All gear switch assemblies require an accurate angular positioning and securing of the switch on the switch shaft in relation to the initiation of continuity between the designated switch contacts (wires) while the shaft is being rotated in a designated clockwise or counterclockwise direction. This can best be accomplished by performing the adjustment on the bench with the aid of a protractor or, preferably, an individual angular locating template and multimeter. However, the adjustment may be made with the switch installed in the aircraft utilizing the templates in figures 5-7 and 5-9. Whether the switch adjustments are made on the bench or in the aircraft, adjustment should be followed by a check to assure that, while tightening the bolt securing the switch arm to the switch shaft, inadvertent movement of the switch arm did not occur.

5-122. RIGGING LANDING GEAR CONTROL SYSTEM. To rig the landing gear control system, see figures 5-5 and 5-6 and proceed as follows:

Tools and Equipment List

Adapter Bundle, Jacking and Mooring	E13710
Bundle, Rig Pin	T3382
Jack, Hydraulic Tripod	556
Jack, Hydraulic Tripod 10-ton	50J25178
External Power Unit	NC-8A

Materials List

Lockwire (0.041-inch diameter steel)	MS20995F41
Clips, Locking	MS21256-1 MS21256-2

5-123. PREPARATION FOR RIGGING.

Note

Electrical power is needed only when performing step 2 under Rigging Instructions.

1. Remove three cargo bay side panels, left side.

2. Remove pilot's instrument panel shroud. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

3. Remove balance bungee. Refer to paragraph 5-30.

4. Remove covers No. 80 and 93 (wing-to-boom upper access panels, left and right booms).

5-124. RIGGING.

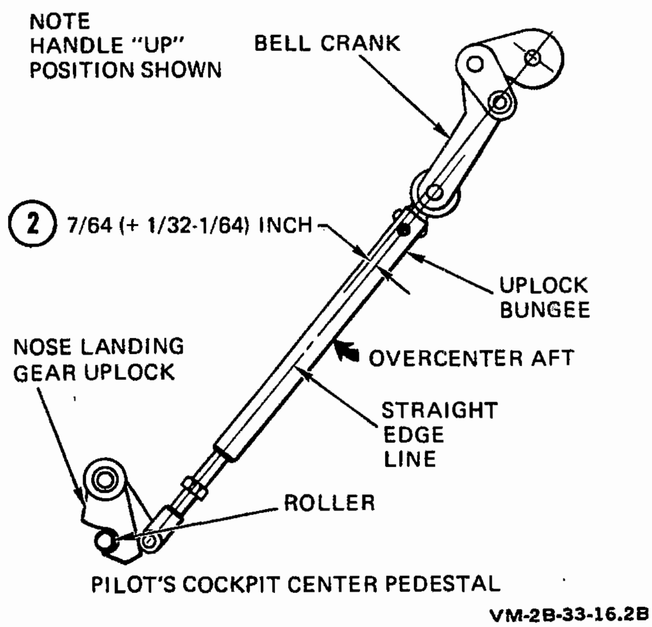
1. Depress landing gear handle lock release and place landing gear control handle in up position and insert rig pin (T3381-7) through control handle and support.

Note

Step 2 must be performed with the nose wheel doors disconnected.

The procedure in step 2 must be performed with aircraft jacked and with external electrical power applied as described in General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

2. Adjust rod assembly until center of bolt connecting uplock bungee to bell crank is 7/64 (+1/32/-1/64)-inch overcenter. Adjust the uplock mechanism bungee rod end as required by paragraph 5-137 currently with rod assembly adjustment.



Step 2—Para. 5-124

Note

The overcenter dimension may be checked using rig tool of local manufacture. See figure 5-5.

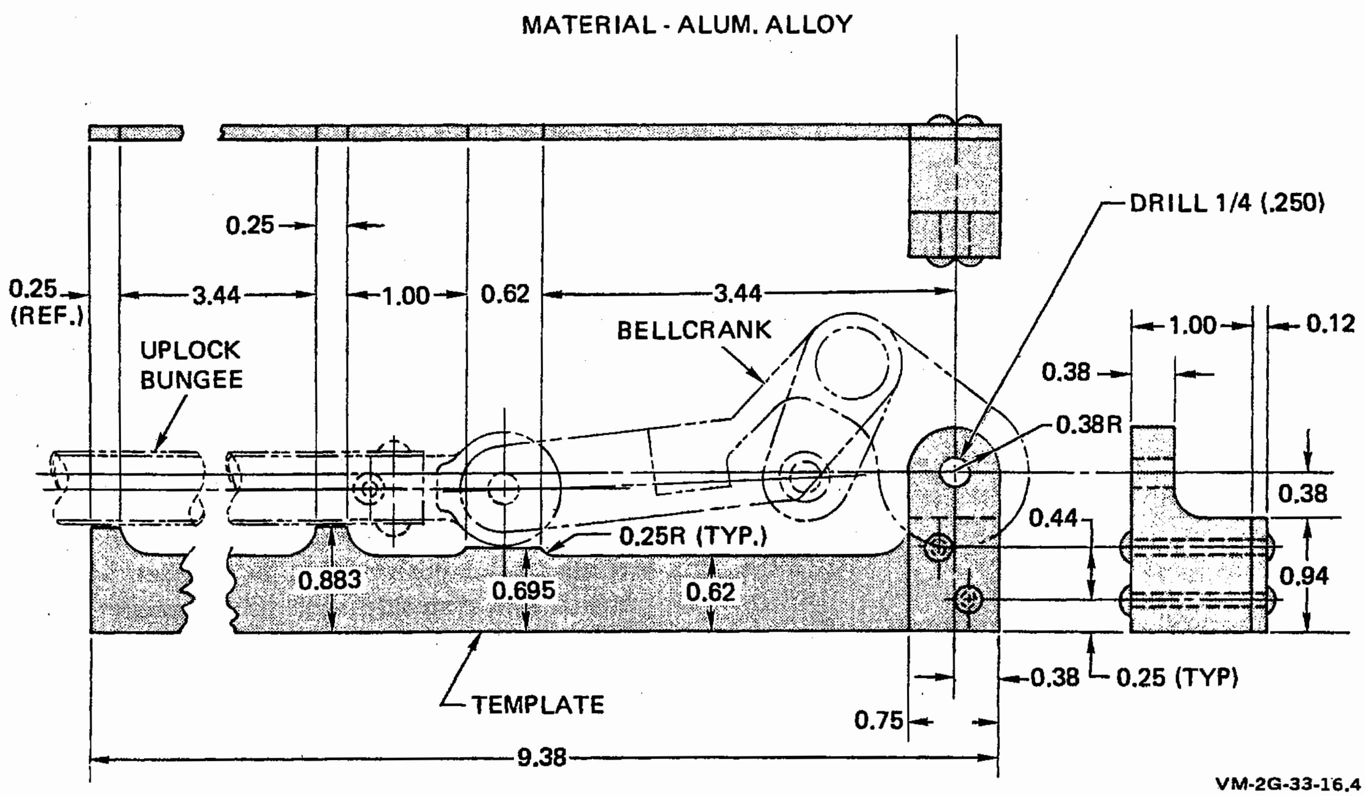
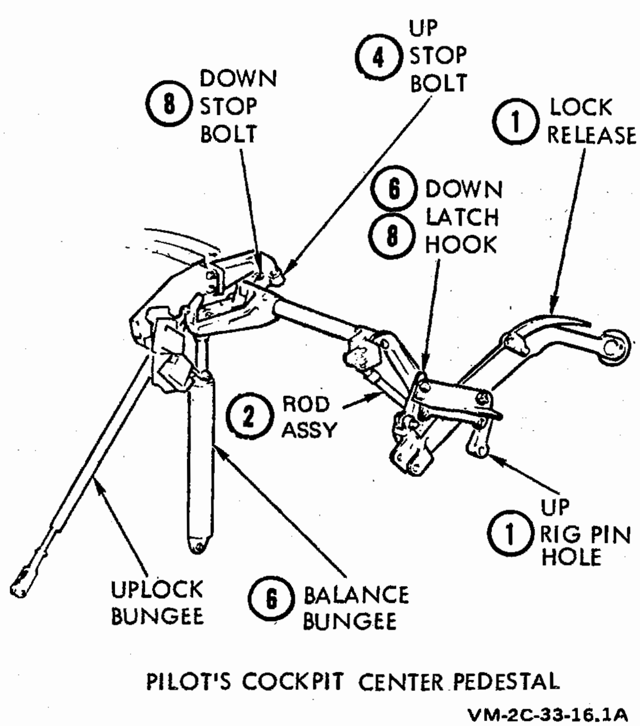


Figure 5-5. Overcenter Rigging Check Template



Steps 1, 2, 4, 6 and 8—Para. 5-124

3. Disconnect selector valve actuating rod from control linkage in cargo bay, left side.

4. Adjust up stop bolt in inboard support against bell crank until rig pin can be freely inserted in up rig pin hole of landing gear handle.

5. Remove rig pin from landing gear handle.

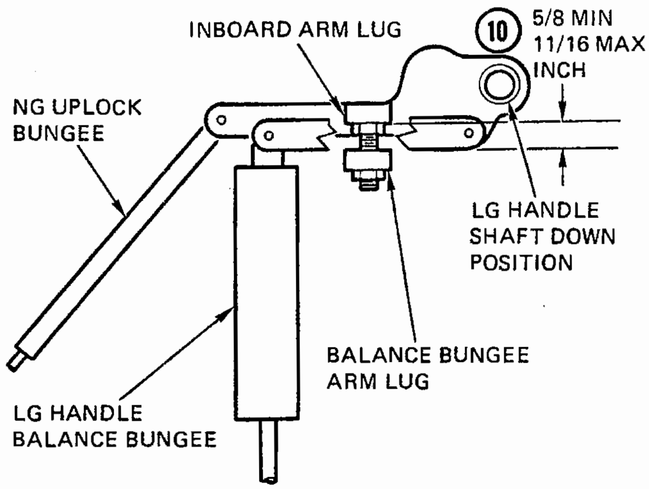
6. Place pilot's landing gear handle in down position. Ensure handle downlatch hook is latched over spacer to prevent system from retracting to up position.

7. Reinstall balance bungee. Refer to paragraph 5-30.

8. Adjust down stop bolt against bell crank to obtain a clearance of 1/32 (1/32/-0.00)+ inch between down latch hook and spacer which the hook latches over.

9. Safety the up stop bolt with lockwire (MS20995F41).

10. Adjust stop bolt in balance bungee drive arm to obtain a clearance of 5/8 inch minimum, 11/16 inch maximum between top surface of arm lug and lower surface of bell crank lug surface.



Steps 6 and 10—Para. 5-124

Note

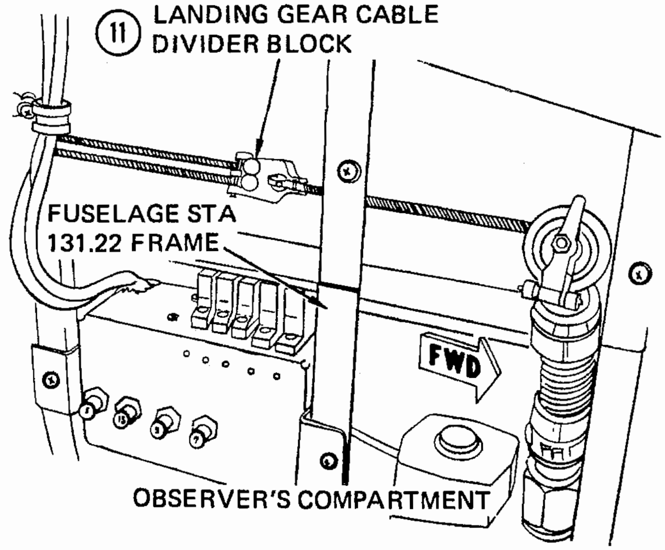
The balance bungee is adjusted during assembly and does not require further adjustment.

11. Tighten stop bolt jamnut and safety with lockwire (MS20995F41).

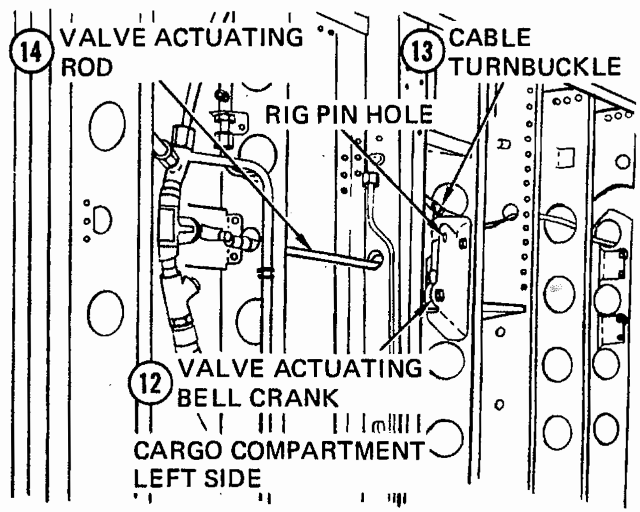
12. Remove left-hand observer's close-out panel (below and in front of observer's quadrant).

13. Adjust turnbuckle between landing gear control cables to obtain 3/4 (± 1/8)-inch measurement between forward end of divider block and back surface of frame at fuselage station 131.22 and install locking clip (MS21256-1) in turnbuckle.

14. Install rig pin (T3381-9) through valve actuating bell crank and support in left-hand side of rear cargo compartment.



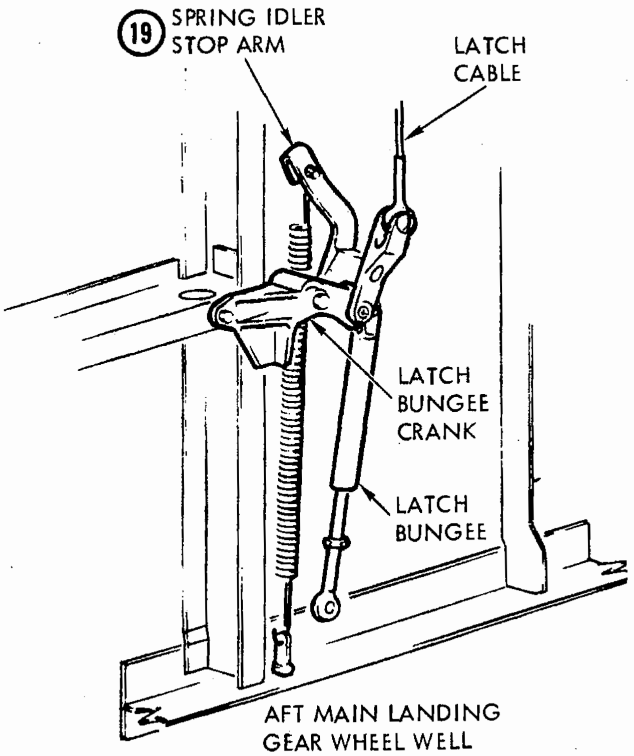
Step 11—Para. 5-124



Steps 12, 13, and 14—Para. 5-124

15. Adjust turnbuckle (near bell crank) until rig pin can be freely removed from actuator bell crank.

16. Install selector valve actuating rod and adjust length of rod until selector valve just bottoms in



Step 16—Para. 5-124

the forward direction ensuring that the cam follower on the valve actuating bell crank is against the cam. While adjusting length, do not preload rod.

17. Remove rig pin from valve bell crank.

18. Move pilot's landing gear control handle to up position and install rig pin (T3381-7) through handle and support.

19. Adjust turnbuckle between left-hand latch cables (in wing) to obtain a gap of 1/16 (+ 1/32/-1/64) inch between stop arm in spring idler and latch crank surface that it contacts when rotated upward (gear-down-direction).

20. Adjust turnbuckle between right-hand latch cables (in right-hand side of wing) as indicated in step 19.

21. Recheck gap on left latch cables (step 19). If out of tolerance, readjust cable to obtain proper dimension.

22. Remove rig pin from pilot's landing gear control handle and move handle to down position.

23. Recheck 1/32 (+1/32/-0.00) gap between handle latch as in step 8. Readjust down stop bolt if necessary to obtain clearance. Tighten stop locknut and safety with lockwire (MS20995F41).

Note

If it was necessary to readjust the down stop bolt, recheck the rig pin insertion and removal required in step 15. If step 15 cannot be performed without adjusting turnbuckle, repeat steps 13 through 25.

24. Safety lock washer, jamnut, and rod end together with lockwire (MS20995F41) on valve actuating rod.

25. Safety all turnbuckles with locking clips (MS21256-2).

26. Perform an operational check of system. Refer to paragraph 5-15.

27. Replace pilot's instrument panel shroud. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

28. Replace cover in observer's compartment, wing access covers, and, if required cargo compartment side panels.

Note

If observer's control equipment package (305-867021) is installed, refer to paragraph 3-196.

5-125. RIGGING AND ADJUSTING MAIN LANDING GEAR. Rigging and adjustment of the main landing gear consists of adjustment of uplock and downlock assemblies, doors, and associated linkage. Rigging and adjustment of the main landing gear shall be performed in the following sequence of steps.

Tools and Equipment List

Mobile Power Unit	NC-8A
Jack, Hydraulic Tripod	996
Jack, Hydraulic Tripod, 10-ton	50J25178
Jack Pads	E13710

Materials List

Lockwire (0.032-inch diameter steel)	MS20995F32
Shim Washers	2W1LB-64-52-94 2W1AL-48-36-64 2W1LB-16-32-125

Note

Omission of any of the following steps, shortcuts or accomplishment of paragraphs or steps, out of sequence may result in improper landing gear operation and cockpit indications.

Complete paragraphs 5-126 thru 5-131 for both left and right main landing gear assemblies before proceeding with paragraph 5-132.

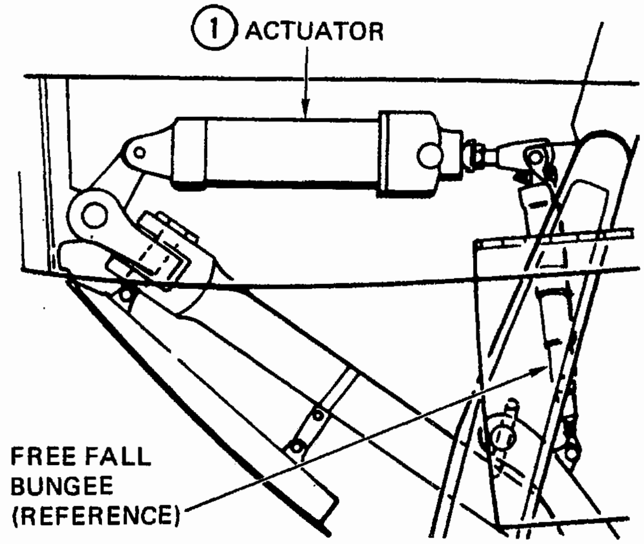
The following procedures are applicable to both main landing gear.

It may be necessary to alternately disconnect one or the other of the wheel doors to perform some of the adjustments described.

These procedures must be performed with the aircraft jacked and with external electrical power applied.

5-126. ADJUSTING LANDING GEAR ACTUATOR.

1. With the landing gear DOWN AND LOCKED and the actuator fully compressed, adjust actuator rod end to a center-to-center length; shorten two full turns.

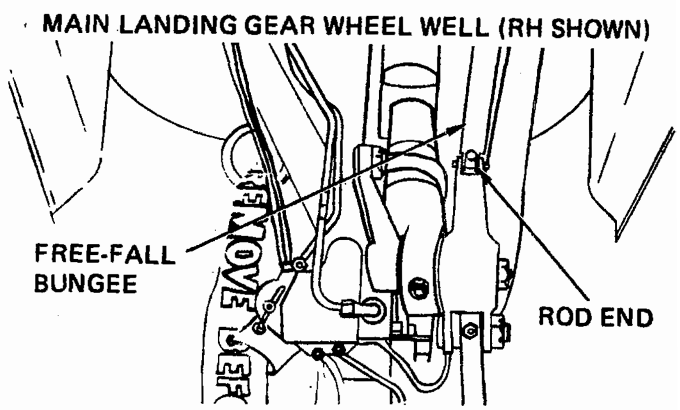


Step 1—Para. 5-126

2. Safety rod end locknut with lockwire (MS20995F41).

5-127. ADJUSTING FREE-FALL BUNGEE.

1. With landing gear DOWN AND LOCKED, and bungee in free (extended) position, adjust bungee rod end for a center-to-center length; lengthen two full turns.



Step 1—Para. 5-127

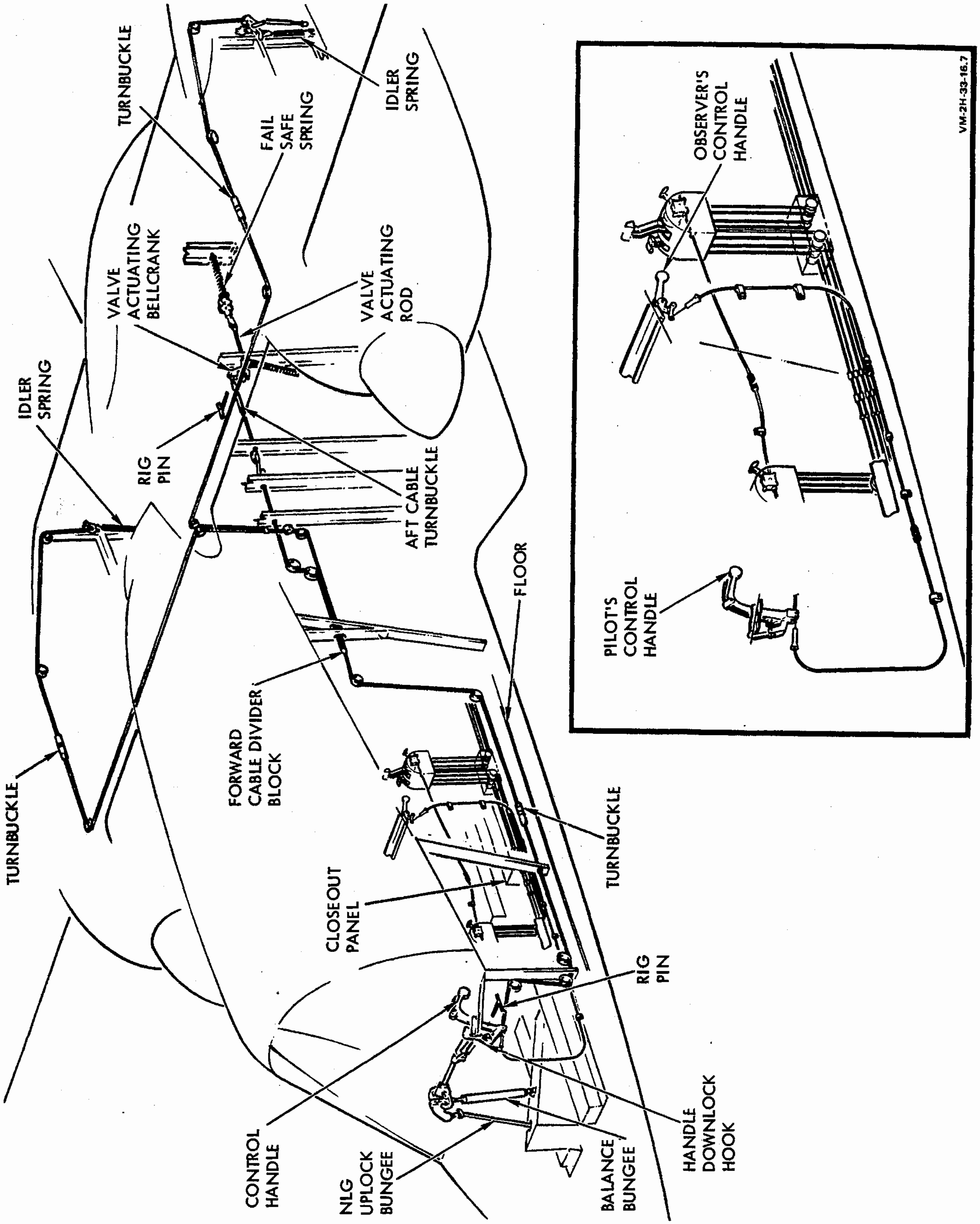


Figure 5-6. Rigging Landing Gear Control System

2. Tighten rod end locknut.

5-128. ADJUSTING SWEEP-BY CLEARANCE.

1. Remove the bolts which secure the main landing gear door links to the wheel door actuating bell cranks. Secure the door links with safety wire through the door hinge to hold the door links out of the way and the doors open to prevent damage during extension and retraction.

2. Position a man in the cockpit and apply external electrical power. Pull the hydraulic pump control circuit breaker located above the pilot's right-hand console. Move the landing gear handle to the UP position.

Note

The gear should not retract.

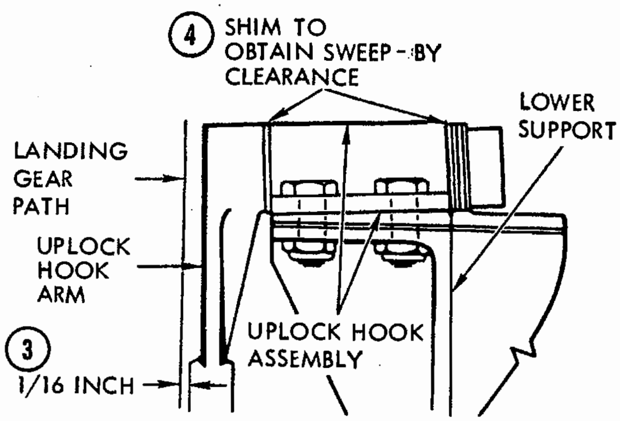
Ensure gap at main landing gear assembly trunnion does not exceed 0.010 inch as specified in paragraph 5-41, step 1.

3. By engaging and pulling the hydraulic pump control circuit breaker, raise the left gear until it starts to enter the wheel well, then pull the hydraulic pump control circuit breaker. Manually (by pushing up on the post), raise the gear while a man checks the sweep-by clearance between the uplock hook and the landing gear post for a minimum clearance of 1/16 inch. DO NOT push the gear into the uplock hook at this time.

4. If necessary, install 2W1AL-48-36-64 washers on uplock to obtain minimum clearance.

Note

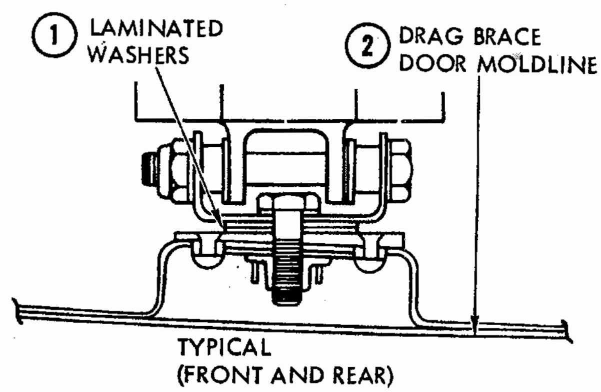
If shims are removed from inboard point on hook they must be added to outboard point on hook to prevent play on hook assembly.



Steps 3 and 4—Para. 5-128

5-129. ADJUSTING DRAG BRACE DOORS.

1. Position a man so he can observe the small drag brace door as the gear is pushed into the uplock hook. (This may require two men to manually raise it). Adjust thickness of laminated washers (2W1LB-16-32-125) between door and drag brace to assure door is just faired with the mold line, and does not cause undue resistance to gear going up and locked.

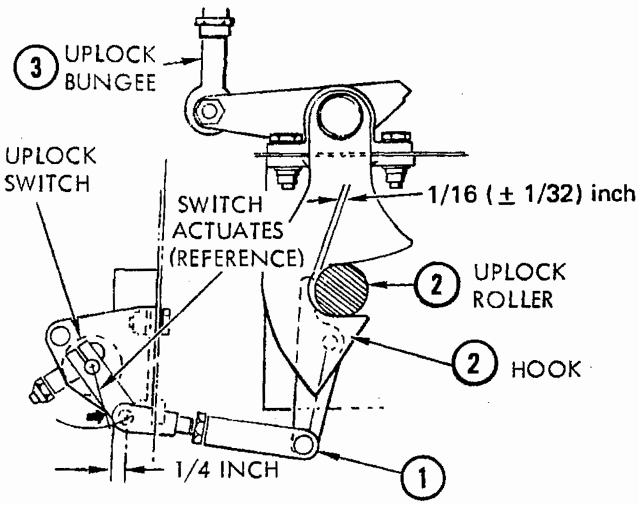


Steps 1 and 2—Para. 5-129

2. Check drag brace door trim lines and mold lines for flush closure.

5-130. ADJUSTING UPLOCK MECHANISM.

1. Assure hydraulic pump control circuit breaker is out and with the gear in the uplock hook, remove the pin and cotter key which secures the uplock switch trigger link to the adjustable link.



Steps 1 through 3—Para. 5-130

2. With a mirror and flashlight, check for a 1/16 (± 1/32) inch clearance between the uplock roller and throat of uplock hook.

3. If clearance in step 2 above is not correct, it will be necessary to drop the landing gear and adjust the length of the uplock bungee. Temporarily insert the pin in the switch trigger link and adjustable link so it will not be damaged during retraction. Engage the hydraulic pump control circuit breaker and retract the gear and recheck the clearance. Repeat this step as necessary to obtain 1/16 (± 1/32) inch clearance between uplock roller and throat of uplock hook. This clearance must be correct before adjusting the uplock switch.

5-131. ADJUSTING MAIN LANDING GEAR UPLOCK SWITCH.

1. With landing gear in DOWN AND UNLOCKED position, adjust switch arm so that switch actuates (continuity between wires 1 and 2 and between 4 and 5) at 23 ± 1/2 degrees position. Tighten bolt sufficiently so that actuating arm is locked firmly in place. Assure switch is mounted on the aft side of attaching bracket and not on the forward side.

Note

A template may be manufactured to measure the 23 ± 1/2 degree position of the switch arm. Refer to figure 5-7.

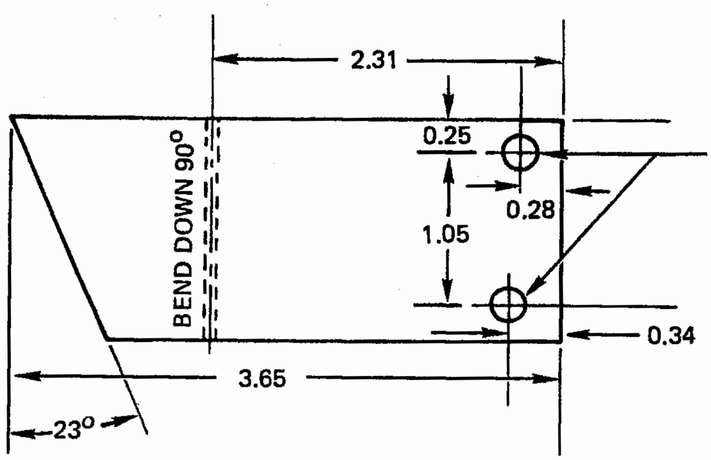


Figure 5-7. Main Landing Gear Uplock Switch Template Manufacture

Note

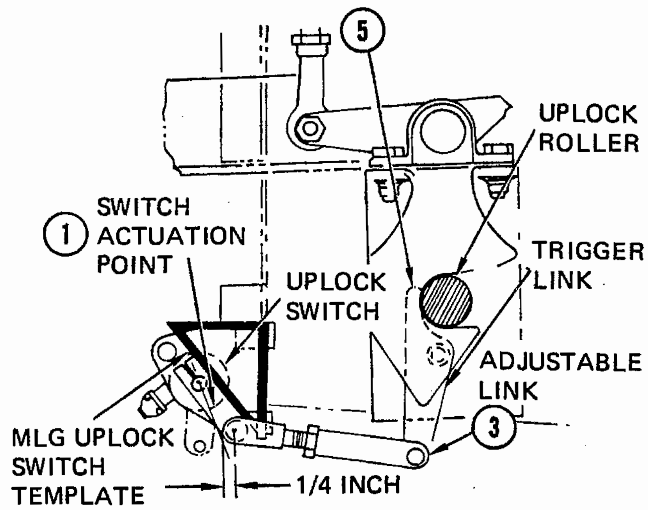
It will be necessary to remove the two bolts securing the switch bracket to the airframe and install the template temporarily to measure the 23 $\pm$ 1/2 degree position of the switch arm.

When the template's slanted face is flush with the top position of the arm, the 23 $\pm$ 1/2 degree position of the switch arm is correct.

2. With the landing gear UP AND LOCKED, pull HYD pump PWR circuit breaker.

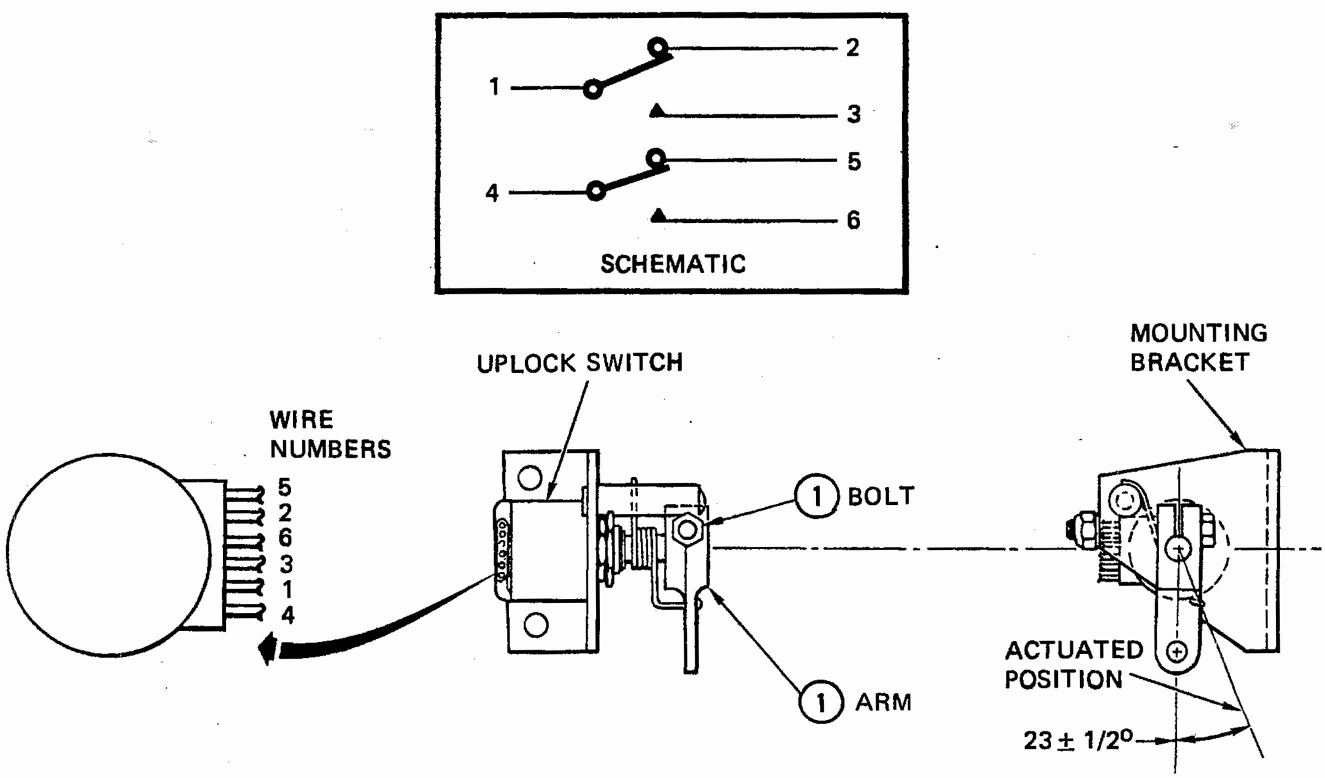
3. Disconnect adjustable link from uplock switch arm.

4. Rotate switch arm away from stop until switch actuates (check continuity on pins 1-2 and 4-5 on terminal strip No. 81 for right-hand gear or No. 62 for left-hand gear). Hold arm in this position until step 5 is completed.



Step 1 through 5—Para. 5-131

5. While holding the trigger link against uplock roller, adjust disconnected link to obtain a center-to-center fit with the trigger link and shorten adjustable link 1/4 inch to assure overtravel.



Step 1—Para. 5-131

6. Reconnect linkage to arm. Tighten adjustable link rod and locknut.

5-132. ADJUSTING MAIN LANDING GEAR DOWNLOCK SWITCH AND DOWNLOCK ASSEMBLY.

1. Place a chock crossway across another chock and place in a position on the deck where each gear will contact it when lowered. Ensure the hydraulic pump control circuit breaker is out and free fall the gear.

Note

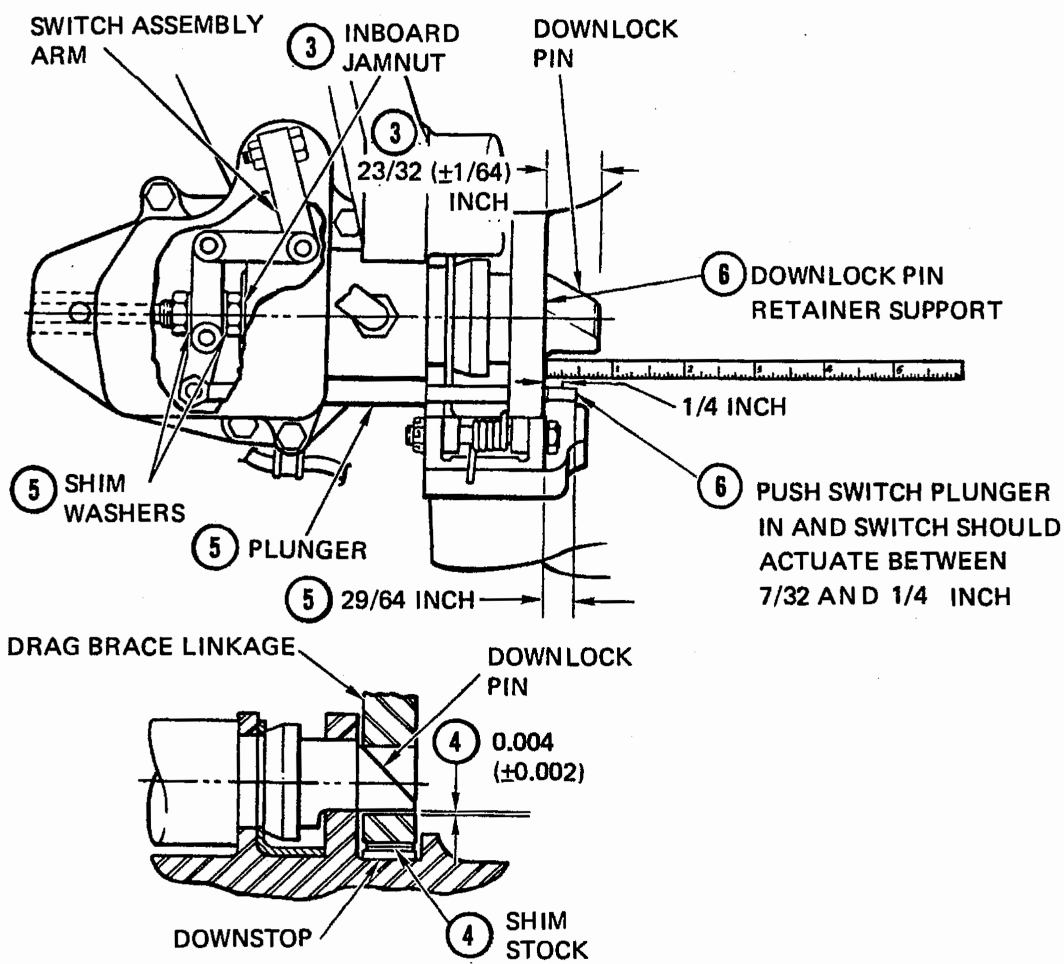
This procedure prevents the gear going down and locked, and is the easy way to keep the drag brace linkage out of the way for adjustments to downlock.

2. It will be necessary to use a block of wood or wooden hammer handle to push the downlock pin retainer assembly forward so the downlock pin will extend all the way. Remove the downlock switch cover and check all switch wiring for wear and broken strands, especially at the bend point. This can be done by moving the wires and watching the indicator for fluctuation.

3. Adjust the inboard jam nut on the downlock assembly until the downlock pin is extended 23/32 (± 1/64) inch as shown. It will be necessary to loosen the outboard jam nut to accomplish this. Tighten jam nuts.

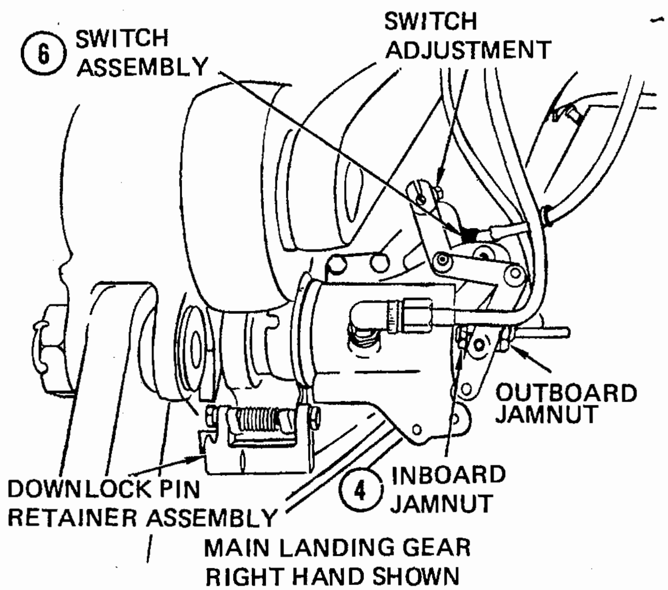
Note

The above adjustment must be correct before adjusting the switch because the length of the downlock pin travel determines the switch plunger travel. Also, ensure plunger moves freely when switch arm is moved.



Steps 3 through 6—Para. 5-132

4. Adjust shim stock on drag brace arm as necessary to ensure a downlock pin sweep-by clearance of 0.004 (± 0.002) inch as shown when arm is held firmly against downstop. Use feeler gage to measure clearance.



Steps 4 and 6—Para. 5-132

5. Ensure downlock switch arm is fully against the switch stop and that downlock pin is fully extended. With a 6-inch scale, check that switch plunger is extended 29/64 inch as shown. Add or subtract washers (LS153-011-0017) between the downlock switch fitting and the inboard jam nut to obtain the clearance. It will be necessary to remove the two bolts securing the down lock support assembly to add or subtract the washers. Secure the jam nuts; install the support, and ensure the switch arm and plunger move freely.

6. Ensure hydraulic control circuit breaker is out and hold a 6-inch scale against the inboard face of the support for the downlock pin retraction retainer and push in on the switch plunger. The cockpit indicator should indicate DOWN and LOCKED and the red light in the handle should go out when the plunger is between 7/32 inch and 1/4 inch from the face of the support (continuity between wires 1-3 and 4-6). Release the plunger and the indicator should show UNSAFE again and a red light in the handle (circuits 1-3 and 4-6 open). If actuation is not correct, loosen bolt securing switch arm to switch and rotate switch shaft in desired direction until actuation point is correct. Ensure the bolt on the switch arm is tight before checking actuation again.

7. Check for security at all connections and install switch covers. Check that switch cover does not interfere with switch movement.

8. Place the landing gear handle in the UP position. Engage the hydraulic pump control circuit breaker and raise the landing gear before removing the chocks from the wheels. Remove the chocks and lower the gear and check both gears for DOWN and LOCKED indications, red light in the handle to be out, and hydraulic motor not running.

5-133. RIGGING WHEEL DOORS.

1. Disconnect both of the MLG doors.

2. With the MLG DOWN and LOCKED, disconnect wheel door bungee from the torque tube fitting attach point.

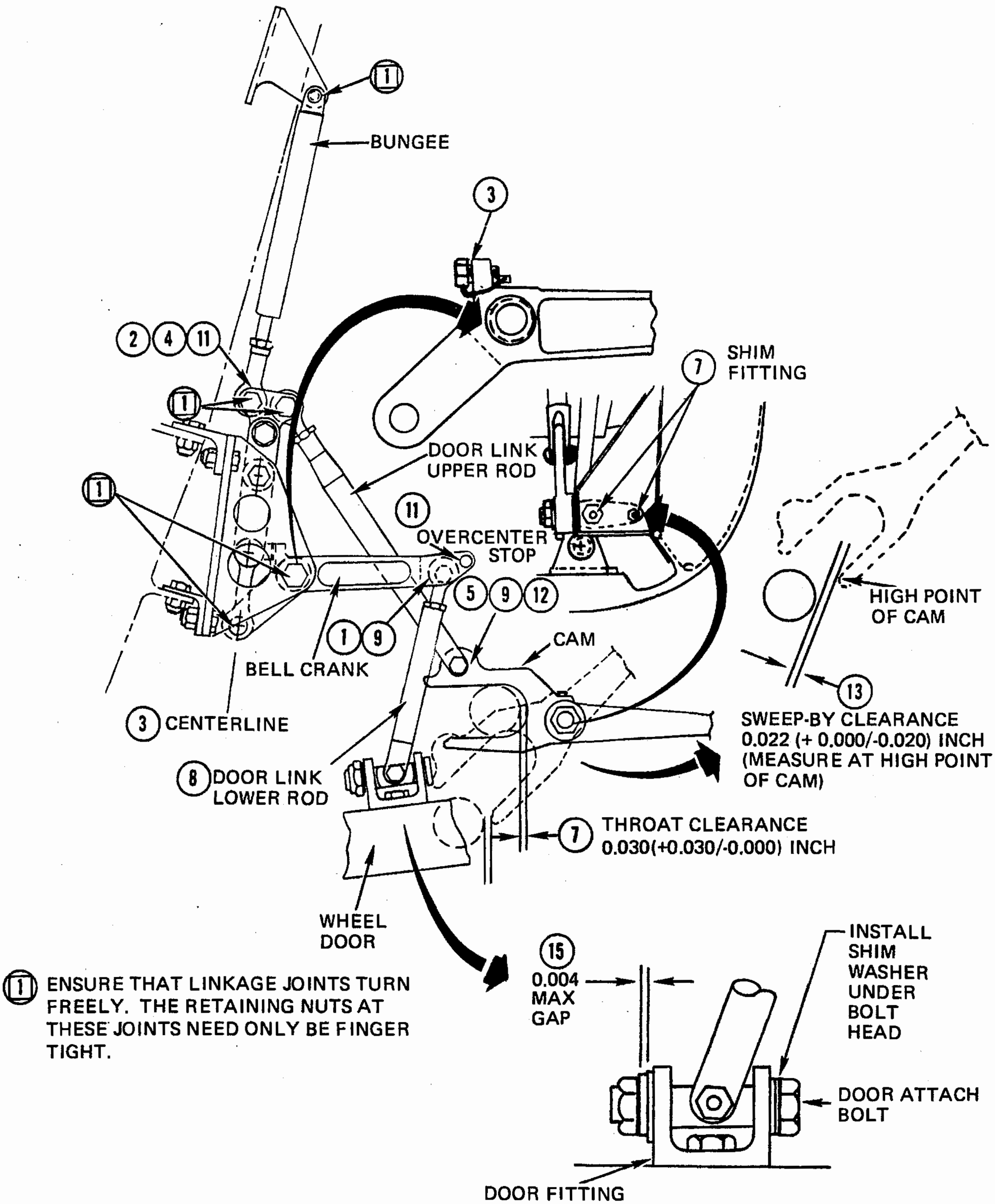
3. Manually position door linkage in locked-up position. Adjust washers under stop bolt to obtain a straight centerline between linkage joints. Safety stop bolt with lockwire (MS20995F41).

4. Position landing gear linkage to down position and temporarily reconnect wheel door bungee to torque tube fitting attach point.

5. Temporarily reverse bolt connecting door link upper rod to cam so that bolt head is on inboard side. Do not install nut and check to ensure that bolt protrusion will not strike gear during retraction.

6. Position a man in the cockpit and apply external electrical power. With the gear down and locked, pull the hydraulic pump control circuit breaker located above the pilot's right-hand console. Move the landing gear handle to the UP position.

7. By engaging and pulling the hydraulic pump control circuit breaker, raise the gear until it starts to enter the wheel well. Ensure that the wheel door cam will accept the roller and retract gear to UP and LOCKED position. Ensure a 0.030 (to +0.030/ -0.000) inch cam-to-roller throat clearance. Shim



Steps 1 through 14—Para. 5-133

cam fitting with washers as required to obtain cam-to-roller clearance.

8. Preadjust each door link lower rod, one at a time, as required to loosely fair doors to boom mold line.

9. Temporarily reconnect door link upper rod end to cam attach point, lower gear, and attach door link lower rod to door.

10. Cycle gear to ensure doors fair to boom mold line. Repeat gear cycle and adjust door rods as required to provide light preload on door while ensuring that MLG wheel door torque shaft bell crank and toggle are positioned on common center-line when door link upper rod is disconnected.

11. Rotate bellcrank to full open position so that rod end of link contacts over-center stop of bell-crank for inboard door. Maintain this position and adjust length of bungee to fit attach points so that lower bolt may be installed without compressing bungee. Remove lower bolt, lengthen bungee one-half turn and reinstall lower bolt. Secure jamnut.

NOTE

Rod end of link on outboard door rod need not be in contact with over-center stop of outboard bellcrank.

12. Disconnect the inboard MLG wheel door link upper rod end and secure door in open position. Do not change door rod adjustment.

13. By engaging and pulling the hydraulic pump control circuit breaker, raise the gear until it starts to enter the wheel well, then pull the hydraulic pump control circuit breaker. Manually (by pushing up on the post) raise the gear while a man adjusts the door link upper rod end to provide 0.022 (+0.000/-0.020) inch cam-to-roller sweep-by clearance. Tighten jamnut.

14. Lower gear, reconnect inboard MLG wheel door.

15. Check axial movement of door attach bolt in door fitting. Shim with laminated washer 2W1LB-32-24-62 if movement (GAP) exceeds 0.004 inch.

5-134. MAIN LANDING GEAR RETRACTION AND EXTENSION CHECK. Perform a landing gear retraction and extension check by cycling the gear three times in accordance with instructions given in paragraph 5-15.

5-135. GROUND SAFETY SWITCH. The ground safety switch is located on the left-hand main landing gear chassis only. To adjust the ground safety switch, proceed as follows:

Tools and Equipment List

Adapter Bundle, Jacking and Mooring	E13710
Jack, Hydraulic Tripod	556
Jack, Hydraulic Tripod, 10-ton	50J25178
Jack, Axle	S030

5-136. ADJUSTING GROUND SAFETY SWITCH.

1. Jack aircraft so that main wheels clear ground. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

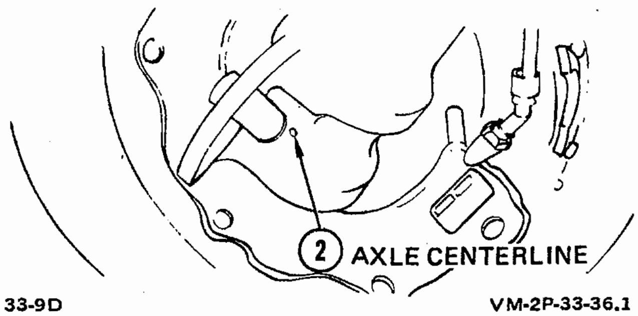
CAUTION

During step 2, observe that the strut piston moves freely into the cylinder when jacking, and do not jack the axle any further than required to obtain switch adjustment. Failure of strut piston to move into the cylinder, when jacking force is applied at the axle, can result in raising the aircraft off the wing jack, resulting in aircraft damage and possible personnel injury.

2. Using an axle jack, jack left main gear 1.62 inches as measured from axle centerline to ground.

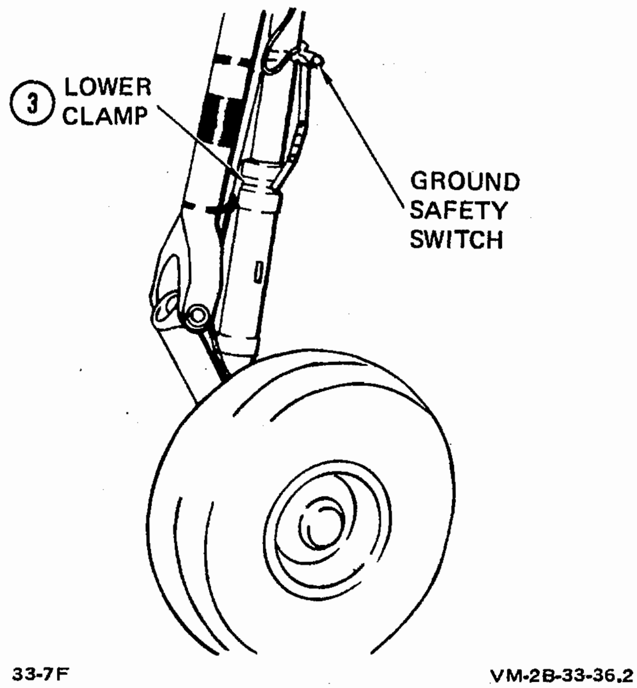
Note

This dimension must be measured from the gear fully extended position through 1.62-inch normal axle stroke.

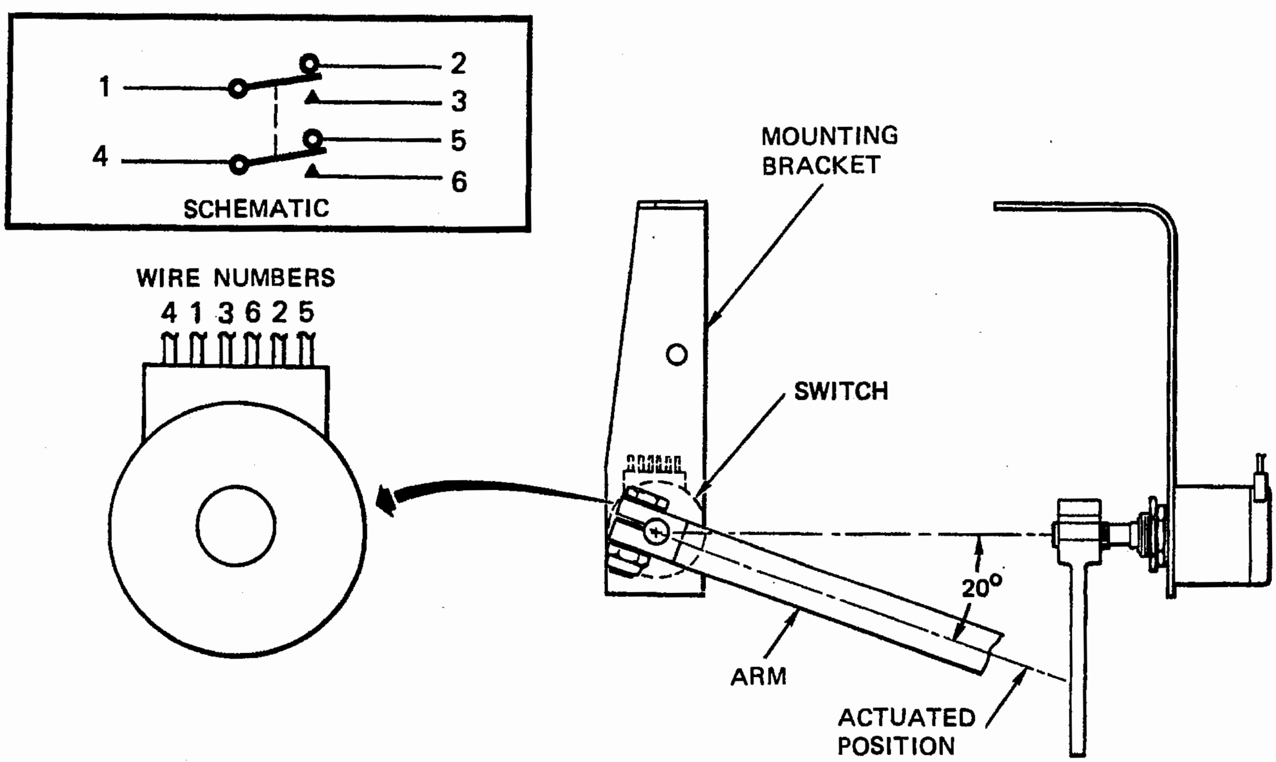


Step 2—Para. 5-135

3. As axle is jacked, check for continuity at studs 1-3 and 4-6, on terminal strip 63, fuselage station 220, left side of main gear wheel well. The switch should actuate at the 20 degree position shown when the axle travel equals 1.62 inches. If the switch does not actuate at this point, positon switch arm, loosen lower clamp and adjust it as required so that the switch actuates at the 20 degree position shown when axle travel equals 1.62 inches. If switch arm is repositioned ensure nut is tightened sufficiently so that the arm is tight on the switch shaft.



Step 3—Para. 5-135



Step 3—Para. 5-135

4. Check that switch deactuates as axle is lowered.

5. Using red paint (Federal Standard 595, color 31136, MIL-L-19538), paint red slippage marks on the ground safety switch lower clamp (901-350-2-5) and oleo cylinder (1525-2A) as follows:

a. Paint one horizontal 1/2-inch long slippage mark in the aft center of the oleo, adjacent to the top edge of the lower clamp.

b. Paint one vertical 1/2-inch long slippage mark in the aft center of the lower clamp, with half of the vertical mark being on the oleo above the clamp.

6. Ensure gear area is clear of personnel and equipment, retract the landing gear, and accomplish operational check of the external stores emergency release system. Refer to Armament Systems Manual (NAVAIR 01-60GCB-2-6).

7. Extend the gear, install ground safety pins, lower and remove jacks, and reinstall terminal strip cover.

5-137. RIGGING AND ADJUSTING NOSE LANDING GEAR. Rigging and adjustment of the nose landing gear consists of adjustment of uplock and downlock assemblies, doors, and associated linkage. Rigging and adjustment of the nose landing gear shall be performed in accordance with the following sequence of steps.

Tools and Equipment List

Adapter Bundle, Jacking and Mooring	E13710
Jacks, Hydraulic Tripod	556
Jacks, Hydraulic Tripod, 10-ton	50J25178
External Power Unit	NC-8A

Materials List

Lockwire (0.041-inch diameter steel)	MS20995F41
Pin, Cotter	MS24665-360

Note

Omission of any of the following steps, shortcuts or accomplishment of steps out of sequence may result in improper landing gear operation and cockpit indications.

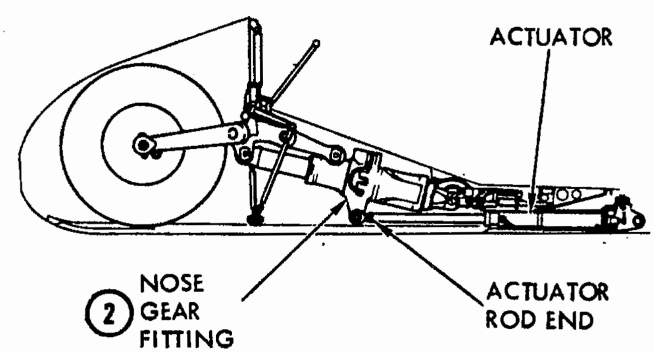
Disconnect the wheel doors to perform the following adjustments.

The following procedures must be performed with the aircraft jacked and with external electrical power applied as described in General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

5-138. ADJUSTING NOSE LANDING GEAR DRAG BRACE (ACTUATOR).

1. Retract landing gear to the locked up position and disconnect nose gear actuator rod end.

2. Fully extend actuator piston and adjust rod end so that rod end hole and nose gear fitting hole are aligned.



Step 2—Para. 5-138

3. Free fall nose gear. Do not push to down and locked position. Disconnect temporary attachment of actuator rod end to landing gear fitting. Lengthen rod end an additional 1(±½) turn. Safety rod end locknut with lockwire (MS20995F41).

4. Reconnect actuator rod end to nose landing gear fitting. Tighten bolt until it bottoms out; align cotter pin hole and slot and install cotter pin (MS24665-360).

5-139. ADJUSTING NOSE LANDING GEAR DOWNLOCK SWITCH. To adjust the nose landing gear downlock switch, proceed as follows:

Note

Due to adverse tolerance conditions in the switch linkage components there exist four points of potential interference which may affect the operational characteristics of the switch assembly. If binding or evidence of previous binding is noted during rigging of the nose gear downlock switch assembly linkage, the linkage may require rework in accordance with figure 5-8.

1. Pull hydraulic pump power circuit breaker.

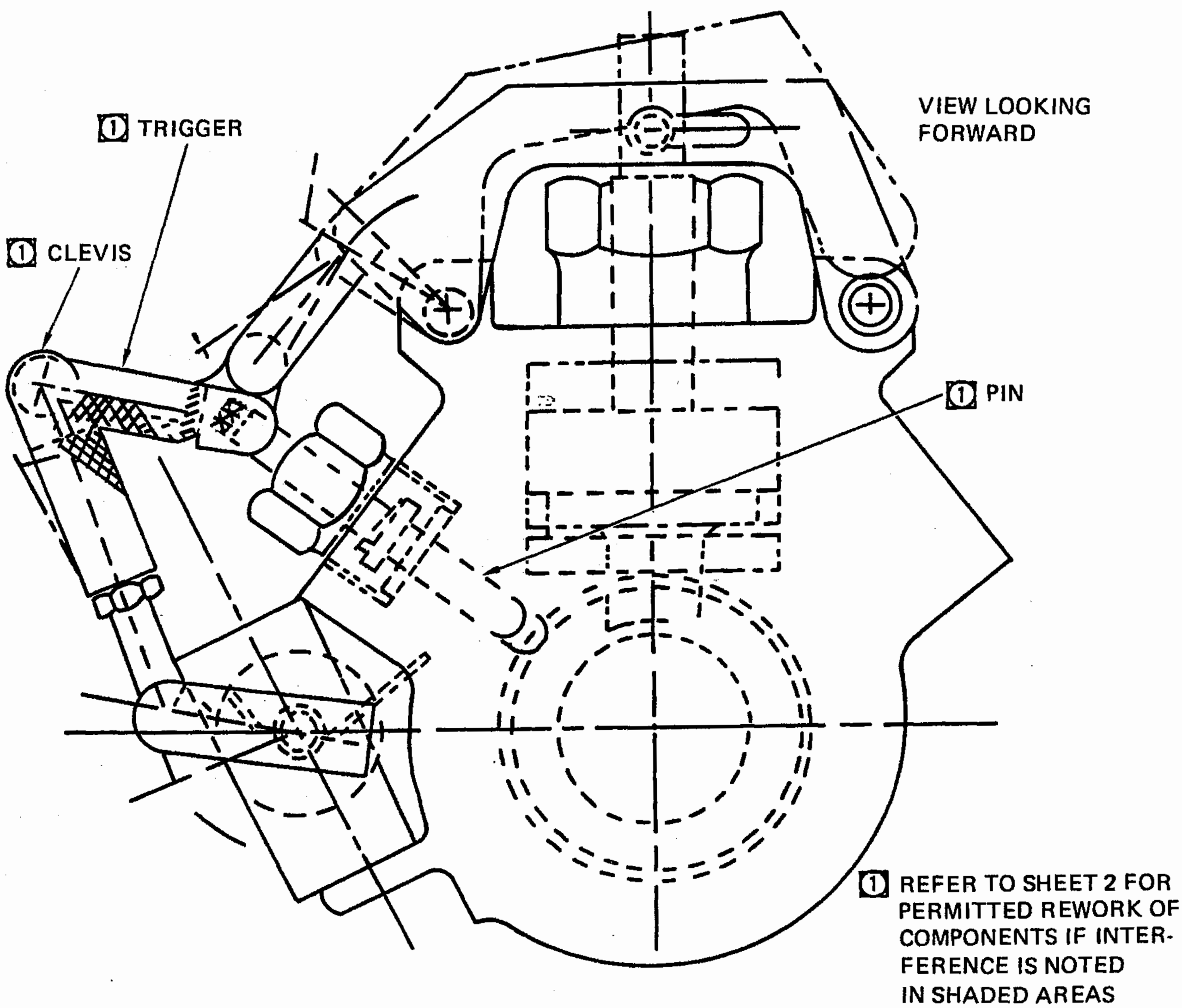
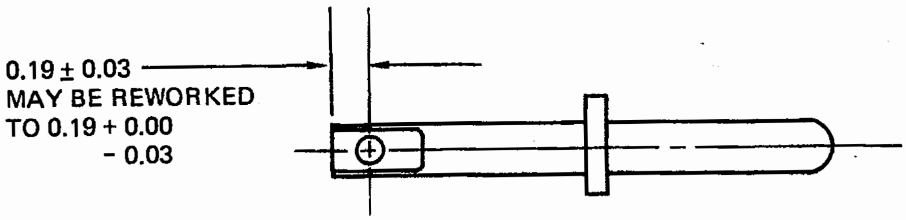
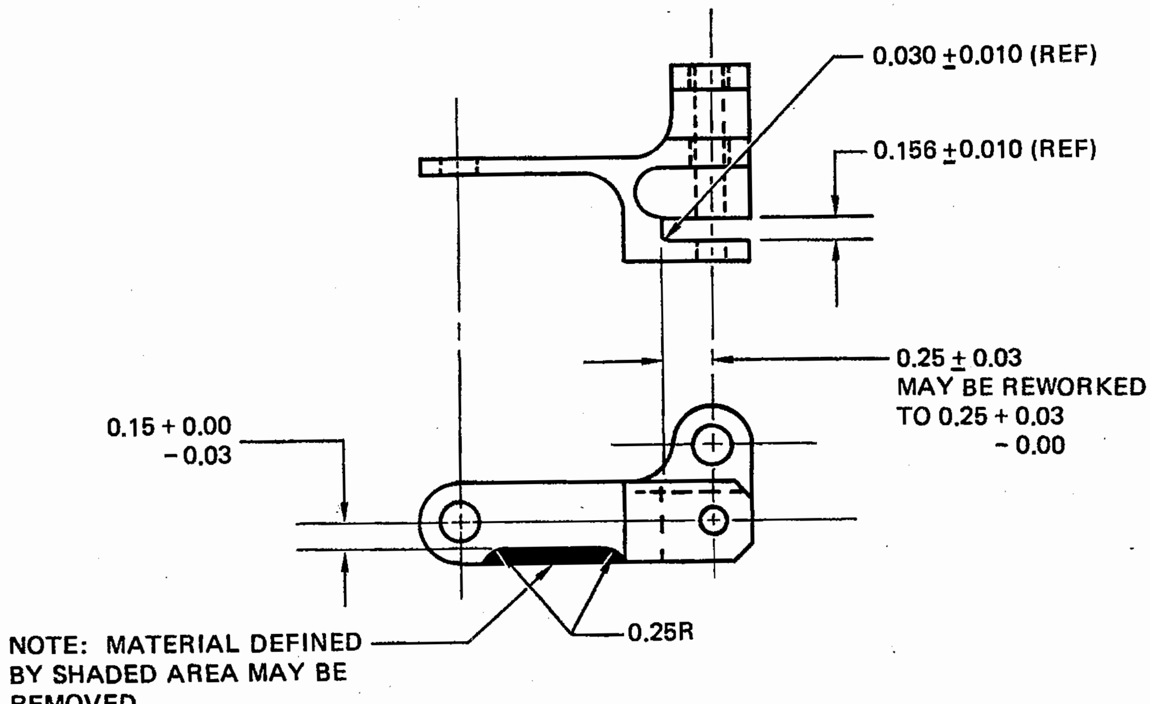


Figure 5-8. Nose Gear Downlock Switch Components - Permissible Rework (Sheet 1 of 2)



PIN



TRIGGER

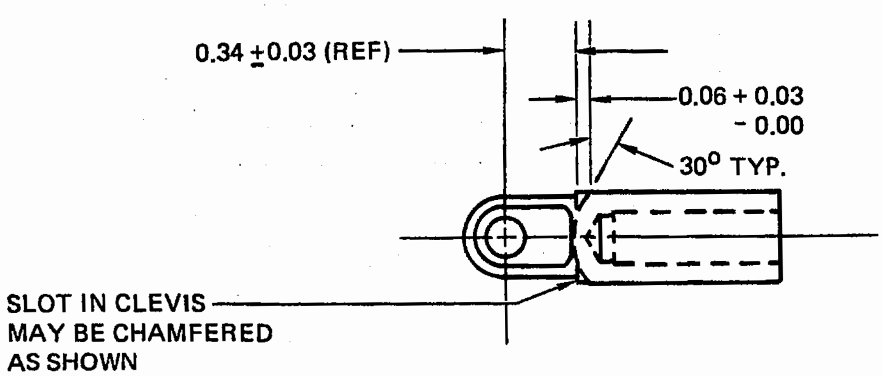


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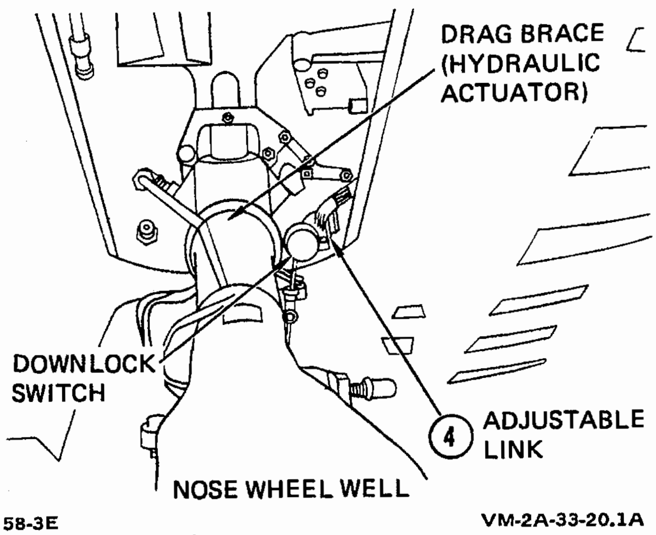
Figure 5-8. Nose Gear Downlock Switch Components - Permissible Rework (Sheet 2 of 2)

2. Ensure nose gear is DOWN and LOCKED and safety pin can be inserted.

3. Remove the nose gear drag brace (actuator) door. Keep the washers (shims) under the bolts, securing the door to the actuator, in their correct position to prevent readjustment of the door upon installation.

4. Disconnect the adjustable switch link from the arm of the downlock switch.



Step 4—Para. 5-139

5. Move the arm in the direction shown (UP) and check that switch actuates and shows DOWN and LOCKED on cockpit indicator when the arm is in the 62 ± 1/2 degree position shown.

Note

A template may be manufactured to measure the 62 ± 1/2 degree position of the switch arm. Refer to figure 5-9.

It will be necessary to remove the two bolts securing the switch to the bracket and remove the switch to use the template. The switch may then be placed in the template and secured with the bolts utilizing spacers to make the switch arm check.

When the template's slanted face is flush with the top position of the arm, the 62 ± 1/2 degree position of the switch arm is correct.

6. If it does not do so, loosen the bolt securing the arm to the switch and adjust the switch until it does actuate correctly.

MATERIAL: GALVANIZED STEEL 0.032 THICK

NOTE: 1. ALL DIMENSIONS IN INCHES
2. MEASURE 62° ANGLE BEFORE BENDING
3. TOLERANCE FOR ALL DIMENSIONS SHALL BE ± 0.010 INCH

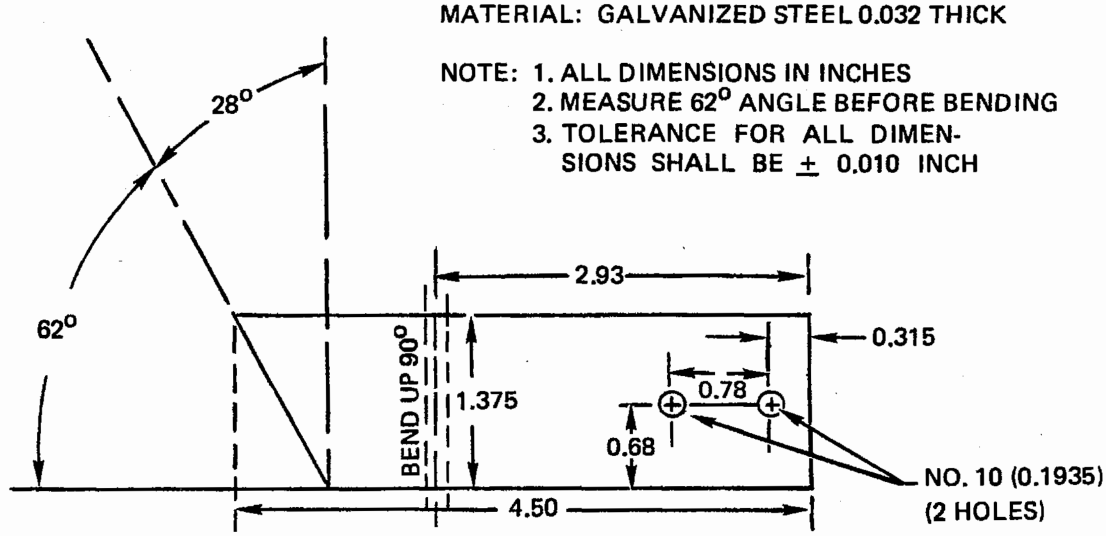
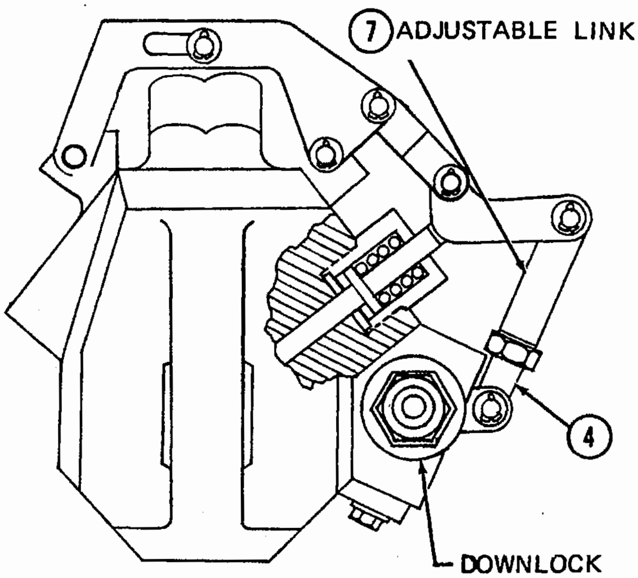


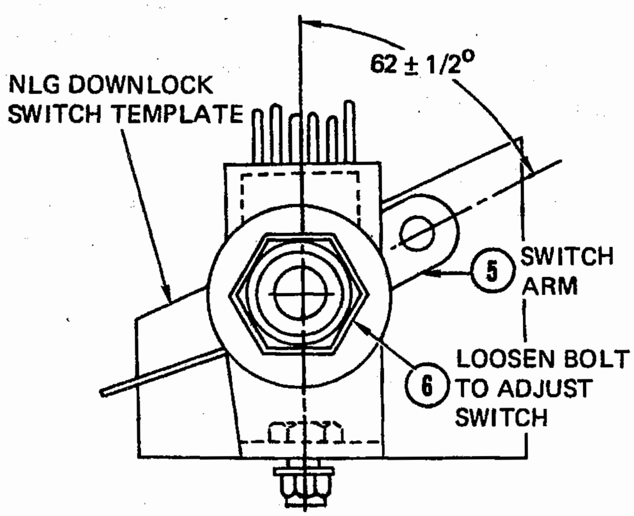
Figure 5-9. Nose Landing Gear Downlock Switch Template Manufacture

Note

It may be necessary to remove the two bolts securing the switch to the bracket and remove the switch to accomplish this.



Steps 4 and 7—Para. 5-139



Steps 5 and 6—Para. 5-139

7. Install the switch (if removed) and assure bolt thru switch arm is tight. Rotate switch arm in direction shown (UP) until it actuates and shows DOWN and LOCKED on the cockpit indicator. Hold in this position and adjust the adjustable link to a center-to-center fit with the hole in the arm; then, shorten two full turns. Tighten the jam nut; replace pin, washer and cotter key.

5-140. ADJUSTING DRAG BRACE (ACTUATOR) DOOR.

1. Disconnect the nose gear door hold-open rods at the bottom end by removing the cotter key and pins securing them. Engage the hydraulic pump control circuit breaker.

CAUTION

When the hold-open rods are disconnected, assure they are positioned and secured before operating the nose gear to prevent them from being damaged.

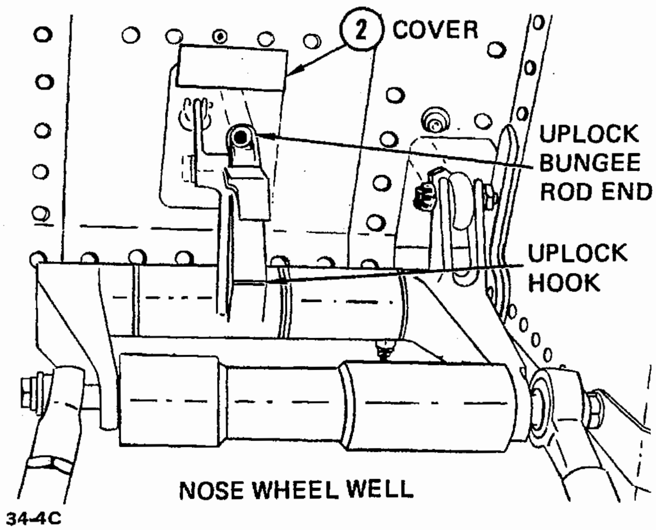
2. Retract the nose gear and check the fit of the door attached to the actuator. Shim with washers (LD153-002-1404) as necessary to assure this door just fairs with the fuselage mold line. This door must be correctly shimmed or it will result in nose gear uplock roller not being positioned correctly in uplock hook.

5-141. ADJUSTING NOSE LANDING GEAR UPLOCK HOOK.

1. If necessary, remove pilot's instrument panel and instrument panel shroud. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

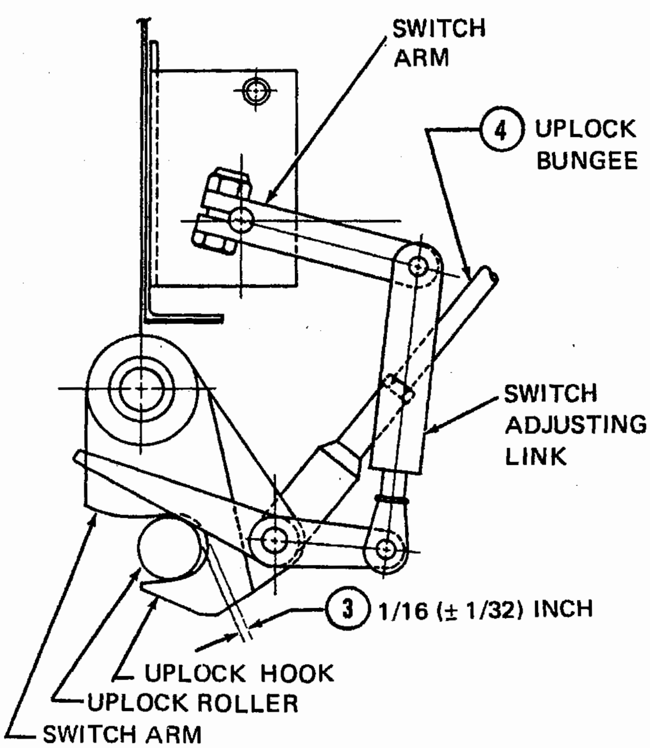
2. Remove uplock switch cover if necessary.

3. Retract the nose gear and with a mirror and flashlight, check the uplock hook to roller clearance of 1/16 (± 1/32) inch as shown.



Step 2—Para. 5-141

4. If clearance is not correct, lower the nose gear and adjust the uplock bungee rod end in the proper direction to give desired clearance. Adjust landing gear control system rod assembly in accordance with paragraph 5-124, Rigging Instructions, steps 1 through 4, currently with uplock hook bungee rod end adjustment.



Steps 3 and 4—Para. 5-141

5. Retract the nose gear and recheck the clearance. This step must be correct before adjusting the switch.

6. If pilot's instrument panel, instrument panel shroud, and uplock switch cover were removed DO NOT reinstall until after steps 5 and 6 are completed.

5-142. ADJUSTING NOSE LANDING GEAR UPLOCK SWITCH.

1. If pilot's instrument panel, and instrument panel shroud were not previously removed they must be removed to perform the following (refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5).

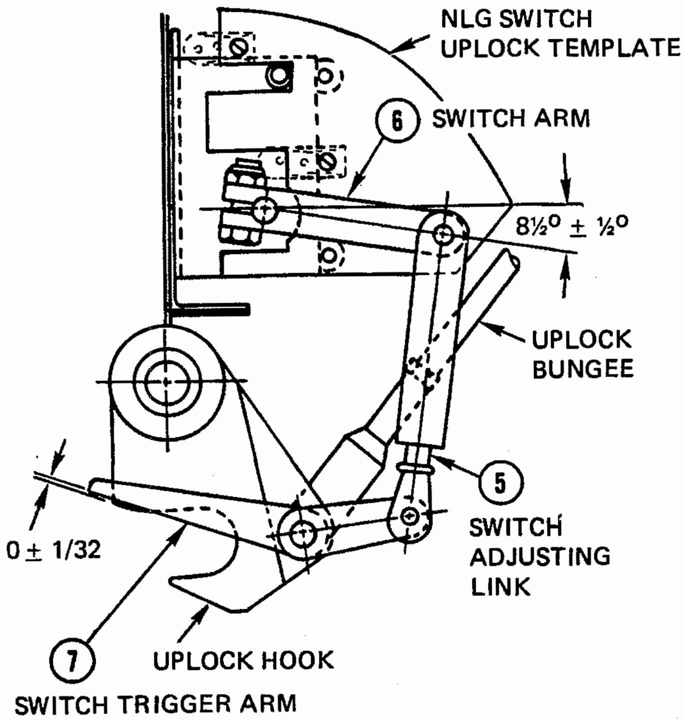
2. With nose gear in UP and LOCKED position pull the hydraulic pump control circuit breaker located above the pilots right-hand console and free fall the landing gear. Do not let the nose gear go down and lock.

3. Ensure the hydraulic pump control circuit breaker is out and raise the landing gear handle. This positions the uplock hook so the switch can now be adjusted.

4. With external power applied, position a man in the cockpit and ensure nose gear shows UNSAFE on the cockpit indicator.

5. Disconnect adjustable link in uplock switch actuation linkage at switch trigger arm.

6. Adjust switch arm so that switch actuates (continuity between wires 1 and 3 and between 4 and 6) at 8 1/2 degree position as shown. Tighten bolt sufficiently so that actuating arm is locked firmly in place.



Steps 5 through 7—Para. 5-142

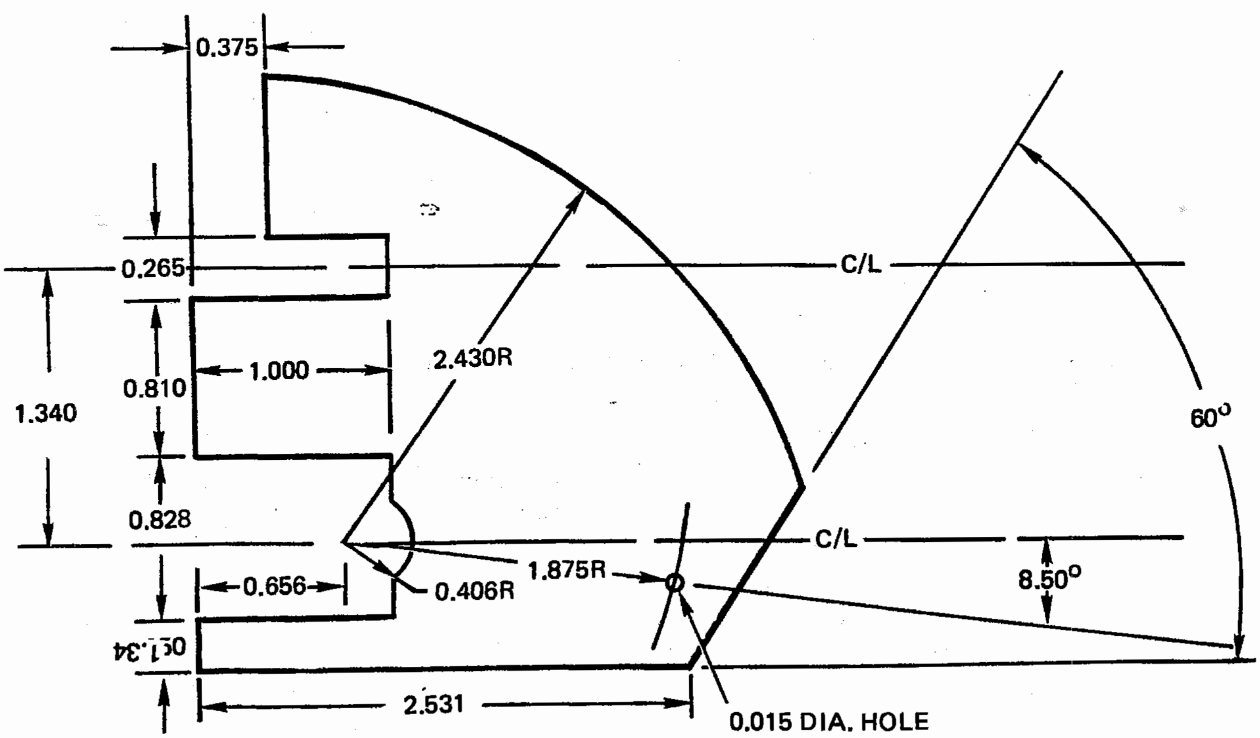
Note

A template may be manufactured to measure the 8 1/2 degree position of the switch arm. Refer to figure 5-10.

7. While holding the switch trigger arm in the position shown to maintain the 0 ± 1/32 inch dimension, adjust the adjustable link on the switch until switch will actuate and show UP and LOCKED on the cockpit indicator.

8. Install the pin through adjustable link in uplock switch actuation linkage at switch trigger, and safety with cotter pin (MS24665-132).

9. Engage the hydraulic pump control circuit breaker and retract the landing gear and check cockpit indicator for nose gear UP AND LOCKED.



MATERIAL: ALUMINUM SHEET 0.032 THICK

NOTE: 1. ALL DIMENSIONS IN INCHES
2. SCRIBE AND DRILL 0.0156 INCH DIA. HOLE AND MARK OFF RADII BEFORE CUTOUT OF TEMPLATE
3. TOLERANCE FOR ALL DIMENSIONS SHALL BE ± 0.001 INCH

Figure 5-10. Nose Landing Gear Uplock Switch Template Manufacture (Sheet 1 of 2)

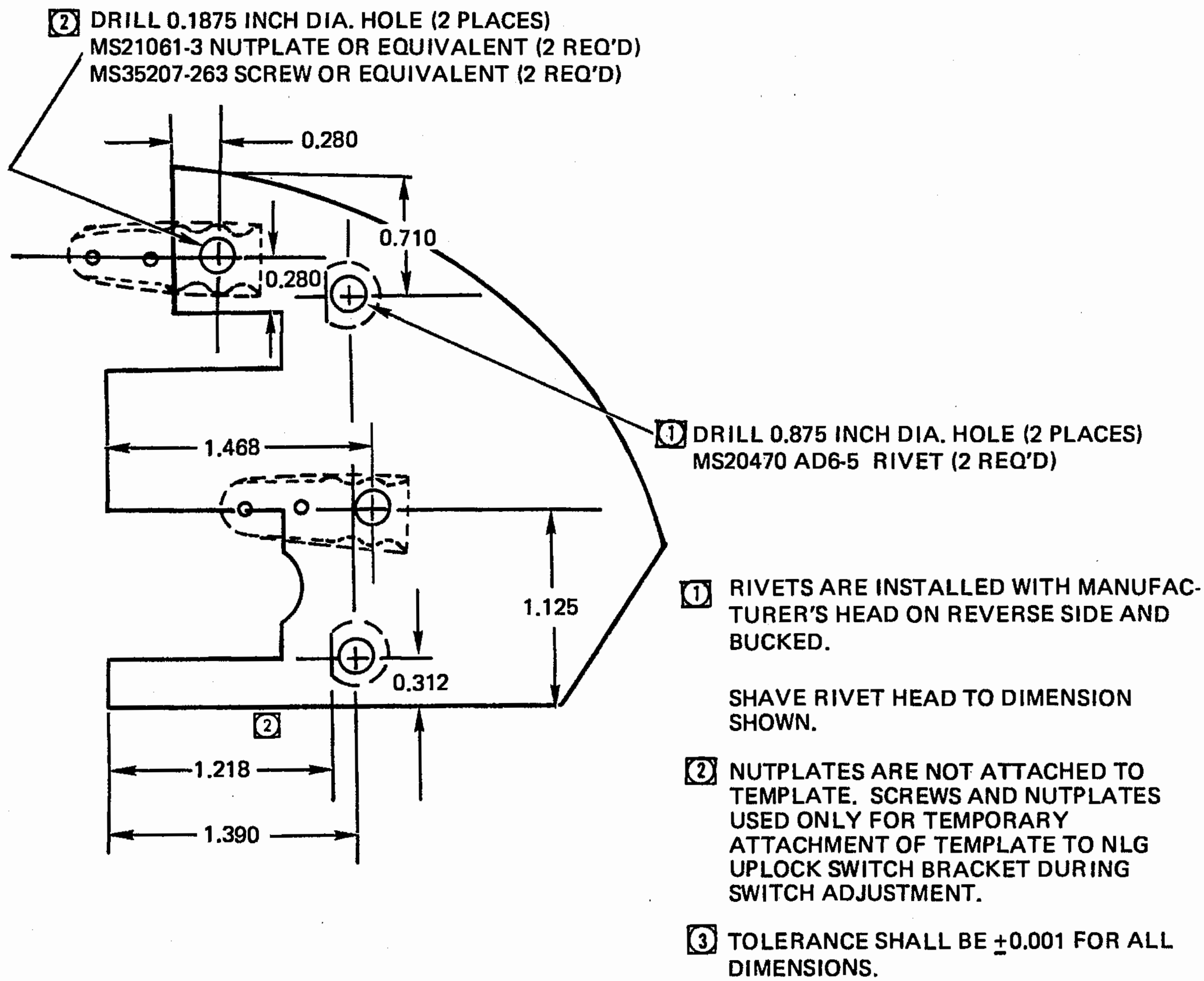


Figure 5-10. Nose Landing Gear Uplock Switch Template Manufacture (Sheet 2 of 2)

5-143. ADJUSTING NOSE LANDING GEAR WHEEL DOORS.

1. With nose gear UP and LOCKED, connect door linkage one side at a time and adjust door hold-open rod until doors are just faired with fuselage mold line. If doors are too tight this will prevent gear going up and locked.

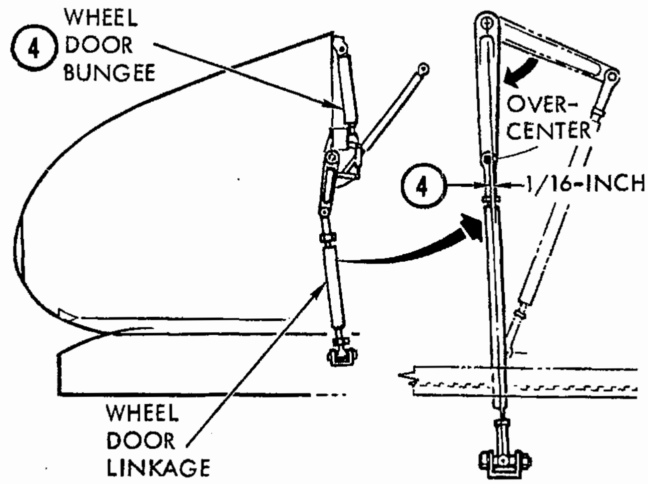
2. Lower the landing gear and install the pins and cotter keys in the hold-open rods. Tighten locknuts on rod ends after adjustment.

3. Raise the landing gear and check that nose gear goes UP AND LOCKED and that doors are faired.

Note

Before making any adjustments on bungee, assure that upper attach bracket is not broken or that bolts are not loose. (This bracket attaches under windshield). Can be inspected with a flashlight and mirror by looking upward, forward of RH rudder pedal.

4. With nose gear in DOWN AND LOCKED position check the nose wheel door linkage for an over-center condition as shown. If this over-center condition is not correct, it will be necessary to remove the pilot's instrument panel and instrument panel shroud to gain access to the door bungee adjustment rod. Refer to Avionics Systems Manual (NAVAIR 01-60GCB-2-5). If adjustments are made to wheel door bungee repeat steps 1, 2, and 3 above. Assure bottom bolt in bungee is installed with head outboard to prevent gear hangup during retraction. Tighten bungee rod end locknut.



Step 4—Para. 5-143

5. Pilot's instrument panel, instrument panel shroud and uplock switch cover, if removed, are to be installed after completion of wheel door adjustment.

5-144. NOSE LANDING GEAR RETRACTION AND EXTENSION CHECK. Perform a landing gear retraction and extension check by cycling the gear three times in accordance with instructions given by paragraph 5-15.

SECTION III
INTERMEDIATE MAINTENANCE

5-145. GENERAL.

5-146. Intermediate maintenance pertaining to the landing gear system is contained in this section. Materials, special tools, and specifications for performing these maintenance procedures are listed as necessary. Repair of components at this level of maintenance generally includes the installation of items contained in provisioned repair kits, along with standard supply items.

5-147. LANDING GEAR COMPONENTS.

5-148. Most of the landing gear components depend on close tolerances for proper operation. Since small particles of dirt and lint could have a serious effect on the hydraulic system, all lines and units which are removed should be capped with clean caps and plugs as soon as possible after removal. When handling and installing O-rings, the part should be kept free of dirt and foreign matter and should not be subjected to extreme weather conditions. The following general rules should be used when replacing O-rings.

1. Prepare a clean working area and provide all necessary tools and equipment.

2. Take necessary precautions for type of unit involved, and disassemble unit far enough to replace O-ring.

3. Check Illustrated Parts Breakdown (NAVAIR 01-60GCB-4) for correct sizes of packings.

4. Replace old O-ring with O-ring of same material.

5. Closely examine new O-ring for any defects such as creases, nicks, cuts, etc.

6. Immerse O-ring in same type of hydraulic fluid as used in the system and install the O-ring while it is wet.

7. Avoid stretching the O-ring any more than is necessary.

Note

Do not use any sharp tools when removing or installing O-rings.

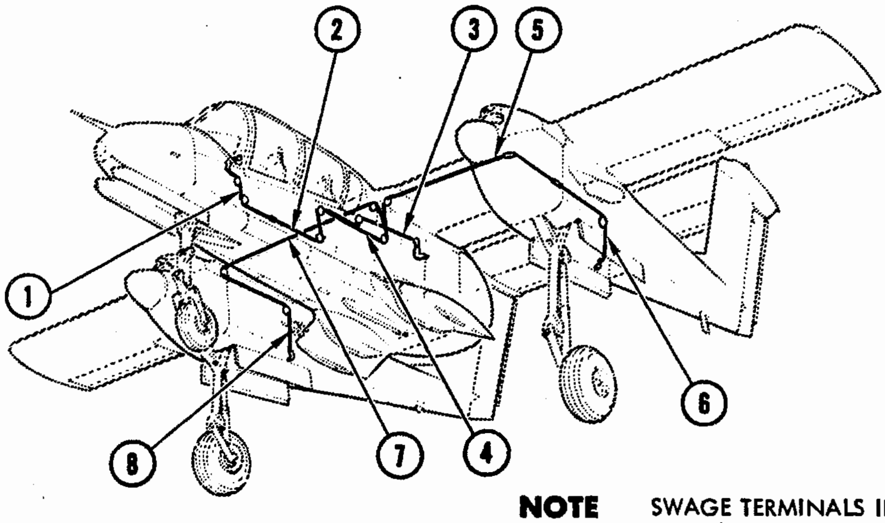
8. After the O-ring is installed, work out any twist existing on the O-ring.

5-149. LANDING GEAR CONTROL SYSTEM CABLE FABRICATION.

5-150. Specific information necessary for local manufacture of cable assemblies used in landing gear control system is shown in figure 5-11. Refer to General Structural Repair Manual (NAVAIR 01-1A-1) for specific fabrication methods, Aircraft Structural Hardware Manual (NAVAIR 01-1A-8) for information concerning end fittings, and Illustrated Parts Breakdown (NAVAIR 01-60GCB-4) for specific parts data.

Tools and Equipment List

Machine, Swaging, Bench-type, Hand-operated	MIL-S-6180, Type 2 (or equivalent) (81349)
Machine, Cable Testing, Hydraulically-operated (4000-pound capacity)	TA19802 (or equivalent)



NOTE SWAGE TERMINALS IN ACCORDANCE WITH MIL-T-6117.

TEST ASSEMBLY AT 552 POUNDS PER MIL-C-5688.

1 APPROXIMATE CUT LENGTH OF CABLE.

2 PARTS PROVISIONED FOR INTERMEDIATE MAINTENANCE.

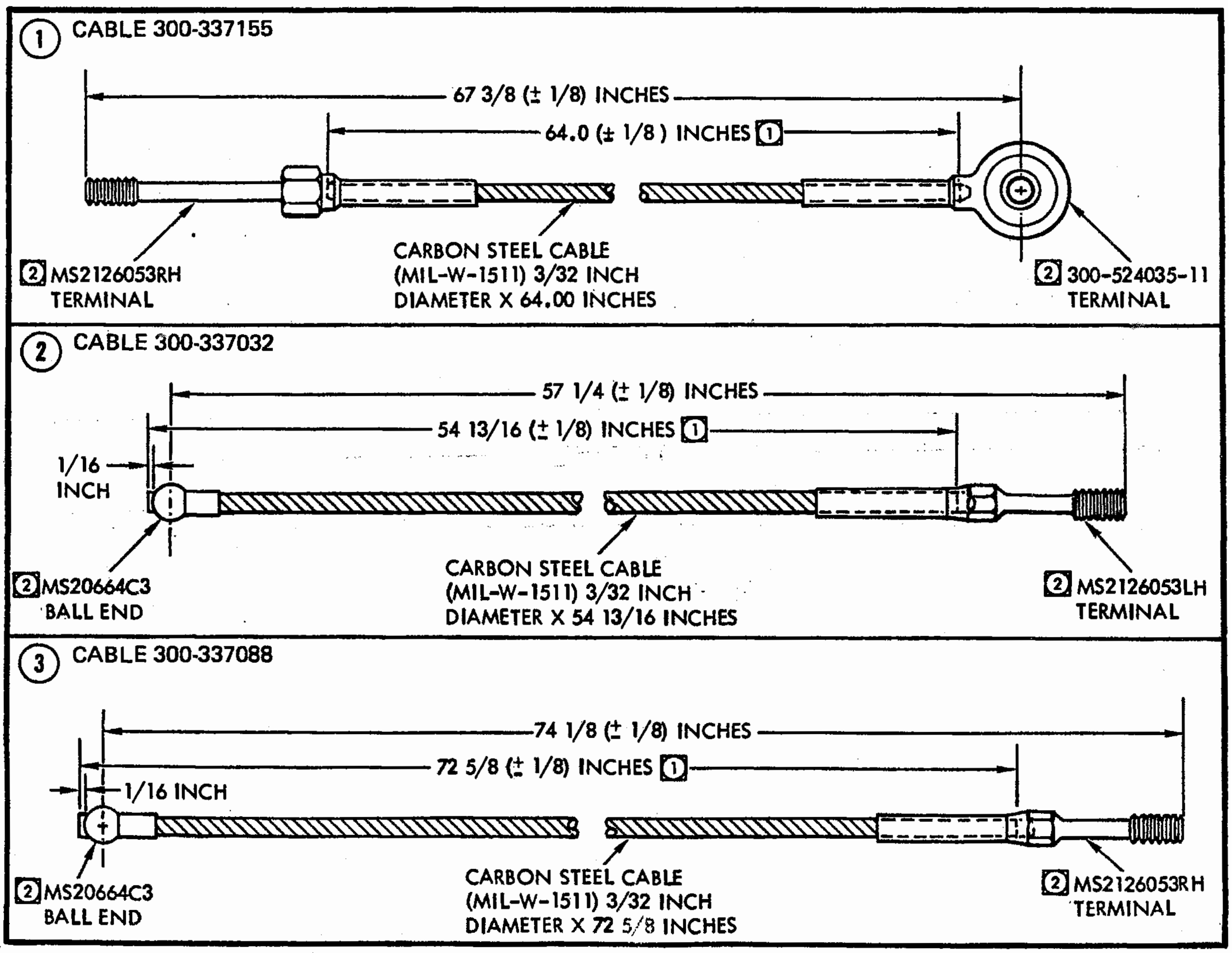


Figure 5-11. Landing Gear Control System Cable Fabrication (Sheet 1 of 2)

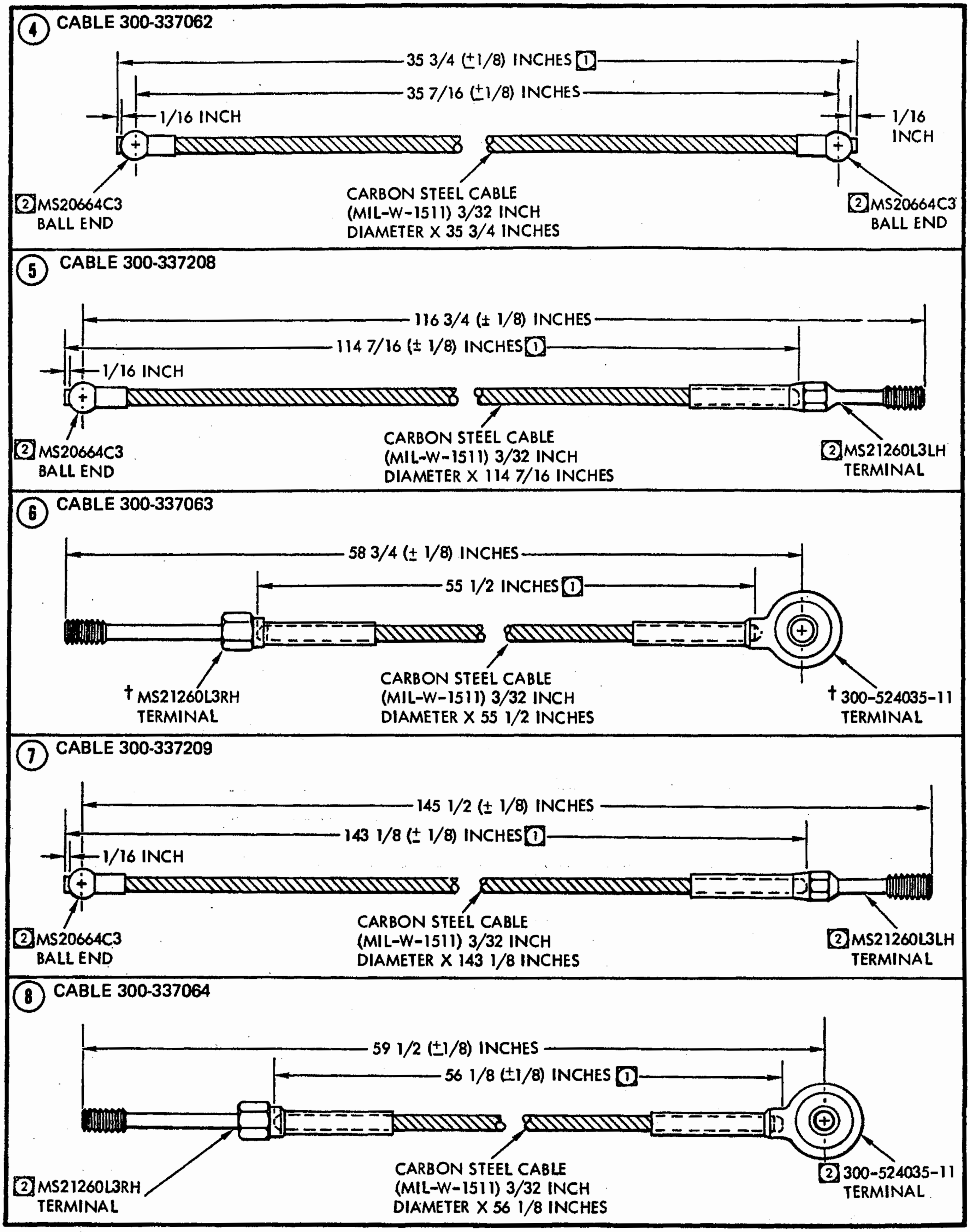


Figure 5-11. Landing Gear Control System Cable Fabrication (Sheet 2 of 2)

5-151. LANDING GEAR HANDLE INTERCONNECT CABLE (305-537216-11) FABRICATION.

5-152. Specific information necessary for the local manufacture of the landing gear handle interconnect cable is shown in figure 5-12. Refer to Illustrated Parts Breakdown (NAVAIR 01-60GCB-4) for specific parts data. To fabricate the cable, obtain the following listed tools, equipment, and materials.

Tools and Equipment List

Machine, Swaging, Bench-type, Hand-operated	MIL-S-6180, Type 2 (or equivalent)
Machine, Cable Testing, Hydraulically-operated (4000-pound capacity)	TA19802 (or equivalent)

Materials List

Cable	Part No. 22058 (Teleflex Inc., North Wales, Pennsylvania 78710)
Ball End	Part No. RA 2487-2 (American Chain and Cable Co., Adrian, Michigan, 80523)
Flux, Brazing, Silver Paste	51F640 (or equivalent) (10001)
Brazing Alloy, Silver Wire	46S657 (or equivalent) (10001)

5-153. LANDING GEAR CONTROL HANDLE ASSEMBLY (300-337011).

5-154. Intermediate maintenance for the landing gear control handle consists of disassembly, inspection, and/or replacement of components, and assembly.

5-155. DISASSEMBLY. To,disassemble the control handle, see figure 5-13 and proceed as follows:

1. Remove two screws assembling the landing gear handle knob.

2. Remove and replace two bearings and spacer. Refer to paragraph 2-193.

3. Examine knob components for evidence of arcing or corrosion. Clean and replace as necessary.

5-156. ASSEMBLY. To assemble the landing gear handle, see figure 5-13 and proceed as follows:

1. Assemble knob as shown in figure 5-13, exercising care to ensure conduit completely covers mounting screws.

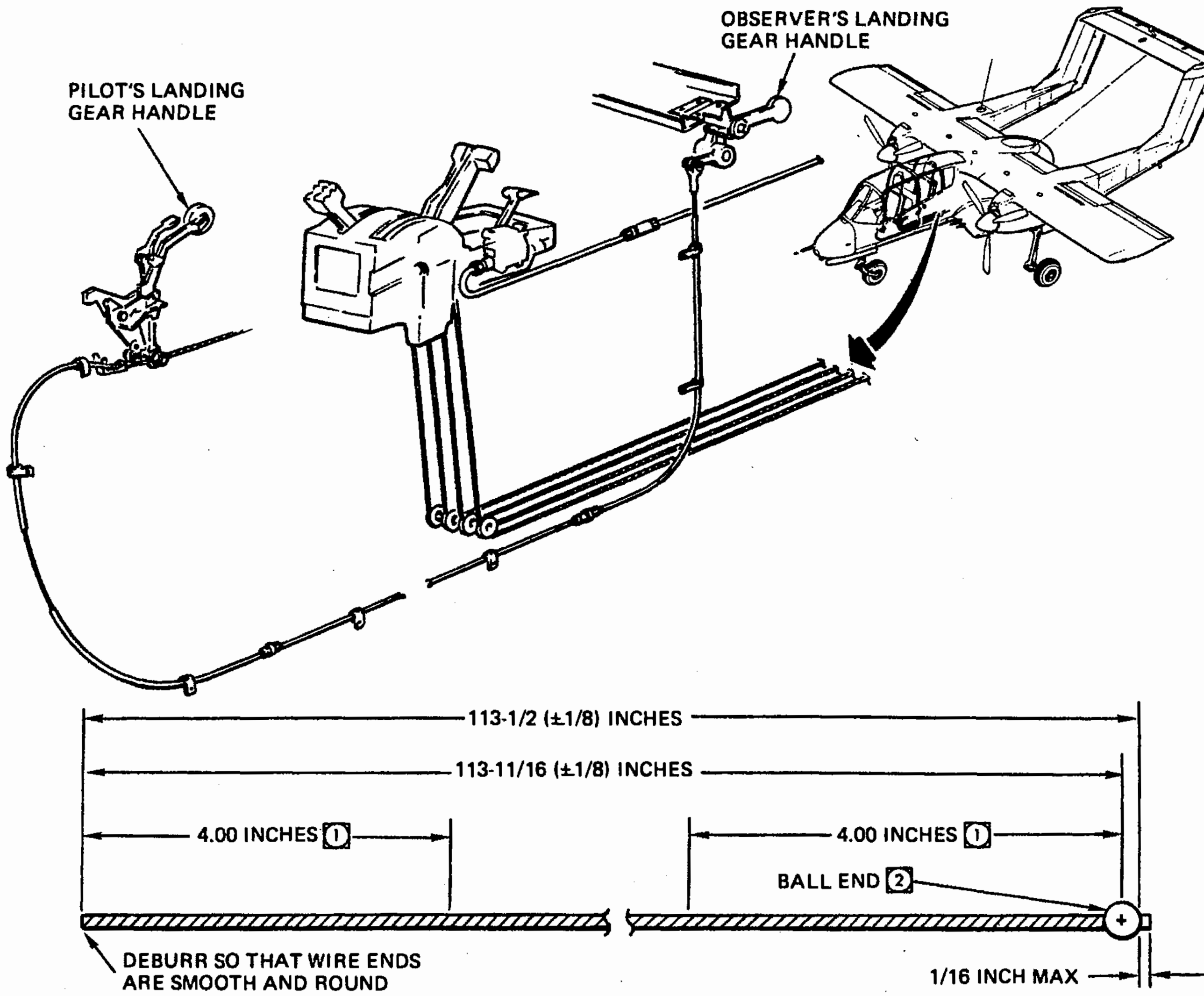
2. Replace bushing in lower handle mounting hole.

5-157. LANDING GEAR RELEASE SYSTEM CAM ASSEMBLY (300-337009-21).

5-158. Intermediate maintenance for the landing gear release system cam assembly consists of replacement of the bearings and spacer. For instructions in replacing, refer to paragraphs 2-189 and 2-193.

5-159. HYDRAULIC MANUAL CONTROL VALVE (LANDING GEAR SELECTOR VALVE—HP548200-6).

5-160. The hydraulic manual control valve has a designed operating pressure of 1500 psi, utilizing hydraulic fluid (MIL-H-5606) as the operating medium. The valve is used to control hydraulic fluid flow to the landing gear actuators. See figure 5-14. Moving the actuating rod from left to right will direct hydraulic pressure out of cylinder 2 while cylinder 1 is open to the return system. Moving the actuating rod from right to left will direct hydraulic pressure out of cylinder 1 while cylinder 2 is open to the return system.



CABLE ASSY PART NUMBER AND REQUIREMENT	CABLE PART NUMBER	BALL END PART NUMBER	CABLE CUT LENGTH IN INCHES	TOTAL LENGTH IN INCHES
305-537216-11 (1 REQUIRED)	P/N 22058, OBTAINED FROM TELEFLEX, INC., NORTH WALES, PENNA. (IDENT CODE 78710)	P/N RA2487-2 OBTAINED FROM AMERICAN CHAIN & CABLE CO., ADRIAN, MICH. (IDENT CODE 80523)	113-1/2(±1/8)	113-1/2 (± 1/8)

NOTES:

1 SILVER BRAZE FOR LENGTH SHOWN PER MIL-B-7883A. BRAZED AREA MUST PASS THROUGH A 0.078 (+0.000 – 0.0005) DIAMETER HOLE AFTER BRAZING.

2 SWAGE BALL END PER MIL-T-6117. EXTERIOR SURFACE OF BALL END MUST BE FREE OF BRAZE.

TEST ASSEMBLY AT 150 POUNDS PER MIL-C-5688.

Figure 5-12. Landing Gear Handle Interconnect Cable Fabrication

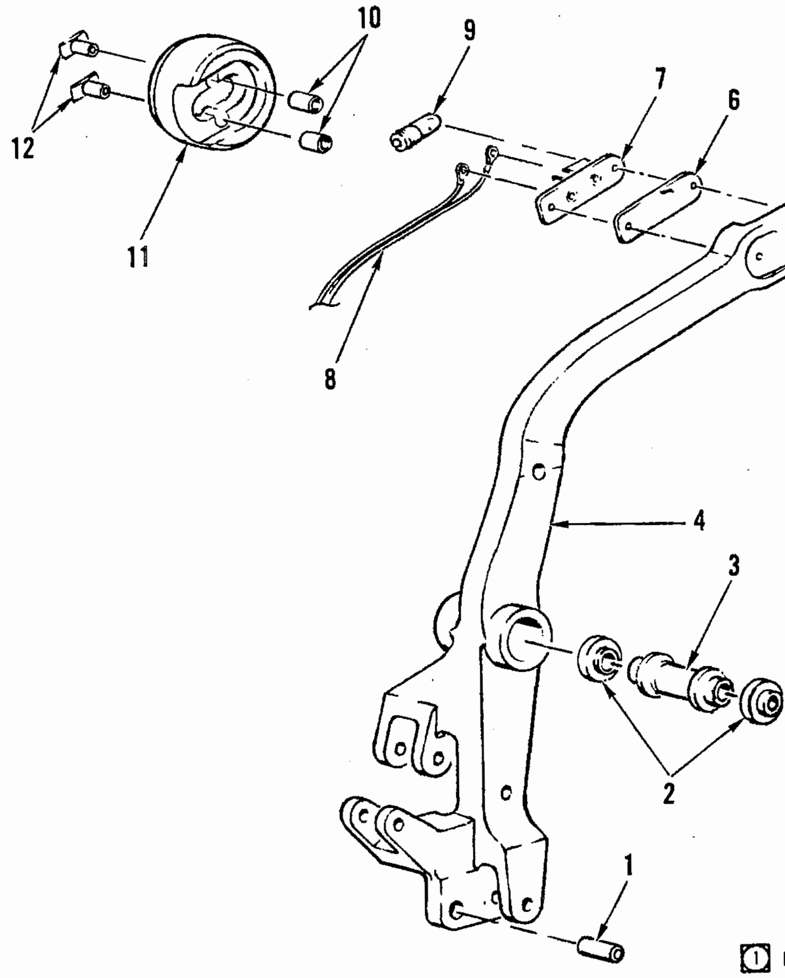


Figure 5-13. Landing Gear Control Handle

5-161. DISASSEMBLY. To disassemble the hydraulic manual control valve, see figure 5-15 and proceed as follows:

1. Remove right-hand mounting foot (2) and left-hand mounting foot (3) by removing attaching screws (4).

2. Unscrew end caps (5) from body (15).

3. Remove backup rings (7) and O-rings (6) from inside groove of end caps (5).

4. Remove backup rings (9) and O-rings (8) from outside ground end caps (5).

5. Remove actuating rod (10) and controller valve (12) from sleeve (13).

6. Remove controller valve (12) from actuating rod (10) by removing retaining pin (11).

7. Remove sleeve (13) from body (15).

8. Remove O-rings (14) from body sleeve (15).

Note

Discard all O-rings and backup rings.

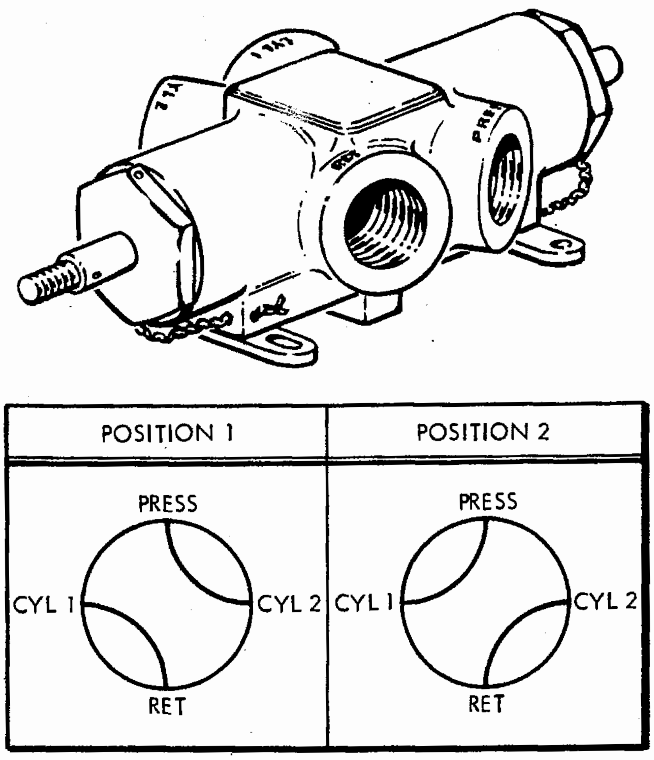


Figure 5-14. Hydraulic Manual Control Valve and Flow Diagram

5-162. CLEANING. To clean the valve components, proceed as follows:

Materials List

Trichlorotrifluoroethane	MIL-C-81302
Penetrant Solution	Type ZL-2
Developer	Type ZL-5

WARNING

When using trichlorotrifluoroethane, keep away from open flame and do not inhale fumes for prolonged periods.

CAUTION

Chlorinated solvents such as trichloroethane, MIL-T-81533; and trichlorotrifluoroethane (freon 113), MIL-C-81302, may be hydrolyzed in contact with free water and form highly corrosive acids. Free water is often found in hydraulic systems, therefore the use of chlorinated solvents should be restricted to external surfaces of hydraulic systems. Chlorinated solvents may be applied to internal surfaces of disassembled hydraulic components for cleaning purposes provided none of the liquid solvent is allowed to remain in the component after cleaning.

Wash all metal parts in trichlorotrifluoroethane (MIL-C-81302) and dry with filtered, compressed air. Ensure that all internal bores and mating surfaces are free from dirt, rust, and corrosion. Place all cleaned parts in a dust-free airtight container with a bag of desiccant (MIL-D-3464) until reassembly.

5-163. INSPECTION. Perform an inspection of components in the following manner:

1. Inspect all threaded parts for crossed, stripped, or worn threads.

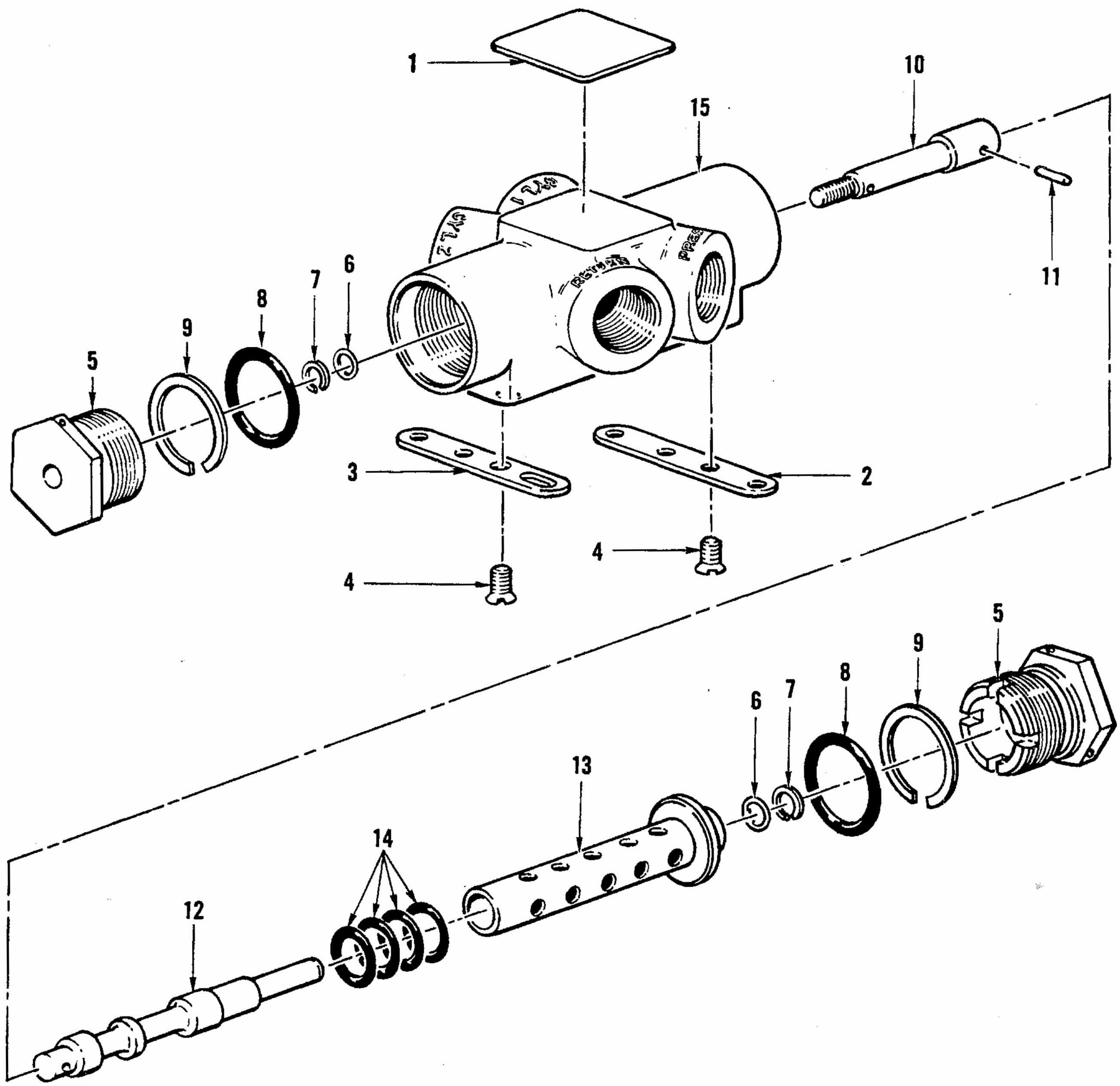
2. Inspect all parts for evidence of scoring, burrs, and corrosion.

3. Inspect body (15) by using the nondestructive inspection as indicated in table 5-2.

5-164. REPAIR. Minor damage to valve components may be repaired by and observing the following procedures:

Materials List

Cloth, Crocus	P-C-458



1 PLATE, IDENTIFICATION	$\boxed{1}$ 9 RING, BACKUP
2 FOOT, MOUNTING	10 ROD, ACTUATING
3 FOOT, MOUNTING	11 PIN, RETAINING
4 SCREW	12 CONTROLLER, VALVE
5 CAP, END	13 SLEEVE
$\boxed{1}$ 6 PACKING, O-RING	$\boxed{1}$ 14 PACKING, O-RING
$\boxed{1}$ 7 RING, BACKUP	15 BODY
$\boxed{1}$ 8 PACKING, O-RING	

$\boxed{1}$ PROVISIONED FOR INTERMEDIATE MAINTENANCE

Figure 5-15. Hydraulic Manual Control Valve—Exploded View

Table 5-2. Hydraulic Manual Control Valve for Nondestructive Inspection Data

PART NAME AND INDEX NO. (Figure 5-15)	TYPE OF NONDESTRUCTIVE TEST	PROCEDURE	ACCEPTABLE DEFECTS
Body Assembly (15)	Type I fluorescent method per MIL-H-6866	1. Clean part thoroughly. 2. Submerge in penetrant solution, Type ZL-2 for 7 to 10 minutes. 3. Remove item. 4. Submerge in emulsifier solution for 2 minutes. 5. Remove and rinse part. 6. Submerge in developer, Type ZL-5 for 7 to 10 minutes. 7. Remove item. 8. Place in oven for 7 to 10 minutes or until dry. 9. Inspect under black (ultra-violet) light.	None

1. Minor thread damage may be repaired on parts with careful use of a fine file. If thread repair results in a loose fit or misalignment of mating parts, replace with new part.

2. Nicks and abrasions on noncritical surfaces may be smoothed with crocus cloth (P-C-458).

3. Replace all worn and distorted parts, marred threadlocks, or any part that does not meet inspection requirements.

5-165. ASSEMBLY. To assemble the valve, see figure 5-15 and proceed as follows:

Materials List

Packing	MS28775-018
Packing	MS28775-009
Packing	MS28775-013
Ring, Backup	MS28774-018
Ring, Backup	MS28774-009

Note

When installing the O-rings (6, 14) in end cap (5) and body (15), surfaces must not be marred or scratched. Using an O-ring tool for this operation, carefully place O-rings in proper grooves.

1. Install O-rings (14) in internal grooves of body (15). Do not block flow passages.

2. Install sleeve (13) into body (15).

3. Install controller valve (12) on actuating rod (10) by inserting retaining pin (11).

4. Install actuating rod (10) and controller valve (12) into sleeve (13).

5. Install O-rings (8) and backup rings (9) on end caps (5).

6. Install backup rings (7) and O-rings (6) into end caps (5).

7. Screw end caps (5) into body (15).

8. Attach mounting feet (2, 3) to body (15) by replacing attaching screws (4).

Note

Left mounting foot has an elongated screw hole and cannot be interchanged with right mounting foot. Ensure elongated hole on left foot is located near return port on valve body.

5-166. TESTING. To test the valve, see figure 5-15 and proceed as follows:

Tools and Equipment List

Test Stand, Hydraulic	S150 (or equivalent)

1. Plug cylinder ports No. 1 and No. 2 (CYL1 & CYL2). Using a hydraulic test stand, apply 1500-psi hydraulic pressure to PRESS and RET ports on valve.

2. Cycle valve manually at least 10 times.

3. Check that there is no binding or evidence of leakage.

5-167. LANDING GEAR RELEASE SYSTEM BALANCE BUNGEE (300-337100).

5-168. The landing gear release system balance bungee assembly (figure 5-16) consists of a lock (1), check nut (2) installed on a rod end assembly (8) which has a bearing (9) staked in it. An end fitting (3) also has a bearing (4) staked in it. Two compression springs (5) and two nylon guides (6) along

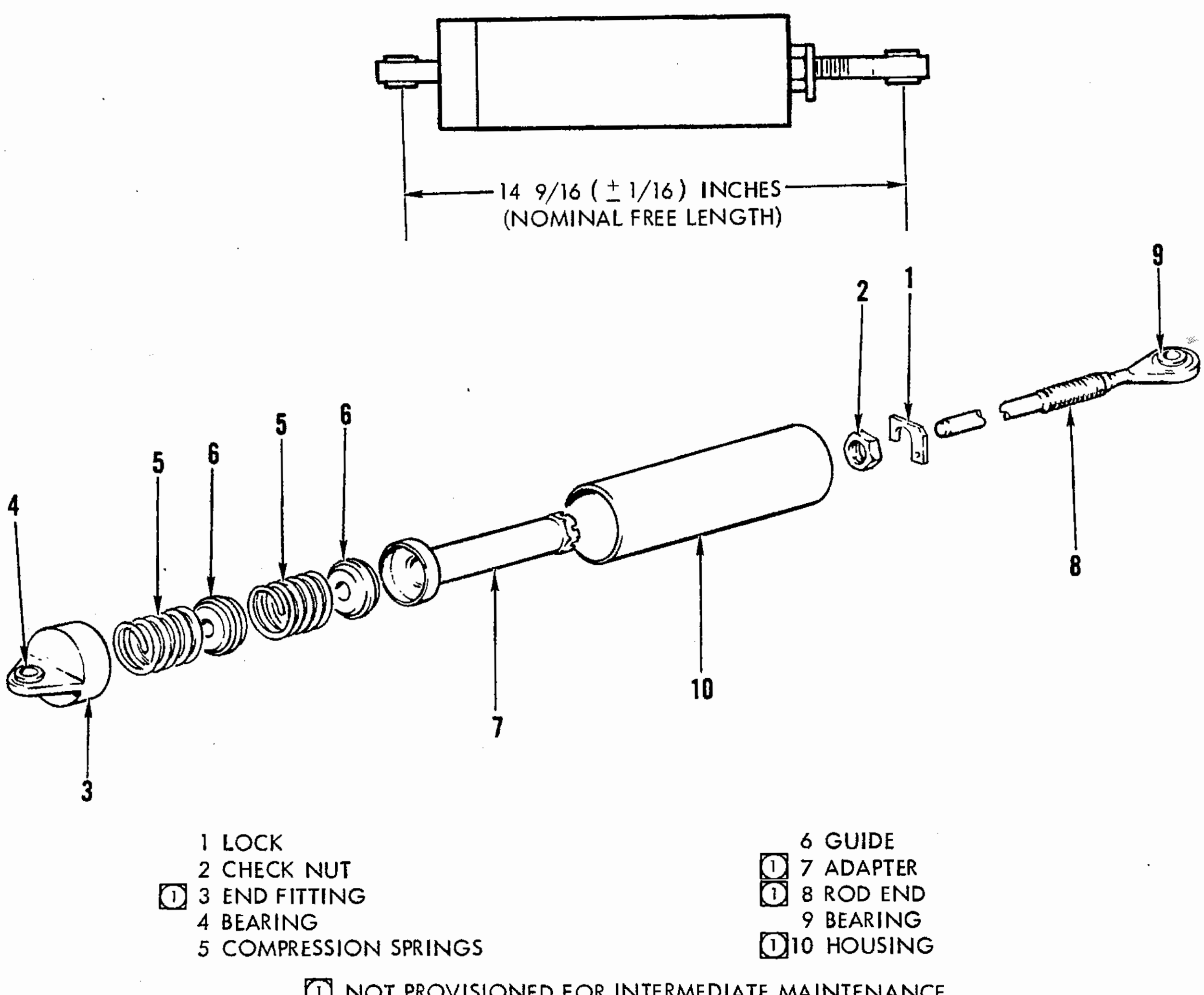


Figure 5-16. Landing Gear Release System Balance Bungee

with an adapter (7) are contained in the housing (10). The end fitting (3) is fastened to the housing with four rivets (MS20600AD4W4).

5-169. DISASSEMBLY. To disassemble the landing gear release system bungee, see figure 5-16 and proceed as follows:

1. Cut the lockwire securing the lock (1) to the check nut (2). Remove the lock and loosen check nut.

2. Drill rivets out of housing (10) and remove end fitting (3).

3. Remove bearing (4) from end fitting (3) only if bearing or end fitting is damaged.

4. Remove compression springs (5) and guides (6) from housing (10).

5. Unscrew rod end assembly (8) from adapter (7) and remove adapter from housing.

6. Remove bearing (9) from rod end assembly only if bearing or rod end assembly is damaged.

5-170. CLEANING. Clean balance bungee components as follows:

Materials List

Lubricant	MIL-L-7870
Solvent, Dry-cleaning	P-D-680, Type II

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

1. Soak all components of the landing gear release system bungee assembly in dry-cleaning solvent (P-D-680 Type II) for 5 minutes.

2. Thoroughly air-dry.

3. Lubricate bearings (4, 9) with MIL-L-7870.

5-171. INSPECTION. If a part does not meet the following standards, it must be replaced.

Tools and Equipment List

Tester, Spring Resiliency,	Type PB4-D (or equivalent)

Materials List

Primer, Zinc chromate	MIL-P-8585 or TT-P-1757

1. Inspect all parts for any damage, scratches, or nicks. Replace any obviously worn or deformed parts.

2. Check all threads and sharp edges to ensure they are free of burrs.

3. Check rod end assembly plating for condition. If rod end (8), end fitting (3) or adapter (7) are damaged, return entire bungee assembly to Supply.

4. Check bearings in end fitting (3) and rod end (8). If bearings have axial or lateral play or are not free to rotate, press out old bearing and stake in new bearing.

5. Check guides and end fitting for evidence of wear.

6. Ensure that spring ends are square within 2 degrees of axis.

7. Springs free length to be 7.43 (±0.03) inches each.

8. Using spring resiliency tester (PB4-D or equivalent), compress spring 3.879 (±0.010) inches and check for a reading of 57.7 (±5) pounds.

9. Check housing (10) for nicks or gouges externally and galling internally. If the housing is damaged, the complete bungee assembly must be discarded.

10. Check housing finish. If required, touchup finish with zinc-chromate primer (MIL-P-8585 or TT-P-1757).

5-172. ASSEMBLY. To assemble the landing gear release system balance bungee assembly, see figure 5-16 and proceed as follows:

Materials List

Silicone Fluid, Dow Corning 200, 20-centistoke	VV-D-1078 (71984)
Lockwire (0.032-inch diameter steel)	MS20995F32
Rivets	MS20600AD4W4

1. Swab interior of housing (10) with Dow Corning 200, 20-centistoke fluid, and install adapter (7) in housing.

2. If bearing (9) has been removed from rod end (8), stake new bearing both sides.

3. Install adapter (7) in housing (10).

4. With check nut (2) installed, install rod end assembly.

5. Swab nylon guides (6) and compression springs (5) with Dow Corning 200, 20-centistoke fluid.

6. Install nylon guides and compression spring.

7. Install end fitting assembly (3), using four rivets (MS20600AD4W4).

5-173. ADJUSTMENT. To adjust the landing gear release system balance bungee assembly, see figure 5-16 and proceed as follows:

Materials List

Lockwire (0.032-inch diameter steel)	MS20995F32

1. Adjust the rod end assembly to obtain 14-9/16 (±1/16) inches between the center of rod end assembly hole and the center of end fitting hole.

2. Tighten check nut and safety to lock with lockwire (MS20995F32).

5-174. TESTING. Check to ensure that bungee force is 59.75 (±6) pounds when retracted 1.00 inch.

5-175. MAIN LANDING GEAR SHOCK STRUT ASSEMBLY (1525B1000-01 OR 1525B 1000-02).

5-176. The main landing gear complete shock strut assembly (figure 5-17) is a trailing-arm type landing gear which operates hydropneumatically to absorb ground impact. Shock absorption is controlled by a metered orifice, which is further aided automatically during landing or take-off on rough terrain, by a spring-loaded pressure relief valve. The main components are common shock strut and drag brace, and the left- or right-hand units of axle beam, post, male and female brace links, and actuator fitting. The main components of the shock strut are the piston terminal, piston, cylinder, orifice, spring-loaded relief valve, packing adapter, gland nut, and air valve. Upon landing, the cylinder moves over the piston, forcing hydraulic fluid through the metered orifice into the piston changer, absorbing the impact energy and stopping the upward travel of the cylinder. The pressurized air within the cylinder augments this action and returns the cylinder toward the extended position. The pressure relief valve, spring loaded to 206 (±6) pounds, is installed inside the lower end of the cylinder to further relieve shock caused by rough terrain. Refer to table 5-3 for shock strut characteristics.

Table 5-3. Main Landing Gear Shock Strut Assembly Characteristics

Shock Strut Assembly Data	
Compressed position length*	25.834 inches
Static position length*	27.249 inches
Extended position length*	34.896 inches
Total stroke	9.062 inches
Extended air pressure	490 psi
Capacity, hydraulic fluid (approx)	2.6 pints
Filling after assembly	MIL-H-6083
Service filling	MIL-H-5606
MLG Complete Shock Strut Assembly Weight	139 pounds

*Measured along shock strut centerline between centers of the spherical bearing in the piston terminal and in the strut lug on the axle beam

5-177. CHECKOUT. Perform the following checkout procedures on the main landing gear shock strut:

Tools and Equipment List

Cylinder, Nitrogen/ Dry Air	60A80D1

Materials List

Fluid, Hydraulic	MIL-H-5606

1. With the equipment serviced with hydraulic fluid, secure the strut in either a vertical or horizontal, fully extended position.

2. Pressurize to the normal extended air pressure of 490 psi. There shall be no evidence of fluid or air leakage after a period of 1 hour.

3. Check that there is no leakage at any joints where there are packings or where there is motion.

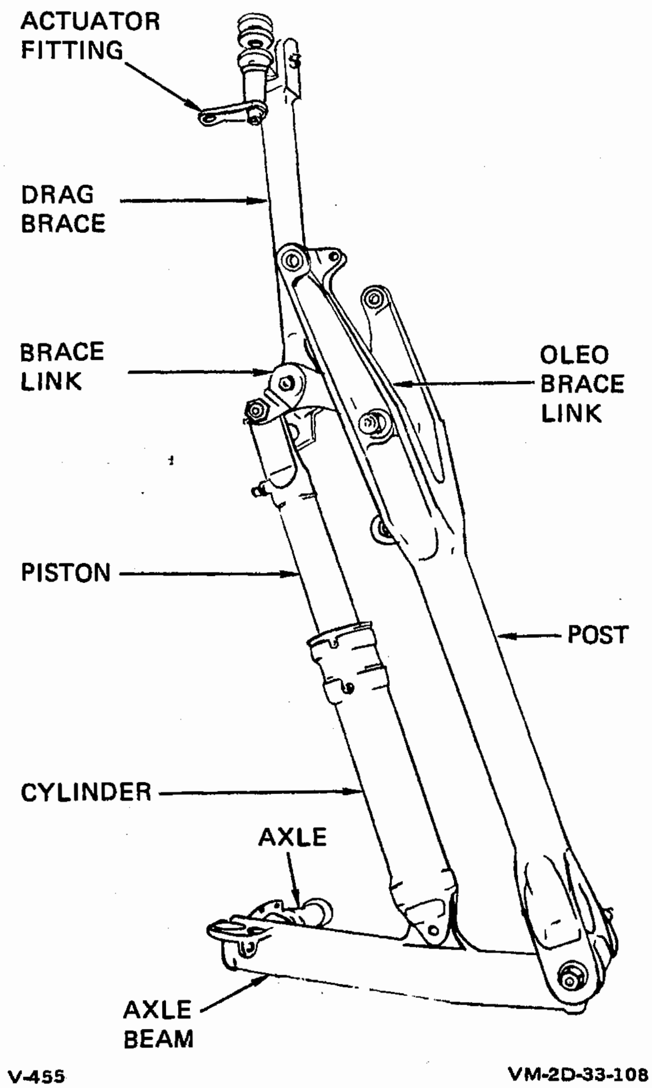


Figure 5-17. Main Landing Gear Complete Shock Strut—General Arrangement

5-178. TROUBLESHOOTING. To troubleshoot the main landing gear shock strut assembly, refer to table 5-4.

5-179. DISASSEMBLY. To disassemble the main landing gear complete shock strut assembly, see figures 5-18 and 5-19 and proceed as follows:

WARNING

Serious injury could result if an attempt is made to remove air valve or bleed plug (3, figure 5-18) before releasing pressurized air.

Table 5-4. Troubleshooting Main Landing Gear Shock Strut Assembly

TROUBLE	PROBABLE CAUSE	REMEDY
Air leak at air valve.	Improperly installed air valve.	Check for proper installation. Torque valve body 100 to 110 inch-pounds and swivel nut 50 to 60 inch-pounds.
	Worn or defective air valve.	Replace air valve.
Fluid/air leakage at piston gland nut area.	Worn O-ring packings in packing adapter.	Replace O-ring packings and backup rings.
	Packings damaged by dirt or foreign matter.	Clean thoroughly and replace packings.
	Scored piston, worn piston head and or packing adapter.	Replace defective or worn parts.
	Rolled O-ring seal	Clean strut and gland nut area, lubricate strut with hydraulic fluid, and actuate up and down four or five times.

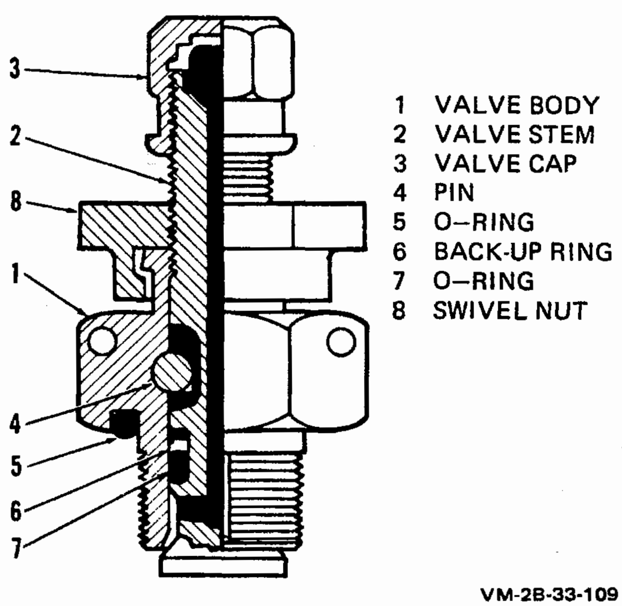


Figure 5-18. Air Charging Valve

Note

Bag or tag (do not steel stamp) all removed parts for reassembly into the same assembly, except for parts which are to be replaced.

Discard all O-ring and backup rings.

1. Remove valve cap **(3, figure 5-18)** from air valve and slowly unscrew swivel nut (8) one-quarter turn (maximum). Release all pressurized air from shock strut before proceeding with disassembly.

2. After all air pressure is released, place the shock strut in the retracted position. Cut lockwire, remove air valve, bleed plug (61) and slowly drain the hydraulic fluid into a suitable container. Compress the piston (83) slowly to aid in fluid removal.

3. Remove cotter pin (1), nut (2), and oleo-to-link bolt (3). As the bolt is removed, be prepared to retain spacers (4).

4. Remove cotter pin (5), nut (6), and oleo-to-axle beam bolt (7). Retain spacers (8) with bolt assembly as shock strut assembly (9) is removed from axle beam.

Note

Store shock strut assembly horizontally on a parts rack. If it is to be stored for a lengthy period of time, wipe exposed portions with hydraulic fluid (MIL-H-5606) and wrap with paper or similar material to protect surfaces from marring.

5. If any of the axle components appear to be damaged, remove cotter pin (10), plug (11), nut (18), tanged washer (19), and spacer (20).

Note

The plug (11) is installed in the hollow axle to prevent entry of foreign matter and must be removed for component cleaning.

6. If axle is damaged, remove nut (13) and bolt (12) and slide axle (21) out of axle beam (28).

7. Remove bolt (22) and washer (23). This will permit barrel nut (27) to drop down in bore of pivot pin (26). This barrel nut is to be retrieved and retained with the nut and washer.

8. Remove retaining ring (24), uplock roller (25), and pivot pin (26). This will permit removal of complete axle beam assembly (28) from post (55).

9. Remove nut (29) from bolt (30) to permit removal of actuator fitting pin (31), actuator fitting pin spacer (32), and actuator fitting assembly (33).

10. If bearing plate is damaged, remove screw (34), bearing plate (35), and shim (36) from oleo brace link (63).

11. Remove cotter pin (37), nut (38) and washer (39) while holding tie-down ring (40). This will permit removal of the tie-down ring (40).

12. Remove cotter pin (41), nut (42), washers (43), and door operator roller (44) from brace link pin assembly (48).

13. Remove cotter pin (45), brace link pin nut (46), and washer (47) from brace link pin assembly (48). Remove brace link pin assembly (48) from post (55).

14. Remove nut (56) and washer (57) and slide brace link (59) out of oleo brace link (63) while supporting drag brace (65).

15. Inspect all bushings (49 through 54, 58, 61, and 62) for excessive wear and looseness.

Note

These bushings are pressed in place and reamed. If they are damaged, the entire assembly must be shipped to the depot facility.

16. Do not remove bearing assembly as it is pressed in place. If damaged, ship complete assembly to depot facility.

17. Remove screw (66) and tab lock (67) from shock strut cylinder (97).

18. If bleed plug (68) and its gasket (69) were not previously removed, remove them at this time. Ensure that all fluid has been drained from the cylinder.

19. Spherical bearing (70), is a press-fit bearing and must not be removed. If damaged, forward entire assembly to depot facility.

20. Remove piston terminal assembly (73), O-ring packing (71) and backup ring (72). Remove and discard lock insert (74).

21. Remove Spirolox (75), retaining ring washer (76), and scraper ring (77).

22. Using a spanner wrench, remove gland nut (78) and carefully remove piston assembly from cylinder (97).

Note

Care must be exercised to avoid dropping components of the assembly as it is being removed.

23. Remove packing washer (79), split piston heads (80), backup rings (81), and O-ring packing (82) from packing adapter (85).

24. Remove backup ring (84), and O-ring packing (83).

25. Remove spacer (86), Spirolox (87), and recoil valve (88) from piston (91).

26. Remove nut (92) and washer (93) and carefully pull relief valve and metering pin assembly (96) from cylinder (97).

27. Remove backup ring (94) and O-ring packing (95) from relief valve and metering pin assembly (96).

28. Remove lock insert (90) from orifice and piston and unscrew orifice (89) from piston (91).

5-180. CLEANING. To clean the disassembled main landing gear complete shock strut assembly, see figure 5-19 and proceed as follows:

Materials List

Paper, Wax	MIL-P-20311
Solvent, Dry-cleaning	P-D-680, Type II

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

CAUTION

All cleaning operations should be conducted in a well-ventilated, dry, clean (dust-free) room.

1. Wash all metal parts except air valve, axle beam bearings, actuator fitting gearings, and spherical bearing (5) with dry-cleaning solvent (P-D-680, Type II). A soft-bristled brush may be used to removed caked residues.

2. Ensure that all foreign matter is removed from internal surfaces of hollow parts.

3. Wipe air valve and bearings with a clean, lint-free cloth moistened with dry-cleaning solvent (P-D-680, Type II).

4. Allow excess solvent to drain from parts and dry with clean, dry, compressed air.

5. Wrap all cleaned parts in clean wax paper (MIL-P-20311) to prevent contamination.

5-181. INSPECTION. To inspect the disassembled main landing gear complete shock strut assembly, see figure 5-19.

Tools and Equipment List

Spring, Resiliency Tester	Type PB4-D

1 COTTER PIN (MS24665-337)
2 NUT
3 OLEO TO LINK BOLT
4 SPACER
5 COTTER PIN (MS24665-374)
6 NUT
7 OLEO TO AXLE BEAM BOLT
8 SPACER
9 SHOCK STRUT ASSEMBLY
10 COTTER PIN (MS24665-379)
11 PLUG
12 BOLT
13 NUT
14 COTTER PIN
15 NUT
16 WASHER
17 JACK PAD
18 AXLE NUT
19 TANG WASHER
20 BEARING SPACER
21 AXLE
22 BOLT
23 WASHER
24 RETAINING RING
25 UPLOCK ROLLER
26 PIVOT PIN
27 NUT
28 COMPLETE AXLE BEAM ASSEMBLY
29 NUT
30 BOLT
31 ACTUATOR FITTING PIN
32 ACTUATOR FITTING PIN SPACER
33 ACTUATOR FITTING ASSEMBLY
34 SCREW
35 BEARING PLATE
36 BEARING PLATE SHIM
37 COTTER PIN (MS24665-377)
38 NUT
39 WASHER
40 TIE DOWN RING ASSEMBLY
41 COTTER PIN (MS24665-157)
42 NUT
43 WASHER
44 DOOR OPERATOR ROLLER
45 COTTER PIN (MS24665-311)
46 BRACE LINK PIN NUT
47 WASHER
48 BRACE LINK PIN ASSEMBLY
49 BUSHING
50 BUSHING
51 BUSHING
52 BUSHING
53 BUSHING
54 BUSHING
55 POST
56 NUT
57 WASHER
58 BUSHING
59 BRACE LINK
60 SPACER
61 BUSHING
62 BUSHING
63 OLEO BRACE LINK
64 BEARING ASSEMBLY
65 DRAG BRACE
66 SCREW

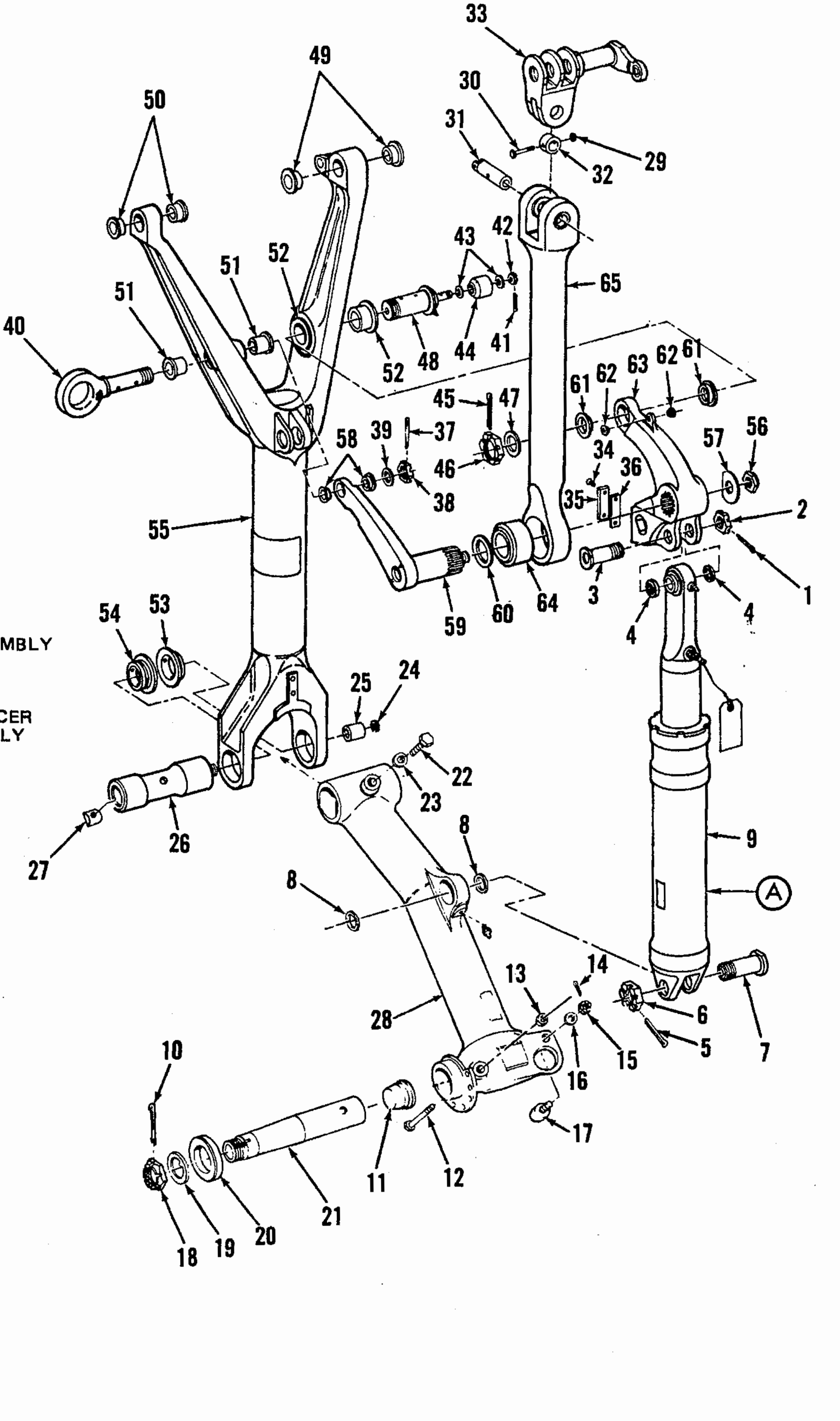


Figure 5-19. Main Landing Gear Complete Shock Strut Assembly (Sheet 1 of 2)

67 TAB LOCK
68 BLEED PLUG
69 GASKET
70 SPHERICAL BEARING
71 O-RING PACKING
72 BACKUP RING
73 PISTON TERMINAL ASSEMBLY
74 LOCK INSERT
75 SPIROLOX
76 RETAINING RING WASHER
77 SCRAPER RING
78 GLAND NUT
79 PACKING WASHER
80 SPLIT PISTON HEAD
81 BACKUP RING
82 O-RING PACKING
83 O-RING PACKING
84 BACKUP RING
85 PACKING ADAPTER
86 SPACER
87 SPIROLOX
88 RECOIL VALVE
89 ORIFICE
90 LOCK INSERT
91 PISTON
92 NUT
93 WASHER
94 BACKUP RING
95 O-RING PACKING
96 RELIEF VALVE AND PIN ASSEMBLY
97 CYLINDER

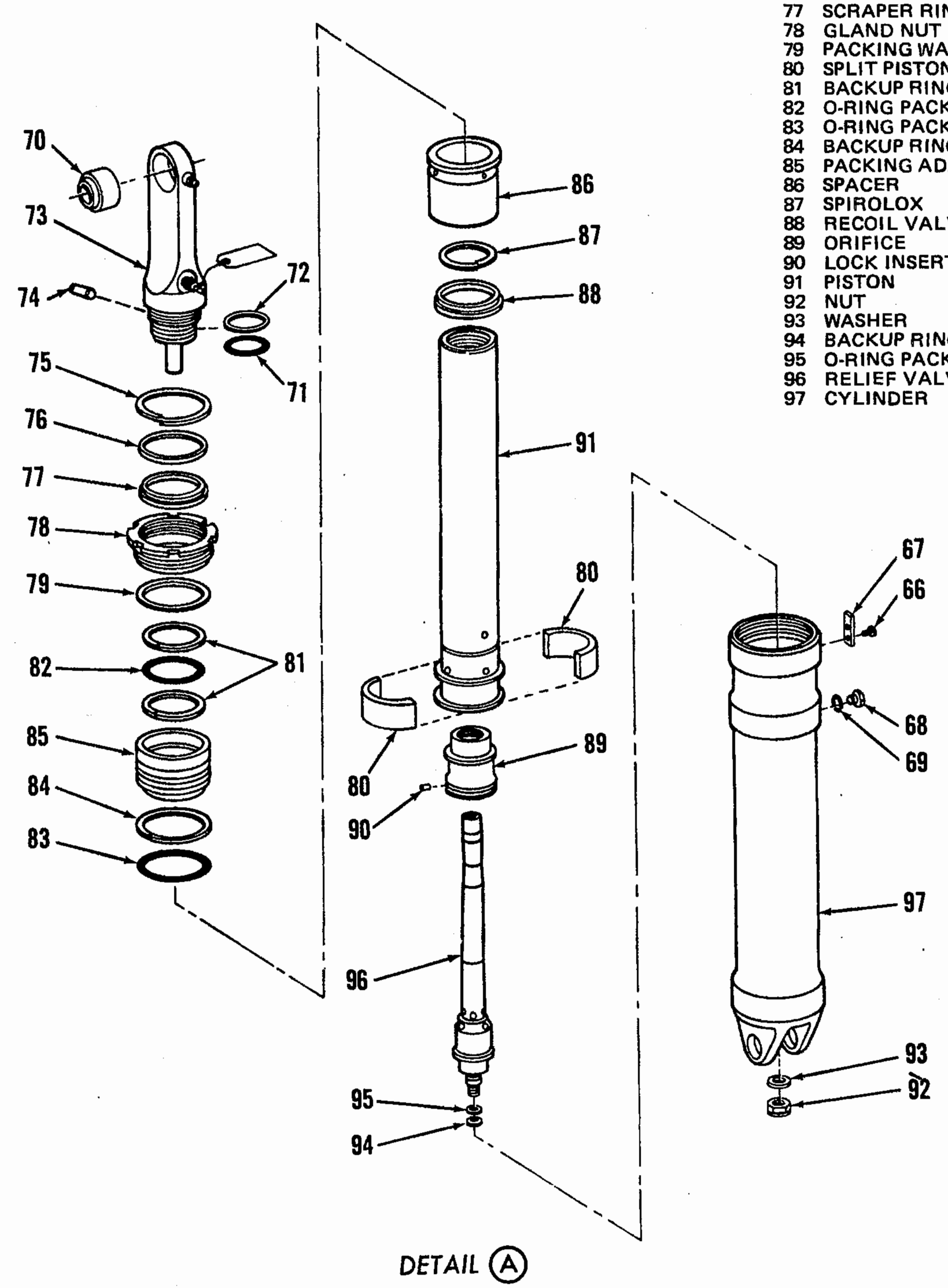


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Figure 5-19. Main Landing Gear Complete Shock Strut Assembly (Sheet 2 of 2)

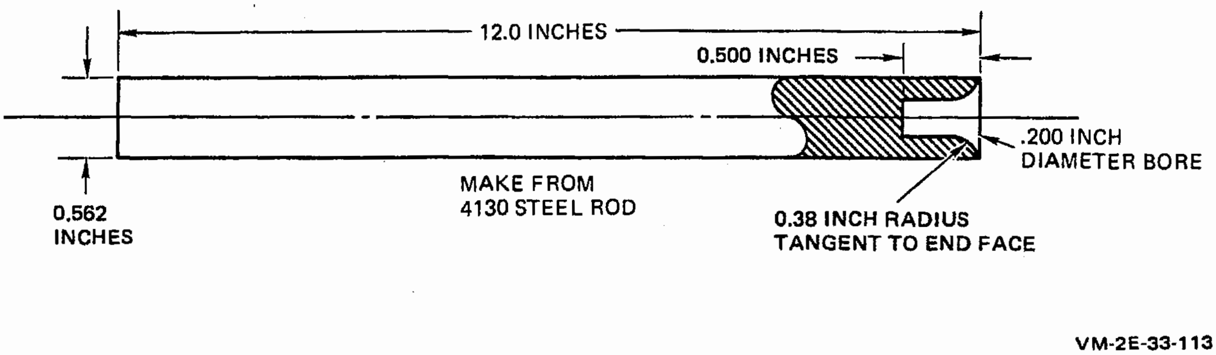


Figure 5-21. Main Landing Gear Relief Valve and Pin Assembly Testing Rod

2. Replace all O-ring packings, backup rings, gaskets, and Spiralox packings. Refer to Illustrated Parts Breakdown (NAVAIR 01-60GCB-4) for component part numbers.

3. Use crocus cloth (P-C-458) to remove minor scratches, nicks, and burrs from machined surfaces of steel components. Use aluminum oxide abrasive cloth (P-C-451), grade 320 or finer (GH80), to polish aluminum parts.

4. Use aluminum oxide abrasive cloth (P-C-451) to smooth all areas where paint has been damaged. After damaged paint has been removed, apply two coats of epoxy primer (MIL-P-23377), and two coats of acrylic lacquer (MIL-L-81352) in accordance with Federal Standard 595, color No. 17875 (gloss insignia white).

5-183. ASSEMBLY. To assemble the main landing gear complete assembly, see figure 5-19 and proceed as follows:

Tools and Equipment List

Wrench, Torque, Type I, Class 1, Style A, Size No. 9	GGG-W-686

Materials List

Fluid, Hydraulic	MIL-H-5606
Lockwire (0.032-inch diameter nickel copper)	MS20995NC32

Note

Check all MS28774 backup rings for proper fit. If required, trim to prevent O-ring packing damage.

Prior to assembly, lubricate all O-rings and backup rings with clean hydraulic fluid (MIL-H-5606). Install rings wet.

CAUTION

Do not use an open flame or torch heat on any of the landing gear components.

1. With O-ring packing (95) and backup ring (94) installed on relief valve and pin assembly (96), install relief valve and pin assembly into cylinder (97). Install washer (93) and nut (92) and torque to 480-690 inch-pounds.

2. Screw orifice (89) into bottom of piston (91) and align 0.187/0.188-inch diameter holes in orifice and piston.

Note

The hole in orifice is blind.

3. Tap the lock insert (90) into the hole, ensuring that the lock does not protrude beyond the OD of piston (91).

4. Position recoil valve (88) and Spiralox (87) in piston (91).

5. Position spacer (86) on piston (91).

6. Install O-ring packings (82 and 83) and backup rings (81 and 84) on packing adapter (85) and install on piston (91).

7. Position packing washer (79), gland nut (78), scraper ring (77), retaining ring washer (76), and Spiralox (75) on piston (91).

8. Tap new lock insert (74) in piston terminal (73), ensuring that lock insert (74) is flush with threads on piston terminal (73).

9. Position backup ring (72) and O-ring packing (71) on piston terminal (73).

10. Replace piston terminal (73) in top end of piston (91), making certain that the threads bottom out so that the shoulder of the piston terminal (73) is snug against the top of the piston (91).

11. Apply one brush-coat of clean hydraulic fluid (MIL-H-5606) to all surfaces to split piston head (80).

12. While holding the halves of the split piston head (80) on the piston, slide the piston assembly into the cylinder (97).

Note

The flanged face of the spacer (86) must bottom on the shoulder of cylinder packing bore and packing adapter (85) must butt against the spacer (86) flange.

13. Using a standard spanner wrench, install gland nut (78) until bottomed against packing washer (79). Lock gland nut (78) in place by installing lock tab (67) with screws (66). Safety screws together with lockwire (MS20995NC32).

Note

Do not fill cylinder (97) with hydraulic fluid at this time.

Do not tighten or lockwire bleed plug at this time.

14. Lightly lubricate brace link (59) splines with hydraulic fluid (MIL-H-5606) to facilitate assembly.

15. Install spacer (60) on brace link (59).

16. Slide brace link (59) through drag brace (65) and match brace link splines with oleo brace link spline slots so that the brace arm holes are aligned. Install washer (57) and nut (56). Torque nut (56) to 500-600 inch-pounds.

17. With all brace link bushings (61 and 58) securely in place and post bushings (51 and 52) installed, position brace link assembly to post and install brace link pin assembly (48). Torque brace link pin nut (46) until snug.

18. Insert tie-down ring assembly (40) and tighten nut (31) until snug.

19. Check that brace links (63 and 59) are free to rotate. If they bind, loosen nuts (46 and 38) and install cotter pins (37 and 45).

Note

Ensure that door operator roller (87) is tapered and not cylindrical on one end. Cylindrical roller does not affect operation of the main landing gear, but does preclude adequate access to grease fitting.

20. Install door operator roller (44) on brace link pin assembly (48). If necessary, use additional washers (43) under nut (42) to properly engage cotter pin (41).

21. Check that door roller operates freely and install cotter pin (38) (MS24665-157).

22. Position shock strut assembly (9) in brace link (63) and install spacers (4), bolt (3), and nut (2). Torque nut to 200-400 inch-pounds, back nut off to align cotter pin holes and install cotter pin (1).

Note

Shock strut must be free to rotate.

23. With grease fittings installed, lubricate all fittings with grease (MIL-G-23827).

24. Install gasket (4) and bleed plug (3, figure 5-18) and safety with lockwire (MS20995NC32).

25. With bushings (53 and 54) installed in post (55), position axle beam assembly (28) in post and install pivot pin (26).

26. Install axle (21) on axle beam (28), using nut (13) and bolt (12). Torque nut to 235-250 inch-pounds.

27. Align hole in pivot pin (26) with hole in axle beam (28) and install bolt (22) and washer (23) while holding nut (27) against hole in hollow pivot pin.

Note

Rounded face of nut must be installed toward bolt head.

28. Torque bolt (22) to 95 to 110 inch-pounds.

29. Install uplock roller (25) on stud of pivot pin (26) and install retaining ring (24).

30. Ensure that retaining ring (24) is not deformed or twisted and is seated properly in groove.

31. Position lower end of shock strut (9) on axle beam (28); align spacers (8) and install bolt (7) and nut (6). Torque nut 200 to 400 inch-pounds, back off to align cotter pin hole, and install cotter pin (MS24665-374).

32. Check that plug (11) is installed in axle, bearing spacer (20) is installed on axle along with tanged washer (19), nut (18) and cotter pin (10).

Note

Tape bearing spacer in place to prevent loss during subsequent handling of assembly.

5-184. TESTING. To test the main landing gear complete shock strut assembly, proceed as follows:

Tools and Equipment List

Cylinder, Portable, Air	60A80D1

Materials List

Fluid, Hydraulic	MIL-H-5606

1. With the equipment serviced with hydraulic fluid, secure the strut in either a vertical or horizontal, fully extended position.

2. Inflate to the normal extended air pressure of 490 psi. There shall be no evidence of fluid or air leakage after a period of 1 hour.

5-185. MAIN LANDING GEAR ACTUATOR CYLINDER (305-583301).

5-186. The main landing gear actuator cylinder is a lineal actuator operating on 1500 psi hydraulic pressure.

5-187. DISASSEMBLY. To disassemble the main landing gear actuator cylinder, see figure 5-22 and proceed as follows:

1. Remove rod end (1) after loosening check nut (2) and lock washer (3).

2. Cut lockwire and remove end cap (4) and nut (5) from body (23).

3. Slide piston (17) from body (23) and end cap (4).

4. Remove ring (6), retainer (7), scraper (8), plain washer (9) and felt washer (10) from first packing groove and two rings (11, 13) and packing (12) from second packing groove of end cap (4).

5. Remove two rings (14, 16) and packing (15) from rear packing groove of end cap (4).

6. Remove two rings (18, 20) and packing (19) from piston (7).

7. If necessary, remove screws (21) securing nameplate (22) to body (23).

5-188. CLEANING. To clean the components of the main landing gear actuator cylinder, proceed as follows:

Materials List

Solvent, Dry-cleaning	P-D-680, Type II

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

1. Using a soft-bristled brush, clean all parts in dry-cleaning solvent (P-D-680, Type II).

2. Dry with dry, compressed air.

5-189. INSPECTION. If a part does not meet the following inspection requirements, it must be replaced.

1. Inspect all parts for damage, scratches, or nicks.

2. Ensure that all threads and sharp edges are free from burrs.

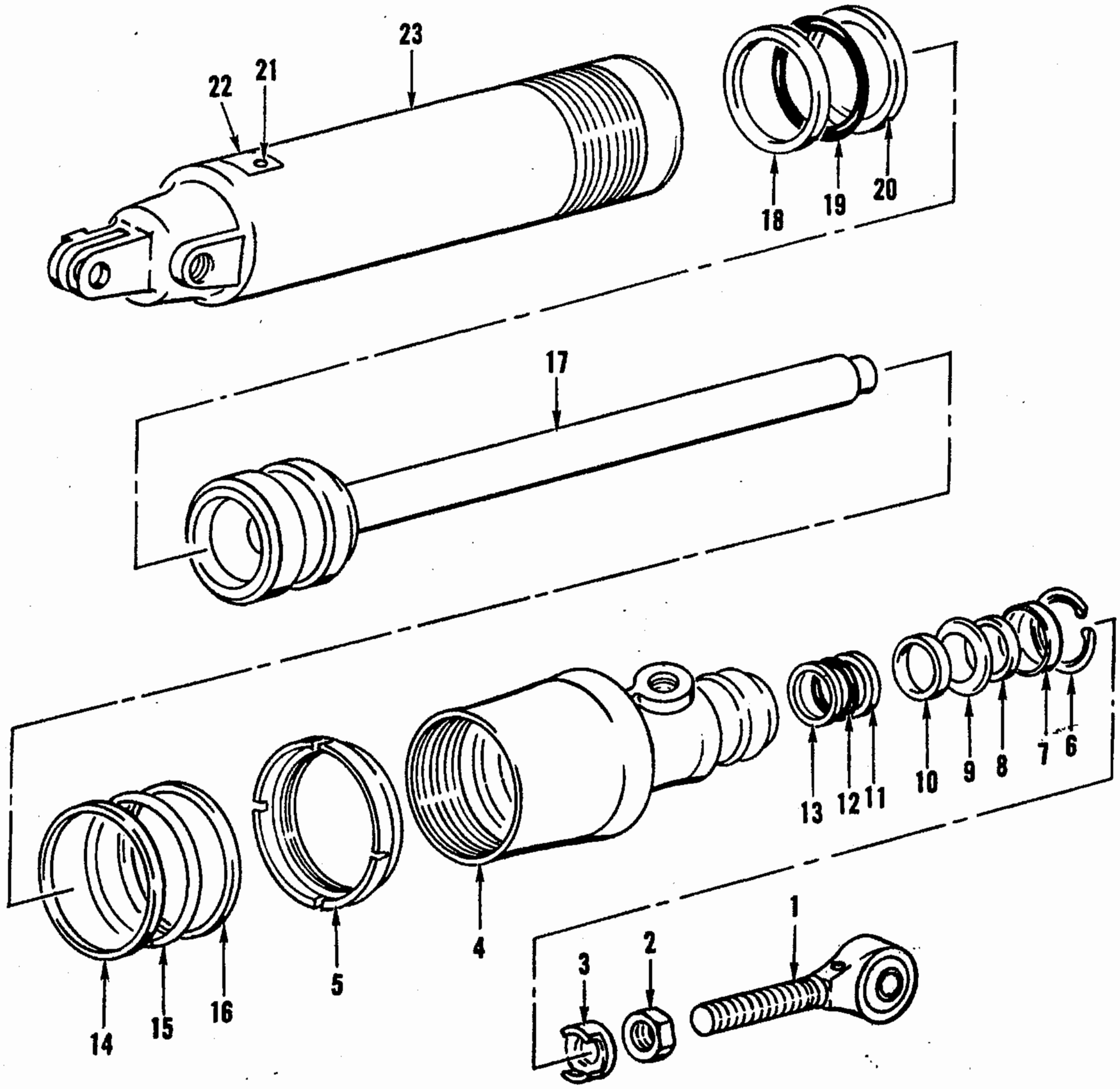
3. Examine bores and packing grooves for flaws and roughness.

4. Check general condition of piston for excessive wear.

5. Check rod end bearing for security and wear. If bearing is loose or worn, the complete rod end must be replaced.

6. Refer to the Illustrated Parts Breakdown (NAVAIR 01-60GCB-4) and replace all O-rings, packings, felt washers, and snap rings.

5-190. ASSEMBLY. Prior to assembly, it should be noted whether the main landing gear actuator cylinder (figure 5-22) incorporates a 305-581303 piston or the 305-581303-3 piston, since assembly procedures will differ. The following assembly procedures are common to all main landing gear actuator cylinder assemblies except where noted.



1 ROD END
2 NUT
3 LOCK WASHER
4 END CAP
5 NUT
6 RING
7 RETAINER
8 SCRAPER
9 PLAIN WASHER
10 FELT WASHER
11 RING
12 PACKING
13 RING
14 RING
15 PACKING
16 RING
17 PISTION
18 RING
19 PACKING
20 RING
21 SCREW
22 NAMEPLATE
23 BODY

VM-2H-33-65A

Figure 5-22. Main Landing Gear Actuator Cylinder

Materials List

Fluid, Hydraulic	MIL-H-5606
Lockwire (0.032-inch diameter steel)	MS20995F32
Packing	MS28775-211
Packing	MS28775-228
Packing	MS28775-326
Washer, Felt	2W12-16
Ring, Backup	MS28783-6
Retainer	MS28782-16
Retainer	MS28782-29

1. Install nameplate (22) on body (23), using screws (21).

2. Install ring (20), packing (19), and ring (18) on piston (17).

3. Install ring (16), packing (15), and ring (14) in rear packing groove of end cap (4).

4. Install ring (13), packing (12), and ring (11) in second packing groove of body end (4).

5. Install felt washer (10), plain washer (9), scraper (8), retainer (7), and ring (6) in front packing groove of body end (4).

6. Lightly lubricate interior surfaces of body (23) and end cap (4) with hydraulic fluid (MIL-H-5606).

7. Install piston (17) in end cap (4) and body (23).

8. Install end cap (4) on body (23) until it bottoms out. After end cap bottoms out, see figure 5-23 and align ports as follows:

a. On actuator cylinder assemblies incorporating the 305-581303-3 piston, back off the end cap not more than one turn to align the port.

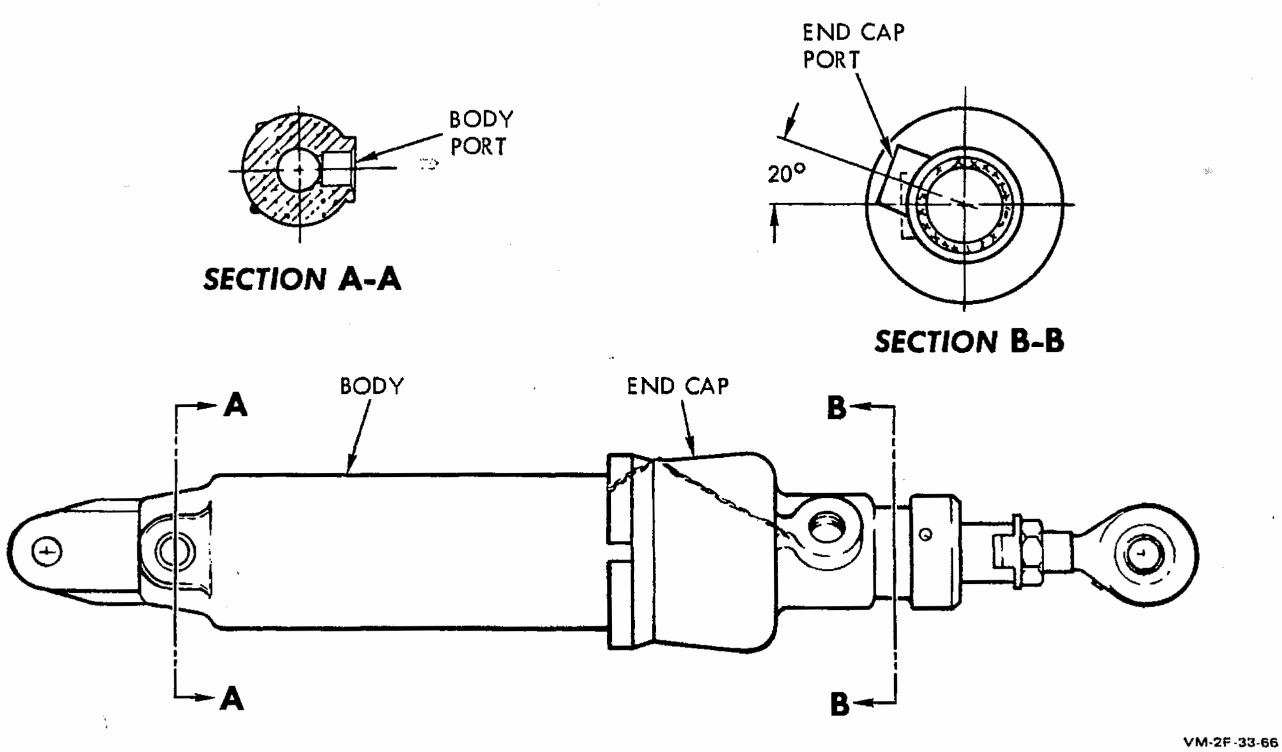


Figure 5-23. Main Landing Gear Actuator Cylinder Port Alignment

b. On actuator cylinder assemblies incorporating the 305-581303 piston, back off the end cap one full turn and up to one additional turn to align the port.

9. Install nut (5) and safety it to end cap (4), using lockwire (MS20995F32).

10. Install rod end (1), nut (2), and lock washer (3) on piston.

5-191. ADJUSTMENT. Adjustment of the main landing gear actuating cylinder consists of adjusting the rod end during installation and rigging.

5-192. TESTING. To test the main landing gear actuator cylinder, proceed as follows:

Tools and Equipment List

Test Stand, Hydraulic	S-610

1. Using an S-610 hydraulic test stand (or equivalent), operate actuator through five complete cycles.

2. Check for leakage and response.

3. Ensure that actuator has smooth operating stroke.

4. Remove hoses at ports, drain all fluid from actuator and plug ports.

5-193. MAIN LANDING GEAR UPLOCK SWITCH ASSEMBLY (300-548020).

5-194. The main landing gear uplock switch assembly is comprised of a switch, arm, bracket assembly, spring, and various hardware. The arm and hardware are the same for either the left- or right-hand switch assembly; all other components are different. The intermediate maintenance instructions for the switch assembly is identical for either assembly.

5-195. CHECKOUT. With the switch assembly adequately mounted in a vise or other holding fixture, perform the following checkout:

Tools and Equipment List

Multimeter	AN/PSM-4C

1. Inspect mounting bracket and actuating arm for cracks, corrosion, and general condition.

2. Check condition of individual wires from switch. Check for broken or frayed insulation.

3. Check that switch has minimal axial and radial play.

4. Check that spring is not broken.

5. Check for continuity between wires 1 and 2 and between 4 and 5 when switch is actuated. See figure 5-24.

5-196. DISASSEMBLY. To disassemble the main landing gear uplock switch assembly, see figure 5-25 and proceed as follows:

1. Remove nut (1), washer (2), spacer (3), and bolt (5).

2. Noting relative position of arm on switch shaft, slide arm (5) off of switch shaft.

3. Remove spring (6) from switch shaft.

4. Remove switch retaining nuts (7) and washer (8) from switch shaft.

5. Remove switch (9) from bracket (10).

6. Check security of spacer (11) fastened to the bracket (10). If spacer is secure do not remove from bracket.

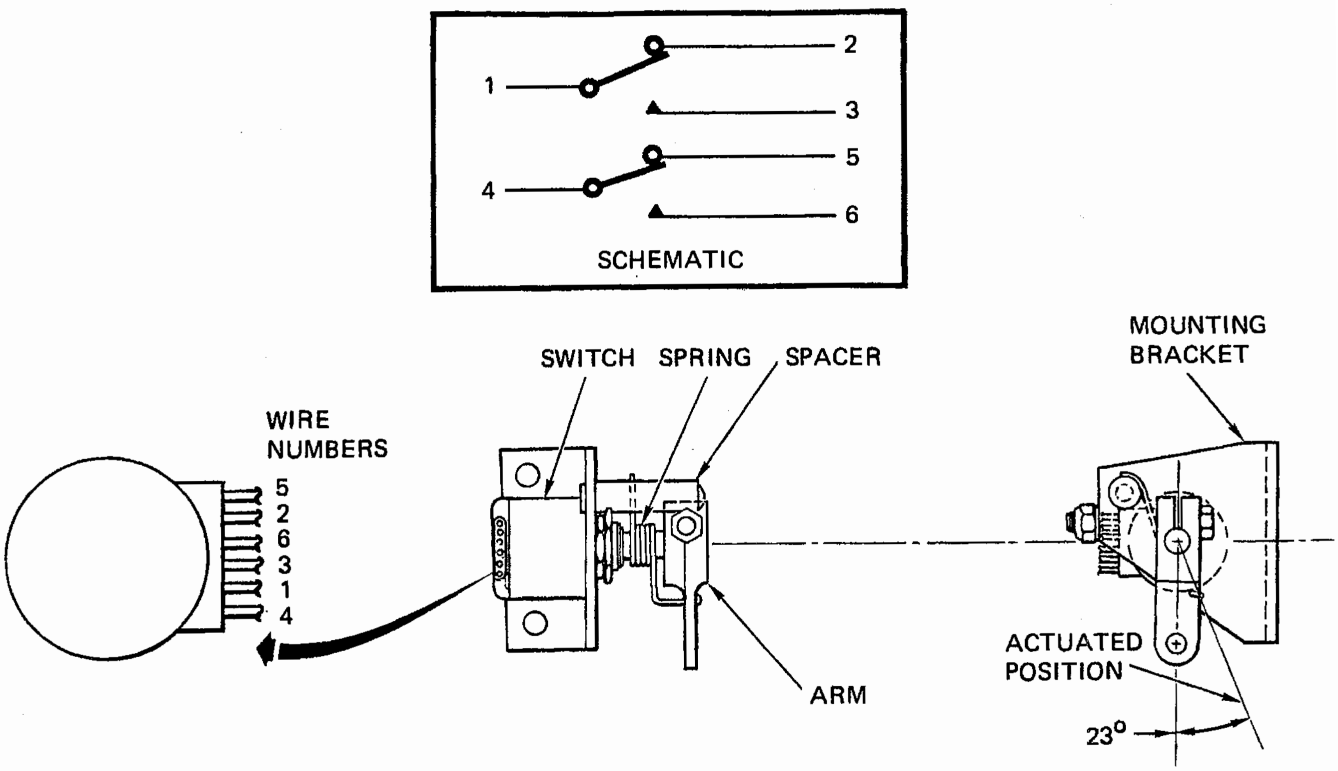


Figure 5-24. Main Landing Gear Uplock Switch Assembly Checkout

5-197. INSPECTION. The inspection requirements are the same as the checkout procedures (paragraph 5-195). In addition, see figures 5-26 and perform the following test of the spring (6).

Tools and Equipment List

Spring Scale (0 to 5 pounds)	Local Manufacture
Test Fixture	Local Manufacture

1. Using a 0.250-inch diameter rod and a suitable base, construct a torsion spring tester as shown **in figure 5-26.**

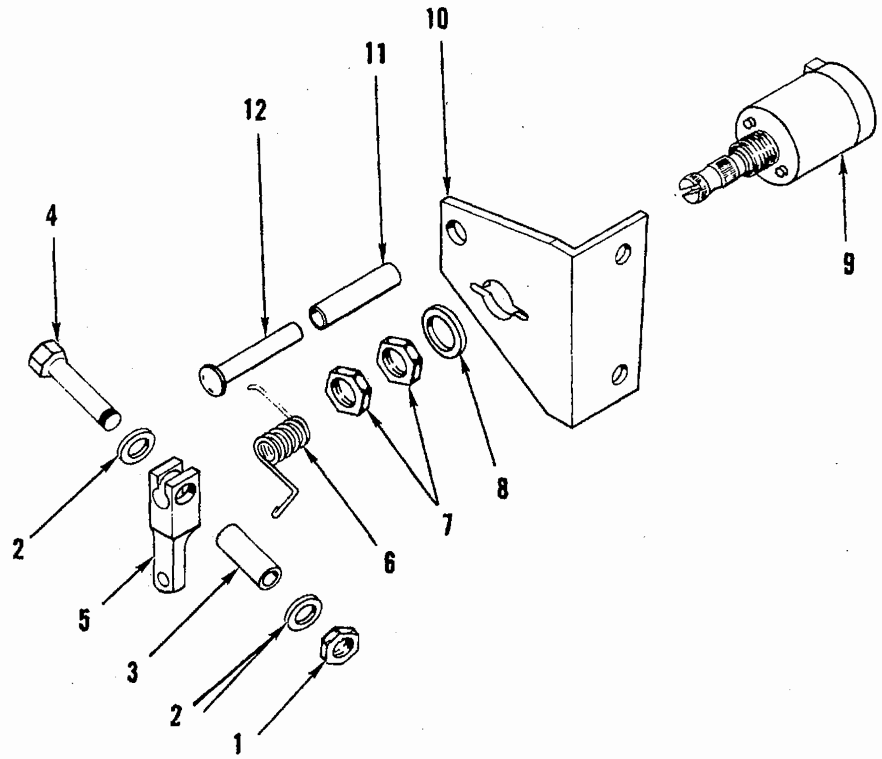
2. Draw axes at 90 degrees to each other.

3. Draw lines F (32 degrees from axis Y), A (30 degrees from axis Y), and B (85 degrees from axis Y).

4. Place spring on rod with long arm of spring on base and staple arm to base at axis X. The hooked arm should be at position F.

5. Deflect hooked arm twice from free position (line F) to line B. Release and check that free arm still aligns with line F.

6. Deflect free arm to position A and check for a force reading on spring scale attached on vertical portion of hook of 1.77 (±0.2) pounds.



1 NUT
2 WASHER
3 SPACER (NAS43DD3-38)
4 BOLT
5 ARM
6 SPRING
7 NUT
8 WASHER
9 SWITCH ASSEMBLY
10 BRACKET
11 SPACER (NAS42-DD5-68)
12 RIVET (MS20470AD-5)

VM-2F-33-105

Figure 5-25. Main Landing Gear Uplock Switch Assembly

5-198. ASSEMBLY. To assemble the main landing gear uplock switch, see figure 5-25 and proceed as follows:

Materials List

Terminal	MS25036-2

1. Using the old switch as a guide, cut wires to proper length and install new terminals (MS25036-2).

2. If spacer (11) has been removed, rivet new spacer on bracket (10), using MS20470AD5 rivet.

3. Position switch (9) in bracket (10) with pins in bracket slots.

4. Install nuts (7) and washer (8) on switch shaft.

5. Install spring (6) on switch shaft with longest (straight) arm of spring against spacer (11). Bend long arm of spring if not previously formed to curve around spacer (11).

6. Install bolt (4), washer (2), spacer (3), washer (2), and nut (1) on arm (5).

7. Install spring arm on actuating arm (5) as arm is installed on switch shaft in the position noted during disassembly. Tighten bolt sufficiently so that actuating arm is locked in place.

5-199. TESTING. To test the assembly, see figure 5-24 and proceed as follows:

Tools and Equipment List

Multimeter	AN/PSM-4C

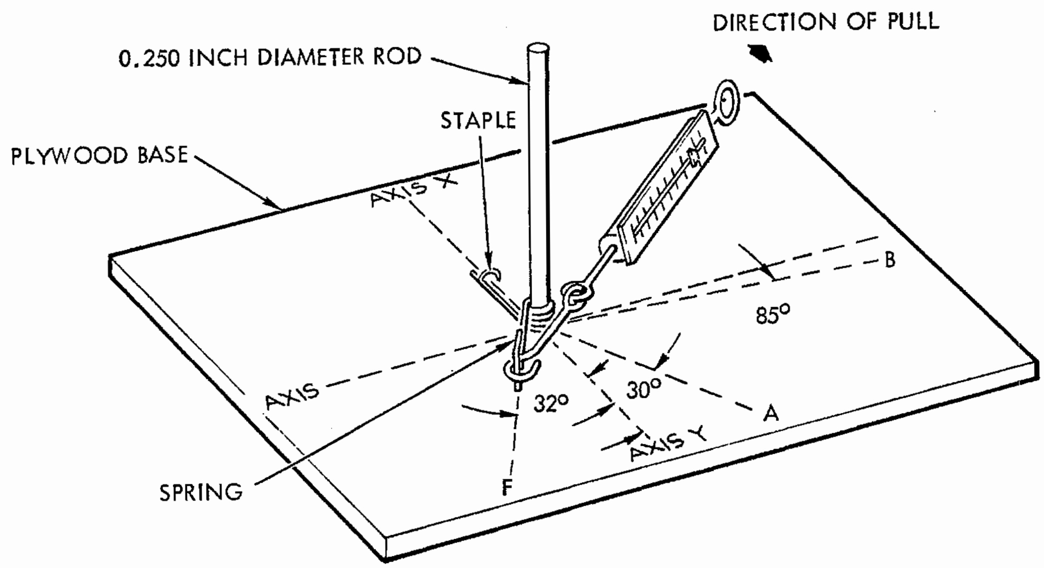


Figure 5-26. Testing Main Landing Gear Uplock Switch Spring

1. Rotate the actuating arm (5) through a 23-degree arc and check for continuity between wires 1 and 2 and between 4 and 5 as switch is actuated.

2. Check for freedom of rotation in switch shaft.

5-200. MAIN LANDING GEAR GROUND SAFETY SWITCH ASSEMBLY (300-548040).

5-201. The main landing gear ground safety switch assembly is comprised of a switch, support, and arm.

5-202. CHECKOUT. Perform the following checks on the main landing gear ground safety switch assembly.

Tools and Equipment List

Multimeter	AN/PSM-4C

1. Inspect mounting bracket and actuating arm for cracks, corrosion, or elongated fastener holes.

2. Check condition of individual wires from switch.

3. Check that switch has minimal axial and radial play.

4. Check for continuity between wires 1 and 3 and between 4 and 6 when the switch is actuated. See figure 5-27.

5-203. DISASSEMBLY. To disassemble the main landing gear ground safety switch assembly, see figure 5-28 and proceed as follows:

1. Remove nut (1) and washers (2) from bolt (3).

2. Note relative position of arm (4) to switch (6) and remove arm from splined switch shaft.

3. Remove nuts (5) from switch (6) and slide switch assembly from mounting bracket (7).

5-204. INSPECTION. Inspection requirements are the same as checkout (paragraph 5-202). Any component which does not meet the inspection requirements must be replaced.

5-205. ASSEMBLY. To assemble the main landing gear ground safety switch, see figure 5-28 and proceed as follows:

Materials List

Terminal	MS25036-2

1. Using the old switch as a guide, cut wires on new switch to proper length and install new terminals (MS25036-2).

2. Position switch (6) in bracket (7) with pins in bracket slots.

3. Install nuts (5) on switch shaft.

4. Position arm on splined switch shaft as noted during disassembly.

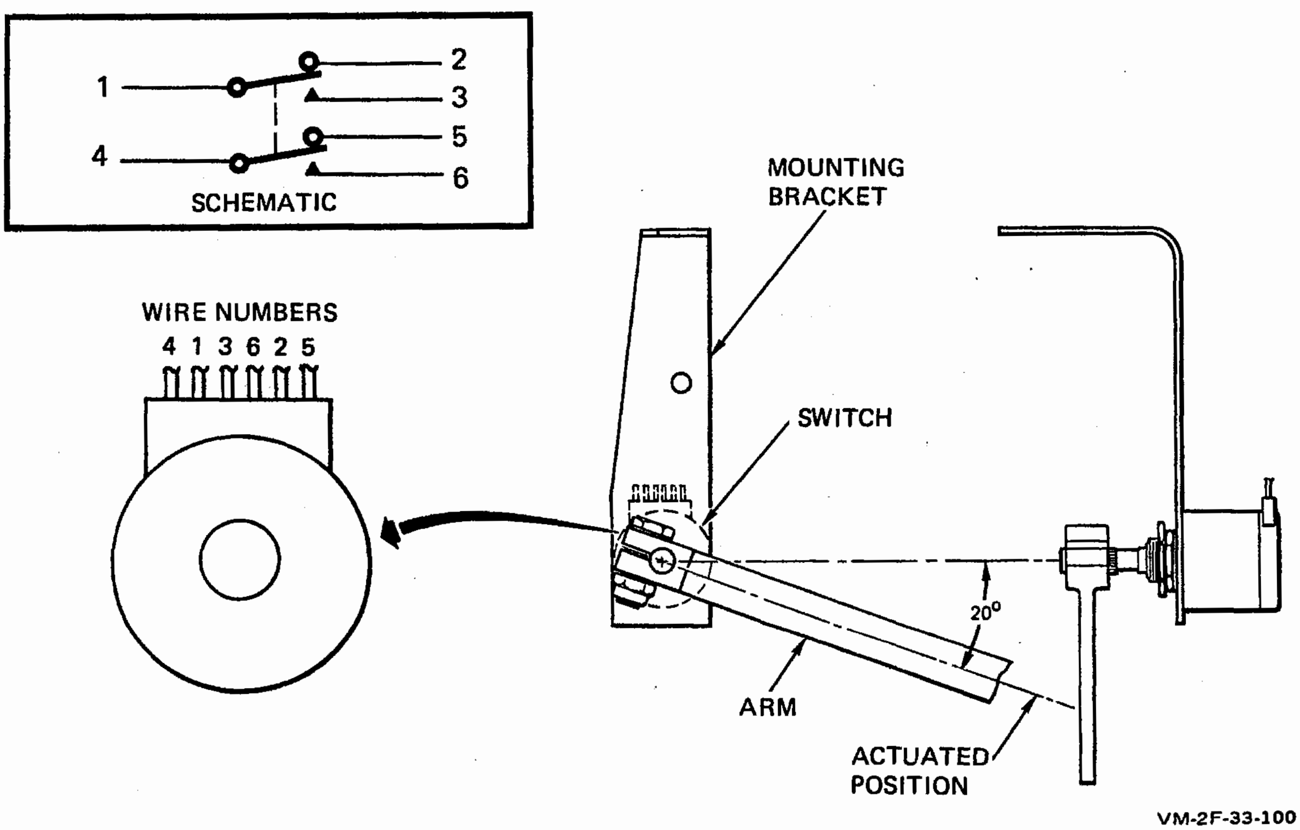


Figure 5-27. Main Landing Gear Ground Safety Switch Checkout

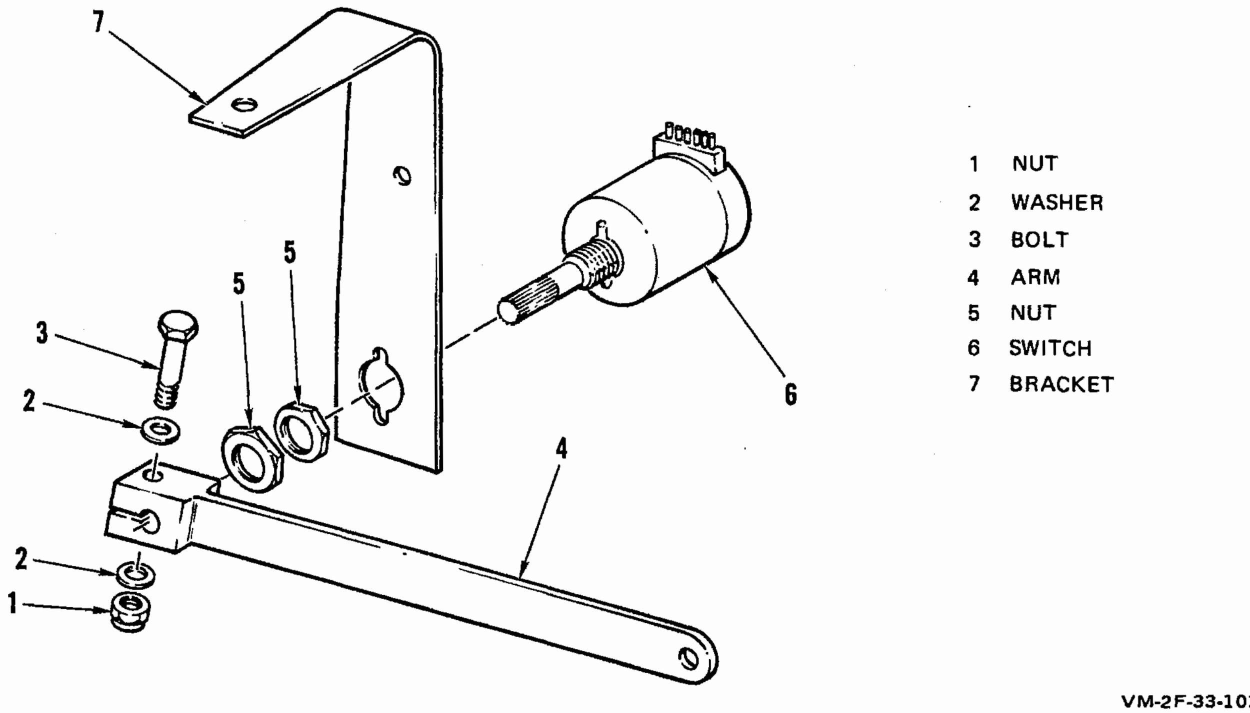


Figure 5-28. Main Landing Gear Ground Safety Switch Assembly

5. Install bolt (3), washers (2), and nut (1). Tighten nut (1) sufficiently so that arm (4) is tight on switch shaft.

5-206. TESTING. Inspect the assembly for proper wire length, wire terminal security, and freedom of switch movement. As arm is moved through the 20-degree position, switch should close (continuity between wires 1-3 and 4-6).

5-207. MAIN LANDING GEAR DOWNLOCK SWITCH PLUNGER (300-548035).

5-208. Inspect and repair main landing gear downlock switch plunger as follows:

Materials List

Solvent, Dry Cleaning	P-D-680, Type II
Cloth, Crocus	P-C-458
Lubricant, Dry Film	MIL-L-46147A

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

1. Using a soft-bristled brush, clean plunger with solvent (Specification P-D-680, Type II).

2. Dry with compressed air or lint-free cloth.

3. Inspect for nicks, gouges, burrs and scratches. Surfaces damaged up to 0.020 inches deep may be blended out using crocus cloth.

Note

For proper operation, plunger must be free of all surface damage. Surface finish shall be 0.125 micron or better.

4. Inspect condition of dry film lubricant. Resurface plunger using dry film lubricant specification MIL-L-46147A as required.

5-209. MAIN LANDING GEAR DOWNLOCK ASSEMBLY (300-331010).

5-210. The main landing gear downlock assembly is mechanically extended and hydraulically retracted. Checking, disassembly, cleaning, inspection, assembly, and testing are within the scope of intermediate maintenance on this component.

5-211. CHECKOUT. To check the main landing gear downlock assembly, see figure 5-29 and proceed as follows:

1. Ensure that all hydraulic fluid is drained from component.

2. Secure in a suitable holding device.

3. Manually push pin (19) into the fully retracted position and then release pin. The pin should return to the fully extended position smoothly.

5-212. DISASSEMBLY. To disassemble the main landing gear downlock assembly, see figure 5-29 and proceed as follows:

1. Remove retaining nut (1), using soft drift pin.

2. Remove outer nut (2) and slide washers (3), fitting (4), and washers (5) off of rod.

3. Remove inner nut (6).

4. Remove retainer (7).

5. Slide washers (8) and felt wiper (9) out of cylinder (23).

6. Push piston, body, and pin assemblies out of cylinder (23).

7. Remove piston (12) from rod (19).

8. Remove retainers (10) and ring (11) from piston (12).

9. Remove body (17) from rod (19).

10. Remove retainers (13, 15) and rings (14, 16) from body (17).

11. Remove spring (18).

12. Using a small pin punch, remove spring pin (20) from pin (21) and remove rod (19).

13. If required, fitting (22) may be removed from pin (21).

5-213. CLEANING. To clean the main landing gear downlock assembly, proceed as follows:

Materials List

Solvent, Dry-cleaning	P-D-680, Type II

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

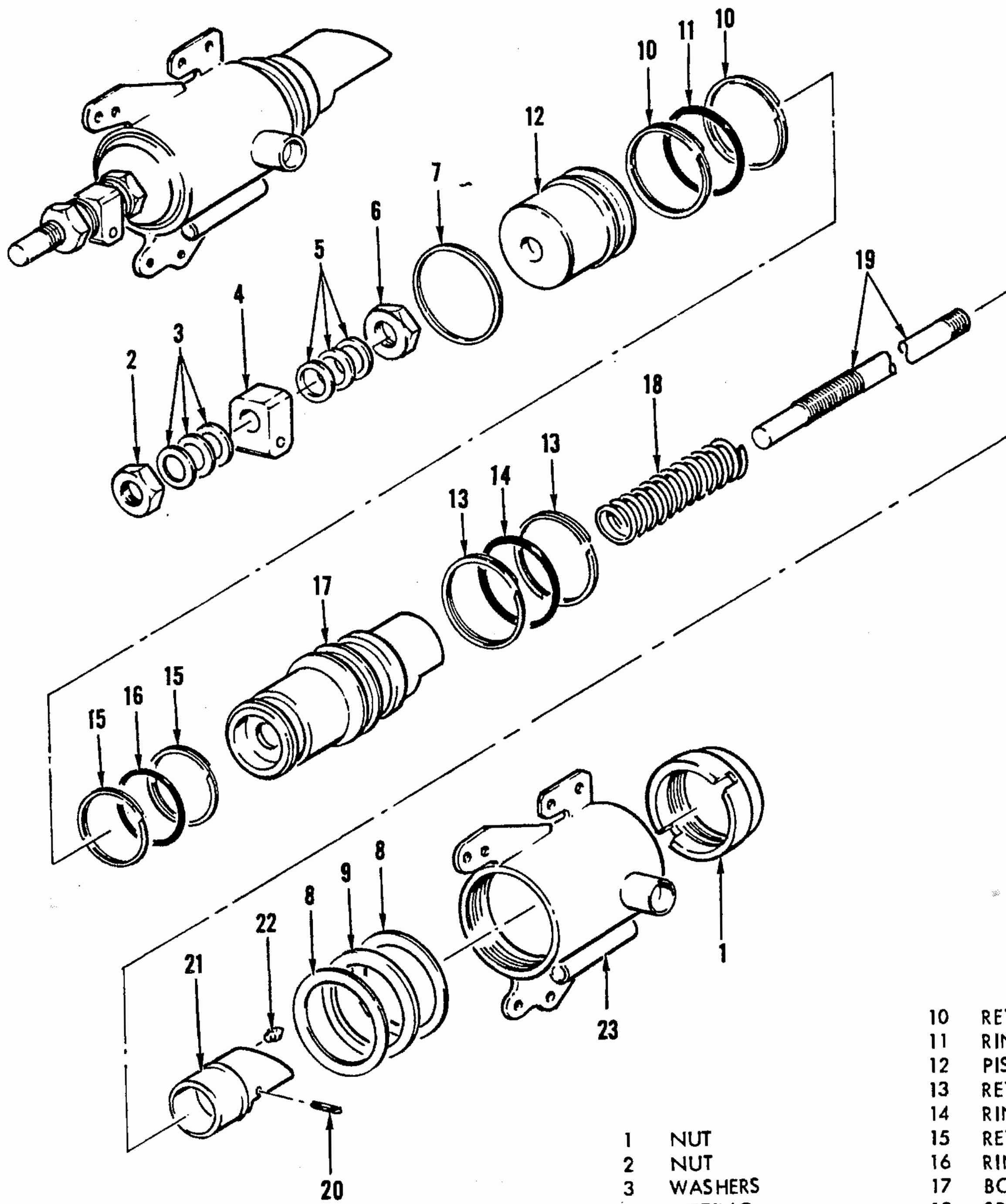
1. Using a soft-bristled brush, clean all parts, including interior of downlock switch plunger guide hole (23), in dry-cleaning solvent (Specification P-D-680, Type II).

2. Dry all parts with compressed air or lint-free cloth.

5-214. INSPECTION. If a main landing gear downlock part does not meet the following requirements, it must be replaced.

Tools and Equipment List

Tester, Spring Resiliency	Type PB4-D (or equivalent)



1	NUT
2	NUT
3	WASHERS
4	FITTING
5	WASHERS
6	NUT
7	RETAINER
8	WASHER
9	WIPER
10	RETAINER
11	RING
12	PISTON
13	RETAINER
14	RING
15	RETAINER
16	RING
17	BODY
18	SPRING
19	ROD
20	SPRING PIN
21	PIN
22	FITTING
23	CYLINDER

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Figure 5-29. Main Landing Gear Downlock Assembly

1. Inspect all parts, including interior of downlock switch plunger guide hole (23), for nicks, gouges or scratches.

2. Check all threaded areas and sharp edges to ensure that they are free of burrs.

3. Check welded areas on cylinder (23) for cracks.

4. Check general condition of spring (18).

5. Place spring (18) in resiliency tester. Free length must be 3.0 (± 1/16) inches. Compress spring to 3/4 inch and note force. Force should be 108 (± 4) pounds.

6. Lubricate or replace spring, as necessary. Lubricate with VV-D-1078 200 centistokes silicon lubricant.

7. Replace all O-rings, retainers, washers, and felt wiper.

8. Check rod (19) to ensure that it is not bent and that threads are in good condition.

9. If any of the parts not provisioned for intermediate maintenance are damaged, return the complete assembly to Supply.

5-215. ASSEMBLY. To assemble the main landing gear downlock assembly, see figure 5-29 and proceed as follows:

Materials List

Fluid, Hydraulic	MIL-H-5606
Retainer	MS28782-19
Retainer	MS28782-25
Ring	AN6227-19
Ring	AN6227-25
Wiper, Felt	2W12-27

1. Lubricate all retainers (10, 13, 15), O-rings (11, 14, 16), spring (18), and felt wiper (9) with hydraulic fluid (MIL-H-5606).

2. Install lubrication fitting (22) in pin (21).

3. Install rod (19) in pin (21), using clevis pin (20).

4. Install spring (18) on rod (19).

5. Install retainers (13, 15) and O-rings (14, 16) on body (17).

6. Install body (17) on rod (19).

7. Install retainers (10) and O-rings (11) on piston (12).

8. Install piston (12) on rod (19).

9. Install cylinder (23) on rod pin (19 and 21) assembly.

10. Install washers (8) and felt wiper (9) inside of cylinder.

11. Install retainer (7) inside of cylinder in retainer groove.

12. Install inner nut (6), three washers (5), fitting (4), three washers (5), and outer nut (2).

13. Using a soft drift punch, install nut (1).

14. Assure initial axial lock pin load of 20 to 50 pounds to initiate retraction of extended lockpin.

5-216. ADJUSTMENT. Adjust inner nut (6) for a 5-1/16 (± 1/32)-inch dimension measured from the tip of the pin (21) and back of piston (12). See figure 5-30.

5-217. TESTING. Test the main landing gear downlock assembly in the following manner.

Tools and Equipment List

Hydraulic Test Stand	S-610

1. Check spring return on pin by manually pushing in pin (21) to the retracted position and releasing. The pin should return to the extended position smoothly.

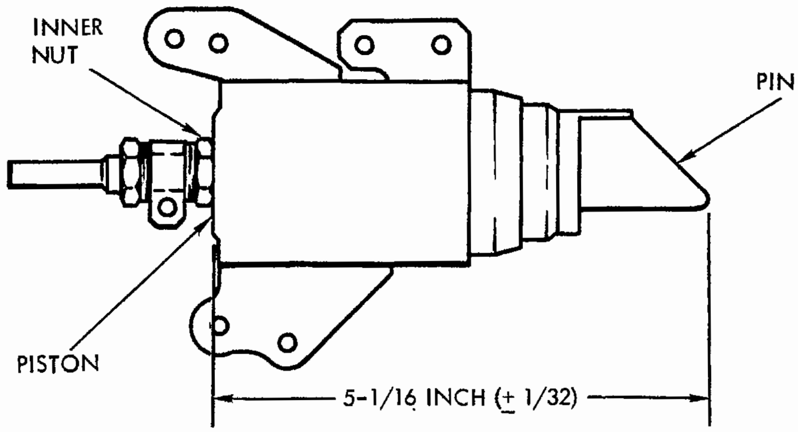


Figure 5-30. Main Landing Gear Downlock Spring Adjustment

2. Using a hydraulic test stand (S-610 or equivalent), apply 1500-psi hydraulic pressure and cycle downlock five times. Check for satisfactory stroke adjustment and leakage.

3. Disconnect test stand, drain fluid, and install dust caps at all open fittings.

5-218. BUNGEE BREAKOUT FORCE AND LUBRICATION.

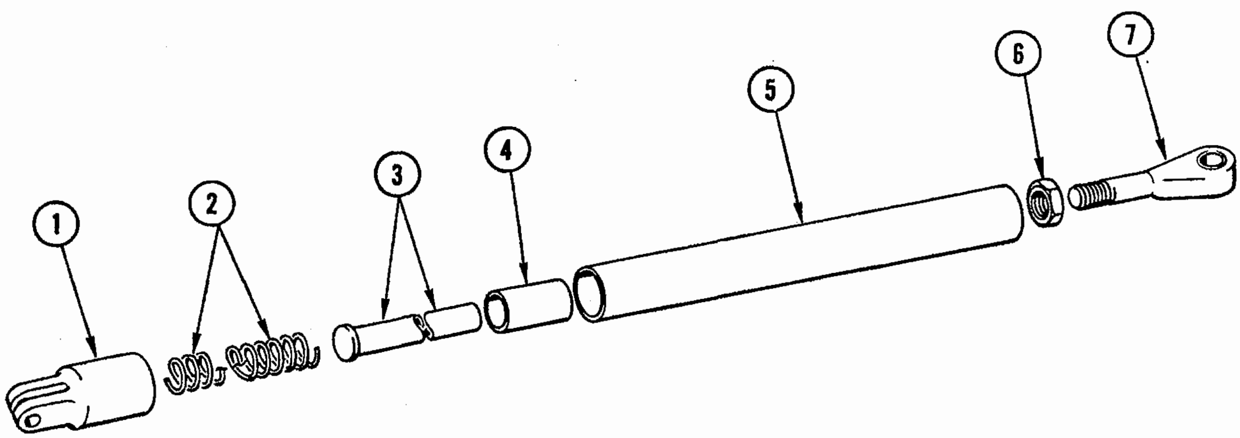
5-219. For bungee breakout force and lubrication requirements, refer to table 5-6.

5-220. MAIN LANDING GEAR WHEEL DOOR BUNGEE (300-333018).

5-221. The main landing gear wheel door bungee is a compression-type bungee. Because of its construction, disassembly, cleaning, inspection, and assembly are within the capability of intermediate maintenance.

5-222. **DISASSEMBLY.** To disassemble the bungee, see figure 5-31 and proceed as follows:

1. Remove rod end bearing (7) and check nut (6) from piston (3).



[I] 1 END FITTING
2 SPRING
[I] 3 PISTON
4 BUSHING
[I] 5 CYLINDER
6 CHECK NUT
7 ROD END BEARING

[I] NOT PROVISIONED FOR INTERMEDIATE MAINTENANCE

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Figure 5-31. Main Landing Gear Wheel Door Bungee

Table 5-6. Breakout Force and Lubrication Requirements

PART NO.	NOMENCLATURE	BUNGEE BREAKOUT FORCE (POUNDS)		FACTORY LUBRICATION	RECOMMENDED FIELD LUBRICATION	RECOMMENDED INSPECTION LUBRICATION INTERVAL (MONTHS)
		NOMINAL INSTALLED	ACCEPTABLE RANGE			
300-330015	MLG Free-fall Bungee	25.6 free 231 at 1.5 inches	10–40 150–265	MIL-L-8937 (dry film)	*	12
300-330017	MLG Uplock Bungee	64	50–80	MIL-L-8937 (dry film)	*	12
300-331010	MLG Downlock (lockpin load)	36	20–50	Dow Corning 200	†	12
300-333018	MLG Wheel Door Bungee	48	35–65	MIL-L-8937 (dry film)	*	12
300-342001	NLG Steer Damper (centering bungee load)	161	140–185	MIL-L-8937 (dry film)	*	12
300-342022	NLG Steering Control Bungee	96	70–110	MIL-L-8937 (dry film)	*	12
300-343006	NLG Door Operating	70	50–95	MIL-L-8937 (dry film)	*	12
300-345001	NLG Drag Brace (lockpin load)	105	80–120	Dow Corning 200	†	12
300-345021	NLG Uplock	40	25–50	MIL-L-8937 (dry film)	*	12

* None; if additional lubrication is required, remove dry film with fine abrasive and coat with VV-D-001078 200 centistokes

† VV-D-001078 200 centistokes (Dow Corning 200) or equivalent

2. Drill out two rivets from end fitting (1) and remove from cylinder (5). Remove all internal components.

Note

Bushing (4) is staked in cylinder. Inside diameter of bushing should be 0.450 (±0.003/-0.000) inch. If found defective during inspection, it must be replaced.

5-223. BUSHING REPLACEMENT. To remove and replace a defective bushing in the main landing gear wheel door bungee, proceed as follows:

Materials List

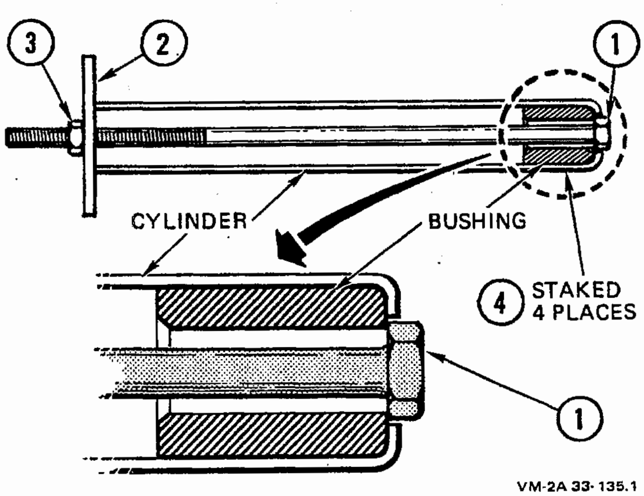
Bolt	AN174-70
Bushing	300-333020-3
Metal, Scrap (2-inch square)	Local Manufacture

Note

Care must be used during removal of bushing so as not to damage the cylinder.

1. Grind down the head of an AN174-70 bolt far enough to allow the head to fit inside the cylinder flange and seat firmly on the bushing.

2. Drill a 1/4-inch hole in the center of a 2-inch square piece of scrap metal, and install on bolt over cylinder at opposite end of bushing.



Steps 1 through 4—Para. 5-223

3. Install nut on bolt over scrap metal.

4. Tighten nut slowly until bushing pulls loose from stakes.

5. When bushing clears stakes it should slide out of the cylinder.

6. Burnish inside of cylinder to smooth old stake marks (four places).

7. Insert new bushing, flanged end first into cylinder.

8. Tap bushing lightly with wooden dowel to ensure a firm seat against cylinder flange.

9. Hold bushing in place and stake (0.013 to 0.020 inch deep) four places. Place new stakes around cylinder between old stake marks.

10. Check bushing to ensure a firm fit.

5-224. CLEANING. To clean bungee, proceed as follows:

Materials List

Lubricant	MIL-L-7870
Solvent, Dry-cleaning	P-D-680, Type II

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

1. Using a soft brush, clean with dry-cleaning solvent (P-D-680, Type II).

2. Dry with clean, compressed air.

3. Lubricate rod end bearing (7) with MIL-L-7870.

5-225. INSPECTION. If a part does not meet the conditions given in the following steps, it must be replaced.

Tools and Equipment List

Tester, Spring Resiliency	Type PB4-D (or equivalent)

Materials List

Primer, Zinc Chromate	MIL-P-8585 or TT-P-1757
Lubricant (Silicon, 200 centistokes)	VV-D-1078

Note

If the end fitting (1), piston (3), or cylinder (5) is found damaged, discard bungee.

1. Inspect bolts holes (0.250 inch) in end fitting (1) and in rod end (7). Maximum allowable radial wear is 0.025 inch.

2. Check general condition of spring. Free length should be 5 (±0.0625) inches. Ends should be square within 2 degrees of axis.

3. Place spring in spring tester (Type PB4-D or equivalent), and compress spring to 4.75 (± 0.010) inches length and record force. Compress spring to 4.25 (± 0.010) inches and record force. Difference should be 26 (± 2.6) pounds.

4. Lubricate or replace spring, as necessary. If additional lubrication is required, remove dry film lubricant from spring using crocus cloth (P-C-458) and coat spring with VV-D-1078 200 centistokes silicon lubricant.

5. Check all components for wear, cracks, worn threads, dents, and other damage.

6. Spot-paint all nicked and scratched painted surfaces with zinc chromate primer (MIL-P-8585 or TT-P-1757).

5-226. ASSEMBLY. To assemble the bungee, see figure 5-31 and proceed as follows:

Materials List

Rivets	MS20470AD4
Primer, Zinc Chromate	MIL-P-8585 or TT-P-1757
Lacquer, Acrylic	MIL-L-81352

Note

If found defective, a new bushing (4) must be staked in cylinder. Refer to paragraph 5-223.

1. Ensure that all parts are clean before assembly.

2. To install components inside bungee, see figure 5-31.

Note

Rivet end fitting to cylinder with two MS20470AD4 rivets.

3. Install check nut (6) and rod end bearing (7) on piston (3). Ensure that rod end is installed past inspection hole.

4. Test to assure axial load of 35 to 65 pounds to initiate compression of the fully extended bungee.

5. Strip and repaint entire cylinder with zinc chromate primer and two coats of lacquer.

5-227. ADJUSTMENT. Adjust rod end bearing until length of bungee from center of end fitting bolt hole to center of rod end bearing bolt hole is 9.00 (±1/8) inches. Tighten check nut against bearing.

5-228. MAIN LANDING GEAR WHEEL DOOR ACTUATOR BELL CRANK ASSEMBLY (300-333009-1 and -2).

5-229. Intermediate maintenance for the wheel door actuator bell crank consists of replacement of bearings and spacer. For instructions to replace bearings, refer to paragraphs 2-189 and 2-193.

5-230. MAIN LANDING GEAR UPLOCK BUNGEE (300-330017).

5-231. The main landing gear uplock bungee is a compression-type bungee. Because of its construction, disassembly, cleaning, inspection, and assembly are within the capability of intermediate maintenance.

5-232. DISASSEMBLY. To disassemble the bungee, see figure 5-32 and proceed as follows:

1. Remove rod end bearing (7) and check nut (6) from piston (3).

2. Drive out two MS20470AD4 rivets from end fitting (1) and remove from cylinder (5). Remove all internal components.

Note

Bushing (4) is staked in the cylinder. If found defective during inspection, it must be replaced.

5-233. CLEANING. To clean bungee, proceed as follows:

Materials List

Lubricant	MIL-L-7870
Solvent, Dry-cleaning	P-D-680, Type II

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

1. Using a soft brush, clean all parts with dry-cleaning solvent (P-D-680, Type II).

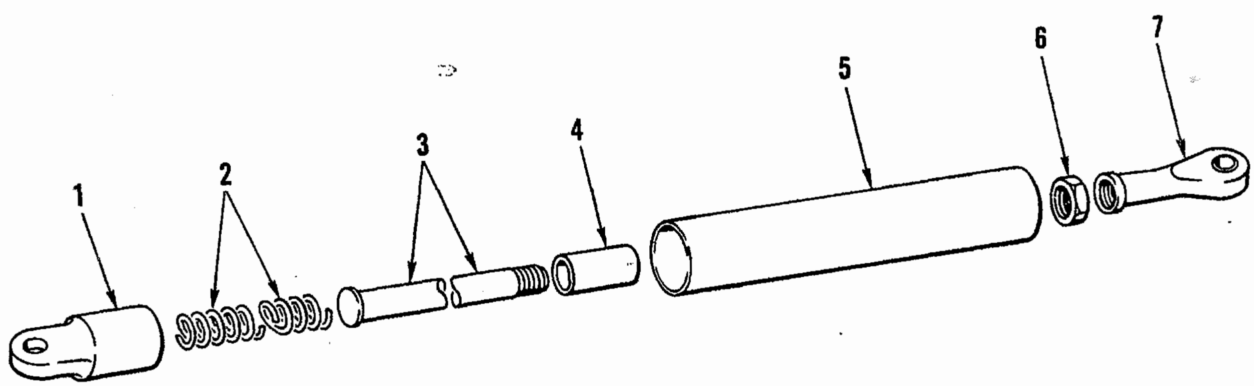
2. Dry parts with clean compressed air.

3. Lubricate rod end bearing (7) with MIL-L-7870.

5-234. INSPECTION. If a part does not meet the conditions given in the following steps, it must be replaced.

Tools and Equipment List

Tester, Spring Resiliency,	Type PB4-D (or equivalent)



1 END FITTING [1]
2 SPRING [1]
3 PISTON
4 BUSHING [1]
5 CYLINDER
6 CHECK NUT [1]
7 ROD END BEARING [1]

[1] REPAIR PARTS PROVISIONED FOR IMTERMEDIATE MAINTENANCE.

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Figure 5-32. Main Landing Gear Uplock Bungee

Materials List

Primer, Zinc-chromate	MIL-P-8585 or TT-P-1757
Lubricant (Silicon, 200 centistokes)	VV-D-1078

1. Inspect bolt holes in bungee end (1) and in rod end bearing (7) for radial wear. Maximum allowable wear is 0.025 inch.

2. Check general condition of spring. Free length should be 4.00 inches. Ends should be square within 2 degrees of axis.

3. Place spring in spring tester (Type PB4-D), and compress spring to 3.75 (± 0.010) inches length and record force. Compress spring to 3.25 (±0.010) inches length and record force. Difference should be 32 (±3.2) pounds.

4. Check all provisional parts for wear, chips, nicks, smoothness, cracks, and gouging.

5. Spot-paint all nickel and scratched surfaces with zinc-chromate primer (MIL-P-8585 or TT-P-1757).

6. Inspect bungee and lubricate or replace spring, as necessary. If additional lubrication is required, remove dry film lubricant from spring using crocus cloth (P-C-458) and coat spring with VV-D-1078 silicon lubricant.

5-235. ASSEMBLY. To assemble the bungee, see figure 5-32 and proceed as follows:

Materials List

Rivets	MS20470AD4

Note

If found defective, a new cylinder bushing (4) will have to be staked in cylinder. Refer to paragraph 5-223.

1. Ensure all parts are clean before assembly.

2. See figure 5-32 to install components inside bungee.

Note

Rivet end fitting to cylinder with two MS20470AD4 rivets.

3. Install check nut (6) and rod end bearing (7) on piston (3).

4. Bench test bungee to assure axial load of 50 to 80 pounds to initiate compression of the fully extended bungee.

5-236. ADJUSTMENT. Adjust rod end bearing until length of bungee from center of end fitting bolt hole to center of rod end bearing hole is 8.00 inches.

5-237. MAIN LANDING GEAR FREE-FALL BUNGEE (300-330015).

5-238. The main landing gear free-fall bungee is a compression-type bungee. Because of its construction, disassembly, cleaning, inspection, and assembly are within the capability of intermediate maintenance.

5-239. DISASSEMBLY. To disassemble bungee, see figure 5-33 and proceed as follows:

1. Remove eyebolt (10), check nut (8), and washer (7) from plunger (5).

2. Screw out end fitting (1) and remove compression spring (2, 3), piston (4), and plunger from body (6).

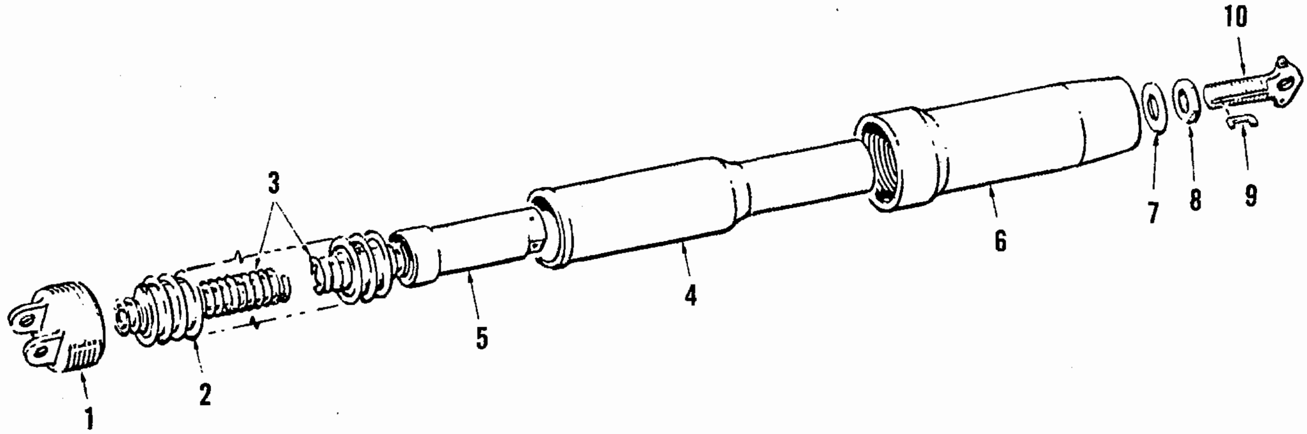
5-240. CLEANING. To clean bungee, proceed as follows:

Materials List

Solvent, Dry-cleaning	P-D-680, Type II

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.



	1 END FITTING
[1]	2 SPRING
[1]	3 SPRINGS (2)
	4 PISTON
	5 PLUNGER
	6 BODY
[1]	7 WASHER
[1]	8 CHECK NUT
[1]	9 ROD END LOCK
	10 EYEBOLT

[1] PROVISIONED FOR INTERMEDIATE MAINTENANCE

VM-2F-33-53B

Figure 5-33. Main Landing Gear Free-fall Bungee

1. Using a soft brush, clean all parts with dry-cleaning solvent Specification P-D-680, Type II.

2. Dry parts with clean, compressed air.

5-241. INSPECTION. If a part does not meet the conditions in the following steps, it must be replaced.

Tools and Equipment List

Tester, Spring Resiliency	MST500 (or equivalent)
Press, Arbor	

Materials List

Primer, Zinc Chromate	MIL-P-8585 or TT-P-1757

Note

If the end fitting (1), piston (4), plunger (5), or main body (6) is found damaged, discard bungee.

1. Check end fitting (10) bolt hole bushing. Inside diameter should be 0.2500 (±0.0005) inch. If bushing is excessively worn, perform steps 2 through 4.

2. Using arbor press, press out old bushing.

3. Check inside diameter of rod end to be 0.3755 (± 0.0005) inch.

4. Press in new bushing and if necessary ream to 0.2500 (± 0.0005) inch.

5. Check general condition of springs. Check that ends of springs are square within 2 degrees of axis. Free length of small springs (3) should be 4.5 inches and large spring (2) should be 6 inches.

6. Place large spring in spring tester and compress to 5.75 (± 0.010)-inch length and record force. Compress spring to 5.25 (± 0.010)-inch length and record force. Difference should be 116 (± 11.6) pounds.

7. Place each small spring in spring tester and compress to 4.25 (± 0.010)-inch length and record

force. Compress spring to 3.75 (±0.010)-inch length and record force. Difference should be 30 (±3.0) pounds.

8. Check all components for wear, cracks, worn threads, scratches, dents, and other obvious damage.

9. Spot-paint all nicked or scratched painted surfaces with zinc chromate primer.

5-242. ASSEMBLY. To assemble the bungee, see figure 5-33 and proceed as follows:

Materials List

Crocus Cloth	P-C-458
Lockwire (0.041-inch diameter steel)	MS20995F41
Lubricant (Silicon, 200 centistokes)	VV-D-1078

1. Ensure that all parts are clean before assembly.

2. To install components inside bungee, see figure 5-33.

Note

Tighten end fitting on body until flush with body within 0.015 inch. Align holes in end fitting and body and safety with lockwire (MS20995F41).

3. Install rod end lock washer, and nut on eyebolt. Turn eyebolt into plunger until five threads are showing above lock nut. Tighten nut and safety with lockwire (MS20995F41).

4. Check that extended bungee has initial load of 10 to 40 pounds and load of 150 to 265 pounds when compressed 1.5 inches. If not, proceed as follows:

a. Disassemble bungee. Refer to paragraph 5-239.

b. Inspect bungee and lubricate or replace springs, as necessary. If additional lubrication is required, remove dry film lubricant from springs, using crocus cloth (P-D-458), and coat springs with Specification VV-D-178 lubricant.

c. Reassemble bungee and test that requirements of step 4 are met.

5-243. MAIN LANDING GEAR UPLOCK MECHANISM (300-330020). Intermediate maintenance of the uplock mechanism consists of disassembly, inspection, replacement and repair of parts, and assembly.

5-244. DISASSEMBLY. Disassemble the uplock mechanism as follows. Refer to figure 5-34.

1. Remove two pins (NAS561P5) from arm and shaft of uplock mechanism.

2. Remove uplock hook, arm shaft and five washers from fitting.

5-245. INSPECTION. Inspect the uplock mechanism as follows:

1. Inspect all components for excessive wear and damage. Replace all parts which cannot be repaired in accordance with paragraph 5-246.

2. Inspect spring pin attach holes in uplock hook, uplock arm, and shaft for wear or damage. If any of the attach holes are worn beyond 0.156 to 0.160 inch diameter repair in accordance with paragraph 5-246.

5-246. REPAIR. Repair of the uplock mechanism is limited to repair of the spring pin attach holes which are worn between 0.160 and 0.192 inch diameter. Repair the uplock mechanism as follows:

Materials List

Pin Spring	NAS561P6-16

1. Assemble the applicable part with the worn attach hole in accordance with paragraph 5-247, steps 1 and 2.

2. Ream in line damaged attach hole 0.187 to 0.192 through arm and shaft or hook and shaft as applicable.

3. Install pin (NAS561P6-16) through reamed holes.

5-247. ASSEMBLY. Assemble the main landing gear uplock mechanism as follows. Refer to figure 5-34.

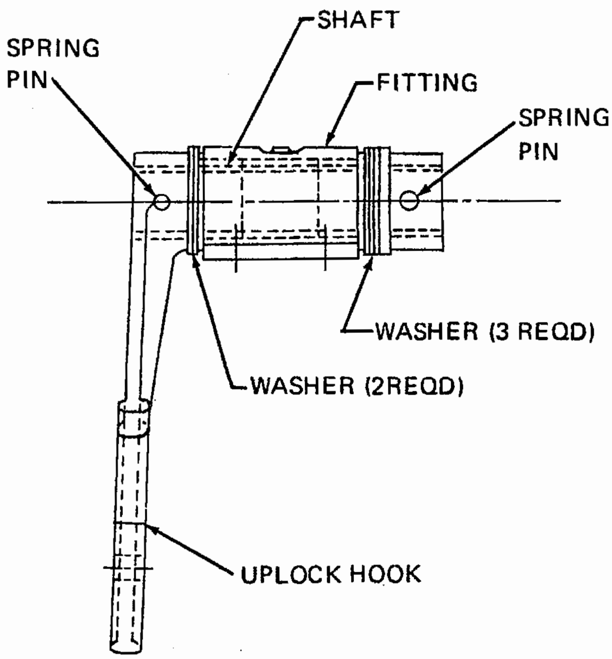


Figure 5-34. Main Landing Gear Uplock Mechanism

Materials List

Pin, Spring	NAS561P5-16

1. Install three washers on shaft between fitting and uplock arm. Align attach holes of arm with attach holes in shaft.

2. Install two washers on shaft between fitting and uplock hook. Align attach holes of hook with attach holes in shaft.

3. Install pin (NAS561P5-6) through arm and shaft and through hook and shaft.

5-248. MAIN LANDING GEAR WHEEL (3-1205).

5-249. The main landing gear wheel (figure 5-35) is a typical split wheel used with a single disk brake. Each wheel consists of an inner and an outer wheel half bolted together with nine bolts. Each wheel half contains the following parts: bearing cups and cones, balance weights, and identification and instruction plate decals. A hub cap and gasket protect the outer wheel bearing from dirt and moisture, and a neoprene grease seal protects the inner bearing. For additional information on wheel maintenance, refer to NAVAIR 04-10-1.

5-250. CHECKOUT. Visually check for loose, broken, or missing parts. Refer to Aircraft Wheel Maintenance Instructions (NAVAIR 04-10-1). Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for proper tire pressure. For general tire changing and repair, refer to Inspection, Maintenance Instructions, Storage, and Disposition of Aircraft Tires and Inner Tubes Manual (NAVAIR 04-10-506).

Note

The main landing gear tires should be replaced when tread has worn to the bottom of the wear depth indicators or the bottom of the tread grooves, whichever occurs first, at any point on the tread, regardless of whether the wear is due to normal use or to skidding.

5-251. DISASSEMBLY. To disassemble the main landing gear wheel, see figure 5-35 and proceed as follows:

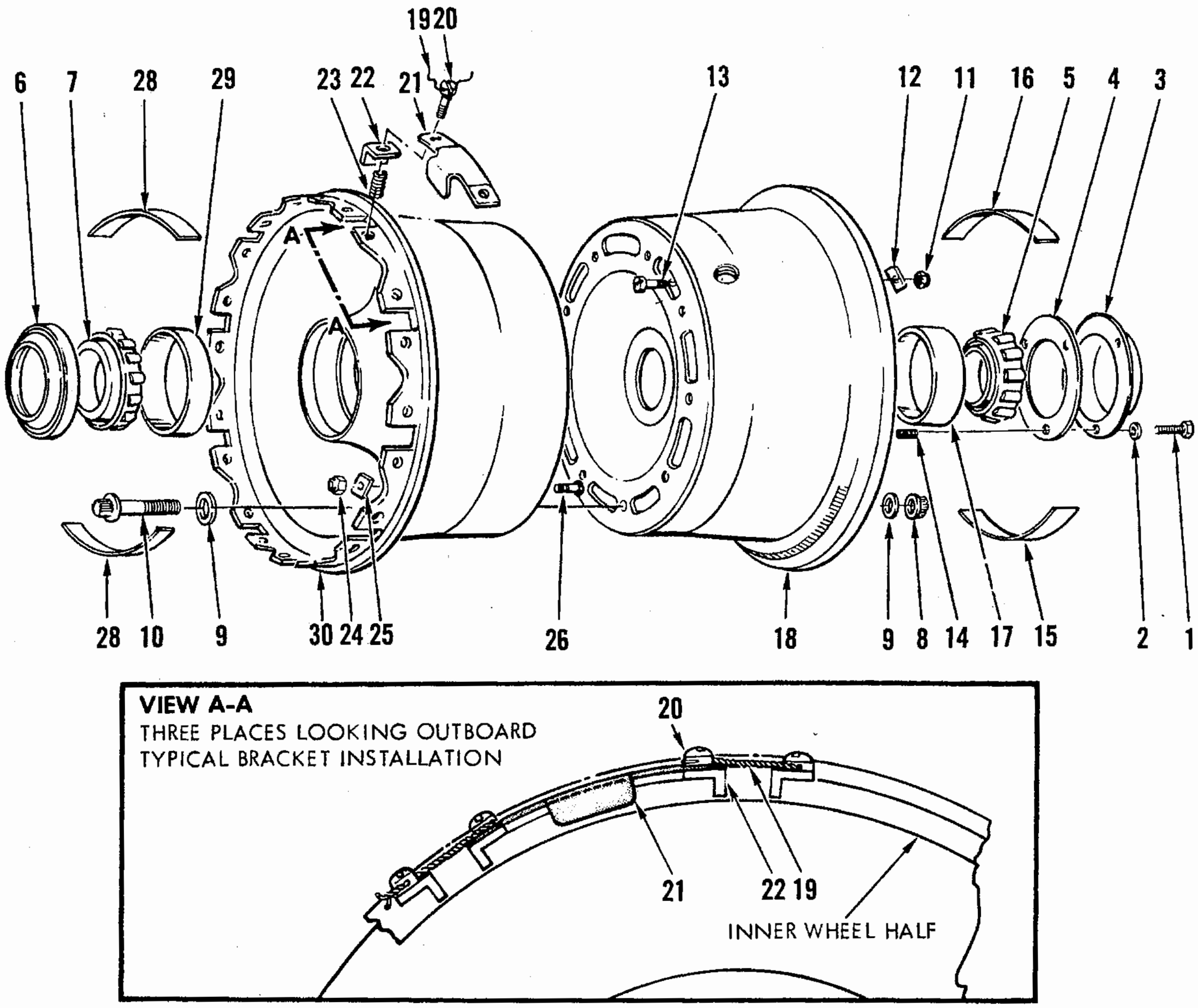
Tools and Equipment List

Bead Breaker

CAUTION

Disassemble on a clean, flat surface to prevent damage to assembly.

1. Remove screws (1), washers (2), hub cap (3), gasket (4), seal (6), and bearing cones (5, 7) from each wheel-half.



1 SCREW (THREE)
2 WASHERS (THREE)
3 HUB CAP (ONE)
4 HUB CAP GASKET
5 BEARING CONE
6 PLAIN ENCASED SEAL
7 BEARING CONE
8 NUT (NINE)
9 WASHER (18)
10 BOLT (NINE)
11 NUT
12 1/4 OUNCE BALANCE WEIGHT
13 SCREW
14 INSERT
15 INSTRUCTION PLATE (TWO)
16 IDENTIFICATION PLATE (TWO)
17 BEARING CUP
18 OUTER WHEEL HALF
19 LOCKWIRE
20 SCREW (20)
21 BRACKET (THREE)
22 TORQUE KEY (20)
23 HELI-COIL INSERT (20)
24 NUT
25 1/4 OUNCE BALANCE WEIGHT
26 SCREW
27 INSTRUCTION PLATE
28 IDENTIFICATION PLATE
29 BEARING CUP
30 INNER WHEEL HALF

Figure 5-35. Main Landing Gear Wheel Assembly

2. Remove valve core and completely deflate tire.

WARNING

Do not loosen or remove nuts from wheel-half retaining bolts until tire is completely deflated.

CAUTION

Use bead breaker instead of tire irons to loosen tire beads from wheel flange.

3. Remove nuts (8), washers (9), and bolts (10).

4. Separate wheel halves (18, 19) and remove tire.

5. If damaged, remove balance weight (12), nut (11), and screw (13).

6. Remove plates (15, 16) only if damaged or illegible.

7. Lay wheel-half, hub up, on suitable work surface.

8. Remove inserts (14) only if replacement is necessary.

Note

On wheels having AFC 47 incorporated, a bracket (21) is installed in three places over the circular slots on top of the adjacent torque keys (22).

9. Remove lockwire (19), screws (20), and torque keys (22).

10. Remove inserts (23) only if replacement is necessary.

11. Remove nuts (24), balance weights (25), and screws (26).

12. Remove plates (27, 28) only if damaged or illegible.

5-252. CLEANING. To clean the components of the main landing gear wheel assembly, see figure 5-35 and proceed as follows:

Materials List

Solvent, Dry-cleaning	P-D-680, Type II
Alcohol, Isopropyl	TT-I-735

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

1. Clean metal parts, except bearings, with dry-cleaning solvent (P-D-680, Type II), using a bristle brush to remove deposits.

2. Remove all chipped, blistered, cracked, or loose paint.

3. Air-dry all parts after cleaning.

4. Degrease bearings as follows:

CAUTION

Wear clean rubber gloves when cleaning bearings, to prevent corrosion caused by body oil.

a. Soak bearings in dry-cleaning solvent (P-D-680, Type II) for 5 minutes.

CAUTION

Do not spin bearing while drying.

b. Remove bearings from solvent and dry with clean, compressed air.

c. Wash again in clean dry-cleaning solvent (P-D-680, Type II), rotating bearing while it is submerged.

d. Remove bearing from solvent and thoroughly rinse in isopropyl alcohol (TT-I-735).

e. Air-dry bearing for 10 minutes.

Table 5-7. Main Landing Gear Wheel Inspection Table

PART NAME	TYPE OF INSPECTION	PROCEDURE	ACCEPTABLE DEFECTS
Name and Instruction Plates	Visual	Inspect for legibility and damage.	None
Screws, Washers, and Nuts	Visual	Inspect for cracks, corrosion, thread defects, and distortion.	None
Bolts	Visual and magnetic particle or eddy current inspection	Inspect for cracks, corrosion, thread defects, and distortion.	None
Hub Cap	Visual	Inspect for corrosion, cracks, and distortion.	None
Inserts	Visual	Inspect for thread defects.	None
Cones and Cups	Visual	Inspect for cracks, corrosion, and surface defects.	None
Seal	Visual	Inspect for embedded foreign material, pliability, breaks and distortion.	None
Torque Keys	Visual	Inspect for cracks, breaks, and distortion and MAX gap dimension of 0.588 inch between keyways.	None
Wheel Halves	Visual and penetrant	Inspect for cracks and corrosion.	Minor surface defects repairable. See figure 5-36, 5-37, and 5-38.

5-253. INSPECTION. To inspect the components of the main landing gear wheel assembly, refer to table 5-7. Also for seal area of inner wheel half, refer to table 5-18 for inspection dimensions. Wheel halves will not be stripped of paint under any circumstances at IMA Level and below.

Tools and Equipment List

Magnetic Particle or Eddy Current Inspection Equipment	Refer to NAVAIR 01-1A-16

5-254. REPAIR. Both wheel halves will be discarded if either half is condemned for fatigue, cracks, fire damage, or corrosion. Refer to table 5-11. When a wheel-half is condemned due to minor surface defects, the opposite half may be mated with an undamaged half. This assembly will be treated as the oldest wheel-half. Repair the components of the main landing gear wheel in the following manner.

Materials List

Primer, Zinc Chromate	MIL-P-8585 or TT-P-1757

1. Replace all parts obviously beyond repair and which do not meet inspection requirements.

2. Replace all damaged gaskets and seals.

3. All sharp corners or edges resulting from minor surface blemishes must be hand-filed. Remove tool marks with emery cloth.

CAUTION

Do not remove more than 0.020 inch below original surface when blending in local areas, unless noted otherwise. Also, do not paint faying (mating) surfaces of wheel halves.

4. If protective coating has been defaced or scratched to bare metal, sand area with emery cloth or a fine grade of sandpaper and apply one coat of zinc chromate primer (MIL-P-8585 or TT-P-1757).

5. For permissible repairs and limits of metal-removal on wheel halves, see figures 5-36, 5-37 and 5-38. If the wheel lightening cutout areas are reworked in accordance with figure 5-37, the inner wheel half shall be balanced to within 1 ounce-inch.

5-255. LUBRICATION. To lubricate components of the main landing gear wheel assembly, see figure 5-35 and proceed as follows:

Materials List

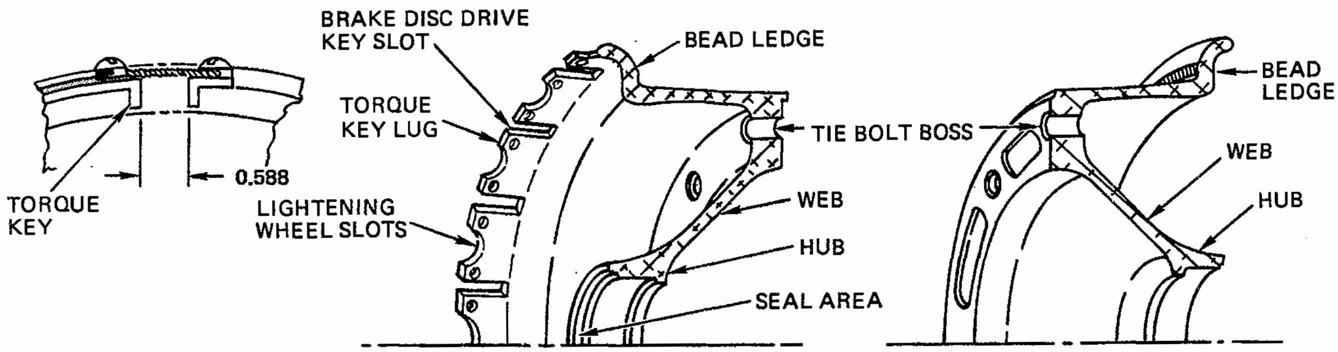
Grease	MIL-G-81322
Thread Compound, Antiseize	MIL-T-5544A

1. Before assembly, hand-pack bearings with grease (MIL-G-81322).

Note

If the wheel has been in storage for more than 90 days in extremely dry climate, repack bearings before installing wheel on aircraft.

2. Before assembly, lubricate threads and bearing surfaces of bolts (10), washers (9), and nuts (8) with antiseize compound (MIL-T-5544A).



DAMAGED AREA	CAUSE OF DAMAGE	METHOD OF REPAIR	ALLOWABLE MATERIAL REMOVABLE	MAXIMUM DAMAGE ALLOWED AFTER REPAIR
BEAD LEDGE	CORROSION AND/OR NICKS	BLEND	0.020-INCH BELOW ORIGINAL SURFACE	NONE
HUB	CORROSION AND/OR NICKS	BLEND	0.020-INCH BELOW ORIGINAL SURFACE	NONE
	HUB HOLE ENLARGEMENT	REMOVE GREASE DAM FLANGE	SEE FIG. 5-38	NONE
WEB	CORROSION AND/OR NICKS	BLEND	0.020-INCH BELOW ORIGINAL SURFACE	NONE
TIE BOLT BOSS	FATIGUE	NONE	NONE	NONE
TORQUE KEY LUG	WEAR AND CORROSION	NONE	NONE	NONE
WHEEL LIGHTENING CUTOUT AREA	FAILURE TO INSTALL BRAKE DISC PROPERLY	SEE FIG. 5-37	SEE FIG. 5-37	NONE
SEAL AREA	CORROSION, WEAR OR SEAL ROTATION	BLEND	NOT TO EXCEED MAX. DIMENSION SPECIFIED IN TABLE 5-8	NONE
TORQUE KEY	WEAR	REPLACE KEYS	MAXIMUM GAP BETWEEN KEY WAYS 0.588 INCH	NONE

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Figure 5-36. Inspecting Wheel Halves

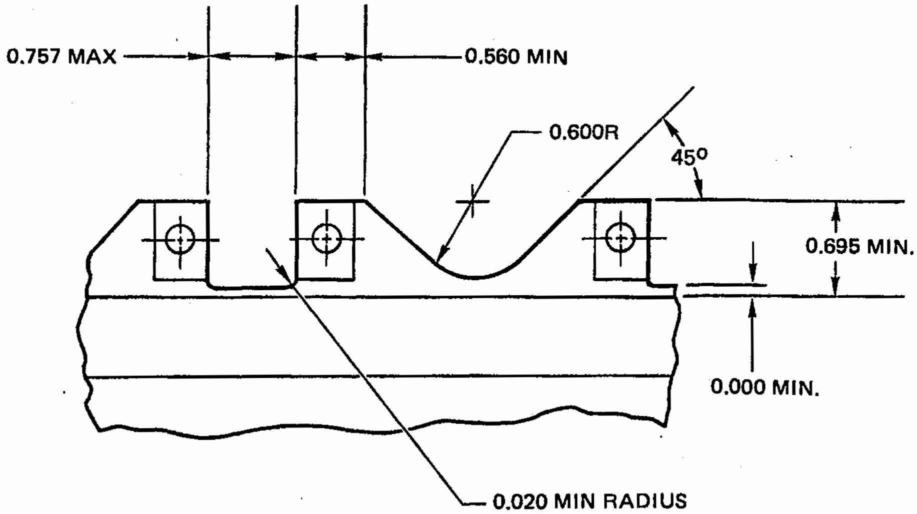
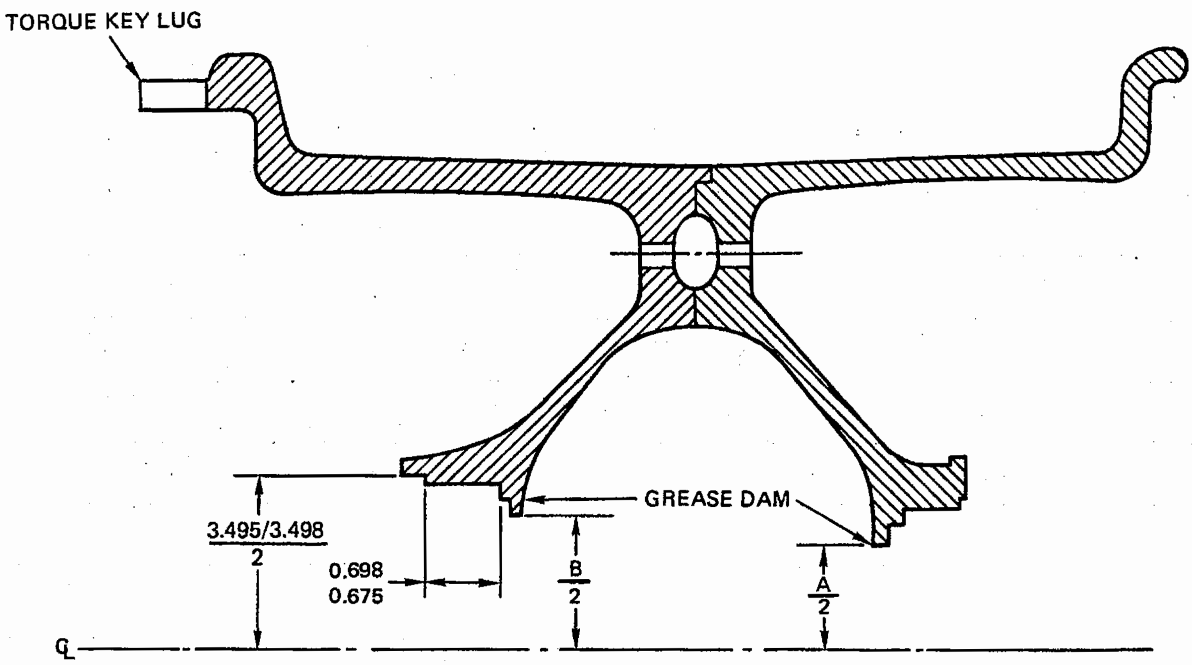


Figure 5-37. Rework Limits for Wheel Lightening Areas of Torque Key Lugs



NOTE: FOR OLD WHEELS (WITH GREASE DAM) A = 1.97 IN., B = 2.34 IN.
FOR NEW OR REWORKED WHEELS (WITHOUT GREASE DAM) A = 2.56 IN., B = 2.97 IN.
TOLERANCES FOR ALL DIMENSIONS SHALL BE ±0.001 IN.

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Figure 5-38. Rework Limits for Wheel Hub Areas

5-256. ASSEMBLY. To assemble the main landing gear wheel assembly, see figure 5-35 and proceed as follows:

Tools and Equipment List

Wrench, Torque (0 to 200 inch-pounds)	GGG-W-686

Materials List

Grease	MIL-G-81322
Primer, Zinc Chromate	MIL-P-8585 or TT-P-1757
Thread Compound, Antiseize	MIL-T-5544A
Lockwire (0.032-inch diameter steel)	MS20995F32

1. Install identification (28) and instruction (27) plates if they have been removed.

2. Install balance weights (25) with screw (26) and nut (24).

Note

On wheels with AFC 47 incorporated, install bracket (21) with tab inboard, over three of the circular slots and spaced every third slot (first two brackets) and fourth slot (third bracket) on top of the two adjacent torque keys (22).

3. Install insert (23) and fasten torque key (22) to inner wheel-half (30) with screw (20). Safety with lockwire (MS20995F32). Maximum gap dimension between keyways is 0.588 inch.

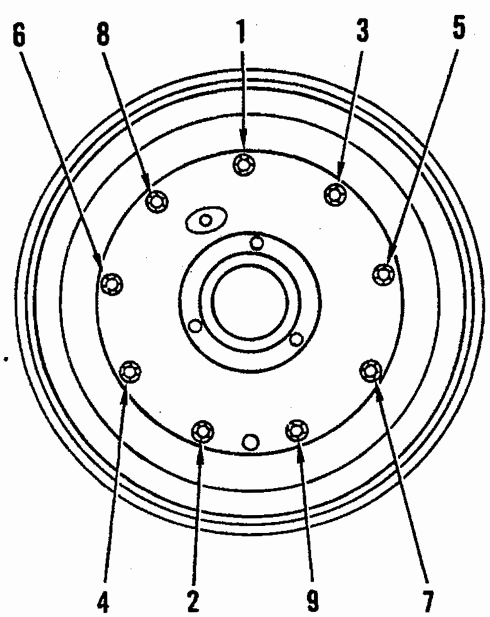
4. Install identification (16) and instruction (15) plates on outer wheel-half (18).

5. Install inserts (14) and fasten balance weight (12) to wheel-half (18) with screw (13) and nut (11).

6. Lubricate threads and bearing surfaces of bolts (10), washers (9), and nuts (8) with antiseize thread compound (MIL-T-5544A). Mount tire with stripe (1/2 x 2 inches in contrasting color) on tube adjacent to dot on tire; fasten wheel-half assemblies together with bolts (10), washers (9), and nuts (8). Lubtork nuts (8) to 150—180 inch-pounds. See figure 5-39 for tie-bolt tightening sequence.

CAUTION

When installing seal (6), ensure that rubber lip of seal faces away from wheel bearing cone (7).



NOTE: ALL VALUES ARE LUBTORK VALUES.

1. PRELIMINARY TORQUE: TIGHTEN TIE BOLTS IN SEQUENCE SHOWN TO 100 INCH-POUNDS.
2. FINAL TORQUE: TIGHTEN TIE BOLTS IN SAME SEQUENCE TO 150-180 INCH-POUNDS.
3. AFTER TIGHTENING TIE BOLT NUMBER 9, RECHECK ALL BOLTS FOR PROPER TORQUE.

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Figure 5-39. Torquing Main Landing Gear Wheel Tie Bolts

7. Lubricate bearing cones (5, 7) with grease (MIL-G-81322) and install cones and seal (6). Coat outside diameter of seal (6) with wet zinc chromate primer and immediately install seal with block of wood and mallet while keeping seal flange even.

8. Install gasket (4) and hub cup (3) with washer (2) and screw (1).

5-257. ADJUSTMENT. Adjustment of the main landing gear wheels is confined to rebalancing and matching of wheel halves.

5-258. BALANCE WEIGHTS. Normally, wheel balance weights should not be distrubed since new wheels are balanced by the manufacturer. Wheels determined to be out of balance or which have missing or loose balance weights must be rebalanced.

5-259. MATCHED WHEEL HALVES. All main landing gear wheels must be matched—a matched wheel is one in which the wheel halves have identical serial numbers and manufacture dates—except in the following instances:

1. Wheels on hand or received mismatched must be dismantled and matched to other wheel halves with a manufacture date within 12 calendar months and maintained in that condition for the remainder of the service life of the oldest wheel-half.

2. Wheel halves without manufacture date and matched with a wheel with a manufacture date will be maintained as a matched set and returned to service and controlled by the wheel-half that has a manufacture date.

Note

All wheels on hand or received with matched wheel halves will be maintained as a matched set by manufacture date and serial number.

If one half of a matched wheel is condemned for fatigue, cracks, fire damage, or corrosion, both wheel halves must be condemned.

If one half of a matched wheel is condemned for minor surface defects, the opposite half may be mated with an undamaged half in accordance with the criteria of steps 1 and 2.

5-260. NOSE LANDING GEAR COMPLETE SHOCK STRUT ASSEMBLY (1526B100).

5-261. The nose landing gear complete shock strut assembly (figure 5-40) is a trailing-arm type of landing gear which operates hydropneumatically to absorb ground impact. Shock absorption is controlled by a metered orifice which is further aided automatically during rough terrain, by a spring-loaded pressure relief valve. The cylinder assembly can rotate 360 degrees within the trunnion housing for ease in steering. The main components are the trunnion housing, cylinder, torque link, fork, piston, axle, orifice support tube, and pressure relief valve. Upon landing, the piston moves into the cylinder, forcing hydraulic fluid through the metered orifice into the cylinder chamber, absorbing the impact energy and stopping the upward travel of the piston. The pressurized air within the piston augments this action and returns the piston toward the extended position. The pressure relief valve, spring-loaded to 277 pounds, is installed into the lower end of the piston, to further relieve shock caused by rough terrain. Refer to table 5-8 for leading characteristics.

Table 5-8. Nose Landing Gear Complete Shock Strut Leading Characteristics

Extended Position Length*	31.00 inches
Total piston stroke	7.03 inches
Extended air pressure	170 psi
Capacity, hydraulic fluid (approx)	2.87 pints
Filling after assembly	MIL-H-6083
Service filling	MIL-H-5606
Weight	80 pounds

*Measured between centers of trunnion pins and the bushings in lower end of piston, on strut centerline

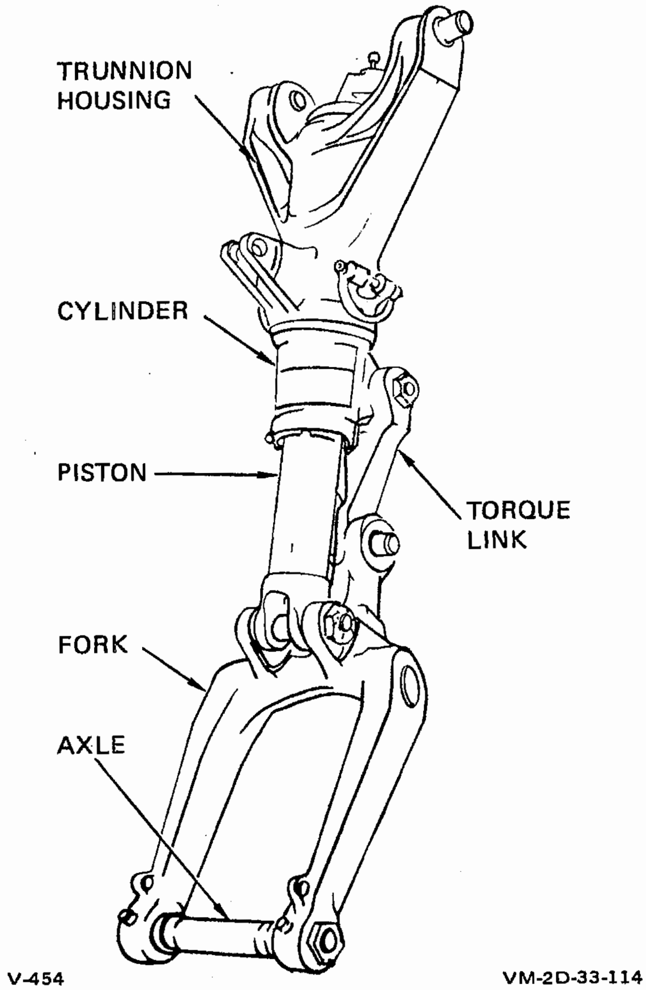


Figure 5-40. Nose Landing Gear Complete Shock Strut Assembly - General Arrangement

5-262. CHECKOUT. To checkout the nose landing gear complete shock strut assembly, proceed as follows:

Tools and Equipment List

Cylinder, Portable Air	60A80D1
Wrench, Torque	GGG-W-686 No. 6

Materials List

Fluid, Hydraulic	MIL-H-5606

1. With the equipment serviced with hydraulic fluid, secure the strut in either a vertical or horizontal, fully extended position.

2. Pressurize to the normal extended air pressure of 170 psi. There shall be no evidence of fluid or air leakage after a period of 1 hour.

3. Check that there is no leakage at any joints where there are packings or where there is motion.

4. With pressurized strut in fully extended position and hanging clear of the ground, rotate cylinder 360 degrees in trunnion housing assembly with torque wrench on steering stud. Torque required should not exceed 50 inch-pounds.

5-263. TROUBLESHOOTING. To troubleshoot the nose landing gear shock strut assembly, refer to table 5-9.

5-264. DISASSEMBLY. To disassemble the nose landing gear complete shock strut assembly, see figures 5-41 and 5-42 and proceed as follows:

WARNING

Serious injury could result if an attempt is made to remove air valve before releasing pressurized air. Such an attempt would cause the valve to be expelled from the shock strut assembly with great velocity.

Note

Bag or tag (do not steep stamp) all removed parts for reassembly into the same assembly, except for parts which are to be replaced.

1. Remove valve cap (3, figure 5-41) from air valve and slowly loosen swivel nut (8) one quarter turn maximum. Allow all pressurized air to be released before proceeding with disassembly.

2. After all air pressure is released place strut in a retracted position. Turn the cylinder assembly within the trunnion housing assembly to move air valve to lowest position.

3. Cut the lockwire, remove the air valve and slowly drain the hydraulic fluid into a suitable container. Slowly compress the piston to aid in ejecting all fluid.

Table 5-9. Troubleshooting Nose Landing Gear Shock Strut Assembly

TROUBLE	PROBABLE CAUSE	REMEDY
Air leak at air valve.	Improperly installed air valve.	Check for proper installation. Torque valve body 100 to 110 inch-pounds and swivel nut 50 to 60 inch-pounds.
	Worn or defective air valve	Replace air valve.
Fluid/air leakage at piston gland nut area.	Rolled O-ring seal.	Clean strut and gland nut area, lubricate strut with hydraulic fluid, and actuate up and down four or five times.
	Worn seals in packing adapter.	Replace O-ring packings and packing retainers.
	Packings damaged by dirt or foreign matter.	Clean thoroughly and replace packings.
	Scored piston, worn piston head and/or lower bearing.	Replace defective or worn parts.
Binding or looseness of cylinder assembly in trunnion housing impairing steering.	Improper torque of housing retaining nut.	Adjust as required.
	Worn bearing liners.	Replace.

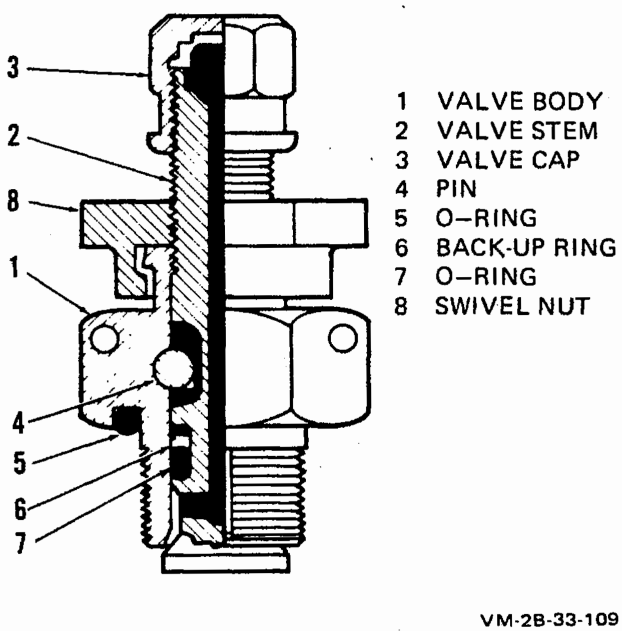


Figure 5-41. Air Charging Valve

4. Remove nuts (1), washers (2), and bolts, (3) from each side of trunnion and remove trunnion pins (4).

5. Remove cotter pin (5), nut (6), and washer (7) from fork attaching pin (10).

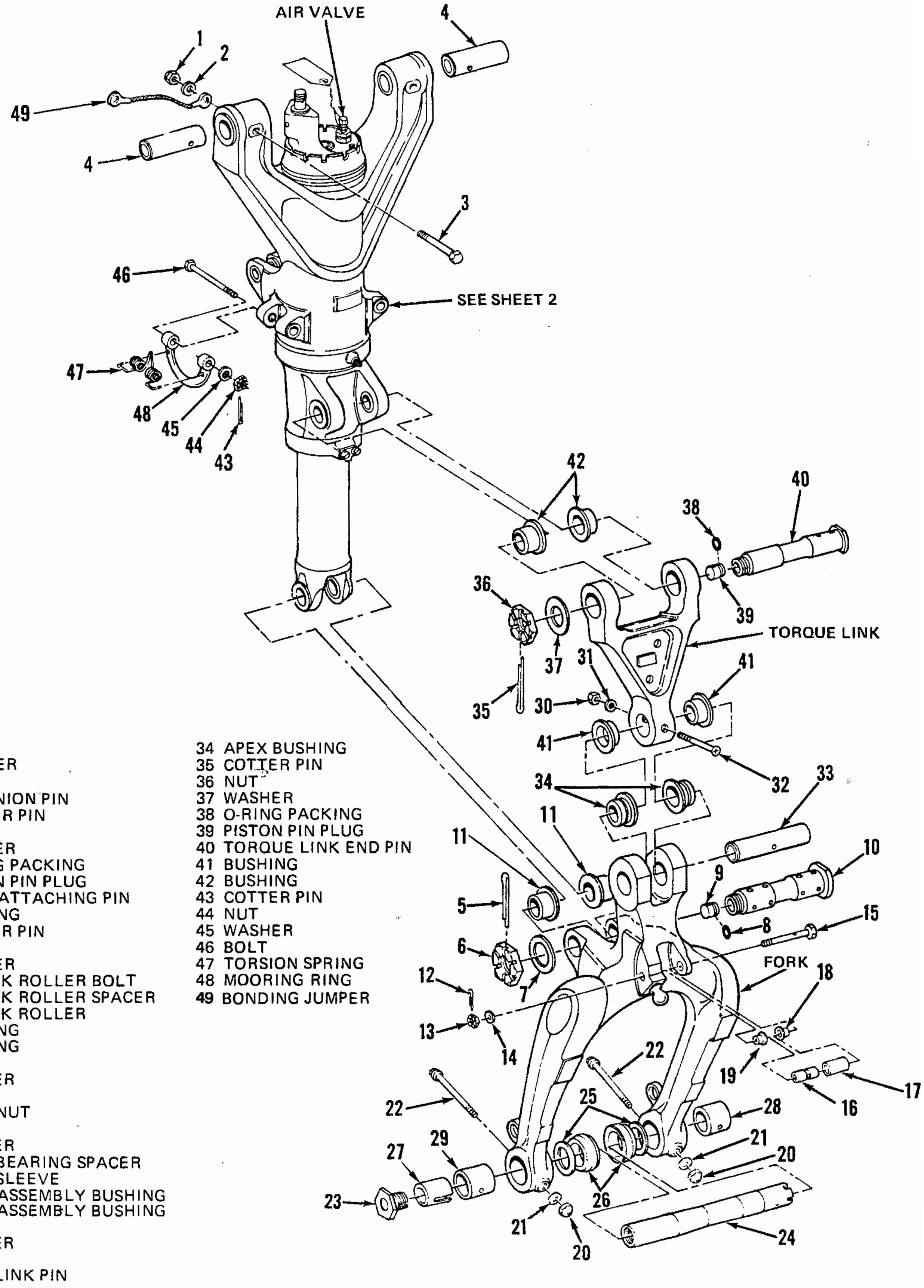
6. Piston pin plug (9) and O-ring packing (8) should be removed to facilitate pin cleaning.

7. Remove cotter pin (12), nut (13), washer (14), and bolt (15) and retrieve uplock roller spacer (16) and uplock roller (17).

8. Remove nuts (20), washers (21), and external wrenching bolts (22).

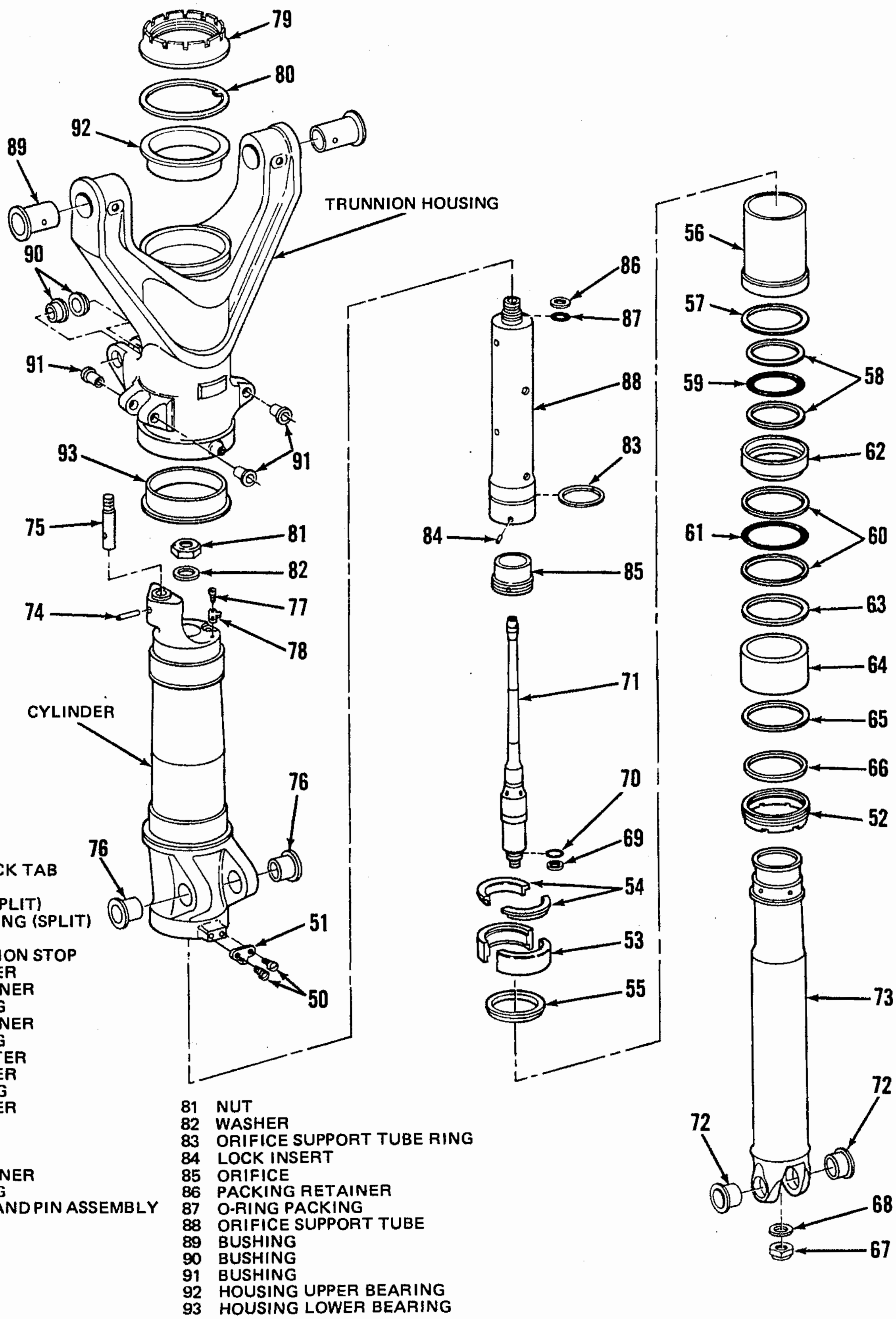
9. Unscrew axle nut (23) and push axle (24) at slotted end out of fork. Remove axle sleeve (27), bushings (28 and 29), spacers (26), and washers (25).

10. Remove nut (30), washer (31), and bolt (32). This will permit apex link pin (33) to be pushed out of fork so that torque link can be removed from fork.



1 NUT
2 WASHER
3 BOLT
4 TRUNNION PIN
5 COTTER PIN
6 NUT
7 WASHER
8 O-RING PACKING
9 PISTON PIN PLUG
10 FORK ATTACHING PIN
11 BUSHING
12 COTTER PIN
13 NUT
14 WASHER
15 UPLOCK ROLLER BOLT
16 UPLOCK ROLLER SPACER
17 UPLOCK ROLLER
18 BUSHING
19 BUSHING
20 NUT
21 WASHER
22 BOLT
23 AXLE NUT
24 AXLE
25 WASHER
26 AXLE BEARING SPACER
27 AXLE SLEEVE
28 FORK ASSEMBLY BUSHING
29 FORK ASSEMBLY BUSHING
30 NUT
31 WASHER
32 BOLT
33 APEX LINK PIN
34 APEX BUSHING
35 COTTER PIN
36 NUT
37 WASHER
38 O-RING PACKING
39 PISTON PIN PLUG
40 TORQUE LINK END PIN
41 BUSHING
42 BUSHING
43 COTTER PIN
44 NUT
45 WASHER
46 BOLT
47 TORSION SPRING
48 MOORING RING
49 BONDING JUMPER

Figure 5-42. Nose Landing Gear Complete Shock Strut Assembly (Sheet 1 of 2)



50 SCREW
51 GLAND NUT LOCK TAB
52 GLAND NUT
53 PISTON HEAD (SPLIT)
54 PISTON HEAD RING (SPLIT)
55 RECOIL VALVE
56 PISTON EXTENSION STOP
57 PACKING WASHER
58 PACKING RETAINER
59 O-RING PACKING
60 PACKING RETAINER
61 O-RING PACKING
62 PACKING ADAPTER
63 PACKING WASHER
64 LOWER BEARING
65 PACKING WASHER
66 ROD SCRAPER
67 NUT
68 WASHER
69 PACKING RETAINER
70 O-RING PACKING
71 RELIEF VALVE AND PIN ASSEMBLY
72 BUSHING
73 PISTON
74 SPRING PIN
75 STEERING STUD
76 BUSHING
77 SCREW
78 LOCK TAB
79 HOUSING RETAINER NUT
80 THRUST BEARING
81 NUT
82 WASHER
83 ORIFICE SUPPORT TUBE RING
84 LOCK INSERT
85 ORIFICE
86 PACKING RETAINER
87 O-RING PACKING
88 ORIFICE SUPPORT TUBE
89 BUSHING
90 BUSHING
91 BUSHING
92 HOUSING UPPER BEARING
93 HOUSING LOWER BEARING

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Figure 5-42. Nose Landing Gear Complete Shock Strut Assembly (Sheet 2 of 2)

11. Remove cotter pin (35), nut (36), washer (37), and torque link end pin (40). This will permit removal of torque link.

12. Remove cotter pin (43), nut (44), washer (45), and bolt (46). Retrieve mooring ring (48) and remove torsion spring (47).

13. With shock strut and trunnion housing positioned horizontally on a bench, remove screws (50) and lock tab (51).

14. Remove gland nut (52) from cylinder and slide piston assembly out of cylinder.

15. Remove split piston heads (53) and rings (54), recoil valve (55), piston extension stop (56), packing washers (57, 63, 65) and retainers (58, 60, 62), O-ring packings (59 and 61), lower bearing (64), and rod scraper (66).

16. Remove nut (67) and washer (68) and carefully slide relief valve and pin assembly (71) out of piston (73).

17. Remove packing retainer (69) and O-ring packing (70) from relief valve and pin assembly (71).

18. If steering stud (75) is damaged, remove spring pin (74) and stud (75).

19. Remove screws (77) and lock tab (78).

20. Using spanner wrench, remove housing retainer nut (79).

21. Remove thrust bearing (80), nut (81), and washer (82).

22. Slide orifice support tube (88) out of trunnion housing and remove ring (83), lock insert (84), and orifice (85). Also, remove packing retainer (86) and O-ring packing (87).

23. Inspect all bushings and bearing for damage. Return to depot facility if damaged.

5-265. CLEANING. To clean the nose landing gear complete shock strut assembly, proceed as follows:

Tools and Equipment List

Brush, Soft-bristle	Commercial

Materials List

Solvent, Dry-cleaning	P-D-680, Type II
Paper, Wax	MIL-P-20311

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

CAUTION

Cleaning should be accomplished in a clean, dry area, which is free from dust or other foreign matter.

1. Wash all metal parts except air valve in cleaning solvent (P-D-680, Type II). Use a soft-bristle brush to facilitate removal of stubborn dirt. Allow excess solvent to drain from parts and dry with clean, dry compressed air.

2. Ensure that all foreign matter is removed from internal surfaces of all hollow parts.

3. After parts are cleaned and dried, wrap all parts in clean wax paper (MIL-P-20311), while awaiting reassembly.

5-266. INSPECTION. To inspect the components of the nose landing gear complete shock strut assembly, proceed as follows:

Tools and Equipment List

Tester, Spring Resiliency	Type PB4-D

Materials List

Steel Rod (7/16-inch diameter)	AISI 4130

1. Inspect all threaded parts for corrosion, stripped or damaged threads.

2. Inspect packing grooves and surrounding areas on all parts for scratches, burrs, nicks or other surface roughness that could damage packings at installation. Refer to table 5-10 for scratch limits.

3. Inspect all parts for cleanliness. Pay particular attention to internal surfaces to ensure that all foreign matter has been removed.

4. Inspect all aluminum and steel parts in accordance with MIL-I-6866 and MIL-I-6868, respectively. Replace parts which show signs of structural failure.

Note

Special care should be exercised during inspection of high- and medium-stress areas. See figure 5-43 for stress area locations.

5. Inspect painted surfaces for signs of peeling, chipping, blistering, flaking, or other damage.

6. Inspect chrome-plated parts for wear-through of chrome plating. If plating is damaged, forward assembly to depot facility for repair.

7. With relief valve and pin assembly suitably mounted and using PB4-D spring resiliency tester (or equivalent) and adapter rod (figure 5-44), check spring operation as follows:

a. Position adapter rod through metering pin hole with bored end of adapter rod facing down.

b. Rod should engage head of shuttle valve.

c. Breakout force (force at initial movement) must be 277 ($\pm$2) pounds.

5-267. REPAIR AND PARTS REPLACEMENT. To repair the components of the nose landing gear complete shock strut assembly, proceed as follows:

Materials List

Cloth, Aluminum Oxide Abrasive	P-C-451
Cloth, Crocus	P-C-458
Lacquer, Acrylic	MIL-L-81352
Primer, Epoxy	MIL-P-23377

1. Remove minor scratches, nicks, and burrs from machined surfaces of steel parts, using crocus cloth (P-C-458). Polish aluminum components with aluminum oxide abrasive cloth (P-C-451). Refer to table 5-10 for permissible depth limits.

2. Smooth all areas where paint is blistered, flaked, or chipped, using aluminum oxide abrasive cloth (P-C-451). After repair of damaged paint, apply two coats of epoxy primer (MIL-P-23377), and two coats of acrylic lacquer MIL-L-81352 in accordance with Federal Standard 595, color No. 17875, gloss insignia white.

3. Replace any component which does not meet the inspection requirements of paragraph 5-266 or cannot be repaired in accordance with steps 1 and 2.

Table 5-10. Damage Limits for Structural Components of Nose Landing Gear

COMPONENT METAL	MAXIMUM DEPTH (INCHES)	
	BLENDED SCRATCH, NICK, OR DENT	UNBLENDED SCRATCH, NICK, OR DENT
Aluminum	0.090	None
Steel	0.030	None

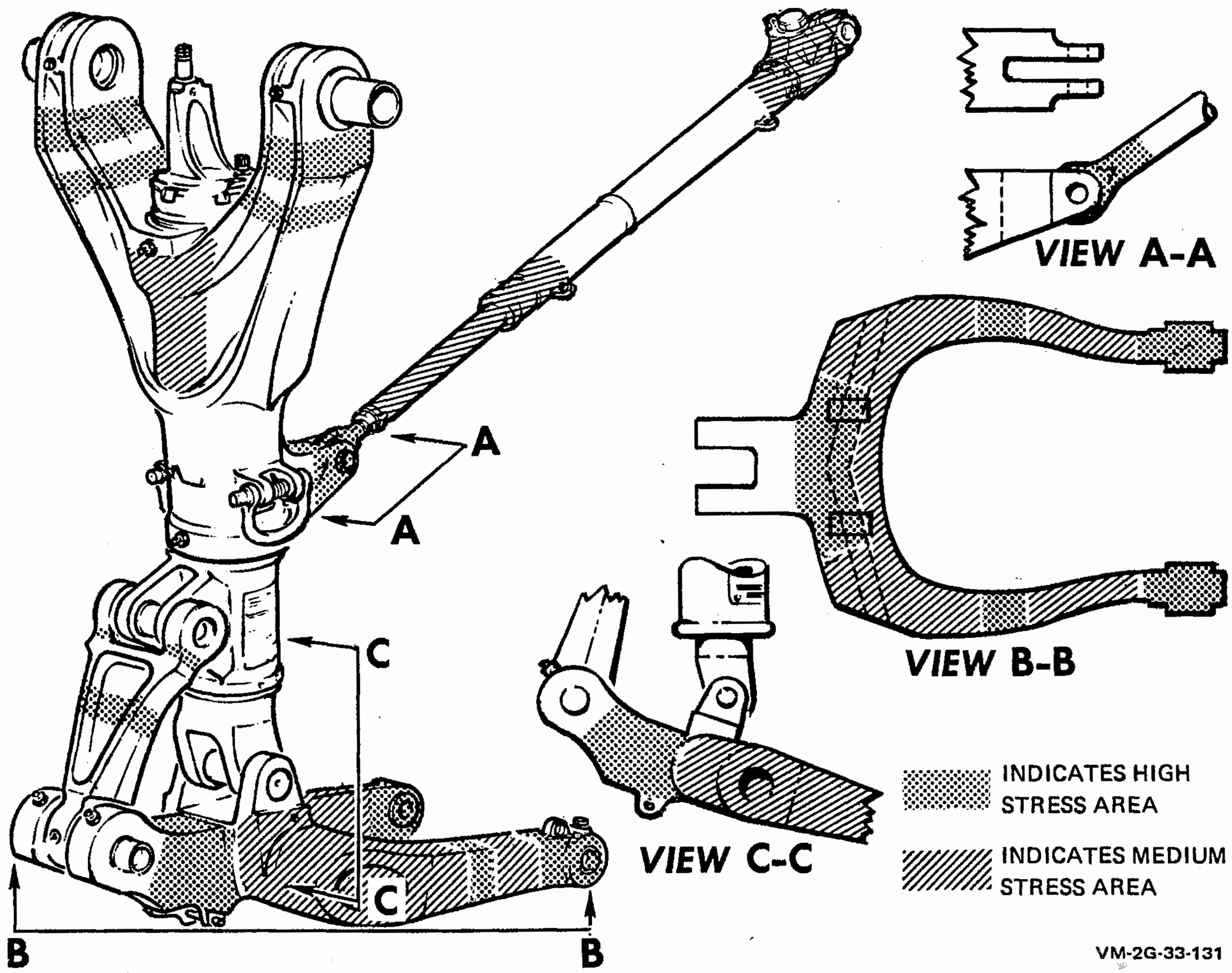


Figure 5-43. Nose Landing Gear Assembly - Stress Diagram

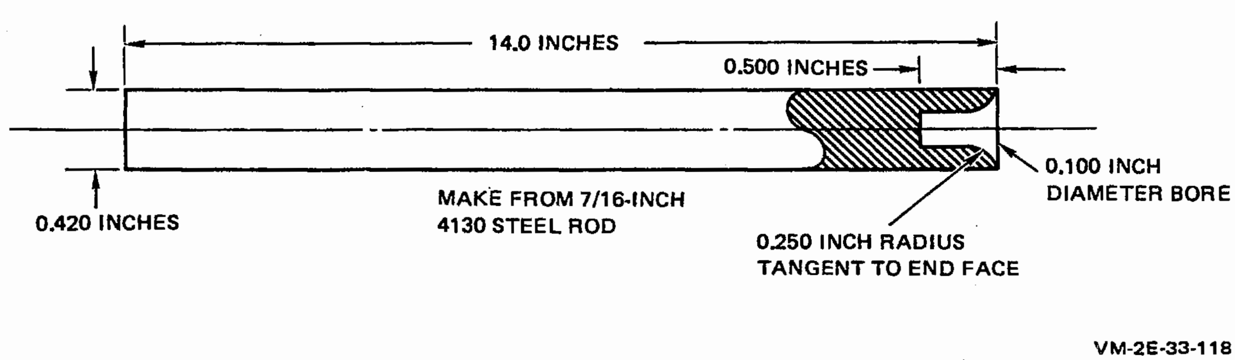


Figure 5-44. Nose Landing Gear Relief Valve and Pin Assembly Testing Rod

4. Replace all packings, backup rings, or other "soft" components. Refer to Illustrated Parts Breakdown (NAVAIR 01-60GCB-4).

CAUTION

The use of open flame or torch heat on any components of this assembly is prohibited.

5-268. ASSEMBLY. To assemble the nose landing gear complete shock strut assembly, see figure 5-42 and proceed as follows:

Tools and Equipment List

Wrench, Torque, Type I Class 1, Style A, Size No. 9	GGG-W-686

Materials List

Fluid, Hydraulic	MIL-H-5606
Grease, Aircraft	MIL-G-23827
Lockwire (0.032-inch diameter nickel copper)	MS20995NC32
Packing	MS28775-016
Packing	MS28775-015
Packing	MS28775-236
Packing	MS28775-337
Ring, Backup	MS28774-016
Ring, Backup	MS28774-015
Ring, Backup	MS28774-236
Ring, Backup	MS28774-337

Note

Check all MS28774 backup rings for proper fit. If required, trim to prevent O-ring packing damage.

Prior to assembly, lubricate O-ring packings and packing retainers by immersing in clean hydraulic fluid and install wet.

CAUTION

The use of open flame or torch heat on any part of this equipment is strictly prohibited. If necessary, temperature-controlled oil baths or ovens should be used.

When positioning the cylinder assembly into trunnion housing assembly, be careful not to damage bearing surfaces of either assembly or threads on the cylinder assembly.

1. Position cylinder assembly in trunnion housing so that its centerline is aligned with the trunnion housing main bore center so that flange faces of housing lower bearing (93) and lower bearing liner of cylinder make sliding contact.

2. Install thrust bearing (80) with tang engaged in mating slot of cylinder, and housing retaining nut (79).

Note

Do not tighten nut (79) until assembly is complete.

3. Install packing (87) and retainer (86) on orifice support tube (88). Screw orifice (85) into orifice support tube (88) until bottomed out, align lock insert holes, and install lock insert (84).

4. Install orifice support tube ring (83).

5. Install orifice support tube assembly in cylinder, using washer (82) and nut (81). Torque nut to 300-400 inch-pounds.

6. If removed, install steering stud (75), using spring pin (74).

7. Install retainer (69) and packing (70) on relief valve and pin assembly and install assembly into piston (73), using washer (68) and nut (67). Torque nut (67) to 660-780 inch-pounds.

8. Install rod scraper (66), packing washers (65, 63, 57), lower bearing (64), packing adapter (62), packing retainers (58, 60), O-ring packings (59, 61), piston extension stop (56), and recoil valve (55) on piston.

9. While holding piston head (53) and piston head ring (54) halves in place, carefully insert assembly into cylinder.

Note

Ensure that piston extension stop (56) shoulder bottoms on cylinder flange.

10. Install gland nut (52), using spanner wrench. Tighten until nut bottoms on rod scraper (66).

11. Install lock tab (51), using screws (50). Safety with lockwire (MS20995NC32).

12. Check to ensure rod scraper (66) and lockwire and properly installed.

13. Install mooring ring (48), using spring (47), bolt (46), washer (45), and nut (44). Tighten nut to a snug position so that mooring ring is free to move and install cotter pin (43).

14. With all bushings in place, position torque link on cylinder housing and install torque link end pin (40).

15. Install piston pin plug (39) and O-ring packing, if removed.

16. Install washer (37) and nut (36); torque to 600-800 inch-pounds, align cotter pin holes and install cotter pin (35).

17. With bushings in place, install fork on torque link, using apex link pin (33), bolt (32), washer (31).

18. With fork assembly bushings (28, 29) in place, install axle sleeve (27), spacers (26), and washers (25) and slide axle (24) through fork arms from axle-nut side.

19. Install nut (23) to snug position and align slot to install bolt (22).

20. Install bolts (22) through fork arms, using washers (21) and nuts (20). It is not necessary to torque these nuts.

21. Install uplock roller (17), using uplock roller spacer (16), bolt (15), washer (14), and nut (13). Torque nut to 20-25 inch-pounds and install cotter pin (12).

Note

Ensure that uplock roller is free to operate. If necessary, back off nut slightly.

22. Position fork in lower portion of shock strut and install O-ring packing (8) on plug (9); install plug in pin (10) and install pin (10) through shock strut, using washer (7) and nut (6). Torque to 200-400 inch-pounds, align cotter pin holes, and install cotter pin (5).

23. Lubricate assembly with grease (MIL-G-23827).

24. Service strut assembly with hydraulic fluid (MIL-H-5606) and air in accordance with instruction plate.

25. With strut serviced in fully extended position and hanging clear of ground, rotate cylinder assembly, using a torque wrench (GGG-W-686, Type I, No. 9) on the steering stud a full 360 degrees. Required torque must not exceed 50 inch-pounds. Adjust housing retaining nut (79) as necessary to obtain proper torque. Secure nut (79) with lock tab (78) and screws (77). Safety screws (77) to air valve, using lockwire (MS20995NC32).

5-269. TESTING. To test the nose landing gear complete shock strut assembly, proceed as follows:

Materials List

Fluid, Hydraulic	MIL-H-5606

Tools and Equipment List

Cylinder, Portable, Air	60A80D1

1. With the equipment fully serviced, secure the strut in either a vertical or horizontal, fully extended position.

2. Pressurize to the normal air extended pressure of 170 psi. There shall be no evidence of fluid or air leakage after a period of 1 hour.

5-270. **PRESERVATION.** Upon completion of tests, preserve the nose landing gear shock strut assembly in accordance with MIL-P-116.

5-271. NOSE LANDING GEAR OLEO ASSEMBLY, SPARE (1526-1100).

5-272. Intermediate maintenance instructions for the spare oleo assembly are the same as the oleo assembly portion of the entire shock strut assembly. Refer to paragraph 5-260 for the oleo assembly maintenance instructions and to the Illustrated Parts Breakdown (NAVAIR 01-60GCB-4) for identification of components.

5-273. NOSE LANDING GEAR DOOR BUNGEE (300-343006).

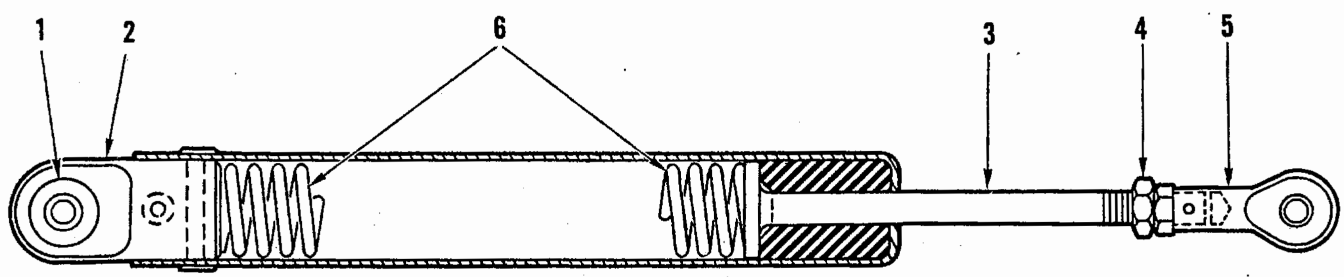
5-274. Intermediate maintenance for the landing gear door bungee consists of disassembly, inspection, assembly, and adjustment. See figure 5-45 and proceed as follows:

1. Remove rod end and check nut.

2. Remove rivets from end fitting.

3. Remove end fitting, spring and piston.

5-275. INSPECTION. If a part does not meet the following conditions, it must be replaced. See figure 5-45 and proceed as follows:



1 END FITTING BEARING
2 END FITTING
3 PISTON
4 CHECK NUT [1]
5 ROD END BEARING [1]
6 SPRING [1]

[1] REPAIR PARTS PROVISIONED FOR INTERMEDIATE MAINTENANCE.

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Figure 5-45. Nose Landing Gear Door Bungee

Materials List

Lubricant (Silicon, 200 centistokes)	VV-D-1078
Primer, Zinc-chromate	MIL-P-8585 or TT-P-1757
Solvent, Dry-cleaning	P-D-680, Type II

1. Examine all components of bungee for general condition. If any serious damage exists, discard bungee.

2. Lubricate or replace spring, as necessary. If additional lubrication is required, remove dry film lubricant using crocus cloth (P-C-458) and coat spring with VV-D-1078 200 centistokes silicon lubricant.

Note

Spring free length should be 6 inches.

3. Check rod end bearing (5) for radial wear. Inspect threads on rod end bearing and check nut (4) for damage.

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

4. Clean end fitting and rod end bearings (1, 5) with dry-cleaning solvent (P-D-680, Type II) and lubricate with MIL-L-7870.

5. Spot-paint any nicked or scratched exterior surfaces with zinc-chromate primer.

5-276. ASSEMBLY. When all components are cleaned and inspected, assemble bungee as follows:

Materials List

Rivets	AN470AD5

1. Install piston in housing.

2. Insert spring and compress with end fitting.

3. Install two rivets in end fitting through housing.

4. Install check nut and rod end bearing.

5. Bench test to assure axial load of 50 to 95 pounds to initiate compression of bungee spring.

5-277. ADJUSTMENT. Adjust the rod end bearing until the length of bungee from center of end fitting bolt hole to center of rod end bearing bolt hole is 12.25 inches. Tighten check nut against rod end bearing.

5-278. NOSE LANDING GEAR UPLOCK BUNGEE (300-345021).

5-279. Intermediate maintenance for the nose gear uplock bungee consists of disassembly, inspection, assembly, and adjustment procedures. See figure 5-46 and proceed as follows:

1. Remove rod end and check nut.

2. Remove two rivets and remove end fitting.

3. Insert a wooden dowel in end of housing to apply pressure to middle bushing, and remove two rivets holding middle bushing.

4. Remove middle bushing and spring.

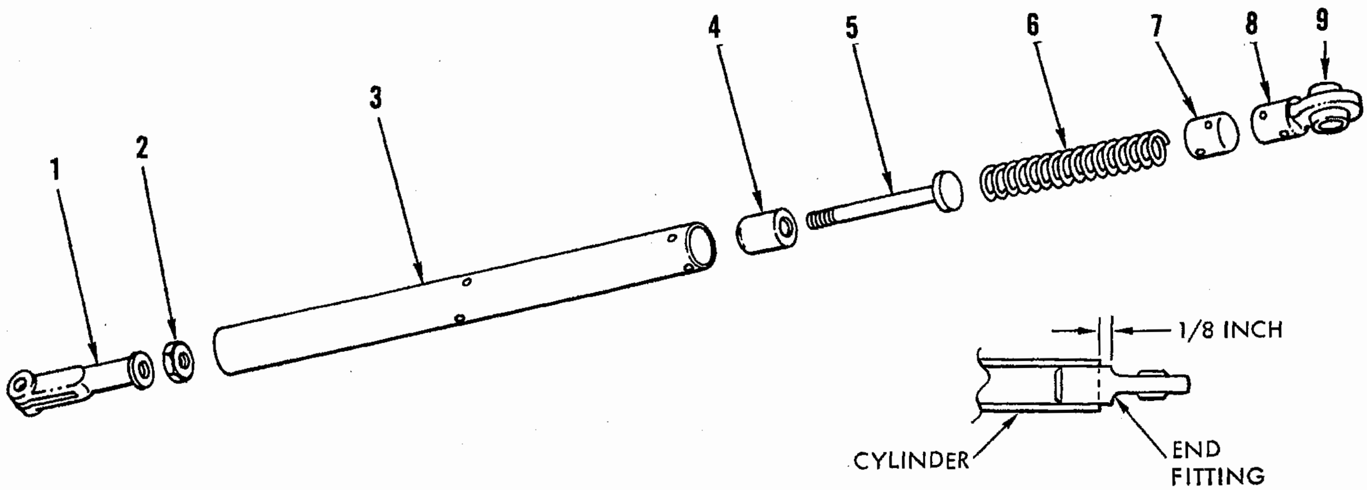
5. Remove piston from cylinder.

5-280. INSPECTION. Inspect all bungee components as follows:

1. Clean and examine all bungee components for general condition. If any serious damage exists, discard bungee.

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.



1 ROD END [1]
2 CHECK NUT [1]
3 CYLINDER
4 BUSHING
5 PISTON
6 SPRING [1]
7 BUSHING
8 END FITTING
9 BEARING [1]

[1] REPAIR PARTS PROVISIONED FOR INTERMEDIATE MAINTENANCE.

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Figure 5-46. Nose Landing Gear Uplock Bungee

2. Clean end fitting bearing (9) with dry-cleaning solvent (P-D-680, Type II) and lubricate with MIL-L-7870.

3. Check rod end and end fitting bearing for elongated holes, cracks, and the bearing to be secure, and free of corrosion.

Note

If end fitting bearing must be replaced, refer to paragraph 2-189 for bearing replacement procedures.

4. Examine interior and exterior of cylinder for cracks, or dents that would hinder the smooth movement of piston and/or spring. If present, discard bungee.

5. Inspect spring to be free of corrosion.

Note

Spring free length should be 4 inches.

6. Lubricate or replace spring, as necessary. If additional lubrication is required, remove dry film lubricant using crocus cloth (P-C-458) and coat spring with VV-D-1078 200 centistokes silicon lubricant.

5-281. ASSEMBLY. To assemble the bungee, proceed as follows:

Materials List

Rivet	AN470AD4

1. Insert piston into cylinder and install check nut and rod end.

2. Insert spring and middle bushing into cylinder.

3. Use a wooden dowel and compress spring and line up bushing rivet holes with holes in cylinder.

4. Install two rivets through cylinder and bushing.

Note

Rework of the 300-345021 bungee to incorporate a C change consists of the following:

(a) Remove rivets from end fitting.

(b) Slide end fitting from cylinder 1/8 inch (figure 5-46) so as to make the bungee total length 1/8 inch longer.

(c) Rotate end fitting 45 degrees, to allow more edge distance for the new holes.

(d) Drill new holes through the end fitting using the existing cylinder holes as a template.

(e) Install two rivets through the cylinder and end fitting.

5. Position end fitting as necessary and install two rivets (AN470AD4).

6. Bench test to assure axial load of 25 to 50 pounds to initiate compression of fully extended bungee.

5-282. ADJUSTMENT. Adjust free length of bungee by adjusting rod end to provide 14.13 inches from center of rod end hole to center of bearing hole. Tighten rod end check nut.

5-283. NOSE LANDING GEAR DRAG BRACE (ACTUATOR) - (300-345001).

5-284. The nose landing gear drag brace is a lineal actuator operating on 1500 psi hydraulic pressure. It also incorporates the downlock cylinder and downlock switch assemblies.

5-285. DISASSEMBLY. To disassemble the nose landing gear drag brace, see figure 5-47 and proceed as follows:

1. Remove cotter pin, washer (1), and pin (2) at switch arm.

2. Remove cotter pin, washer (3), and pin (4) at switch clevis (5).

3. Disassemble switch clevis by removing nut (6) and switch rod (7).

4. Remove cotter pin, washer (8), and pin (9) from switch link.

5. Remove spring pin (10) from switch trigger (11).

6. Remove cotter pins, washers (12), and pins (13) from switch fitting.

7. Remove cotter pins, washers (15), and pins (16) from two places on switch fitting (17).

8. If required, the switch assembly may be disassembled as follows:

a. Loosen bolt (19) and slide switch arm (20) off of splined switch shaft.

b. Remove spring (21).

c. Remove nuts (18) from switch and slide switch (22) from bracket (23).

9. Unscrew guide (24) and remove spring (25), pin (26), washer (27), retainers (28), and packing (29) from cap (36).

10. Unscrew pin housing (30) from cap (36) and remove spring (31), lock pin (32), retainers (33), and packing (34).

11. Cut lockwire and remove locking clip (35).

12. Unscrew cap (36) from cylinder (52).

13. Remove packing (37) from cap (36).

14. Unscrew nut (38) from cylinder (52).

15. Unscrew rod end (39) from piston (42) and remove check nut (40) and lock washer (41).

16. Remove piston (42) from cylinder (52) and remove retainers (43) and packing (44).

17. Remove retainer (45) from cylinder (52).

18. Remove wiper ring (46), scraper (47), plain washer (48), felt washer (49), retainers (50), and packing (51) from cylinder (52).

5-286. CLEANING. To clean the nose landing gear drag brace, proceed as follows:

Materials List

Lubricant	MIL-L-7870
Solvent, Dry-cleaning	P-D-680, Type II

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

1. Using a soft-bristled brush, clean all parts in dry-cleaning solvent (P-D-680, Type II).

2. Dry with dry, compressed air.

3. Lubricate bearings with MIL-L-7870.

4. If nose landing gear drag brace cylinder requires exterior corrosion rework, refer to paragraph 5-288.

5-287. INSPECTION. If a part does not meet the following inspection requirements, it must be replaced, unless an applicable repair procedure is provided for the specific part.

Tools and Equipment List

Tester, Spring Resiliency	Type PB4-D (or equivalent)
Tester, Spring (torsion 0 to 10 pounds)	Local Manufacture

Materials List

Lubricant (Silicon, 200 centistokes)	VV-D-1078
Adhesive, Oil-resistant	EC1357 (or equivalent)

1. Inspect all parts for damage, scratches, or nicks.

2. Ensure that all threads and sharp edges are free from burrs.

3. Examine bores and packing grooves for flaws and roughness.

4. Check general condition of piston for excessive wear. If repairs are required, refer to paragraph 5-289.

5. Check rod end bearing for security and wear. If bearing is loose or worn, the complete rod end must be replaced.

6. Check security of nameplate. If loose, apply EC1357 oil-resistant adhesive (or equivalent) to surface next to cylinder in accordance with manufacturer's instructions.

7. Replace all O-rings, packings, felt washers, and snap rings. Refer to Illustrated Parts Breakdown (NAVAIR 01-60GCB-4).

8. Check general condition of switch wires, bracket, and attaching hardware. If bracket is damaged, replace entire switch assembly.

9. Check general condition of spring (25), spring (31), and spring (21).

10. Check resiliency of spring (25), using resiliency tester (Type PB4-D or equivalent). Free length must be 1.22 (± 0.05) inches. Compress spring to 0.78 (±0.03) inch and note force. Force must be 15 (±2) pounds. If damaged, return entire assembly to Supply.

11. Check resiliency of spring (31), using resiliency tester (Type PB4-D or equivalent). Free length must be 2.00 (± 0.05) inches. Compress to 0.59 inch and note force. Force must be 155 (±5) pounds.

12. Lubricate or replace spring, as necessary. If additional lubrication is required, use VV-D-1078 200 centistokes silicon lubricant.

13. Check spring (21) as follows:

a. Using a 0.265-inch diameter rod and a suitable base, construct a torsion spring tester as shown in figure 5-48.

b. Draw axes at 90 degrees to each other.

c. Draw lines F (30 degrees from axis Y), A (54° 30′ from axis Y), and B (85° from axis Y).

d. Place spring on rod with long arm of spring on base and staple arm to base at axis X. The hooked arm should be at position F.

e. Deflect hooked arm twice from free position (line F) to line B. Release and check that free arm still aligns with line F.

f. Deflect free arm to position A and check for a force reading of 1.1 pounds with spring scale attached on vertical portion of hook.

5-288. NOSE LANDING GEAR DRAG BRACE CYLINDER (300-345002) CORROSION REWORK LIMITS. If the cylinder is corroded in the area of the clamp (STU12-218-4AS), rework limits and surface treatment are as follows:

1. Remove corrosion by blending over area up to 1.25 inches wide and not to exceed maximum of 0.035 inch depth from original surface. Surface finish of blended area to be 63 rms or smoother. Direction of blend rework should be parallel to axis of cylinder. For general corrosion removal requirements, refer to paragraph 2-155 and to Corrosion Control for Aircraft Handbook (NAVAIR 01-1A-509). Apply a chemical conversion treatment (alodine) (MIL-C-5541) and touch up paint in accordance with Structural Repair Manual (NAVAIR 01-60GCB-3).

2. After paint has dried, mask off clamp installation area and apply a brush coat of one-half sealant 10 to 15 mils thick (MIL-S-8802, Class A). Remove masking before the coating cures. Allow to cure until tack-free and reinstall clamp.

5-289. REPAIRS TO PISTON (See item 42, Figure 5-47).

1. Minor defects of the chrome-plated surface of the rod end, such as scoring or localized wear, may be blended out by polishing, buffing, or stoning to restore the surface finish of AA16 microinches, within the limit of 1.183-inch minimum finish rod diameter. Remove the minimum chromium plating necessary to blend the surface and avoid penetration to base metal.

2. Surface defects on the shaft end of piston, which cannot be removed in accordance with step 1, shall be removed by machine grinding the minimum amount to remove the defects.

3. If the chrome plating has been penetrated to expose the base metal, the plating must be completely removed by grinding and the shaft processed in accordance with the following steps.

4. Magnetic particle inspect in accordance with Specification MIL-I-6868. Cracks shall not be acceptable.

5. Shot peen ground surfaces in accordance with Specification MIL-S-13165. Peen with S-330 shot to an intensity of 7-A2 on the shaft end of surface only, masking 2.062 inches of the head end and the internal threads, but peen the 0.12-inch radius transition from piston shaft to head.

6. Chrome plate the outside diameter surface in accordance with Specification QQ-C-320a, Class 2C to a sufficient thickness to allow grinding to a finish diameter of 1.183 to 1.184 inches.

7. Immediately following chrome plating (within 1 hour), bake at a temperature of 126.67°C to 143.33°C (260° to 290°F) for a minimum of 5 hours.

8. Clean and protect the interior as follows:

a. Mask the complete exterior surface and the interior threads. Vapor blast the interior cavity (0.875- to 0.873-inch inside diameter) to remove the old primer and any corrosion.

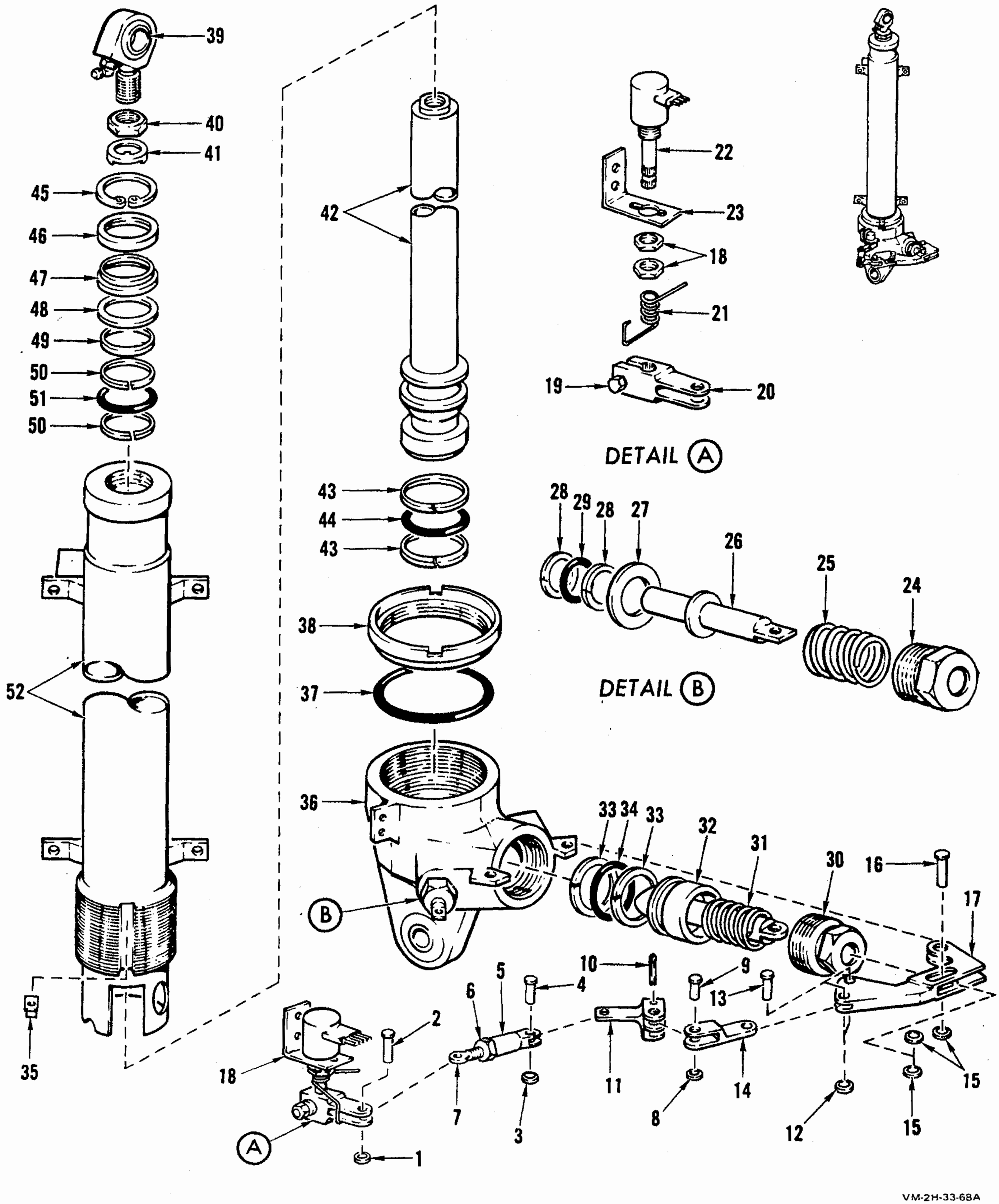

Figure 5-47. Nose Landing Gear Drag Brace (Actuator)

KEY TO FIGURE 5-47

1	WASHER	15	WASHERS	29	PACKING	43	RETAINER
2	PIN	16	PIN	30	PIN HOUSING	44	PACKING
3	WASHER	17	SWITCH FITTING	31	HELICAL SPRING	45	RETAINER
4	PIN	18	NUT	32	LOCK PIN	46	WIPER RING
5	SWITCH CLEVIS	19	BOLT	33	RETAINER	47	SCRAPER
6	NUT	20	SWITCH ARM	34	PACKING	48	PLAIN WASHER
7	SWITCH ROD	21	SPRING	35	ROTATION LOCK	49	FELT WASHER
8	WASHER	22	SWITCH	36	CAP	50	RETAINER
9	PIN	23	SWITCH BRACKET	37	PACKING	51	PACKING
10	PIN	24	GUIDE	38	NUT	52	CYLINDER
11	SWITCH TRIGGER	25	COMPRESSION SPRING	39	ROD END		
12	WASHER	26	PIN	40	CHECK NUT		
13	PIN	27	WASHER	41	LOCK WASHER		
14	SWITCH LINK	28	RETAINER	42	PISTON		

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b. Thoroughly rinse the affected inside diameter of the piston (42) with an approved solvent and dry with compressed air.

c. Coat the interior cavity with two coats of zinc chromate primer conforming to Specification MIL-P-8585 or TT-P-1757.

9. Grind the chrome-plated shaft end of the piston to a diameter of 1.184 to 1.183 inches and a finish of AA16 microinches, maintaining a concentricity of 0.003-inch TIR with the 1.871- to 1.870-inch major outside diameter of the piston head.

10. Immediately following the grinding operation of step 9 (within 1 hour), bake at a temperature of 126.67° to 143.33°C (260° to 290°F) for a minimum of 5 hours.

5-290. ASSEMBLY. To assemble the nose landing gear drag brace, see figure 5-47 and proceed as follows:

Materials List

Fluid, Hydraulic	MIL-H-5606
Lockwire	
(0.032-inch diameter steel)	MS20995F32
(0.041-inch diameter steel)	MS20995F41

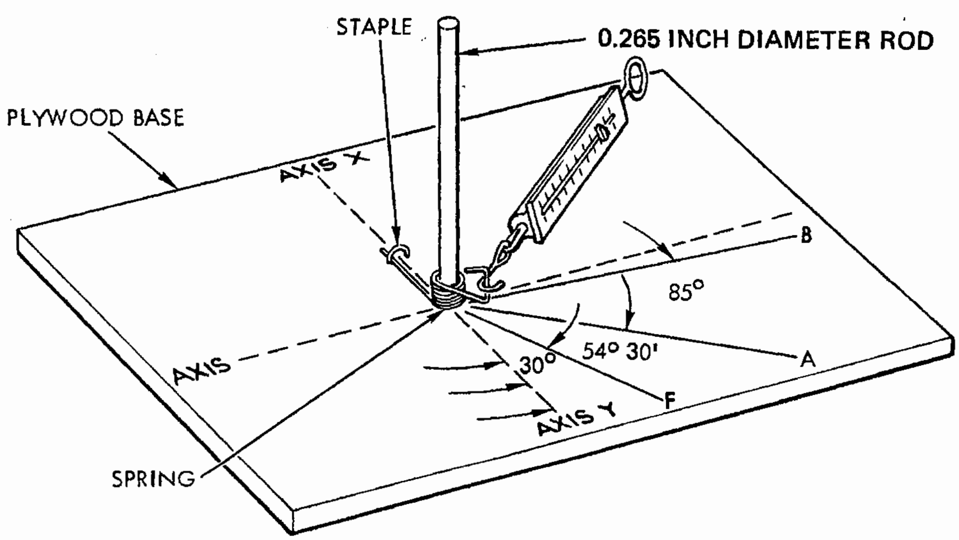


Figure 5-48. Testing Nose Landing Gear Downlock Switch Spring

Materials List (Cont)

Pins, Cotter	MS24665-227
Packing	MS28775-010
Packing	MS28775-218
Packing	MS28775-329
Packing	MS28775-325
Packing	MS28775-217
Retainer	MS28774-010
Retainer	MS28774-218
Retainer	MS28774-325
Retainer	MS16625-1168
Retainer	MS28774-217

1. Lubricate all packings, retainers, O-rings, and felt washers with hydraulic fluid (MIL-H-5606).

2. With cylinder (52) properly supported, install packing (51) and retainers (50) in second groove of cylinder.

3. Install felt washer (49), plain washer (48), scraper (47), wiper ring (46), and ring (45) in first groove of cylinder.

4. Install packing (44) and retainers (43) on piston (42).

5. Install piston (42) in cylinder (52) and install lock washer (41), check nut (40), and rod end (39) on piston. Do not tighten check nut at this time.

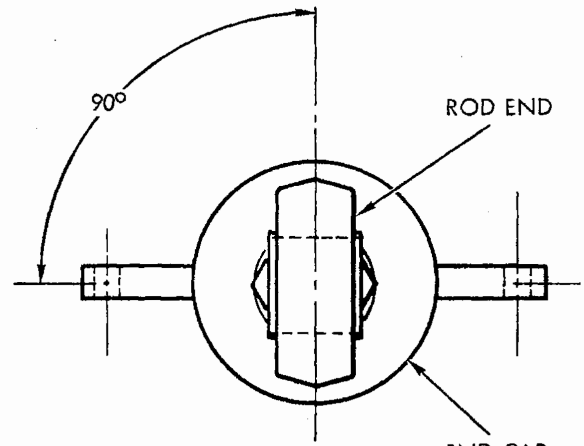
6. Install nut (38) on cylinder with chamfered side facing outward.

7. Install packing (37) in cap (36).

8. Install cap (36) on cylinder (52) and tighten until cap bottoms out. Back off up to one full turn to align cap with cylinder.

9. Install lock (35) in cylinder groove, tighten nut (38) against cap (36) and lock (35) and safety with lockwire (MS20995F41).

10. Install retainers (33) and packing (34) on lock pin (32).



Step 8—Para. 5-290

11. Install spring (31) on lock pin (32).

12. Insert lock pin in end cap and install lock pin housing (30). Tighten until lock pin housing bottoms out and safety with lockwire (MS20995F32).

13. Install retainers (28), packing (29), and washer (27) in end cap hole.

14. Install indicator pin (26), compression spring (25), and indicator guide (24). Tighten guide until it bottoms out and safety with lockwire (MS20995F32).

15. Position downlock switch (22) on bracket (23) and install nuts (18) on switch.

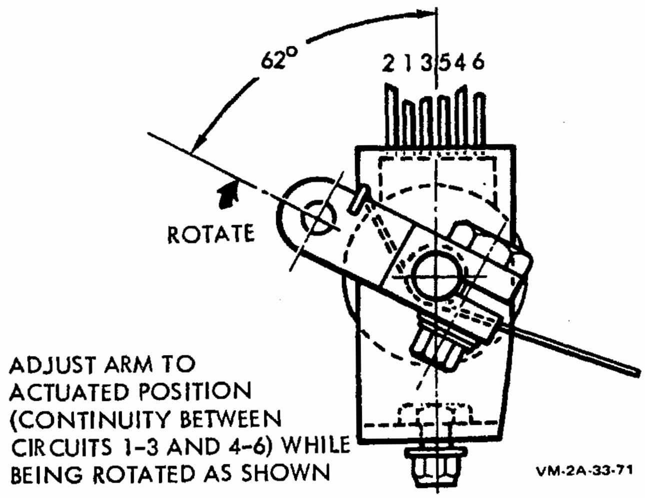
16. Install spring (21) with hooked arm away from switch body.

17. Install switch arm (20) as shown. Tighten bolt (19).

18. Install switch bracket (23) on end cap (36).

19. Install switch fitting (17), using pin (16), and washers (15). Install cotter pin (MS24665-227).

20. Install pin (13) and washer (12) through switch fitting and end cap. Install cotter pin (MS24665-227).



Step 17—Para. 5-290

21. Install switch link (14) in switch fitting (17), using pin (13), washer (12), and cotter pin (MS24665-227).

22. Install switch trigger (11) on switch link (14), using pin (9), washer (8), and cotter pin (MS24665-227).

23. Install switch trigger (11) on indicator pin (26), using spring pin (10).

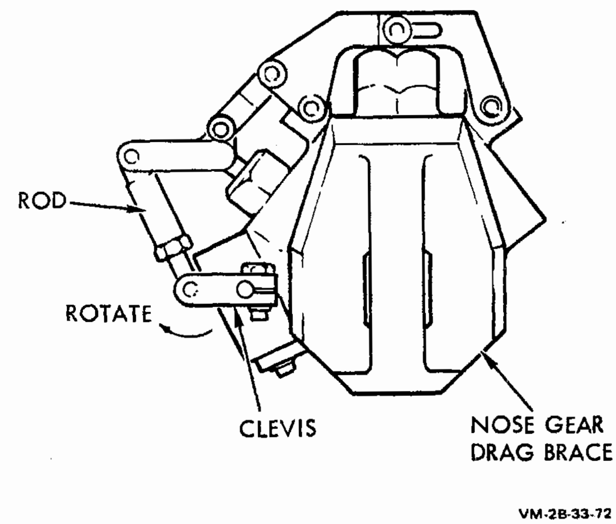
24. Install nut (6) on rod (7) and install on clevis (5).

25. Install clevis assembly on switch trigger (11), using pin (4), washer (3), and cotter pin (MS24665-227).

26. With drag brace assembly fully compressed and downlock engaged, adjust rod (7) and clevis (5) so that switch actuates when rotated as shown. Shorten rod (7) two full turns.

27. Install rod (7) in switch arm (20), using pin (2), washer (1), and cotter pin (MS24665-227).

28. Test downlock portion to assure lockpin load of 80 to 120 pounds to initiate retraction of the extended lockpin.



Step 26—Para. 5-290

5-291. ADJUSTMENT. Since the rod end (39) must be adjusted when the drag-brace assembly is installed, the rod end should not be adjusted at intermediate maintenance activities, nor will it be necessary to safety the rod end check nut or lock washer.

5-292. TESTING. Using a 1500-psi hydraulic pressure source, cycle nose landing drag-brace assembly five complete cycles and check for the following:

Tools and Equipment List

Test Stand, Hydraulic	(S-610)

1. Assembly must operate smoothly.

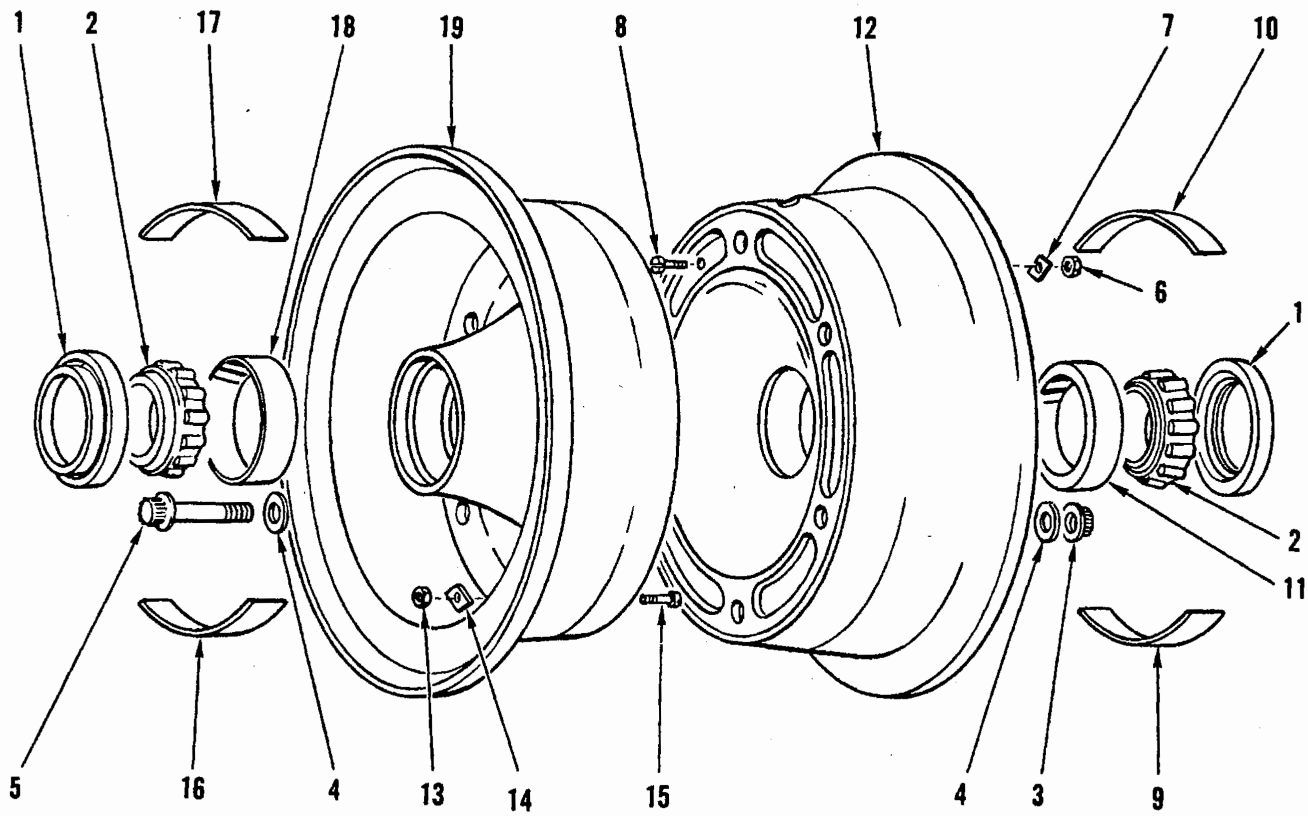
2. There should be no evidence of leakage.

3. Switch linkage must operate freely.

After test, drain all fluid from cylinder and install plugs and dust caps on all open ports.

5-293. NOSE LANDING GEAR WHEEL (3-1200).

5-294. The nose landing gear wheel (figure 5-49) is a split-type wheel designed for use with a 7.50-



1 SEAL (TWO)
2 BEARING CONE (TWO)
3 NUT (SIX)
4 WASHER (TWELVE)
5 BOLT (SIX)
6 NUT
7 BALANCE WEIGHT - 1/4 OUNCE
8 SCREW
[1] 9 INSTRUCTION PLATE (TWO)
[1] 10 IDENTIFICATION PLATE (TWO)
11 BEARING CUP
[1] 12 OUTER WHEEL HALF
13 NUT
14 BALANCE WEIGHT - 1/4 OUNCE
15 SCREW
[1] 16 INSTRUCTION PLATE
[1] 17 IDENTIFICATION PLATE
18 BEARING CUP
[1] 19 INNER WHEEL HALF

[1] NOT PROVISIONED FOR INTERMEDIATE MAINTENANCE

VM-2H-33-48A

Figure 5-49. Nose Landing Gear Wheel Assembly

10, Type III, low-pressure, tubed tire. The wheel halves are forged aluminum and the nose landing gear wheel consists of the following parts: an inner and outer wheel-half assembly bolted together with six nuts (3) and bolts (5). Washers (4) placed beneath the nuts and boltheads prevent galling and stress concentrations. Each wheel-half assembly consists of the following common parts: bearing cups (11, 18) and cones (2), installed in the bearing bore of the wheel halves (6, 19); neoprene lip-type wheel seals (1) to protect the bearings against dirt and moisture contamination; balance weights (7, 14) fastened to the wheel halves with screws (8, 15) and nuts (6, 13) and identification (10, 17) and instruction (9, 16) plate decals. For additional information on wheel maintenance, refer to NAVAIR 04-10-1.

5-295. CHECKOUT. Visually check wheel assembly for loose, broken, or missing parts. Check tire inflation in accordance with General Information and Servicing Manual (NAVAIR 01-60GCB-2-1). For general tire changing and repair, refer to Inspection, Maintenance Instructions, Storage, and Disposition of Aircraft Tires and Inner Tubes (NAVAIR 04-10-506).

Note

The nose wheel should be replaced when any portion of the area between the tire ridges makes contact with the runway or taxiway. Red core shall not be used as removal criteria.

5-296. DISASSEMBLY. To disassemble the nose landing gear wheel assembly, see figure 5-49 and proceed as follows:

Tools and Equipment List

Bead Breaker	Model 5033

CAUTION

Disassemble wheel on a clean, flat surface to prevent nicking or gouging the wheel halves.

1. Remove seals (1) and cones (2) from wheel-half bearing bores.

2. Remove valve cap and completely deflate tire by removing valve core.

WARNING

Ensure that tire is completely deflated and break beads before loosening tie bolts to prevent damage or injury caused by flying parts under air pressure.

CAUTION

Use bead breaker instead of tire irons to loosen tire beads from wheel flange to lessen probability of damage.

3. Remove nuts (3), washers (4), and bolts (5).

4. Separate wheel halves (12, 19) and remove tire.

5. Remove nut (6), balance weight (7), and screw (8) only if balance weights are damaged.

6. Remove plates (9, 10) only if damaged or illegible.

7. Lay wheel-half on a suitable work surface, hub up.

8. Check bearing cups (11, 18) for visual damage. If damaged, return entire assembly to Supply.

9. Remove nuts (13), balance weights (14), and screws (15).

10. Remove plates (16, 17) only if damaged or illegible.

5-297. CLEANING. To clean the components of the nose landing gear wheel, proceed as follows:

Materials List

Alcohol, Isopropyl	TT-I-735A
Solvent, Dry-cleaning	P-D-680, Type II

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

1. Clean metal parts, except bearings, with dry-cleaning solvent (P-D-680, Type II), using a stiff-bristle brush to remove foreign deposits.

2. Remove all chipped, blistered, cracked, or loose paint.

3. Air-dry all parts after cleaning.

4. Degrease bearings as follows:

CAUTION

Wear clean rubber gloves to prevent corrosion caused by handling bearings with bare hands. Handle bearings carefully to avoid contact with dirt, dust, moisture, or other contaminants.

a. Soak bearings in dry-cleaning solvent (P-D-680, Type II) for 5 minutes.

CAUTION

Do not spin bearings while drying with compressed air.

b. Remove bearings from solvent and air-dry with clean, compressed air.

c. Wash in clean solvent, rotating bearing by hand while it is submerged.

d. Remove bearing from solvent and rinse in isopropyl alcohol (TT-I-735A).

e. Air-dry for 5 minutes.

5-298. INSPECTION. To inspect the components of the nose landing gear wheel assembly, refer to table 5-11.

Tools and Equipment List

Magnetic Particle or Eddy Current Inspection Equipment	Refer to NAVAIR 01-1A-16
Penetrant Inspection Equipment	Refer to NAVAIR 01-1A-16

5-299. REPAIR. Both wheel halves will be discarded if either half is condemned for fatigue, cracks, fire damage, or corrosion. Refer to table 5-11. When a wheel-half is condemned due to minor surface defects, the opposite half may be mated with an undamaged half. This assembly will be treated as the oldest wheel-half. To repair the components of the nose landing gear wheel assembly, see figure 5-49 and proceed as follows:

Materials List

Primer, Zinc-chromate	MIL-P-8585 or TT-P-1757

1. Replace all parts obviously damaged beyond repair and which do not meet inspection requirements.

2. Replace seals at each reassembly.

3. Hand-file minor surface blemishes to relieve all sharp corners that might cause stress concentrations. Remove tool marks with emery cloth.

CAUTION

Do not remove more than 0.020 inch below original surface in local areas for blending. Do not paint mating surface of wheel halves.

4. If protective coating has been defaced or scratched to bare metal, sand the affected area with

Table 5-11. Nose Landing Gear Wheel Inspection Table

PART NAME	TYPE OF INSPECTION	PROCEDURE	ACCEPTABLE DEFECTS
Plates	Visual	Inspect for legibility.	None
Screws and Washers	Visual	Inspect for cracks, corrosion, thread defect, and distortion.	None
Nuts and Bolts	Visual and magnetic particle or eddy current	Inspect for cracks, corrosion, thread defect, and distortion.	None
Cones and Cups	Visual	Inspect for cracks, corrosion, and surface defects.	None
Seal	Visual	Inspect for imbedded foreign matter, pliability, breaks, and distortion.	
Wheel Halves	Visual and penetrant*	Inspect for cracks and corrosion.	Minor surface defects repairable. See figure 5-50.
Seal Recess V	Visual	Inspect for corrosion, wear, enlargement.	Refer to paragraph 5-300.

*Perform dye-penetrant inspection following each 14 tire changes

emery cloth or a fine grade of sandpaper, then apply one coat of zinc-chromate primer (MIL-P-8585 or TT-P-1757).

5. For permissible repair and metal removal limits on wheel halves, see figure 5-50.

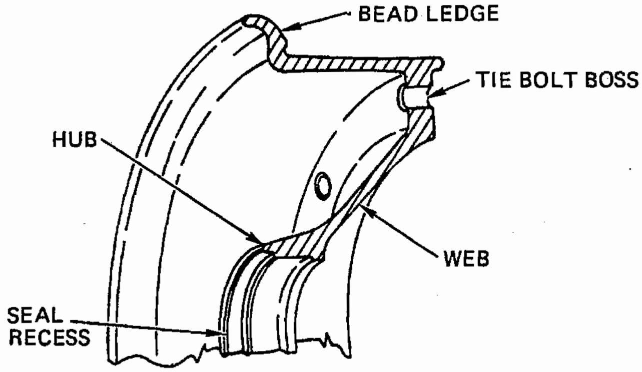
6. For repair of outer wheel half (10-1083), with rough or damaged valve stem hole, the original 0.625-inch wide by 0.94-inch long full radius slotted hole as required by Accessory Change No. 268 may be increased as necessary to 0.75-inch wide by 1.00-inch long full radius slotted hole to remove damage. Chamfer or radius hole edge 0.090 inch by 45 degrees or 0.09-inch radius. Break all sharp edges.

5-300. REPAIR OF NOSE LANDING WHEEL SEAL RECESS. If the seal recess area in either the outer or inner wheel half (figure 5-49, index numbers 12 and 19) has become enlarged so that it exceeds 2.876 inches, proceed as follows:

Materials List

Alodine 1200	MIL-C-5541
Devcon "F"	NSN 8030-00-670-8553 (93648)

1. Machine seal area to the minimum ID required to remove worn or damaged areas, maintaining a diameter of 2.885 to 2.925 inches. Surface finish shall be RMS 125 to RMS 250.



DAMAGED AREA	CAUSE OF DAMAGE	METHOD OF REPAIR	ALLOWABLE MATERIAL REMOVABLE	MAXIMUM DAMAGE ALLOWED AFTER REPAIR
BEAD LEDGE	CORROSION AND/OR NICKS	BLEND	0.020-INCH BELOW ORIGINAL SURFACE	NONE
HUB	CORROSION AND/OR NICKS	BLEND	0.020-INCH BELOW ORIGINAL SURFACE	NONE
WEB	CORROSION AND/OR NICKS	BLEND	0.020-INCH BELOW ORIGINAL SURFACE	NONE
TIE BOLT BOSS	FATIGUE	NONE	NONE	NONE
SEAL RECESS	WEAR, CORROSION, SEAL ROTATION	SEE PARA. 5-300	MAX I.D. 2.925 INCH BEFORE REPAIR	NONE

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Figure 5-50. Inspecting Nose Landing Gear Wheel Halves

2. Treat machined surface of seal recess with Alodine 1200, (MIL-C-5541), in accordance with NAVAIR 01-60GCB-3.

3. Apply Devcon "F" (aluminized epoxy sealing compound) to the machined seal recess according to manufacturer's instruction.

Note

Apply sufficient pressure to the layer of Devcon "F" material in contact with the machined areas to ensure complete contact between the Devcon and the metal.

4. Wipe off any excess Devcon "F."

5. Cure in oven at 150°F for 1 1/2 hours, or at room temperature for 3 to 4 hours.

6. Machine the hardened Devcon "F" to ID of 2.874 to 2.876 inches.

7. During reassembly of wheel, install seal (figure 5-49, index number 1) in accordance with step 8 of paragraph 5-302.

5-301. LUBRICATION. To lubricate the components of the nose landing gear wheel assembly, see figure 5-49 and proceed as follows:

Materials List

Grease	MIL-G-81322
Thread Compound, Antiseize	MIL-T-5544A

1. Before assembly, pack bearings with grease (MIL-G-81322) until grease starts to come out the opposite end. Wipe off excess grease.

2. If the wheel has been in storage for more than 90 days in extremely dry climate, repack bearings before installing wheel on aircraft; however, in normal climatic conditions, the wheel may be stored for 6 months before relubrication is required.

3. Before assembly, lubricate threads and bearing surfaces of bolts (5), washers (4), and nuts (3) with antiseize thread compound (MIL-T-5544A).

5-302. ASSEMBLY. To assemble the nose landing gear wheel assembly, see figure 5-49 and proceed as follows:

Tools and Equipment List

Torque Wrench	GGG-W-686

Materials List

Grease	MIL-G-81322
Thread Compound, Antiseize	MIL-T-5544A
Primer, Zinc chromate	MIL-P-8585 or TT-P-1757

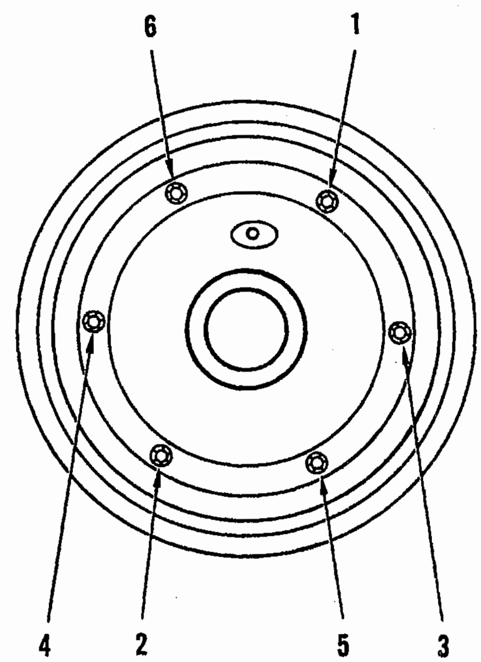
1. Install identification (17) and instructions (16) plates if they have been removed.

2. Install balance weights (14) with screws (15) and nut (13).

3. On outer wheel-half (12), install identification (10) and instruction (9) plates.

4. Fasten balance weight (7) to wheel-half (12) with screw (8) and nut (6).

5. Lubricate threads of bolts (5) and bearing surfaces of bolts (5), washers (4), and nuts (3) with antiseize thread compound (MIL-T-5544A). Mount tire with stripe on tube adjacent to dot on tire and fasten the wheel-half assemblies together with bolts (5), washers (4), and nuts (3). Lubtork nuts (3) to 250-260 inch-pounds. See figure 5-51 for tightening sequence.



NOTE: ALL VALUES ARE LUBTORK VALUES.

1. PRELIMINARY TORQUE: TIGHTEN TIE BOLTS IN SEQUENCE SHOWN TO 150 INCH-POUNDS.

2. FINAL TORQUE: TIGHTEN TIE BOLTS IN SAME SEQUENCE TO 250-260 INCH-POUNDS.

3. AFTER TIGHTENING TIE BOLT NUMBER 6, RECHECK ALL BOLTS FOR PROPER TORQUE.

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Figure 5-51. Nose Landing Gear Wheel Torquing Sequence

Note

The nose wheel tire should be replaced if worn down to the red layer or if the wheel shimmies, whichever comes first.

6. Lubricate bearing cones (2) with grease (MIL-G-81322A); then install cones and seal (1), pressing seal into place with wet zinc chromate primer (MIL-P-8585 or TT-P-1757).

5-303. ADJUSTMENT. Adjustment of the nose landing gear wheel is confined to rebalancing and matching of wheel halves.

5-304. BALANCE WEIGHTS. Normally, wheel balance weights should not be disturbed, since new wheels are balanced by the manufacturer. Wheels determined to be out of balance or which have missing or loose balance weights must be returned to depot level of maintenance for rebalancing. Refer to All Type Aircraft Wheels (NAVAIR 04-10-1).

5-305. MATCHED WHEEL HALVES. All nose landing gear wheels must be matched. A matched wheel is one in which the wheel halves have identical serial numbers and manufacture dates, except in the following instances:

1. Wheels on hand or received mismatched must be dismantled and matched to other wheel halves with a manufacture date within 12 calendar months and maintained in that condition for the remainder of the service life of the oldest wheel-half.

2. Wheel halves without manufacture date and matched with a wheel with a manufacture date will be maintained as a matched set, returned to service, and controlled by the wheel-half that has a manufacture date.

Note

All wheels on hand or received with matched wheel halves will be maintained as a matched set by manufacture date and serial number.

If one half of a matched wheel is condemned for fatigue, cracks, fire damage, or corrosion, both wheel halves must be condemned.

If one half of a matched wheel is condemned for minor surface defects, the opposite half may be mated with an undamaged half in accordance with the criteria of steps 1 and 2.

SECTION IV
DEPOT MAINTENANCE

5-306. GENERAL.

5-307. Depot maintenance of components of the landing gear system consists of checkout, disassembly, cleaning, inspection, repair, tolerance limits, assembly, adjustment, calibration, preservation, and shipment. In some instances, depot maintenance may include manufacture of parts, modification, testing, and reclamation of assemblies or subassemblies of the landing gear system components.

5-308. HYDRAULIC MANUAL CONTROL VALVE (LANDING GEAR SELECTOR VALVE-300-586102).

5-309. The valve (figure 5-52) has a designed operating pressure of 1500 psi. The thermal operation range is between –54° to +71°C (–65° to +160°F), utilizing hydraulic fluid (MIL-H-5606) as the operating medium. The valve is a four-way, two-position unit. Overall dimensions are 5.25 inches long by 1.50 inches high by 2.50 inches wide. The valve is used to control hydraulic power in the landing gear system. Refer to table 5-12 for valve assembly characteristics.

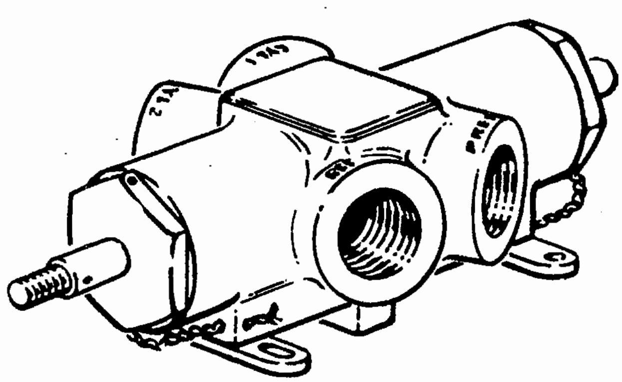


Figure 5-52. Hydraulic Manual Control Valve

5-310. DISASSEMBLY. To disassemble the valve, see figure 5-14 and refer to paragraph 5-161.

5-311. CLEANING. Clean the valve components in accordance with paragraph 5-162.

5-312. INSPECTION. Perform inspection of disassembled parts for wear tolerances and/or surface conditions requiring replacement of damaged parts as shown in table 5-2 and paragraph 5-163.

5-313. REPAIR. Minor thread damage may be repaired on parts with the careful use of a fine file. If thread repair results in a loose fit or misalignment of mating parts, replace with new part. Nicks and abrasions appearing on noncritical surfaces may be smoothed with crocus cloth (P-C-458). Replace all worn and distorted parts, marred threadlocks, and any part that does not fall within the limits of table 5-13.

Materials List

Cloth, Crocus	P-C-458

5-314. ASSEMBLY. Assemble the valve in accordance with paragraph 5-165.

5-315. TESTING. To test the valve, see figure 5-53 and proceed as follows:

Tools and Equipment List

Hydraulic Test Stand	Model 1395-10((FSCM 89307
Spring Scale (push-pull type)	719-2((FSCM 11710

Materials List

Hydraulic Fluid	MIL-H-560(
Hydraulic Fluid	MIL-H-608:

Table 5-12. Hydraulic Manual Control Valve Assembly Characteristics

Operating Pressure	1500 psi
Proof Pressure	2250 psi
Burst Pressure	3750 psi
Hydraulic Fluid	MIL-H-5606
Weight	.62 pounds
Overall Dimensions	5.25 inches long by 1.50 inches high by 2.50 inches wide
Temperature Range	-65° to $+160^{\circ}F$
Pressure Drop	25 psi maximum pressure to cylinder or cylinder to return at 3.5 gpm
Manual Force	5 pounds maximum from position 1 to 2 or position 2 to 1 with 1500 psi at pressure port
Leakage:	
External	Zero
Shaft Seal	One drop per 25 cycles each end.
Internal	8 cc/minimum; maximum at 1500 psi and -65° to $+160^{\circ}F$ under the following conditions: 1. From pressure to return with cylinder 1 to cylinder 2 ports capped. 2. From pressure to cylinder 2 with cylinder 1 open. 3. From pressure to cylinder 1 with cylinder 2 open.

Table 5-13. Hydraulic Manual Control Valve Wear Tolerances

PART NAME AND INDEX NO. (Figure 5-52)	CRITICAL SURFACE AND/OR DIMENSION (INCHES)	TOLERANCE OR ALLOWABLE WEAR	CONDITION REQ. REPLACEMENT OF PART
Controller Assembly Valve (12 and 13)	Controller O.D. 343 dia. with sleeve I.D. 343 dia.	0.0001 to 0.00015 diametrical clearance	Any scratches or score marks on lapped surface.
Controller, Valve (12)	Controller O.D. 0.2170 (+0.000/-0.001) with end caps I.D. 0.2190	0.0019 to 0.0031 diametrical clearance	Any score marks or dirt that might cause surface damage.
Rod, Actuating (10)	Rod O.D. 0.2170 (±0.000/ -0.001) end cap I.D. 0.2190	0.0019 to 0.0031 diametrical clearance	Any scratches, scoring, or dirt.

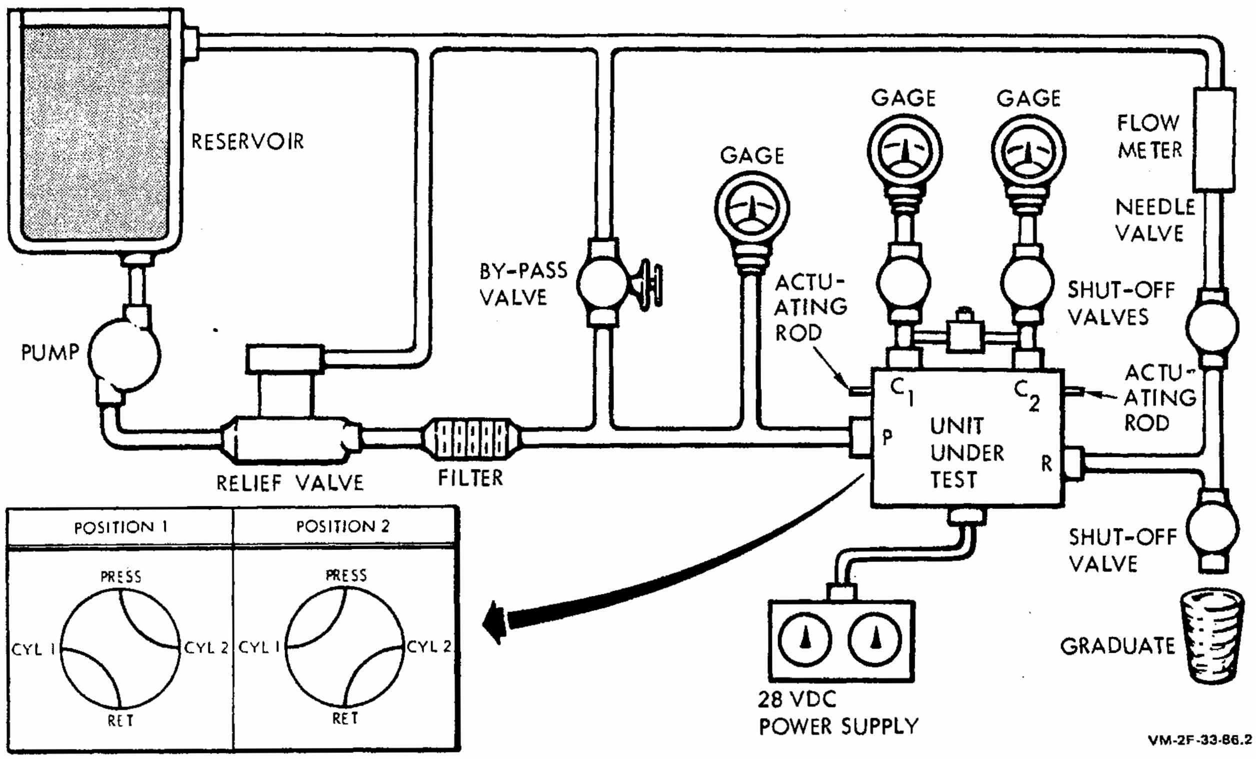


Figure 5-53. Hydraulic Manual Control Valve Test Setup

Note

All tests must be conducted at a fluid temperature of +21.1° to +43.3°C(+70° to +110°F). Use either hydraulic fluid (MIL-H-5606 or MIL-H-6083). If MIL-H-5606 is used, flush with MIL-H-6083 after test and drip drain. If MIL-H-6083 is used, drip drain after test. Flush valve thoroughly to remove air before testing and cap all ports immediately after testing.

CAUTION

The test and flush fluids shall be continuously filtered by a 10-micron absolute non-bypass filter located upstream of the test unit.

5-316. PROOF PRESSURE TEST.

1. Using the hydraulic test stand, apply a pressure of 2250 psi simultaneously to the pressure and return ports with both cylinder ports capped.

2. Maintain pressure for 2 minutes.

3. Check that there is no evidence of external leakage, failure, or permanent set.

5-317. ACTUATION TEST.

1. Using the hydraulic test stand, apply a pressure of 1500 psi to the pressure port with the return open and the cylinder ports connected to gages. See figure 5-53.

2. Conduct 25 cycles of operation.

3. Check that there is no evidence of binding. Leakage at each shaft shall not exceed one drop per 25 cycles of operation.

5-318. LEAKAGE TEST.

1. Using the hydraulic test stand, apply a pressure of 1500 psi to the pressure port with the return port open and both cylinder ports capped.

2. The leakage from the return port shall not exceed 6.0 cc/minute in position 1, or 6.0 cc/minute in position 2. See figure 5-53.

3. Leakage shall be measured after a 2-minute waiting period.

Note

Internal leakage shall not exceed 8 cc/minute at 71.1°C (160°F).

5-319. OPERATION TEST.

1. Using the hydraulic test stand, apply a pressure of 1500 psi to the pressure port with the return port connected to a flow meter (figure 5-53) and the cylinder ports looped with a needle valve installed between the two ports.

2. Open the needle valve to produce a flow of 3.5 gpm.

3. Using a spring scale, measure the force required to operate the valve from position 1 to position 2 or position 2 to position 1.

4. Force required shall not exceed 5 pounds.

5-320. TROUBLESHOOTING. If valve fails any of the previous tests, refer to table 5-14 and see figure 5-52 to determine probable causes and remedial maintenance actions.

5-321. PRESERVATION. Preserve the valve in accordance with directions contained in Preservation of Naval Aircraft for Shipment and Storage (NAVAIR 15-01-500).

5-322. MAIN LANDING GEAR COMPLETE SHOCK STRUT ASSEMBLY (1525B1000-01 OR 1525B1000-02).

5-323. The main landing gear complete shock strut assembly (figure 5-17) is a trailing-arm type landing gear which operates hydropneumatically to absorb ground impact. An internal metered orifice and spring-loaded pressure relief valve control shock absorption. The primary components are the shock strut, drag brace, axle beam, post, brace links, and actuator fitting. The shock strut incorporates a piston terminal, piston, cylinder, orifice, spring-loaded relief valve, packing adapter, gland nut, and air valve. Upon impact, the cylinder moves over the piston, forcing hydraulic fluid through the metered orifice into the piston chamber to absorb the energy. Pressurized air in the cylinder returns it to the extended position. Refer to table 5-3 for leading characteristics of the assembly.

Table 5-14. Troubleshooting Hydraulic Manual Control Valve

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: EXTERNAL LEAKAGE BETWEEN BODY (15) AND CAPS (5).		
Defective packing (8).	Check condition of packing.	Replace packing.
TROUBLE: EXTERNAL LEAKAGE BETWEEN CAPS (5) AND ACTIVATING ROD (10).		
Defective packing (6).	Check condition of packing.	Replace packing.
TROUBLE: INTERNAL LEAKAGE.		
Defective packing (14).	Check condition of packing.	Replace packing.
TROUBLE: BINDING, LAGGING, OR OTHER MALFUNCTION OF OPERATION OF VALVE.		
Defective controller valve assembly (12, 13).	Check condition of valve assembly.	Replace controller valve assembly.

5-324. CHECKOUT. To perform a checkout of the shock strut, proceed as follows:

Tools and Equipment List

Cylinder, Portable, Air	60A80D1
Dolly, Landing Gear Buildup	93034-64A-101

1. With the shock strut serviced with hydraulic fluid, secure the strut in a vertical or horizontal fully extended position.

2. Pressurize with air pressure of 490 psi and check that there is no evidence of fluid or air leakage for at least 1 hour.

3. Check that there is no leakage at joints where there are packings or motion.

5-325. DISASSEMBLY. To disassemble the main landing gear complete shock strut assembly, see figures 5-54 and 5-55 and proceed as follows:

Tools and Equipment List

Dolly, Landing Gear Buildup	93034-64A-101

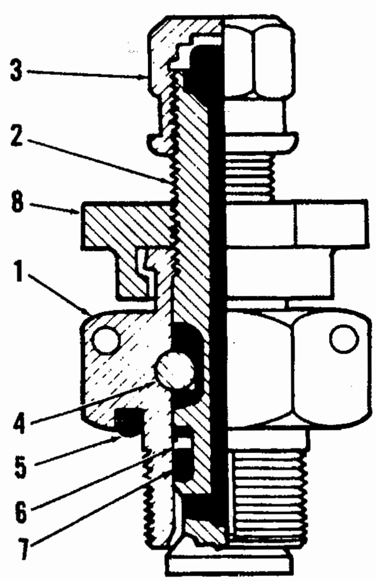


Figure 5-54. Air Charging Valve

Note

Bag or tag (do not steel stamp) all parts which are to be reused during assembly.

Discard all O-rings and backup rings.

1. Remove oil tag (1) from air valve (4).

2. Check security and legibility of identification plates (2) and name and instruction plate (3). Remove only if damaged.

WARNING

Serious injury could result if an attempt is made to remove air valve (4) or bleed plug (112) before releasing pressurized air.

3. Remove valve cap (3, figure 5-54) from air valve and slowly unscrew swivel nut (8) one-quarter turn (maximum). Allow all pressurized air to be released before proceeding with disassembly.

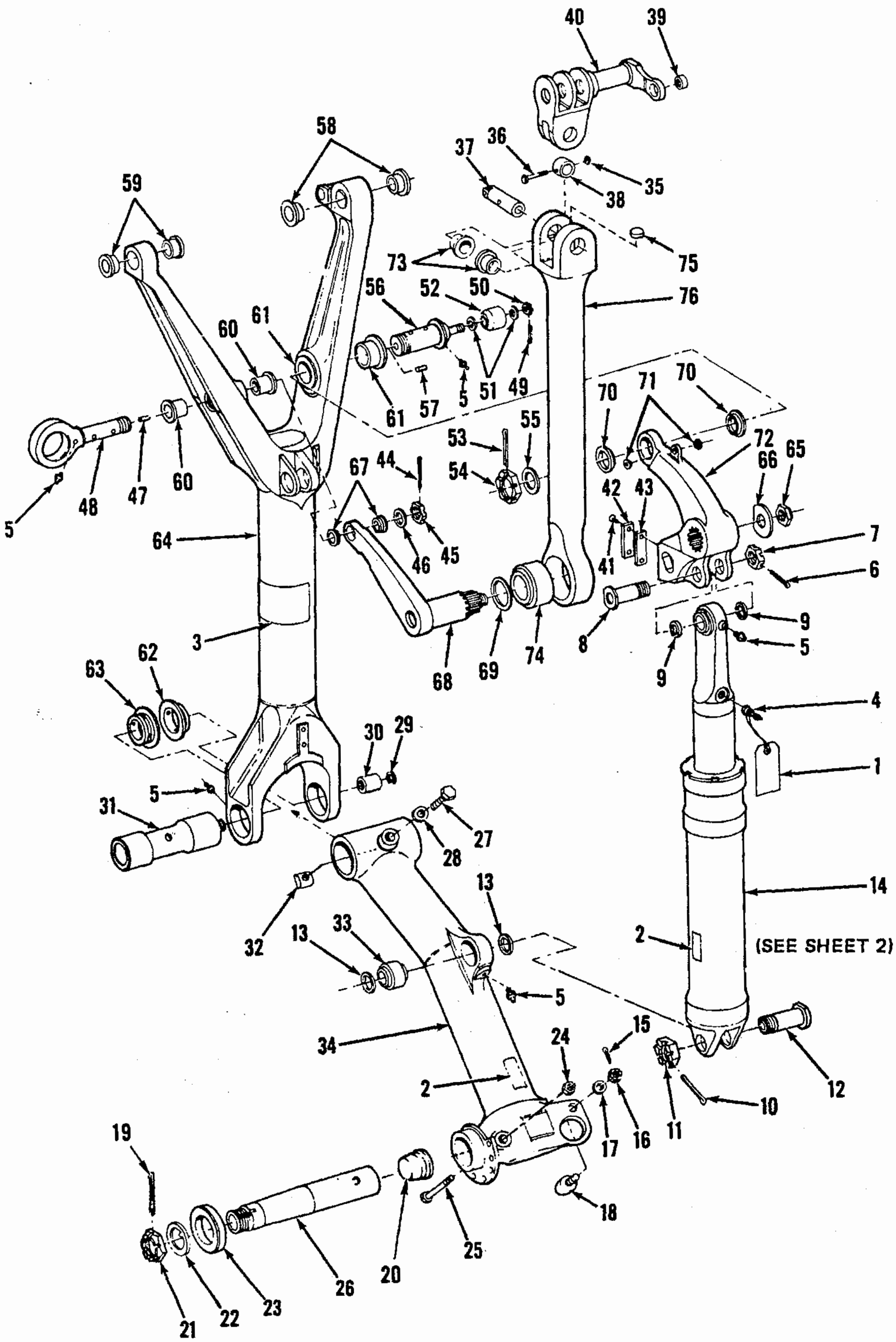
4. After all air pressure is released, retract strut, cut lockwire and remove air valve (4). Disassemble air valve and dispose of all O-ring packings and backup rings.

5. Remove bleed plug (37) and slowly drain the hydraulic fluid into a suitable container. Slowly compress the strut to facilitate fluid removal.

6. If damaged, remove lubrication fittings (5).

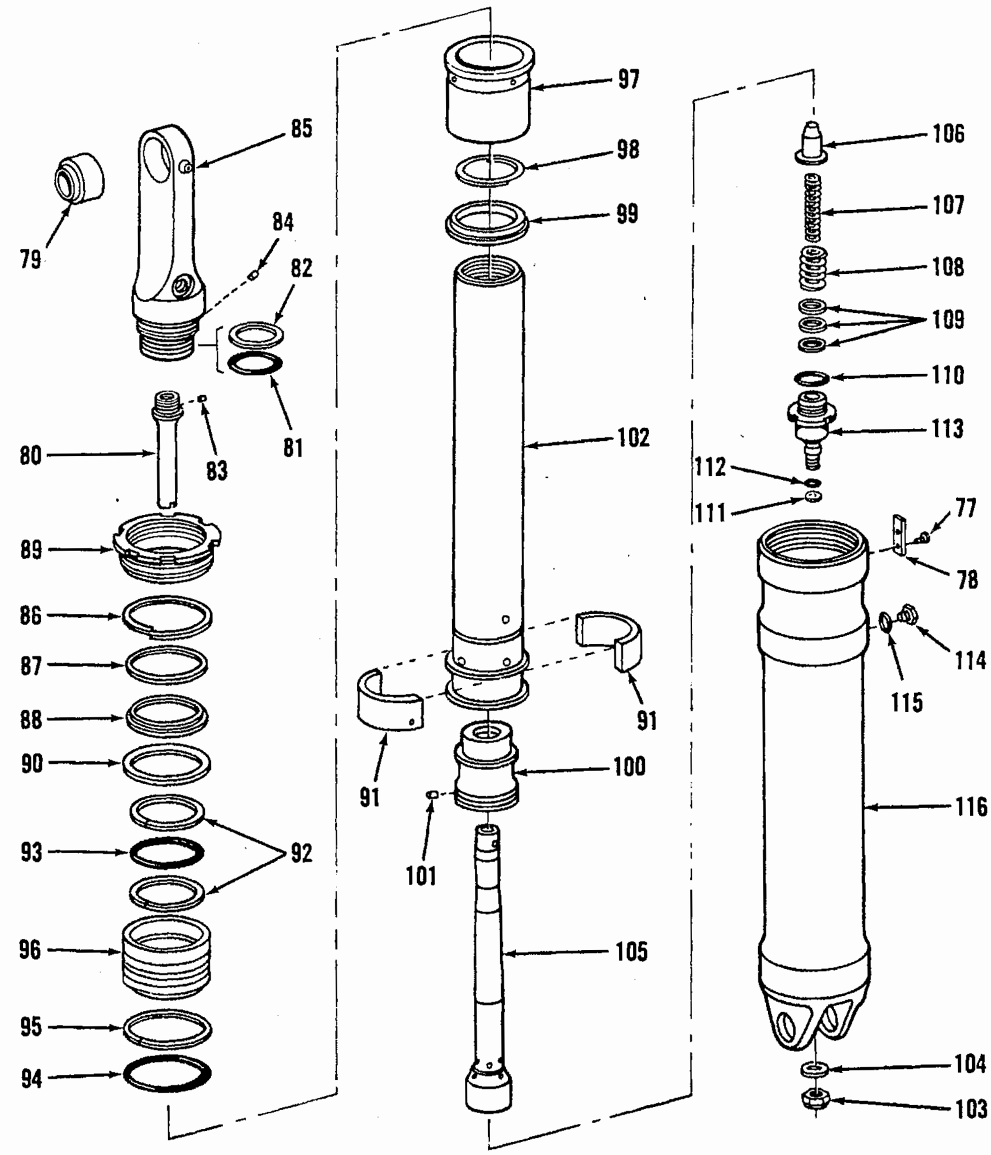
7. Remove cotter pin (6), nut (7), and oleo-to-link bolt (8). As the bolt is removed, retrieve spacers (9).

8. Remove cotter pin (10), nut (11), and oleo-to-axle beam bolt (12). Retrieve spacers (13) as shock strut (14) is removed from axle beam.



1 OIL TAG
2 IDENTIFICATION PLATE
3 NAME AND INSTRUCTION PLATE
4 AIR VALVE
5 LUBRICATING FITTING
6 COTTER PIN (MS24665-377)
7 NUT
8 OLEO TO LINK BOLT
9 SPACER
10 COTTER PIN (MS24665-374)
11 NUT
12 OLEO TO AXLE BEAM BOLT
13 SPACER
14 SHOCK STRUT ASSEMBLY
15 COTTER PIN
16 NUT
17 WASHER
18 JACK PAD
19 COTTER PIN (MS24665-379)
20 PIN
21 AXLE NUT
22 TANG WASHER
23 BEARING SPACER
24 NUT
25 BOLT
26 AXLE
27 BOLT
28 WASHER
29 RETAINING RING
30 UPLOCK ROLLER
31 PIVOT PIN
32 NUT
33 SPHERICAL BEARING
34 AXLE BEAM
35 NUT
36 BOLT
37 ACTUATOR FITTING PIN
38 ACTUATOR FITTING PIN SPACER
39 BEARING
40 ACTUATOR FITTING
41 SCREW
42 BEARING PLATE
43 BEARING PLATE SHIM
44 COTTER PIN (MS24665-377)
45 NUT
46 WASHER
47 PIN
48 TIE DOWN RING
49 COTTER PIN (MS24665-157)
50 NUT
51 WASHER
52 DOOR OPERATOR ROLLER
53 COTTER PIN (MS24665-311)
54 BRACE LINK PIN NUT
55 WASHER
56 PIN
57 BRACE LINK PIN
58 BUSHING
59 BUSHING
60 BUSHING
61 BUSHING
62 BUSHING
63 BUSHING
64 POST
65 NUT
66 WASHER
67 BUSHING
68 BRACE LINK
69 SPACER
70 BUSHING
71 BUSHING
72 OLEO BRACE LINK
73 BUSHING
74 BEARING ASSY
75 PLUG
76 DRAG BRACE

Figure 5-55. Main Landing Gear Complete Shock Strut Assembly (Sheet 1 of 2)



77 SCREW
78 TAB LOCK
79 SPHERICAL BEARING
80 FLUID LEVEL TUBE
81 O-RING PACKING (MS28775-224)
82 BACKUP RING (MS28774-224)
83 THREAD LOCK INSERT (1525-80A)
84 THREAD LOCK INSERT (1525-80A)
85 PISTON TERMINAL
86 SPIROLOX (UR281S)
87 RETAINING RING WASHER
88 SCRAPER RING
89 GLAND NUT
90 PACKING WASHER
91 SPLIT PISTON HEAD
92 BACKUP RING (MS28774-333)
93 O-RING PACKING (MS28775-333)
94 O-RING PACKING (MS28775-336)
95 BACKUP RING (MS28774-336)
96 PACKING ADAPTER
97 SPACER
98 SPIROLOX (RS25C)
99 RECOIL VALVE
100 ORIFICE
101 LOCK INSERT (1526-84)
102 PISTON
103 NUT
104 WASHER
105 METERING PIN
106 SHUTTLE VALVE
107 SMALL SPRING 1
1 108 LARGE SPRING
109 LAMINATED SHIM
110 O-RING PACKING (MS28775-021)
111 BACKUP RING (MS28774-014)
112 O-RING PACKING (MS28775-014)
113 VALVE HOUSING
114 BLEED PLUG
115 GASKET (MS28778-2)
116 CYLINDER

1 SOME MAIN LANDING GEAR STRUTS HAVE SPRINGS (107) AND (108) INSTALLED.
OTHER STRUTS HAVE SPRING (108) ONLY INSTALLED, BUT MAY REQUIRE SPRING (107) ADDITIONALLY IF SPRING (108) DOES NOT MEET TENSION REQUIREMENTS.

VM-2H-33-120A

Figure 5-55. Main Landing Gear Complete Shock Strut Assembly (Sheet 2 of 2)

Note

Store shock strut assembly horizontally on a parts rack. If it is to be stored for a lengthy period of time, wipe exposed portions with hydraulic fluid (MIL-H-5606) and wrap with paper or similar material to protect surfaces from marring.

9. If damaged, remove cotter pin (15), nut (16), washer (17), and jack pad (18).

10. If any of the axle components appear to be damaged, remove cotter pin (19), plug (20), nut (21), tanged washer (22), and spacer (23).

Note

The plug (20) is installed in the hollow axle to prevent entry of foreign matter and must be removed for component cleaning.

11. If axle is damaged, remove nut (24) and bolt (25) and slide axle (26) out of axle beam (34).

12. Remove bolt (27) and washer (28). This will permit barrel nut (32) to drop down in bore of pivot pin (31). This barrel nut is to be retrieved and retained with the nut and washer.

13. Remove retaining ring (29), uplock roller (30), and pivot pin (31). This will permit removal of complete axle beam assembly (34) from post (62).

14. Remove nut (35) from bolt (36) to permit removal of actuator fitting pin (37), actuator fitting pin spacer (38), and actuator fitting assembly (40).

15. If bearing plate is damaged, remove screw (41), bearing plate (42), and shim (43) from oleo brace link (70).

16. Remove cotter pin (44), nut (45), and washer (46) while holding tie-down ring (47). This will permit removal of the tie-down ring (47).

Note

A machined dowel pin (48) is installed in the tie-down ring (47) and does not normally require removal.

17. Remove cotter pin (49), nut (50), washers (51), and door-operator roller (52) from brace link pin assembly (56).

18. Remove cotter pin (53), brace link pin nut (54), and washer (55) from brace link pin assembly (56). Remove brace link pin assembly (56) from post (64).

Note

A machined dowel pin (57) is installed in the brace link pin assembly (56) and does not normally require removal.

19. Remove nut (65) and washer (66) and slide brace link (68) out of oleo brace link (72) while supporting drag (76). Retain spacer (69) with brace link (68).

20. Plug (75) does not have to be removed from drag brace (76) unless damaged.

21. Do not remove spherical bearings (33 and 79) **unless damaged or worn. Refer to paragraph 5-327.**

22. Do not remove bearing (39) or bearing assembly (74) unless damaged beyond limits. Refer to **paragraph 5-327 for wear limits.**

23. Do not remove any pressed bushings unless damaged or worn beyond limits specified in paragraph **5-327.**

24. Remove screw (77) and tab lock (78) from cylinder (116).

25. Back out piston terminal (85) and remove fluid level tube (80). Discard thread locks (83 and 84).

26. Remove and discard O-ring packing (81), backup ring (82), Spirolox (86), retaining ring washer (87), and scraper ring (88).

27. With gland nut (89), removed, remove and discard packing washer (90) and carefully slide piston assembly out of cylinder (116).

Note

Use care not to drop any parts as piston assembly is being withdrawn from cylinder.

28. Remove split piston heads (91), backup rings (92), O-ring packings (93 and 94), and backup ring (95). Discard all components except piston heads (91).

29. With packing adapter (96) and spacer (97) removed, remove and discard Spirolox (98).

30. Remove recoil valve (99) from piston (102).

31. Remove orifice (100) from piston (102). Remove and discard lock insert (101).

32. Remove nut (103) and washer (104) and relief valve and pin assembly (105 through 113) from cylinder (116).

WARNING

Take care to control installed spring force (approximately 210 pounds) against metering pin (105) and valve housing (113) during relief valve disassembly.

33. Remove and discard backup ring (111) and O-ring packing (112) from bottom of relief valve.

34. With relief valve assembly in a suitable holding device, carefully remove valve housing (113) from metering pin (105).

35. Remove shuttle valve (106) and retain it with metering pin (105) since these are matched components and cannot be interchanged.

36. Remove springs (107 and 108), O-ring packings (110 and 112), laminated shim, and backup ring (111).

Note

Main landing gear struts may have one or two springs installed. If the large spring does not meet proper tension requirements the small spring must be installed in addition to the large spring. Refer to step 8, paragraph 5-327.

37. If not previously removed, unscrew plug (114) and remove gasket (115) from cylinder (116).

5-326. CLEANING. To clean the disassembled main landing gear complete shock strut assembly, see figure 5-55 and proceed as follows:

Materials List

Paper, Wax	MIL-P-20311
Solvent, Dry-cleaning	P-D-680, Type II

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

CAUTION

All cleaning operations should be conducted in a well-ventilated, dry, clean (dust-free) room.

1. Wash all metal parts except air valve, axle beam bearings, actuator fitting bearings, and spherical bearing (5) with dry-cleaning solvent (P-D-680, Type II). A soft-bristle brush may be used to remove caked residues.

2. Ensure that all foreign matter is removed from internal surfaces of hollow parts.

3. Wipe air valve and bearings with a clean, lint-free cloth moistened with dry-cleaning solvent (P-D-680, Type II).

4. Allow excess solvent to drain from parts and dry with clean, dry, compressed air.

5. Wrap all cleaned parts in clean wax paper (MIL-P-20311) to prevent contamination.

6. Strip all lacquer from shock strut and other external components, using paint and lacquer remover (MIL-R-25134).

7. Flush in tap water to remove residues.

8. Dry parts thoroughly with compressed air.

5-327. INSPECTION. To inspect the disassembled main landing gear complete shock strut assembly, see figure 5-55 and proceed as follows:

Tools and Equipment List

Tester, Spring Resiliency	Type PB4-D

Materials List

Sulfate, Cupric (copper)	O-C-828

1. Visually inspect all threaded parts for corroded, stripped, or damaged threads.

2. Inspect packing grooves and adjacent areas for scratches, burrs, nicks, or other roughness which might damage packings.

3. Ensure that all parts are clean internally and externally.

4. Perform a nondestructive inspection on all aluminum and steel components in accordance with MIL-I-6866 and MIL-I-6868, respectively. Replace any component which does not meet inspection standards. See figure 5-20 for stress locations.

5. Check all bushings, rollers, and pivot points for noticeable wear. Ensure that all components are within tolerances. Refer to tables 5-15 and 5-16.

6. Inspect chrome-plated parts for wear-through of chrome as follows:

a. Swab plated surfaces with a saturated solution of cupric (copper) sulfate (O-C-828).

b. Thoroughly inspect plating; worn-through areas will collect a visible trace of copper.

c. For partial or complete chrome-plating repairs, refer to paragraph 5-329.

7. Check spherical bearing in axle beam assembly (33), bearing in actuator fitting assembly (39), bearing assembly (74), and spherical bearing (79) for impaired rotation and excessive radial and axial movement. If any of these bearings are worn or damaged, replace in accordance with instructions in paragraph 5-328.

Note

All bushings to be line reamed.

8. If recess for spherical bearing (79) in piston terminal (85) has become enlarged so that bearing is loose in recess, repair terminal (85) in accordance with paragraph 5-328.

9. Inspect large spring (108) for a free length of 2.00 ($\pm$0.03) inches. Deflect spring 0.125 inch and check for a 46-pound load, using PB4-D spring resiliency tester or equivalent.

Note

Main landing gear struts may have one or two springs installed. If the large spring does not meet proper tension requirements, the small spring must be installed in addition to the large spring.

10. Inspect small spring (107) for a free length of 3.00 ($\pm$0.03) inches. Compress spring to 2.588 ($\pm$0.030) inches and check for a load of 30 ($\pm$3) pounds, using PB4-D spring resiliency tester.

11. Reassemble relief valve and pin assembly but do not install shims (109).

Table 5-15. Tolerance and Limits

FIGURE 5-55 INDEX NUMBER	NOMENCLATURE AND WEAR AREA	ORIGINAL DIAMETER (INCHES)	WEAR TOLERANCE (INCHES)
8	Oleo-to-link bolt OD	0.9985 / 0.9971	–0.002
12	Oleo-to-axle beam bolt OD	0.9985 / 0.9971	–0.002
26	Axle–inner bearing OD	1.9995 / 1.9990	–0.002
26	Axle–outer bearing OD	1.6245 / 1.6240	–0.002
30	Uplock roller OD	0.875 / 0.870	–0.004
30	Uplock roller ID	0.503 / 0.506	+0.004
31	Pivot pin large OD	1.9990 / 1.9975	–0.003
31	Pivot Pin, OD at uplock roller	0.5001 / 0.4994	–0.003
37	Actuator fitting pin OD	0.9990 / 0.9975	–0.002
52	Door operator, roller OD	1.375 / 1.370	–0.005
57	Brace link pin, large OD	1.3740 / 1.3725	–0.002
57	Brace link pin, small end OD	0.4985 / 0.4975	–0.002
58	Bushing ID	1.000 / 1.001	+0.002
59	Bushing ID	1.000 / 1.001	+0.002
60	Bushing ID	1.000 / 1.001	+0.002
61	Bushing ID	1.375 / 1.376	+0.002

Table 5-15. Tolerance and Limits (Cont)

FIGURE 5-55 INDEX NO.	NOMENCLATURE AND WEAR AREA	ORIGINAL DIAMETER (INCHES)	WEAR TOLERANCE (INCHES)
62	Bushing ID	2.000/2.001	+0.002
63	Bushing ID	2.000/2.001	+0.002
67	Bushing ID	1.000/1.001	+0.002
70	Bushing ID	1.375/1.376	+0.002
71	Bushing ID	0.250/0.251	+0.003
73	Bushing ID	1.000/1.001	+0.002
91	Split piston head, two halves with no gap—OD	2.997/2.995	—0.005
96	Packing adapter ID	2.500/2.502	+0.005
102	Piston OD	2.498/2.496	—0.002
105	Metering pin smaller base ID	0.5760/0.5765	+0.0005
105	Metering pin larger base ID	0.6250/0.6255	+0.0005
106	Shuttle valve smaller base OD	0.5755/0.5750	—0.0005
106	Shuttle valve larger base OD	0.6245/0.6240	—0.0005
116	Cylinder, main ID	3.000/3.002	+0.001

Table 5-16. Bushing Replacement Data

FIGURE 5-55 BUSHING INDEX NO.	REAM DIAMETER (INCHES)		MICRO-INCH SURFACE FINISH (RMS)
	MINIMUM	MAXIMUM	
58 and 59	1.000	1.001	32
60*	1.000	1.001	32
61	1.375	1.376	32
67	1.000	1.001	32
70	1.375	1.376	32
62 and 63	2.000	2.001	32
71	0.250	0.251	32
73	1.000	1.001	125

*Ream bushing (60) to be concentric with bushing (61); ream within 0.002 inch true indicator radius.

12. Using hydraulic test stand (1395-100) and hydraulic fluid (MIL-H-5606), check relief valve and pin assembly as follows:

a. Using spring resiliency tester (PB4-D) and testing adapter rod (figure 5-21), determine spring preload.

b. Install relief valve and pin assembly in test setup, using test block (figure 5-56).

c. See figure 5-57. Read from spring preload horizontally to determine pressure required to crack valve.

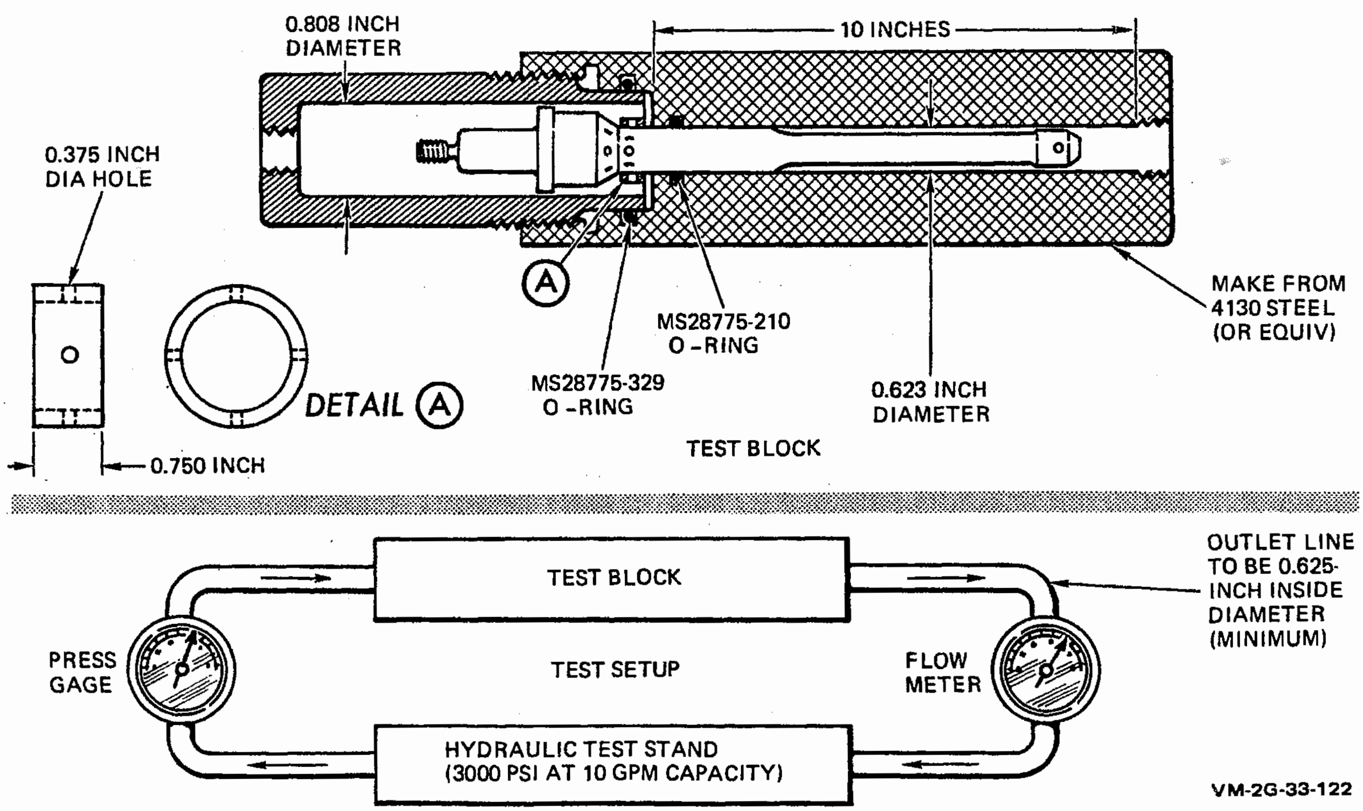


Figure 5-56. Main Landing Gear Relief Valve Test Block and Test Setup

d. Cracking point may be determined by an audible "crack" sound or by noting a marked increase in fluid flow.

Note

If cracking point is not in accordance with figure 5-57, install small spring in addition to large spring or replace large spring.

e. Reduce hydraulic pressure to close valve. Valve leakage must not exceed 2 gallons per minute at 3000 psi.

f. Remove hydraulic pressure, disassemble valve and reinstall a sufficient number of shims (109) to obtain a spring preload of 206 (±6) pounds.

5-328. REPAIR AND PARTS REPLACEMENT. To repair or replace components of the main landing gear complete shock strut assembly, see figure 5-55 and proceed as follows:

Tools and Equipment List

Oven, Heating	NSN 4440-00-529-3740
Press, Hydraulic	1 1-2 (15746)

Materials List

Cloth, Aluminum Oxide, Abrasive	P-C-451
Cloth, Crocus	P-C-458
Lacquer, Acrylic	MIL-L-81352
Primer, Epoxy	MIL-P-23377
Primer, Zinc Chromate	MIL-P-8585 or TT-P-1757

CAUTION

The use of open flame or torch heat on any part of this assembly is prohibited. Temperature-controlled oil baths or ovens are to be used if applicable.

1. Remove minor scratches, nicks, and burrs from ferrous components, using crocus cloth (P-C-

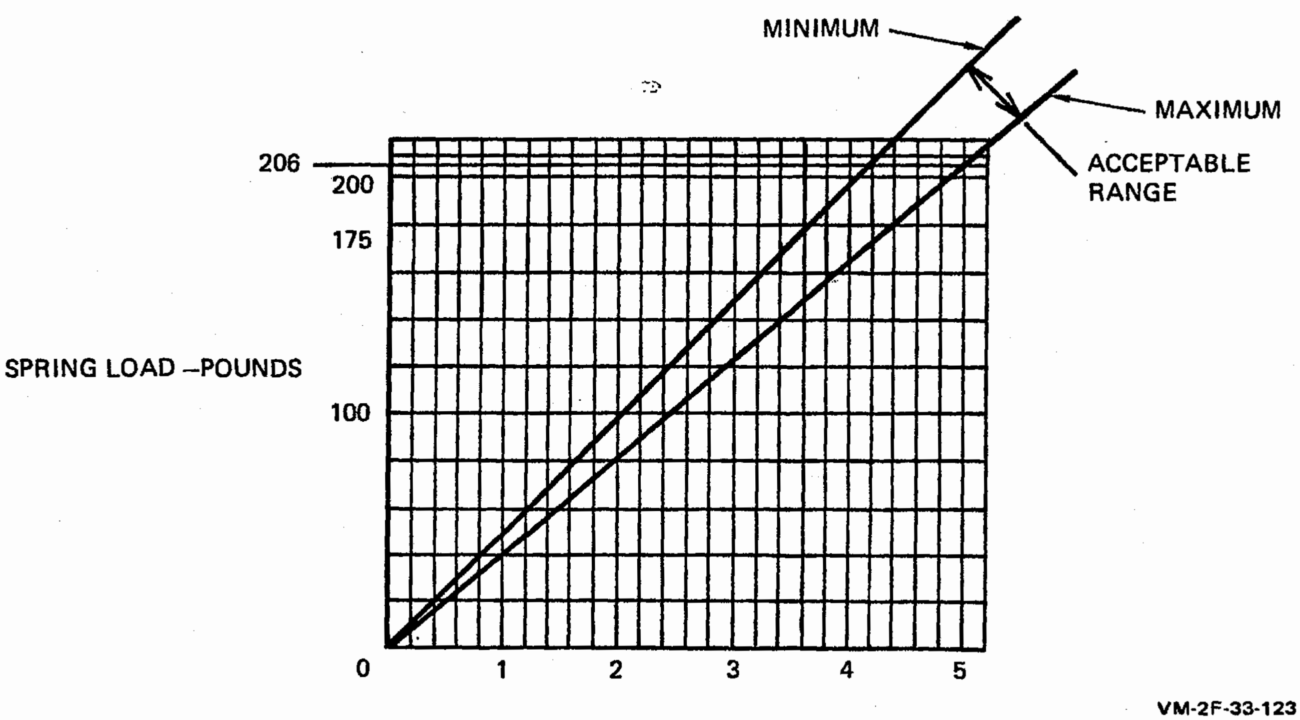


Figure 5-57. Main Landing Gear Relief Valve Test Data

458). Use aluminum oxide abrasive cloth (P-C-451 to polish aluminum components. Refer to table 5-5 for permissible damage limits.

2. Repaint exterior surfaces with paint sprayer by applying two coats of epoxy primer (MIL-P-23377), and two coats of acrylic lacquer (MIL-L-81352) in accordance with Federal Standard 595, color No. 17875, gloss insignia white.

Note

Paint all external surfaces except functional surfaces (external and internal) as accomplished on final assembly. Surface of axle beam flange that mates with brake to have only one coat of epoxy primer (MIL-P-23377), applied in accordance with MIL-C-22751.

3. Any part not chrome plated which cannot be repaired in accordance with step 1, must be replaced, except as noted herein. Refer to paragraph 5-329 for repair of plated parts. For repair of enlarged bearing access in piston terminal (figure 5-55, item 85), proceed in accordance with the following:

a. Ream damaged terminal recess to a diameter of 1.7898 (+0.0005/-0.0010) inches.

b. Surface treat reworked surfaces in accordance with MIL-C-5541.

c. Manufacture a bushing with OD to provide 0.0005 to 0.0010 inch interference fit with the reamed hole mentioned in substep a., an ID of 1.7493 to 1.7498 inches and a length of 0.802 (+0.000/-0.006) inch.

Note

Bushing to be manufactured from 4130 steel tubing (MIL-T-6736, Type I, Condition "N" or equivalent). Heat treat to 160,000 to 180,000 psi per MIL-H-6875.

d. All machined surfaces will have finish of 125 microinches or better. Chamfer sharp corners to 0.005 to 0.015 inch.

e. Cadmium plate per QQ-P-416, Type II Class 3, all surfaces except ID.

f. Install bushing with wet zinc chromate primer (MIL-P-8585 or TT-P-1757) so that bushing is flush to 0.005 inch below surface.

g. Drill a No. 3 (0.2130-inch) diameter hole through newly installed bushing at the 0.25-inch diameter lubrication hole located in the piston terminal housing.

4. Replace all O-ring packings and packing retainers. Refer to Illustrated Parts Breakdown (NAVAIR 01-60GCB-4) for part numbers.

Note

Check all MS28774 backup rings for proper fit. If required, trim to prevent O-ring packing damage.

5. If it is necessary to replace any of the bushings listed in table 5-15, replace all bushings in the same line (mating bushings) and proceed as follows:

a. Machine to size referenced in table 5-15.

b. Coat body OD and inner flange face of bushing with primer (MIL-P-8585 or TT-P-1757).

c. Press bushings into place while wet so that all edges are sealed.

d. Remove excess primer from grease grooves and holes; roller or anvil stake in place.

e. Line ream bushings in accordance with table 5-16 dimensions.

6. If it is necessary to replace the orifice (100) or piston (102), see figure 5-58 and proceed as follows:

a. Mark the location of the lock insert bore on the top face of orifice, using marking crayon and screw orifice into piston until it bottoms out.

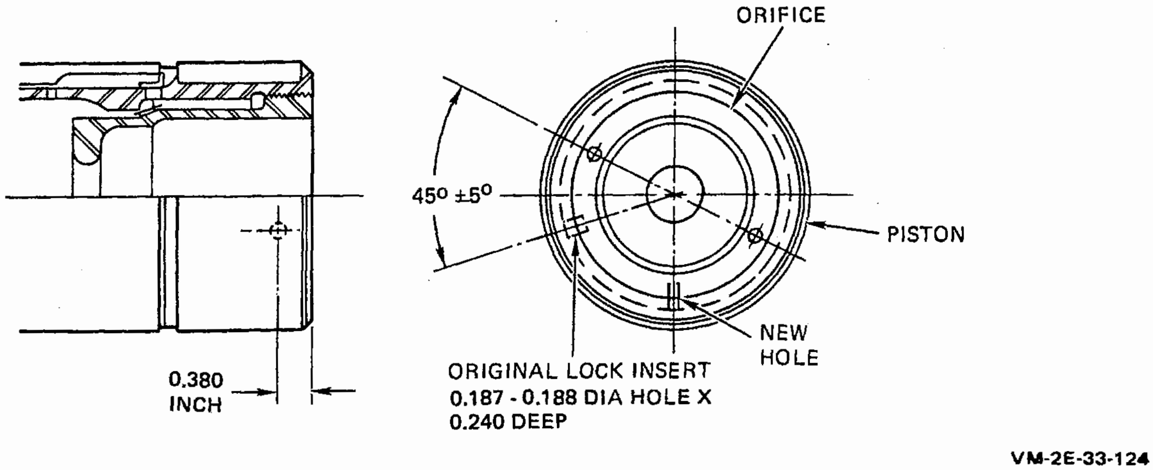


Figure 5-58. Locating Lock Insert in Piston or Orifice

b. Drill a hole approximately 40 to 50 degrees radially away from the crayon mark in the direction opposite from the nearest hole in the face of the orifice. The hole must be 0.187 (+0.001/0.000) inch in diameter, 0.240 (±0.010) inch deep from OD of piston and located 0.380 (±0.010) inch from bottom end face of piston.

c. Clean to remove all foreign matter.

d. Tap lock insert in place and check that it does not extend beyond piston.

5-329. CHROME-PLATED COMPONENT REPAIR. If any component requires repair of its chrome-plated surface, proceed as follows:

Tools and Equipment List

Oven	NSN 4440-00-529-3740

Materials List

Acid, Chromic	Commercial
Acid, Sulphuric	Commercial

5-330. STRIPPING.

1. Strip the plating by the reverse current (etch) method, using a caustic bath with the part being the anode.

CAUTION

Acid stripping is forbidden.

2. Oven bake at 190 (±14)°C [375 (±25)°F] for 4 hours to stress relieve part.

3. Air cool at room temperature with no forced draft.

4. Magnetic particle inspect in accordance with MIL-I-6868. Reject unsatisfactory parts.

5. For repair of chrome plating, grind only a minimum to clean up discrepancy while removing not more than 0.001 inch on any one pass during grinding operation. Rework cannot exceed component **dimensions in table 5-17 or exceed original chromium plated length.**

6. After any rework grinding, stress relieve part for 2 hours at 343° to 371°C (650° to 700°F). If grinding is not performed, omit stress relief.

7. Before chrome plating, shot peen piston in accordance with MIL-S-13165. Use 0.019 to 0.028 shot size and 0.006 to 0.010A2 shot intensity. Remove all shot fragments from rework surfaces by brushing methods only.

Table 5-17. Main Landing Gear Complete Shock Strut Chrome-plated Component Reconditioning Tolerances

INDEX NO. (FIGURE 5-55)	PART NO.	NOMENCLATURE	ORIGINAL DIAMETER BEFORE PLATE (INCHES)	SURFACE FINISH (RMS)	MINIMUM REWORK OD AFTER GRIND BEFORE PLATE (INCHES)	FINISH GRIND OD AFTER PLATE (INCHES)
26	1525-85	Axle	1.995/1.994	63	1.984	1.9995/1.9990
			1.620/1.619	63	1.614	1.6245/1.6240
12	1525-64	Bolt, oleo-axle	0.9977/0.9967	32	0.9927	0.9985/0.9971
8	1525-21	Bolt, oleo-eye	0.9977/0.9967	32	0.992	0.9985/0.9971
47	1525-67	Pin	1.3685/1.3677	32	1.3577	1.3740/1.3725
37	1525-95	Pin, actuator fitting	0.9935/0.9927	32	0.982	0.9990/0.9975
31	1525-19	Pin, pivot	1.9945/1.9930	32	1.986	1.9990/1.9975
102	1525-4A	Piston	2.494/2.493	16	2.487	2.498/2.496
48	1525-81	Ring, tie-down	0.9935/0.9927	32	0.982	0.9990/0.9975

5-331. RECHROMIUM PLATING.

1. Remove any scale or rust by grit blasting, using 180 mesh or finer of silicon oxide or aluminum oxide grit, or by vapor blasting.

2. Degrease by vapor degreasing or solvent clean, followed by a fresh-water rinse.

CAUTION

Pickling, cathodic cleaning, or cathodic acid etching are not permitted.

3. Plating shall be purchased from approved sources in accordance with QQ-C-320, Class 2.

4. Chromium plate shall be deposited from a plating bath containing (per gallon of solution) 30 to 34 ounces of chromic acid and 0.30 to 0.34 ounces of sulphate (furnished by sulphuric acid). Bath temperature to be 57° to 60°C (135° to 140°F). Current density to be 2 to 4 amperes per square inch.

5. Chromium plate to finish grind OD listed in table 5-17.

6. Rinse part in clean tap water at room temperature after plating.

7. Immediately after removal from the plating bath, oven bake for 24 hours at 390°–400°F to remove hydrogen embrittlement.

8. Air cool at room temperature with no forced draft.

9. Grind the chromium-plated reworked surface to finish grind OD listed in table 5-17 removing no more than 0.001 inch on each pass of grinder.

10. Surface finish using 14 to 16 buffs and speed of 2750 rpm (maximum).

5-332. ASSEMBLY. To assemble the main landing gear complete shock strut assembly, see figure 5-55 and proceed as follows:

Tools and Equipment List

Dolly, Landing Gear, Buildup and Transport	93034-64A-101
Tester, Spring Resiliency	Type PB4-D
Wrench, Torque, Type I, Class 1, Style A, Size No. 9	GGG-W-686

Materials List

Fluid, Hydraulic	MIL-H-5606
Grease, Aircraft	MIL-G-23827

Materials List (Cont)

Lockwire (0.032-inch diameter nickel copper)	MS20995NC32
Packing	MS28775-014
Packing	MS28775-021
Packing	MS28775-224
Packing	MS28775-333
Packing	MS28775-336
Ring, Backup	MS28774-014
Ring, Backup	MS28774-224
Ring, Backup (two)	MS28774-333
Ring, Backup	MS28774-336
Insert, Thread Lock	1526-84
Insert, Thread Lock	1525-80A
Spirolox	UR281S
Spirolox	RS25C
Gasket	MS28778-2
Pin, Cotter	MS24665-157
Pin, Cotter	MS24665-311
Pin, Cotter	MS24665-374
Pin, Cotter (two)	MS24665-377
Pin, Cotter	MS24665-379

Note

Prior to assembly, lubricate all O-rings and backup rings with clean hydraulic fluid (MIL-H-5606). Install them wet.

Use new thread lock inserts for each assembly.

CAUTION

Do not use an open flame or torch heat on any of the landing gear components.

1. Ensure that all bushings and bearings are properly installed and line reamed.

2. If not previously assembled, assemble the relief valve and pin assembly as follows:

a. Cycle large spring (108) at least 25 times from free length to solid height to free length.

Note

Main landing gear struts may have one or two springs installed (107 and/or 108) depending on inspection results in paragraph 5-327.

b. Using a suitable clamping device, install shuttle valve (106) and springs (107 and 108) in metering pin (105).

Note

Shuttle valve (106) and metering pin (105) are matched components.

c. Install O-ring packing (110) and laminated shims (109) on valve housing (113).

d. Install valve housing (113) in metering pin (105) and tighten.

WARNING

Care must be exercised to control the installed force (200 to 212 pounds) of the two springs of the relief valve and pin assembly.

3. Using PB4-D spring resiliency tester and testing adapter rod (figure 5-21), check and record the actual spring force required for initial movement of shuttle valve (29).

4. Lockwire metering pin (105) to valve housing (113), using MS20995NC32 lockwire, by starting at the metering pin (105) hole, wind wire counterclockwise one revolution (minimum) and tie off at valve housing (113).

5. Install relief valve and pin assembly into cylinder (116) with washer (104) and nut (103). Torque nut to 480-690 inch-pounds.

6. Screw orifice (100) into bottom of piston (102) and align the blind hole in orifice with same diameter hole in piston; tap lock insert (101) into place.

7. Check that lock insert (101) does not protrude beyond OD of piston (102) when installed.

8. Position recoil valve (99) and Spirolox (98) on piston (102).

9. Position spacer (97) and packing adapter (96) with O-ring packings (93 and 94) and backup rings (92 and 95) installed, on piston (102).

10. Position packing washer (90) and gland nut (89) with scraper ring (88), retaining ring washer (87), and spirolox (86) on piston (102).

11. Tap new lock insert (83) into place in fluid level tube (80). Be sure lock insert (83) is flush with OD of fluid level tube (80) when installed. Reinstall tube (80) in piston (102).

12. Tap new lock insert (84) into place in piston terminal (85). Check to make sure that lock insert (84) is flush with OD of threads of piston terminal (85).

13. Position new backup ring (82) and new O-ring packing (81) on piston terminal (85).

14. Replace piston terminal (85) in piston (102), making sure that the threads bottom out so that the shoulder of piston terminal (85) is snug against the top of the piston (102).

15. If removed, install spherical bearing (79), and roller or anvil stake in place.

16. Apply a brush-coat of hydraulic fluid (MIL-H-5606) to all surfaces of split piston head (91).

17. While holding split piston head halves (91) in places, carefully insert piston assembly into cylinder (116). The flanged face of spacer (97) must bottom on shoulder of cylinder packing bore and packing adapter (96) must butt against spacer (97) flange.

18. Using a standard spanner wrench, install gland nut (89) until bottomed against packing washer (90).

19. Install lock tab (78), using screws (77). Lockwire screws (77) together with MS20995NC32 lockwire.

20. Insert fluid level tube (80) into piston terminal (85) and tap in thread lock insert (83).

21. Assemble piston terminal (85) with packing (81) and backup ring (82) into top of piston (102) and tap in thread lock insert (84).

22. Check that shock strut is properly assembled and safetied.

Note

Do not fill shock strut with hydraulic fluid or tighten and safety bleed plug at this time.

23. If removed, press new bearing assembly (74) into drag brace (76) and roller or anvil stake in place.

24. Check that bushings (73, 71, 70, and 67) are properly installed.

25. Check security of plug (75).

26. Match tooth of brace link (68) with slot in oleo brace link (72) and assemble, using spacer (69), washer (66), and nut (65) so that arms of brace links are in same relative position. Torque nut to 500 to 600 inch-pounds.

27. Align link assembly arm bushings with post bushings (60 and 61) and install brace link pin (56), washer (55), and nut (54). Torque nut to snug position with cotter pin holes aligned and install cotter pin (MS24665-311).

28. Install tie-down ring (48) with pin (47) installed, using washer (46) and nut (45). Torque to a snug position, align cotter pin holes, and install cotter pin (MS24665-377).

29. Check that brace links rotate freely. If they bind, loosen nuts slightly.

Note

Ensure that door operator roller (37) is tapered and not cylindrical on one end. Cylindrical roller does not affect operation of the main landing gear, but does preclude adequate access to grease fitting.

30. Install door operator roller (52) on brace link pin assembly (56). If necessary use additional washers (51) under nut (50) to properly engage cotter pin (49). Tighten to snug position and install cotter pin (MS24665-157).

Note

Check for free operation of door operator. Loosen nut if roller binds.

31. Install spacer (43) and plate (42), using two screws (41).

32. If removed, press new bearing (39) into actuator fitting (40) and roller or anvil stake into place.

33. Install actuator fitting into drag brace (76), using pin spacer (38), pin (37), bolt (36), and nut (35). Torque nut to 50 to 70 inch-pounds.

34. With bearing (33) installed in axle beam (34), position axle beam in post (64) fork, center pivot pin (31) so that hole in pivot pin aligns with hole in axle beam (34); install bolt (27) and washer (28) while holding nut (32) against hole in hollow pivot pin.

Note

Rounded face of nut must be installed toward bolt head.

35. Torque bolt (27) to 95 to 110 inch-pounds.

36. Install axle (26) on axle beam (34), using nut (24) and bolt (25). Torque nut to 235 to 250 inch-pounds.

37. Install spacer (23), tanged washer (22) nut (21), plug (20), and cotter pin (19). Protect axle from damage by wrapping with wax paper.

38. Install jack pad (18), using washer (17) and nut (16). Torque nut to 290 to 410 inch-pounds and safety with cotter pin (MS24665-157).

39. With spacers (9 and 13) in place, position shock strut assembly (14) to oleo brace link (72) and axle beam (34). Install bolt (12) and nut (11) at lower attach point; torque to 200 to 400 inch-pounds, back nut off to align cotter pin holes, and install cotter pin (10).

40. Install bolt (8) and nut (7); torque to 200 to 400 inch-pounds, back nut off to align cotter pin holes, and install cotter pin (6).

41. Install all lubrication fittings (5) and lubricate with grease (MIL-G-23827).

42. Install air valve (4) and safety with lockwire (MS20995NC32).

43. Check that bleed plug (114) is tight and properly safetied.

44. Service strut in accordance with instruction plate (3) and install oil tag (1).

5-333. TESTING. Refer to paragraph 5-184 to test the main landing gear complete shock strut assembly.

5-334. PRESERVATION. Upon completion of test procedures, preserve the main landing shock strut assembly in accordance with MIL-P-116.

5-335. PREPARATION FOR SHIPMENT. Prepare the main landing gear shock strut assembly for shipment in accordance with MIL-L-8552.

5-336. MAIN LANDING GEAR ACTUATOR CYLINDER (305-583301-11 and -12).

5-337. Refer to intermediate maintenance instructions on the main landing gear actuator for disassembly, cleaning, inspection, assembly, adjustment, and test procedures. The following procedures provide repair of the main landing gear actuator piston.

5-338. PISTON REPAIR (305-581303/-3). Repair to the piston is limited to grind-plate-grind procedures to the 0.808/0.809 inch diameter surface.

1. Grind the 0.808/0.809 inch diameter surface 0.798 inches to 0.804 inches.

2. If chrome plating is removed to the base metal, all of the chrome plating shall be removed.

3. If all of the damage is not removed by grinding to the 0.798 inch diameter, scrap the piston.

4. After grinding magnetic particle inspect the piston in accordance with MIL-I-6868. No cracks are allowed.

5. If piston was ground to the base metal, shot peen reworked area in accordance with MIL-S-13165 utilizing 170-330 steel shot size and a peening intensity of .015A2.

6. Chrome plate reworked area in accordance with QQ-C-320, class 2, to a sufficient thickness to allow grinding to the finished diameter of 0.808/0.809 inches.

7. Bake the piston at 375° plus or minus 25°F for eight (8) hours within 15 minutes after plating.

8. Grind plated area to a diameter of 0.808/0.809 inches, with a 8 to 16 microinch finish. The finished diameter of 0.808/0.809 inches shall be concentric with the O.D. of the piston head with 0.003 inch TIR.

9. Magnetic particle inspect piston in accordance with MIL-I-6868. No cracks are allowed.

5-339. MAIN LANDING GEAR DOWNLOCK ASSEMBLY (300-331010).

5-340. Depot maintenance instructions for the main landing gear downlock assembly are the same as intermediate maintenance. Refer to paragraph 5-209 of this manual.

5-341. MAIN LANDING GEAR WHEEL (3-1205).

5-342. The main landing gear wheel assembly is a typical split wheel. It consists of an inner and outer wheel-half bolted together. Each wheel-half contains bearing cups and cones, balance weights, and identification and instruction plate decals. A hub cap and gasket protects the outer wheel bearings and a neoprene grease seal protects the inner bearing. All wheels to be overhauled shall be disassembled, thoroughly cleaned and all paint removed. All previously installed tire change counters shall be removed. Tire change counters shall not be reinstalled. Wheel halves shall be fluorescent-penetrant inspected in accordance with NAVAIR 01-1A-16. Nonreparable cracked wheels shall be analyzed and reported in accordance with NAVAIR 04-10-1. Refer to intermediate maintenance instructions on the main landing gear wheel for standard checkout, disassembly, cleaning, inspection, repair, lubrication, assembly and adjustment procedures. The following procedures and NAVAIR 04-10-1 provide instructions for removing and installing bearing cups, tolerance limits for bearing cups and bores, repairs for seal recess areas and instructions for applying the overhaul identifier.

5-343. REMOVING MAIN LANDING GEAR WHEEL BEARING CUPS. To remove main landing gear wheel bearing cups, proceed as follows:

Tools and Equipment List

Puller, Bearing	5519-CG-250 or 4331-P-136A
Oven, Heating Equipment	

1. With wheel disassembled, place wheel in heating oven.

CAUTION

To prevent damage to wheel half, do not maintain heat longer than 30 minutes or exceed 149°C (300°F).

2. Heat wheel half to 135° to 149°C (275° to 300°F).

CAUTION

Ensure that bearing puller jaws are correctly seated to prevent cocking the bearing cup.

3. Place a piece of bar stock (1/2 x 1 x 8 inch) across hub. Install bearing puller and, using bar

stock as a pressure point, remove bearing cup. Do not remove cup unless damaged.

5-344. TOLERANCES. See figure 5-35 and refer to table 5-18 for diameter tolerances.

5-345. INSTALLING MAIN LANDING GEAR WHEEL BEARING CUPS. To install new bearing cups, proceed as follows:

Tools and Equipment List

Oven, Heating Equipment	NSN 4440-00-529-3740
Refrigeration Equipment	MIL-R-4582 (81349)
Press, Hand, Arbor	1 1-2 (15746)

Materials List

Primer, Zinc Chromate	MIL-P-8585 or TT-P-1757

1. Thoroughly clean the cup cavity and apply one coat of zinc-chromate primer (MIL-P-8585 or TT-P-1757). Allow to dry for 30 minutes.

CAUTION

Heating the wheel half higher than 149°C (300°F) or maintaining this temperature longer than 30 minutes may damage wheel half.

2. Heat wheel half in oven (NSN 4440-00-529-3740) to 135° to 149°C (275° to 300°F). Cool cups in refrigerator (MIL-R-4582) to approximately -18°C (0°F).

Note

Perform this operation quickly, since the bearing cup will absorb heat quickly and may expand in the wheel bore before it is properly seated.

3. Rapidly place cup into cup seat. Using a hand arbor press, keep cup aligned with wheel bearing bore.

4. Ensure that a 0.002-inch feeler gage will not go between the back leg of bearing bore and cup seat.

5-346. REPAIR OF MAIN LANDING WHEEL SEAL RECESS. If the seal recess in the hub of the inner wheel half (figure 5-35, index number 30) has become so worn that it exceeds the maximum limits specified in table 5-18, proceed as follows:

Tools and Equipment List

Oven, Heating Equipment	NSN 4440-00-529-3740 or equivalent

Table 5-18. Main Landing Gear Wheel Diameter Tolerances

LOCATION	PART NO.	FIGURE 5-35 INDEX NO.	DIAMETER - INCHES MAXIMUM	DIAMETER - INCHES MINIMUM
Outer Wheel-half Bearing Bore	10-1081	18	2.8740	2.8720
Inner Wheel-half Bearing Bore	10-1080	30	3.3440	3.3410
Outer Bearing Cup - Outside Diameter	18520	17	2.8755	2.8750
Inner Bearing Cup - Outside Diameter	18720	29	3.3474	3.3464
Inner Wheel-half Seal Recess	10-1080	30	3.498	3.495

Materials List

Alodine 1200	MIL-C-5541
Devcon "F"	NSN 8030-00-670-8853 (93648)

1. Machine seal area to a minimum as necessary to remove worn or damaged areas, maintaining a diameter of 3.503 to 3.538 inches. Surface finish shall be RMS 125 to RMS 250.

2. Treat machined surface of seal recess with Alodine (1200, MIL-C-5541), in accordance with NAVAIR 01-60GCB-3.

Note

This procedure must be performed rapidly to prevent wheel-half from cooling before cup is removed.

3. Apply Devcon "F" (aluminized epoxy sealing compound, to the machined seal recess according to manufacturer's instructions).

Note

Apply sufficient pressure to the layer of Devcon "F" in the machined areas to ensure complete contact between the metal and the sealant.

4. Wipe off any excess Devcon "F."

5. Cure in oven at 150°F for 1 1/2 hours, or 3 to 4 hours at room temperature.

6. Machine the hardened Devcon to ID of 3.495 inches to 3.498 inches.

7. During reassembly of wheel, install seal so that the black rubber edge of the seal is visible from the outboard side of wheel when assembled, see paragraph 5-256, step 7.

5-347. LUBRICATION. All wheel bearings must be cleaned, inspected, and pressure lubricated prior to assembly.

5-348. ASSEMBLY. Assemble the main landing gear wheels in accordance with instructions provided in intermediate maintenance of main landing gear wheels (paragraph 5-256).

5-349. NOSE LANDING GEAR COMPLETE SHOCK STRUT ASSEMBLY (1526B100).

5-350. The nose landing gear shock strut assembly is a trailing-arm type of landing gear which operates hydropneumatically to absorb ground impact. Shock absorption is controlled by a metered orifice, which is further aided automatically during landing on rough terrain, by a spring-loaded pressure relief valve. The cylinder assembly can rotate 360 degrees within the trunnion housing for ease in steering. The main components are the trunnion housing, cylinder, torque link, fork, piston, axle, orifice support tube, and pressure relief valve. Upon landing, the piston moves into the cylinder, forcing hydraulic fluid through the metered orifice into the cylinder chamber, absorbing the impact energy and stopping the upward travel of the piston. The pressurized air within the piston augments this action and returns the piston toward the extended position. The pressure relief valve, spring loaded to 277 pounds, is installed inside the lower end of the piston to further relieve shock caused by rough terrain. Refer to table 5-8 for leading characteristics of the assembly.

5-351. CHECKOUT. Check the nose landing gear shock strut as follows:

Tools and Equipment List

Wrench, Torque, Size No. 6	GGG-W-686

1. With the equipment serviced with hydraulic fluid, secure the strut in either a vertical or horizontal, fully extended position.

2. Pressurize to the normal extended air pressure of 170 psi. There shall be no evidence of fluid or air leakage after a period of 1 hour.

3. Check that there is no leakage at any joints where there are packings or where there is motion.

4. With pressurized strut in fully extended position and hanging clear of the ground, rotate the cylinder 360 degrees in trunnion housing with steering stud. Torque required should not exceed 50 inch-pounds.

5-352. DISASSEMBLY. To disassemble the nose landing gear complete shock strut assembly, see figures 5-59 and 5-60 and proceed as follows:

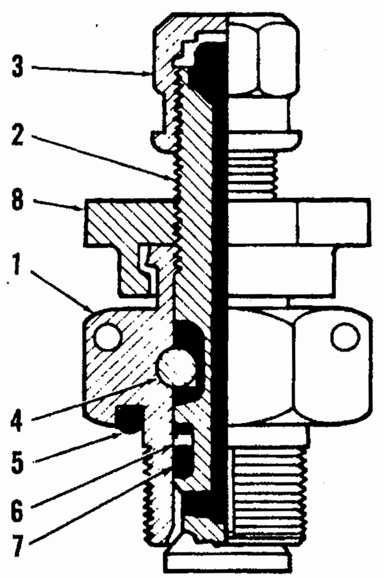


Figure 5-59. Air Charging Valve

Tools and Equipment List

Dolly, Landing Gear Buildup and Transport	93034-64A-101
Press, Arbor, Hydraulic	1 1-2 (15746)

Note

Bag or tag (do not steel stamp) all parts for reassembly into the same assembly, except parts which are to be replaced.

1. If damaged, remove identification plates (2) and name and instruction plate (3).

Note

Bushings, upper and lower bearing liners (94 and 95), and housing upper and lower bearings (90 and 96), must be forced out of position if replacement is necessary.

WARNING

Serious injury could result if an attempt is made to remove air valve (4) before releasing pressurized air. Such an attempt would cause the valve to be expelled from the shock strut assembly with great velocity.

2. Remove valve cap (3, figure 5-59) from air valve and slowly unscrew swivel nut (8) one quarter turn maximum. Allow all pressurized air to be released before proceeding with disassembly.

3. After all air pressure is released, place strut in a retracted attitude. Turn the cylinder assembly within the trunnion housing assembly to move air valve (4) to lowest position. Cut the lockwire, remove air valve (4), and slowly drain the hydraulic fluid into a suitable container. Slowly compress the piston to aid in ejecting all fluid.

4. Remove nuts (5), washers (6), and bolts (7) on trunnion arms and slide trunnion pins (8) out of arms.

5. Remove cotter pin (9), nut (10), and washer (11) and slide bolt (12) out of trunnion fitting. Retrieve spring (13) and mooring ring (14).

6. Remove all lubrication fittings (15).

7. Remove cotter pin (16), nut (17), and washer (18). Back out piston pin plug (20) and remove O-ring packing (19). This will permit removal of torque link end pin (21).

8. Remove nut (22), washer (23), and bolt (24) and slide apex link pin (25) out of torque link (28).

9. Remove cotter pin (30), nut (31) and washer (32). Back out piston pin plug (34) from fork attaching pin (35) and remove O-ring packing (33).

1 OIL TAG
2 IDENTIFICATION PLATE
3 NAME AND INSTRUCTION PLATE
4 AIR VALVE
5 NUT
6 WASHER
7 BOLT
8 TRUNNION PIN
9 COTTER PIN
10 NUT
11 WASHER
12 BOLT
13 TORSION SPRING
14 MOORING RING
15 LUBRICATION FITTING
16 COTTER PIN
17 NUT
18 WASHER
19 O-RING PACKING
20 PISTON PIN PLUG
21 TORQUE LINK END PIN
22 NUT
23 WASHER
24 BOLT
25 APEX LINK PIN
26 BUSHING
27 BUSHING
28 TORQUE LINK
29 APEX BUSHING
30 COTTER PIN
31 NUT
32 WASHER
33 O-RING PACKING
34 PISTON PIN PLUG
35 FORK ATTACHING PIN
36 COTTER PIN
37 NUT
38 WASHER
39 UPLOCK ROLLER BOLT
40 UPLOCK ROLLER SPACER
41 UPLOCK ROLLER
42 BUSHING
43 BUSHING
44 JACK PAD FITTING
45 NUT
46 WASHER
47 BOLT
48 AXLE NUT
49 AXLE SLEEVE
50 AXLE
51 FORK ASSEMBLY BUSHING
52 FORK ASSEMBLY BUSHING
53 AXLE BEARING SPACER
54 WASHER
55 BUSHING
56 FORK

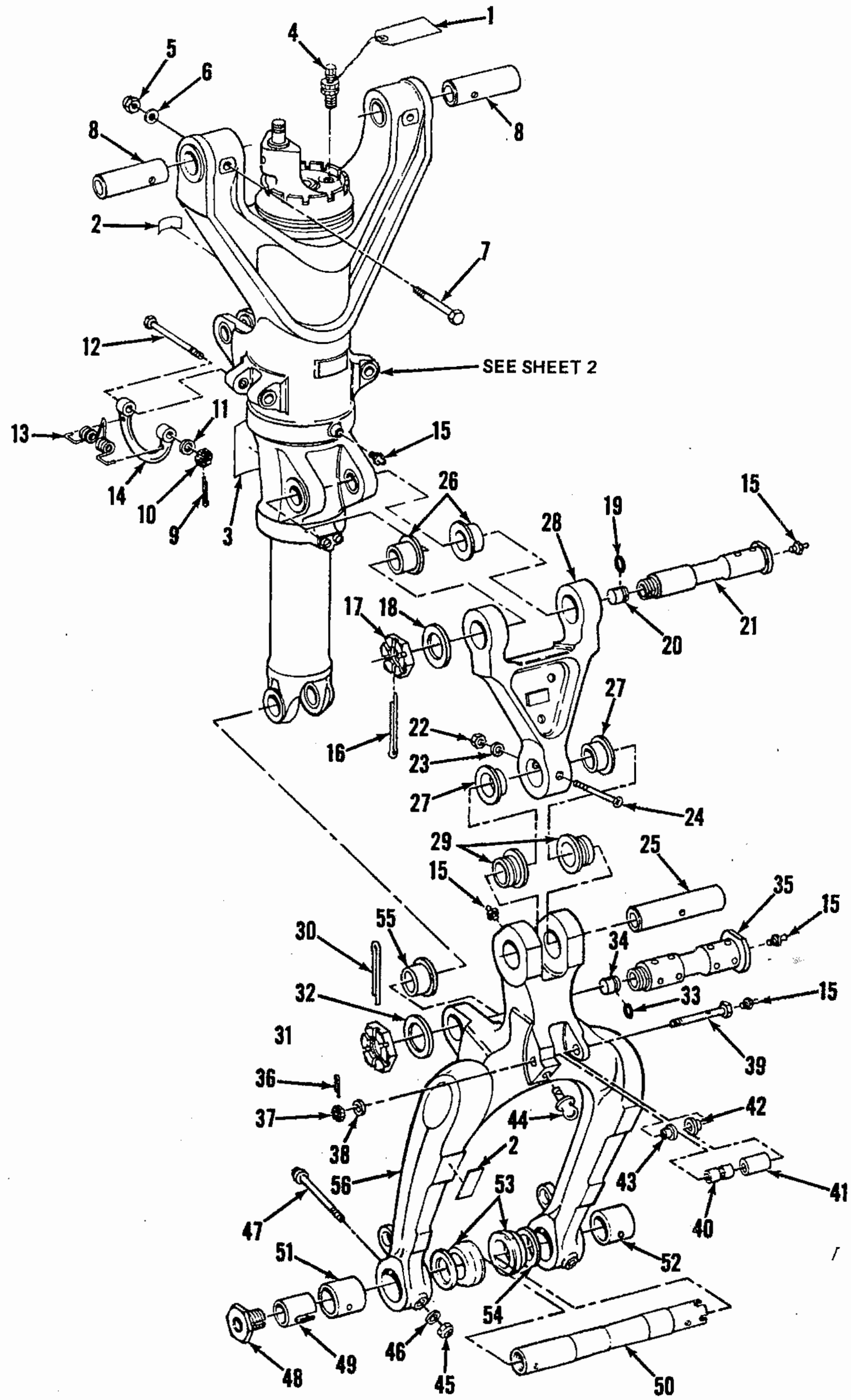


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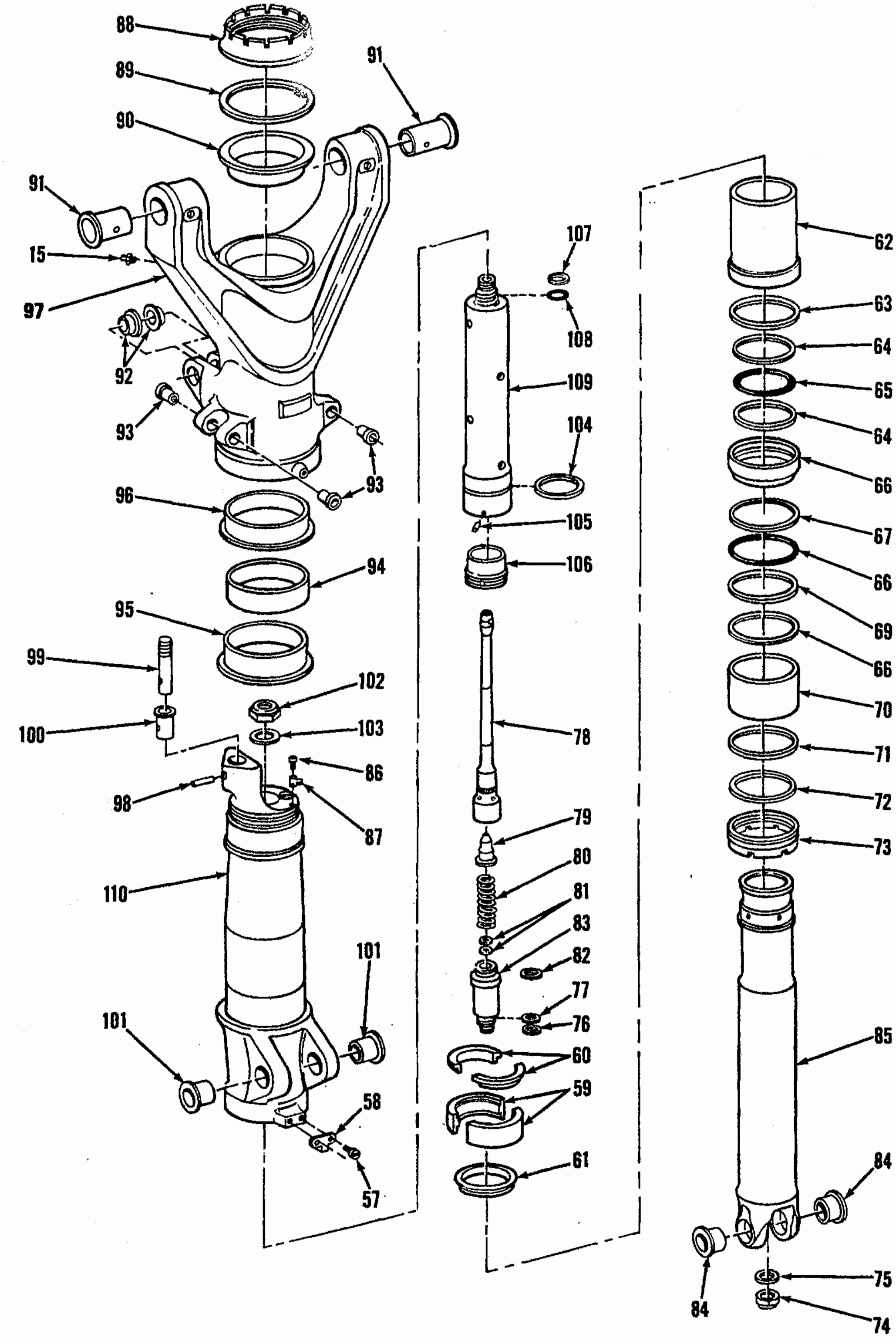
Figure 5-60. Nose Landing Gear Complete Shock Strut Assembly (Sheet 1 of 2)



57 SCREW
58 GLAND NUT LOCK TAB
59 PISTON HEAD (SPLIT)
60 PISTON HEAD RING (SPLIT)
61 RECOIL VALVE
62 PISTON EXTENSION STOP
63 PACKING WASHER
64 PACKING RETAINER
65 O-RING PACKING
66 PACKING RETAINER
67 O-RING PACKING
68 PACKING ADAPTER
69 PACKING WASHER
70 LOWER BEARING
71 PACKING WASHER
72 ROD SCRAPER
73 GLAND NUT
74 NUT
75 WASHER
76 PACKING RETAINER
77 O-RING PACKING
78 METERING PIN
79 VALVE SHUTTLE
80 VALVE SPRING
81 LAMINATED SHIM
82 O-RING PACKING
83 VALVE HOUSING
84 BUSHING
85 PISTON
86 SCREW
87 LOCK TAB
88 HOUSING RETAINING NUT
89 THRUST BEARING
90 HOUSING UPPER BEARING
91 BUSHING
92 BUSHING
93 BUSHING
94 UPPER BEARING LINER
95 LOWER BEARING LINER
96 HOUSING LOWER BEARING
97 TRUNNION HOUSING
98 SPRING PIN
99 STEERING STUD
100 BUSHING
101 BUSHING
102 NUT
103 WASHER
104 ORIFICE SUPPORT TUBE RING
105 LOCK INSERT
106 ORIFICE
107 PACKING RETAINER
108 O-RING PACKING
109 ORIFICE SUPPORT TUBE
110 CYLINDER

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Figure 5-60. Nose Landing Gear Complete Shock Strut Assembly (Sheet 2 of 2)

10. Remove cotter pin (36), nut (37), washer (38), and uplock roller bolt (39). Push uplock roller spacer (40) from uplock roller (41) and remove bushings (42 and 43), if damaged or worn.

11. Removal of uplock roller bolt (39) permits lifting off jack pad fitting (44).

12. At axle nut (48) end of axle (50), remove nut (45), washer (46), and bolt (47). Unscrew axle nut (48) and then at other end of axle (50), remove nut (45), washer (46), and bolt (47). Push axle (50) at slotted end, out of the fork (56). Remove axle sleeve (49), fork assembly bushings (51 and 52), axle bearing spacers (53), washers (54), and bushings (55).

13. Cut lockwire and remove screws (57) and gland nut lock tab (58). Unscrew gland nut (73) and slide to end of piston.

CAUTION

When removing piston and related parts from cylinder, exercise care to avoid damage to those parts and the inside of the cylinder (110).

14. Carefully pull piston assembly from cylinder assembly.

15. Remove the split piston head (59), split piston head ring (60), recoil valve (61), piston extension stop (62), and packing washer (63), from piston assembly.

16. Slide packing adapter (68) from piston assembly and remove packing retainers (64 and 66) and O-ring packings (65 and 67).

17. Slide packing washer (69), lower bearing (70), packing washer (71), rod scraper (72), and gland nut (73), from piston assembly.

18. Remove nut (74) and washer (75) and carefully pull metering pin and relief valve assembly from piston assembly.

WARNING

Take care to control the 277-pound (installed) force of the valve spring (80) against metering pin (78) and valve housing (83).

19. Cut lockwire and carefully unscrew metering pin (78), taking care to control the 277-pound force (installed) of valve spring (80) against metering pin (78) and valve housing. Valve shuttle (79) and valve spring (80) are free parts. Remove laminated shims (81), noting and recording thickness, and O-ring packing (82) from valve housing (83).

Note

Valve shuttle (79) and metering pin (78) are matched components and must be taped together after disassembly.

20. Cut lockwire, remove two screws (86), lock tap (87) and unscrew housing retaining nut (88). Pull cylinder assembly from trunnion housing. assembly.

21. If steering stud (99) is damaged, remove spring pin (98) and steering stud (99).

22. Remove orifice support tube (109) from cylinder (110) by removing nut (102) and washer (103). Slide support tube (109) from cylinder (110) and remove packing retainer (107), O-ring packing (108), and orifice support tube ring (104).

23. Pull lock insert (105) from its socket and unscrew orifice (106).

24. All bushings must be inspected before removal. If removal is necessary, bushings must be pressed out, using hand arbor press (1 1-2) or equivalent.

25. Discard all O-ring packings.

5-353. CLEANING. To clean the nose landing complete shock strut components, proceed as follows:

Materials List

Solvent, Dry-cleaning	P-D-680, Type II
Remover, Paint and Lacquer	MIL-R-25134
Paper, Wax	MIL-P-20311

Tools and Equipment List

Brush, Soft-bristle	Commercial

1. Strip all lacquer from shock strut, trunnion, and fork exterior, using paint and lacquer remover (MIL-R-25134).

2. Flush in tap water to remove residues.

3. Dry parts thoroughly with compressed air.

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

CAUTION

Cleaning should be accomplished in a clean, dry area, which is free from dust or other foreign matter.

4. Wash all metal parts except air valve (4) in cleaning solvent (P-D-680, Type II). Use a soft-bristle brush to facilitate removal of stubborn dirt. Allow excess solvent to drain from parts and dry with clean, dry, compressed air.

5. Ensure that all foreign matter is removed from internal surfaces of all hollow parts.

6. After parts are cleaned and dried, wrap all parts in clean wax paper (MIL-P-20311) while awaiting reassembly.

5-354. INSPECTION. To inspect the components of the nose landing gear complete shock strut assembly, proceed as follows:

Tools and Equipment List

Tester, Spring Resiliency	Type PB4-D

Materials List

Cupric (Copper) Sulphate	O-C-828

1. Inspect all threaded parts for corrosion, stripped or damaged threads.

2. Inspect packing grooves and surrounding areas on all parts for scratches, burrs, nicks, or other surface roughness that could damage packings at installation.

3. Inspect all parts for cleanliness. Pay particular attention to internal surfaces to ensure that all foreign matter has been removed.

4. Inspect all aluminum and steel parts in accordance with MIL-I-6866 and MIL-I-6868, respectively. Replace all parts which show signs of structural failure. See figure 5-42 for stress locations.

5. Inspect the drag brace lug of trunnion housing (97) for loose bushing (92) or elongated holes. If bushings are worn or loose, or if drag brace lug holes are oversize, repair the housing in accordance with paragraph 5-355.

6. Inspect cadmium-plated surfaces for signs of damage.

7. Inspect the bolt holes in the strap-retaining eyes on fork (56) for enlargement or distortion. If the hole is elongated or damaged not more than 0.030 inch, it shall be repaired in accordance with paragraph 5-356.

8. In addition to the preceding, table 5-19 lists inspection requirements for determining allowable service tolerances.

Table 5-19. Tolerance and Limits

INDEX NO. FIGURE 5-60	NOMENCLATURE AND WEAR AREA	ORIGINAL DIAMETER (INCHES)	WEAR TOLERANCE (INCHES)
8	Trunnion pin OD	1.2490 1.2475	−0.002
12	Bolt OD	0.3745 0.3735	−0.002
21	Torque link end pin, both large OD	1.1240 1.1225	−0.002
25	Apex link pin OD	1.2490 1.2475	−0.002
26	Bushing ID	1.125 1.126	+0.002
27	Bushing ID	1.250 1.251	+0.002
29	Apex bushing ID	1.250 1.251	+0.002
35	Fork attaching pin, both large OD	1.2490 1.2475	−0.002
39	Uplock roller bolt OD	0.3120 0.3105	−0.002
42	Bushing ID	0.313 0.314	+0.002
43	Bushing ID	0.313 0.314	+0.002
50	Axle, axle nut end OD	1.5000 1.4995	−0.002
50	Axle, slotted end OD	1.4805 1.4800	−0.002
51	Fork assembly bushing ID	1.625 1.626	+0.001
52	Fork assembly bushing ID	1.4815 1.4825	+0.001
55	Bushing ID	1.250 1.251	+0.002

Table 5-19. Tolerance and Limits (Cont)

INDEX NO. FIGURE 5-60	NOMENCLATURE AND WEAR AREA	ORIGINAL DIAMETER (INCHES)	WEAR TOLERANCE (INCHES)
59	Piston head, two halves with no gap OD	3.309 / 3.307	−0.006
70	Lower bearing ID	3.000 / 3.002	+0.004
78	Metering pin, smaller base ID	0.4375 / 0.4380	+0.0005
78	Metering pin, larger base ID	0.5000 / 0.5005	+0.0005
79	Valve shuttle, smaller base OD	0.4370 / 0.4365	−0.0005
79	Valve shuttle, larger base OD	0.4995 / 0.4990	−0.0005
84	Bushing ID	1.250 / 1.251	+0.002
85	Piston OD	2.998 / 2.996	−0.002
90	Housing upper bearing ID	4.1875 / 4.1900	+0.002
91	Bushing ID	1.250 / 1.251	+0.002
92	Bushing ID	0.875 / 0.876	+0.002
93	Bushing ID	0.375 / 0.376	+0.003
94	Upper bearing liner OD	4.1855 / 4.1840	−0.002
95	Lower bearing liner OD	4.4975 / 4.4960	−0.002
96	Housing lower bearing ID	4.4995 / 4.5020	+0.002
101	Bushing ID	1.125 / 1.126	+0.002

9. Inspect compression spring (80) for a free length of 3.00 (±0.19) inches.

10. Inspect chrome-plated parts for wear-through of chrome as follows:

a. Swab plated surfaces with a saturated solution of cupric (copper) sulphate (O-C-828).

b. Thoroughly inspect plating; worn-through areas will collect a visible trace of copper.

c. For partial and complete chrome-plating repairs, refer to paragraph 5-357.

11. Using hydraulic test stand (1395-100) and hydraulic fluid (MIL-H-5606), check relief valve and pin assembly as follows:

a. Remove shims (81) to reduce spring preload and reassemble relief valve and pin assembly.

b. Using spring resiliency tester (PB4-D) and testing adapter rod (figure 5-43), determine spring preload.

c. Install relief valve and pin assembly in test setup, using test block (figure 5-61).

d. See figure 5-62. Read from spring preload vertically to determine pressure required to crack valve.

e. Ensure that valve cracks within specified range.

f. Reduce hydraulic pressure to close valve. Valve leakage must not exceed 2 gallons per minute at 3000 psi.

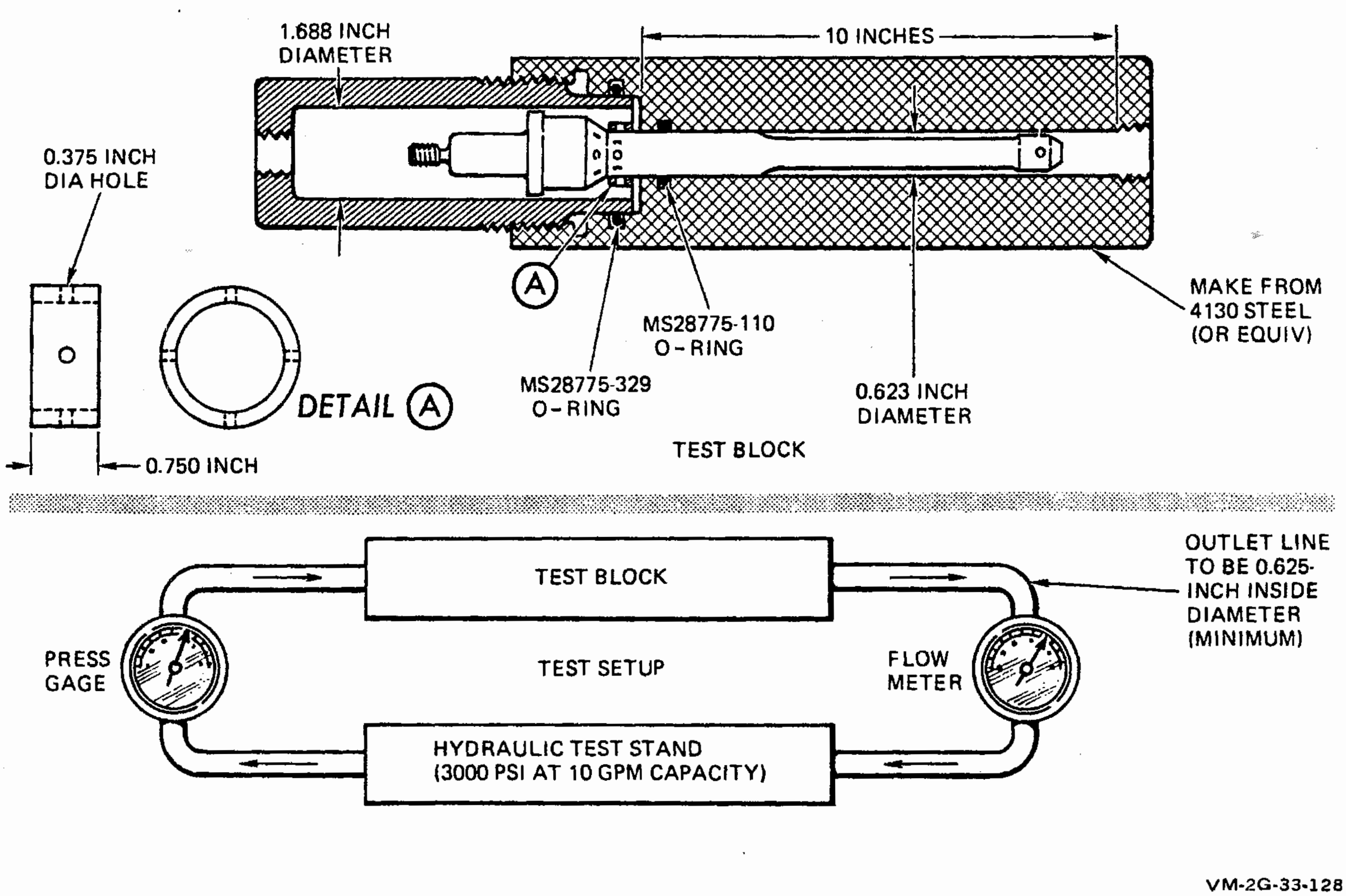


Figure 5-61. Nose Landing Gear Relief Valve Test Block and Test Setup

g. Remove hydraulic pressure, disassemble valve and reinstall a sufficient number of shims (81) to obtain a spring preload of 277 (±2) pounds.

5-355. REPAIR AND PARTS REPLACEMENT. To repair or replace components of the nose landing gear complete shock strut assembly, see figure 5-60 and proceed as follows:

Tools and Equipment List

Oven, Heating	NSN 4440-00-529-3740
Press, Hydraulic	1 1-2 (15746)

Materials List

Cloth, Aluminum Oxide, Abrasive	P-C-451
Cloth, Crocus	P-C-458
Lacquer, Acrylic	MIL-L-81352
Primer, Epoxy	MIL-P-23377
Primer, Zinc Chromate	MIL-P-8585 or TT-P-1757

CAUTION

The use of open flame or torch heat on any part of this assembly is prohibited. Temperature-controlled oil baths or ovens are to be used if applicable.

1. Remove minor scratches, nicks, and burrs from ferrous components, using crocus cloth (P-C-458). Use aluminum oxide abrasive cloth (P-C-451) to polish aluminum components. Refer to table 5-10 for permissible damage limits.

2. Repaint exterior surfaces with paint sprayer by applying two coats of epoxy primer (MIL-P-23377), and two coats of acrylic lacquer (MIL-L-81352), in accordance with Federal Standard 595, color No. 17875, gloss insignia white.

3. Any part not chrome plated which cannot be repaired in accordance with step 1 must be replaced. Refer to paragraph 5-357 for repair of plated parts.

4. Replace all O-ring packings and packing retainers. Refer to Illustrated Parts Breakdown (NAVAIR 01-60GCB-4) for part numbers.

5. If the trunnion housing (97) has damaged or oversized drag brace lug holes, repair the holes as follows:

a. Ream out the damaged holes in line, maintaining center of holes dimensions and a surface finish of 125 microinches. Ream holes to the minimum diameter necessary to clean up the damage and maintain a true hole not to exceed a 1.061-inch diameter. Chamfer inside corners of the lug holes 0.040 x 45°. Apply chemical film treatment (MIL-C-5541) to the reamed holes, rinse and allow to dry.

b. Manufacture the bushings in accordance with figure 5-63 and install the bushings in accordance with step 6.

Note

Check all MS28774 backup rings for proper fit. If required, trim to prevent O-ring packing damage.

6. If it is necessary to replace any of the bushings listed in table 5-19, replace all bushings in the same line (mating bushings) and proceed as follows:

a. Machine to size referenced in table 5-19.

b. Coat body OD and inner flange face of bushing with primer (MIL-P-8585 or TT-P-1757).

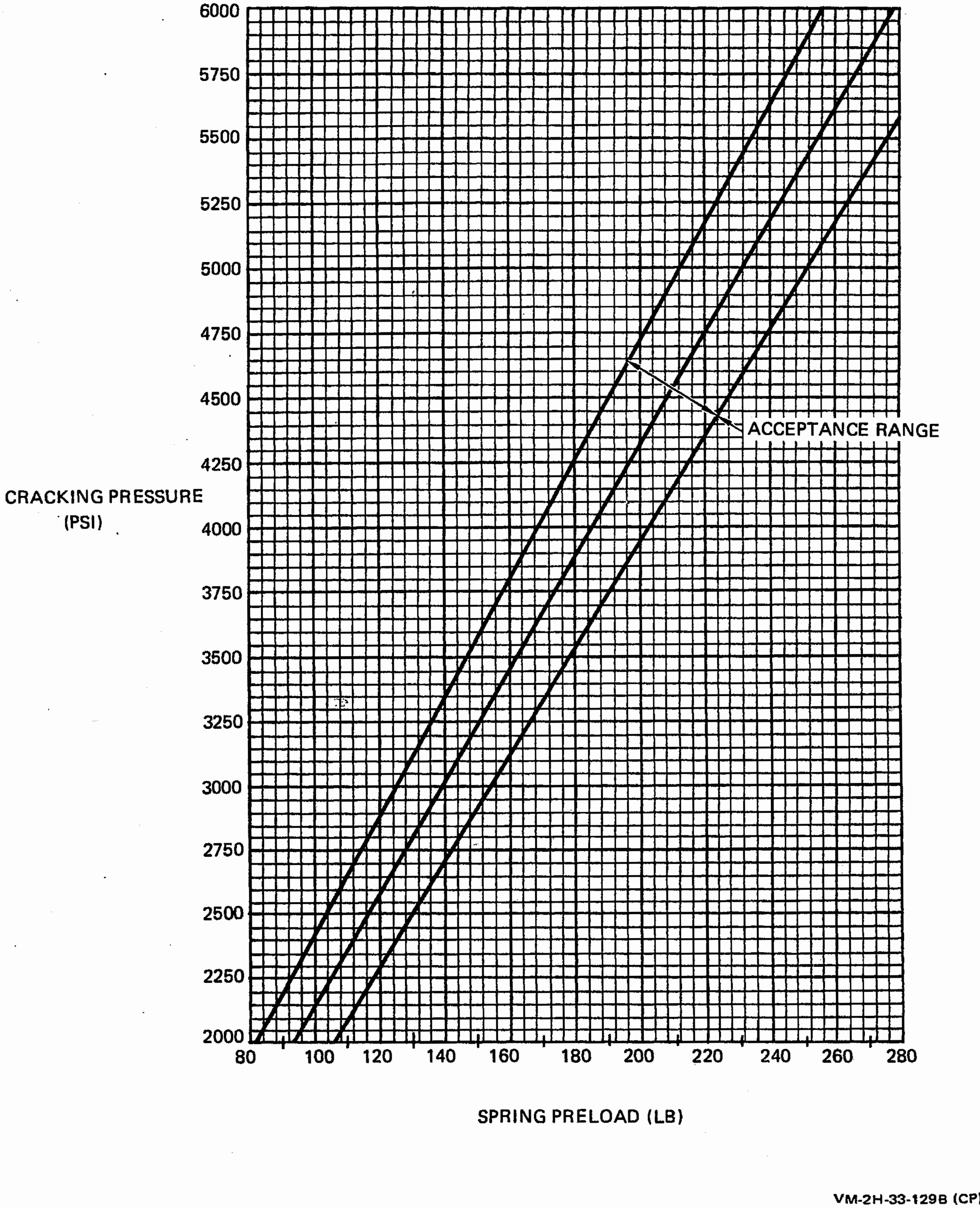


Figure 5-62. Nose Landing Gear Relief Valve Test Data

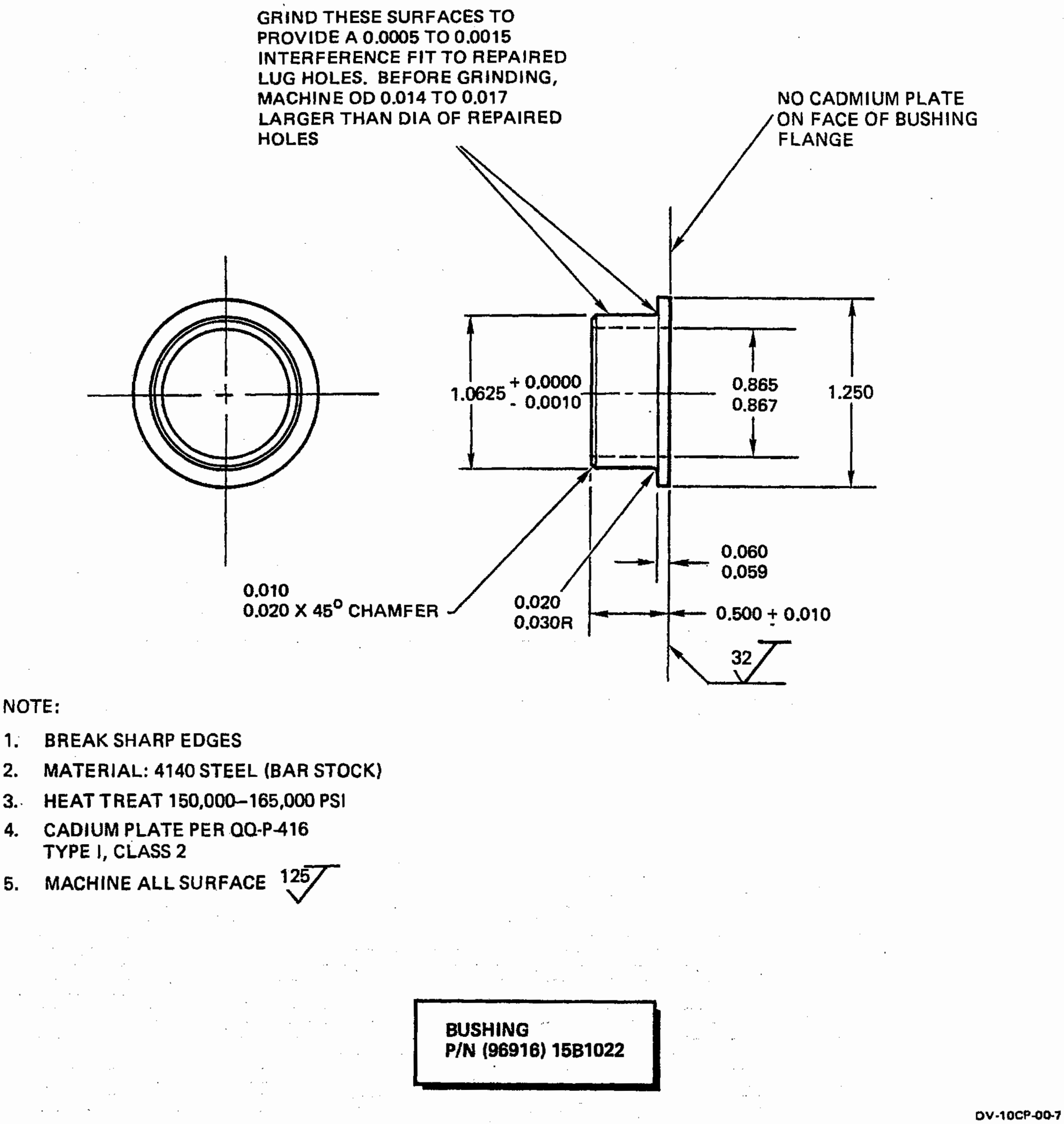


Figure 5-63. Drag Brace Lug Bushing Fabrication

c. Press bushings into place while wet so that all edges are sealed.

d. Remove excess primer from grease grooves and holes.

e. Fine ream bushings in accordance with table 5-20 dimensions.

7. To replace steering stud (99), press stud into bushing (100) so that the top surface of steering

Table 5-20. Bushing Replacement Data

INDEX NO. FIGURE 5-60	REAM TO INCHES MINIMUM	MAXIMUM	MICRO-INCH SURFACE FINISH (RMS)
26, 101	**1.125***	1.126	32
27, 29	**1.250***	1.251	32, 125
42, 43	**0.313*†**	0.314	125
51	**1.625**	1.626	32
52	**1.4815****	1.4825	32
55, 84	**1.250***	1.251	32
91	**1.250††**	1.251	32
92	**0.875***	0.876	32
93	**0.375***	0.376	32

***Ream in line**
†Chamfer 42 ID at unflanged end to 0.030 (± 0.010) 45 degrees
****Concentric with 51, ream within 0.001 inch true indicator radius (TIR)**
††Machine 0.190/0.191 inch diameter through on center of hole for bolt (7)

stud (99) is 1.250 (±0.010) inches from top of cylinder lug (not bushing flange). Using existing holes in cylinder lug for spring pin (98), drill 0.156–0.160-inch diameter hole through bushing and steering stud.

8. If replacement of either (or both) the orifice support tube (109) or orifice (106) is necessary, proceed as follows:

a. Mark on end face of components position of old lock insert (105) bores if one part is being replaced.

b. Install orifice (106) until bottomed in place.

c. Machine a 0.187/0.188-inch diameter hole radially 45 (±5) degrees away from the existing hole in the old part and either of the two holes in the orifice end face. The new lock insert hole must be 0.240 (±0.010)-inch deep from OD of aluminum orifice support tube (109) into steel orifice (106) and located 0.220 (±0.010) inch from bottom end face of orifice support tube.

9. If replacement of upper bearing liner (94) and/or lower bearing liner (95) is necessary, proceed as follows:

a. Machine the upper bearing liner (94) OD to 4.1855-4.1840-inch diameter.

b. Machine the OD and flange of lower bearing liner (95) to 4.4975-4.4960-inch diameter, a length of 1.060-1.065 from its upper end face, and a 0.120 (±0.010)-inch radius at the flange. Maintain at least 32 micro-inch finish. The upper diameter of bearing liner to be concentric with lower bearing liner within 0.002 TIR and lower bearing liner to be concentric with the 3.312-3.314-inch diameter bore of cylinder within 0.006 TIR.

c. Using refrigerator (MIL-R-4582) chill bearing liners to approximately -18°C (0°F) for approximately 1 hour.

d. Rapidly remove bearing liner from refrigerator and press into place, using a hand arbor press or hydraulic press.

10. If necessary, fill the "V" notch in the center of mooring rings (14) and the three dimples (0.060-inch diameter 55 degrees apart) in cylinder (110) flange just below the lower bearing liner (95) on the outboard side, with acrylic lacquer (MIL-L-

81352, color No. 11105, gloss insignia red per Federal Standard 595), after all other painting.

5-356. REPAIR OF NOSE LANDING GEAR FORK (1526-60-10) STRAP RETAINING EYE. To repair nose landing gear fork strap retaining eye, proceed as follows:

Materials List

Bushing	NAS75-9-014
Zinc Chromate Primer	MIL-P-8585 or TT-P-1757

1. Ream damaged hole to provide 0.0005 to 0.0010 interference fit with bushing (NAS75-9-014). Minimum final wall thickness of the eye shall be not less than 0.125 inch.

2. If necessary, cut bushing (NAS75-9-014) to a length to ensure that it can be installed flush to 0.005 inch below surface. Chamfer cut end if necessary, in accordance with NAS75 requirements.

3. Ream bushing to ID of 0.625 (+0.005/-0.000) inch.

4. Cadmium plate bushing in accordance with QQ-P-416, Class 1, Type II requirements.

5. Press bushing into strap retaining eye, using wet zinc chromate primer, so that bushing is flush to 0.005 inch below surface.

6. Inspect bushing to ensure ID of 0.625 (+0.005/-0.000) inch.

5-357. CHROME-PLATED COMPONENT REPAIR. If any component requires repair of its chrome-plated surface, proceed as follows:

Tools and Equipment List

Oven	NSN 4440-00-529-3740

Materials List

Acid, Chromic	Commercial
Acid, Sulphuric	Commercial

5-358. STRIPPING.

1. Strip the plating by the reverse current (etch) method, using a caustic bath with the part being the anode.

CAUTION

Acid stripping is forbidden.

2. Oven bake at 190 (±14)°C [375 (±25)°F] for 4 hours to stress relieve part.

3. Air cool at room temperature with no forced draft.

4. Magnetic particle inspect in accordance with MIL-I-6868. Reject unsatisfactory parts.

5. For repair of chrome plating, grind only a minimum to clean up discrepancy while removing not more than 0.001-inch on any one pass during grinding operation. Rework cannot exceed component dimensions in table 5-21 or exceed original chromium-plated length.

6. After any rework grinding, stress relieve part for 2 hours at 343° to 371°C (650° to 700°F). If grinding is not performed, omit stress relief.

7. Before chrome plating, shot peen piston in accordance with MIL-S-13165. Use 0.019 to 0.028 shot size and 0.006 to 0.010A2 shot intensity. Remove all shot fragments from rework surfaces by brushing methods only.

5-359. RECHROMIUM PLATING.

1. Remove any scale or rust by grit blasting, using 180 mesh or finer of silicon oxide or aluminum oxide grit, or by vapor blasting.

2. Degrease by vapor degreasing or solvent clean, followed by a fresh water rinse.

WARNING

Pickling, cathodic cleaning, or cathodic acid etching are not permitted.

3. Plating shall be purchased from approved sources in accordance with QQ-C-320, Class 2.

4. Chromium plate shall be deposited from a plating bath containing (per gallon of solution) 30 to 34 ounces of chromic acid and 0.30 to 0.34 ounces of sulphate (furnished by sulphuric acid). Bath temperature to be 57° to 60°C (135° to 140°F). Current density to be 2 to 4 amperes per square inch.

5. Chromium plate to finish grind OD listed in table 5-21.

6. Rinse part in clean tap water at room temperature after plating.

7. Immediately after removal from the plating bath, oven bake for 24 hours at 390°–400°F, to remove hydrogen embrittlement.

8. Air cool at room temperature with no forced draft.

9. Grind the chromium-plated reworked surface to finish grind OD listed in table 5-21, removing no more than 0.001 inch on each pass of grinder.

10. Surface finish using 14 to 16 buffs and speed of 2750 rpm (maximum).

Table 5-21. Nose Landing Gear Complete Shock Strut Chrome-plated Component Reconditioning Tolerances

INDEX NO. (FIGURE 5-60)	PART NO.	NOMENCLATURE	ORIGINAL DIAMETER BEFORE PLATE (INCHES)	SURFACE FINISH (RMS)	MINIMUM REWORK OD AFTER GRIND BEFORE PLATE (INCHES)	FINISH GRIND OD AFTER PLATE (INCHES)
50	1526A85	Axle	1.4955/1.4945 1.476/1.475	63	1.491 1.470	1.5000/1.4995 1.4805/1.4800
25	1526A93	Pin, apex	1.2435/1.2425	32	1.236	1.2490/1.2475
35	1526-29	Pin, fork attach	1.2435/1.2425	32	1.230	1.2490/1.2475
21	1526-21	Pin, torque link	1.1185/1.1175	32	1.100	1.1240/1.1225
8	1526-14	Pin, trunnion	1.2435/1.2425	32	1.235	1.2490/1.2475
85	1526A4	Piston	2.9940/2.9935	16	2.983	2.998/2.996
40	1526-32A	Spacer, uplock roller	0.4315/0.4300	32	0.426	0.4370/0.4355

5-360. ASSEMBLY. To assemble the nose landing gear complete shock strut assembly, see figure 5-60 and proceed as follows:

Tools and Equipment List

Dolly, Landing Gear Buildup and Transport	93034-64A-101
Tester, Spring Resiliency,	Type PB4-D
Wrench, Torque, Type I, Class 1, Style A, Size No. 9	GGG-W-686

Materials List

Fluid, Hydraulic	MIL-H-5606
Grease, Aircraft	MIL-G-23827
Lockwire (0.032-inch diameter nickel copper)	MS20995NC32

Note

Prior to assembly, lubricate O ring packings and packing retainers by immersing in clean hydraulic fluid and install wet.

CAUTION

The use of open flame or torch heat on any part of this equipment is strictly prohibited. If necessary, temperature-controlled oil baths or ovens should be used as applicable.

1. Ensure that all bushings are securely in place and machined in accordance with paragraph 5-355.

2. Install O-ring packing (108), packing retainer (107), and orifice support tube ring (104) on orifice support tube (109).

3. Screw orifice (106) in orifice support tube (109) until bottomed out and install lock insert (105) so that it does not extend beyond OD of orifice support tube (109).

4. Install orifice support tube assembly in cylinder (110), using washer (103) and nut (102) and torque to 300-400 inch-pounds.

5. If removed, press new housing lower bearing (96) and housing upper bearing (90) in trunnion housing (97). Machining of ID is not required on (90) and (96) parts.

CAUTION

When positioning the cylinder assembly into trunnion housing assembly, be careful not to damage bearing surfaces of either assembly or the threads on the cylinder assembly.

6. Position the cylinder assembly, to align its centerline with trunnion housing assembly main bore center, and carefully slide into place.

Note

Ensure that the flange faces of housing lower bearing (96) and lower bearing liner (95) make sliding contact.

7. Install thrust bearing (89) with tang engaged in mating slot of cylinder (110), and housing retaining nut (88). Do not tighten nut (88) with wrench until assembly is completed and strut is serviced.

8. Check relief valve in accordance with paragraph 5-354.

9. Lockwire metering pin (78) to valve housing (83), using MS20995NC32 lockwire. Starting with hole in metering pin (78), wind lockwire counter clockwise a minimum of one revolution before tying off at valve housing (83).

10. Check to ensure that lockwire is properly installed.

11. **After satisfactory tests, with O-ring packing** (77) and packing retainer (76) in place, install relief valve and pin assembly into piston (85) and secure with washer (75) and nut (74). Torque nut 300 to 400 inch-pounds.

12. Install gland nut (73), rod scraper (72), packing washer (71), lower bearing (70) and packing washer (69) on lower end of piston (85).

13. **With O-ring packings (65 and 67) and packing** retainers (64 and 66) installed on packing adapter (68), position packing adapter (68), packing washer (63), piston extension stop (62), recoil valve (61), piston head ring (two halves) (60), and lubricated piston head (59) (two halves).

Note

Piston head (59) and piston head rings (60) must be lubricated with hydraulic fluid (MIL-H-5606) prior to installation.

14. While holding the piston head (59) and piston head ring (60) halves in place, carefully insert the preceding assemblage of parts into the cylinder assembly. With the shoulder of the piston extension stop (62) bottomed in cylinder assembly, slide the complete piston assembly into position, making sure that parts (62) through (71) are properly seated in the packing bore of cylinder (110).

15. Check to see that all parts are seated properly.

16. With the rod scraper (72) mounted in gland nut (73), screw gland nut (73) into cylinder (110). Tighten gland nut (73) and install gland nut lock tab (58) with screws (57) and lockwire in place with lockwire (MS20995NC32).

17. Check to ensure that rod scraper and lockwire are properly installed.

18. With fork assembly bushings (52 and 51) installed and machined to size, insert axle (50), slotted end first, through bushing (51) and position washers (54) and axle bearing spacers (53). Then slide axle through bushing (52) and align holes. Secure the slotted end of axle first with bolt (47), washer (46), and nut (45) and then install axle nut (48) before securing that end with bolt (47), washer (46), and nut (45).

19. Position fork (56) assembly (with all bushings installed and machined to size) to installed piston. Secure with fork attaching pin (35), washer (32), **and nut (31). Install O-ring packing (33) on piston** pin plug (34), insert into pin (35) and secure with cotter pin (30).

20. With bushings installed and machined to size, position torque link (28) to fork assembly. Secure with apex link pin (25), bolt (24), washer (23), and nut (22).

21. Position torque link assembly to cylinder assembly and secure with torque link end pin (21), **washer (18), and nut (27). Install O-ring packing** (19) on piston pin plug (20), insert into pin (21) and secure with cotter pin (16).

22. Check to ensure that all cotter pins are properly installed.

23. Lubricate all seven lubrication fittings with grease (MIL-G-23827).

24. Fully service nose landing gear shock strut assembly, with hydraulic fluid and air pressure.

25. With pressurized strut in fully extended position and hanging clear of the ground, rotate the cylinder assembly, using a torque wrench to the steering stud (99), a full 360 degrees. Torque required must not exceed 50 inch-pounds. Adjust the housing retaining nut (88) as necessary to achieve correct torque. Secure with lock tab (87) and screws (86). Lockwire screws (86) to air valve (4), using MS20995NC32 lockwire.

26. Check to see that lockwire is properly installed.

5-361. TESTING. To test the nose landing gear complete shock strut assembly, proceed as follows:

1. With the equipment fully serviced, secure the strut in either a vertical or horizontal fully extended position.

2. Pressurize to the normal extended air pressure of 170 psi. There shall be no evidence of fluid or air leakage after a period of 1 hour.

5-362. TROUBLESHOOTING. To troubleshoot the nose landing gear complete shock strut assembly, refer to table 5-22.

5-363. PRESERVATION. Upon completion of test procedures, preserve the nose landing gear shock strut assembly, in accordance with MIL-P-116.

5-364. PREPARATION FOR SHIPMENT. Prepare the nose landing gear shock strut assembly for shipment in accordance with MIL-L-8552.

5-365. NOSE LANDING GEAR DRAG BRACE ACTUATING CYLINDER (300-345001).

5-366. For depot maintenance instructions for the nose landing gear drag brace actuating cylinder, refer to paragraph 5-283 of this manual.

5-367. NOSE LANDING GEAR WHEEL (3-1200).

5-368. The nose landing gear wheel is a split-type wheel. Each wheel-half contains bearing cups and cones, neoprene lip-type seals, balance weights and identification and instruction plates. All wheels to be overhauled shall be disassembled, thoroughly cleaned and all paint removed. All previously installed tire change counters shall be removed. Tire change counters shall not be reinstalled. Wheel halves shall be fluorescent penetrant inspected in accordance with NAVAIR 01-1A-16. Nonreparable cracked wheels shall be analyzed and reported in accordance with NAVAIR 04-10-1. Refer to intermediate maintenance instructions on the nose landing gear wheel for standard checkout, disassembly, cleaning, inspection, repair, lubrication, assembly

Table 5-22. Troubleshooting Nose Landing Gear Complete Shock Strut Assembly

TROUBLE	PROBABLE CAUSE	REMEDY
Air leak at air valve.	Improperly installed air valve.	Check for proper installation. Torque valve body 100 to 110 inch-pounds and swivel nut 50 to 60 inch-pounds.
	Worn or defective air valve	Replace air valve.
Fluid leak at piston, gland nut area.	Worn seals in packing adapter.	Replace O-ring packings and packing retainers.
	Packings damaged by dirt or foreign matter.	Clean thoroughly and replace packings.
	Scored piston, worn piston head and/or lower bearing.	Replace defective or worn parts.
Binding or looseness of cylinder assembly in trunnion housing impairing steering.	Improper torque of housing retaining nut.	Adjust as required.
	Worn bearing liners.	Replace.

and adjustment procedures. The following procedures and NAVAIR 04-10-1 provide instructions for removing and installing bearing cups, tolerance limits for bearing cups and bores, and instructions for applying the overhaul identifier.

5-369. REMOVING NOSE LANDING GEAR WHEEL BEARING CUPS. To remove nose landing gear wheel bearing cups, proceed as follows:

Tools and Equipment List

Bearing Puller	Snap-on 5519-CG-250 or New Britain 4331-P-136-A
Heating Equipment—Oven	

1. With wheel disassembled, place wheel halves in heating oven.

CAUTION

To prevent damage to wheel-half, do not maintain heat longer than 30 minutes nor exceed 135°C (275°F).

2. Heat wheel-half to 121° to 135°C (250° to 275°F).

CAUTION

Ensure that bearing puller jaws are correctly seated to prevent cocking the bearing cups.

Note

The procedure must be performed rapidly to prevent wheel-half from cooling before cup is removed.

3. Place a piece of bar stock (1/2 x 1 x 8-inch) across the hub. Install bearing puller, and using the bar stock as a pressure point, pull the bearing cup. Do not remove cup unless replacement is necessary.

5-370. TOLERANCES. See figure 5-49 and refer to table 5-23 for diameter tolerances.

5-371. INSTALLING NOSE LANDING GEAR WHEEL BEARING CUPS. To install new bearing cups, proceed as follows:

Tools and Equipment List

Heating Equipment—Oven
Refrigeration Equipment
Hand Arbor Press or
  Hydraulic Press

Materials List

Primer, Zinc-chromate	MIL-P-8585 or TT-P-1757

CAUTION

Heating the wheel-half higher than 149°C (300°F) or maintaining this temperature longer than 30 minutes may damage the wheel-half.

Note

Perform this operation rapidly because the bearing cup will absorb heat quickly and may expand in the wheel bore before it is properly seated.

1. To install new bearing cups, thoroughly clean the cup cavity and apply one coat of zinc-chromate

primer (MIL-P-8585 or TT-P-1757). Let dry approximately 30 minutes and then heat wheel-half to 135° to 149°C (275° to 300°F). Cool cups to approximately -18°C (0°F), so that the cup will shrink as the wheel expands, then rapidly place the cup into the cup seat, using a hand arbor press to keep cup aligned with wheel bearing bore.

2. Ensure that a 0.002-inch feeler gage will not go between the back leg of the bearing bore and cup seat.

5-372. LUBRICATION. All wheel bearings must be cleaned and inspected in accordance with intermediate maintenance instructions for the nose landing gear wheel and pressure lubricated prior to assembly.

5-373. ASSEMBLY. Assemble the nose landing gear wheel in accordance with intermediate maintenance instructions for nose landing gear wheel (paragraph 5-302).

Table 5-23. Nose Landing Gear Wheel Diameter Tolerances

LOCATION	PART NO.	FIGURE 5-30 INDEX NO.	DIAMETER - INCHES	
			MAXIMUM	MINIMUM
Outer Wheel-half Bearing Bore	10-1082	16	2.6860	2.6840
Inner Wheel-half Bearing Bore	10-1083	23	2.6860	2.6840
Outer Bearing Cup - Outside Diameter	19268	15	2.6880	2.6875
Inner Bearing Cup - Outside Diameter	19268	22	2.6880	2.6875

CHAPTER 6
WHEEL BRAKE SYSTEM

SECTION I
DESCRIPTION AND OPERATION

6-1. GENERAL.

6-2. The wheel brake system (figures 6-1 and 6-2) is a manually controlled, hydraulic pressure generating system for stopping the aircraft during landing-rollout and to help maneuver during ground operations. The wheel brake system consists of two master brake cylinders, four brake (rudder) pedals, parking brake handle, four bleeder valves, two wheel brake assemblies, and associated plumbing and linkage. This system provides independent braking action to each main landing gear with optional control through the right and left brake (rudder) pedals in the observer's compartment. Hydraulic fluid is fed from the main hydraulic reservoir at fuselage station 224.8 to the master brake cylinders by gravity flow. One hydromechanical wheel brake assembly is provided at each main landing gear.

Note

Two types of wheel brake assemblies are available for installation; one has provisions in the piston housing for adjusters while the other assembly does not have these provisions. The assemblies are interchangeable.

Separate master cylinders are manually controlled by a brake (rudder) pedal in the pilot's and observer's compartment which moves the master cylinder piston, blocking fluid flow through the cylinder piston, and forcing the remaining fluid to the wheel brake cylinder. The braking action is directly proportional to the amount of pressure applied to the rudder pedals. The parking brake mechanism is connected through cables and linkage to a single control handle in the pilot's compartment which is used in conjunction with the brake (rudder) pedals. When the control handle is pulled, the parking brake mechanism is moved in both master cylinders to block hydraulic flow downstream of the compression chamber and maintain the pressure applied to the brakes through the brake pedals. Four bleeder valves are installed in the system to permit servicing after maintenance.

SECTION II
ORGANIZATIONAL MAINTENANCE

6-3. GENERAL.

6-4. Organizational maintenance of the wheel brake system is described in the following paragraphs.

6-5. OPERATIONAL CHECK.

6-6. An operational check of the wheel brake system must be made if a unit has been replaced or hydraulic lines disconnected. The procedure is to be performed to ensure that the system is free of hydraulic leaks and malfunctioning components. See figures 6-1 and 6-2 and proceed as follows:

Note

> Ensure that hydraulic reservoir in upper cargo compartment is filled with MIL-H-5606 hydraulic fluid and that hydraulic equipment power package is in stowed (horizontal) position.

1. With a crew member rocking the aircraft back and forth at the right main landing gear so that the wheel rolls slightly, press pilot's right-hand brake pedal. The crew member should note that the wheel movement stops; no fluid leakage should occur at the wheel brake, master cylinder, or lines. The brake pedal should not bottom out and should be firm.

2. With a crew member rocking the aircraft back and forth at the left main landing gear so that wheel rolls slightly, press pilot's left brake pedal. The crew member should note that the wheel movement stops, no fluid leakage should occur at the wheel brake, master cylinder, or lines. The brake pedal should not bottom out and should be firm.

3. Depress both pilot's brake pedals, pull parking brake handle on pilot's center pedestal, and release brake pedals. Instruct crew member to attempt to roll both main landing gear wheels. Both wheels should be immovable.

4. Release parking brake by depressing brake pedals. The parking brake control handle should automatically release and both brakes should disengage.

5. Check both master cylinders, wheel brakes, and hydraulic lines for evidence of leakage.

6-7. TROUBLESHOOTING.

6-8. Troubleshooting procedure for the wheel brake system is provided in table 6-1.

6-9. SERVICING.

6-10. The brake system hydraulic fluid is supplied by gravity flow from the main hydraulic reservoir at fuselage station 224.8. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for filling procedures. The wheel brakes must be bled after maintenance has been performed on the system if any fluid has been drained or plumbing disconnected.

6-11. BLEEDING WHEEL BRAKE SYSTEM. To bleed the wheel brake system, proceed as follows:

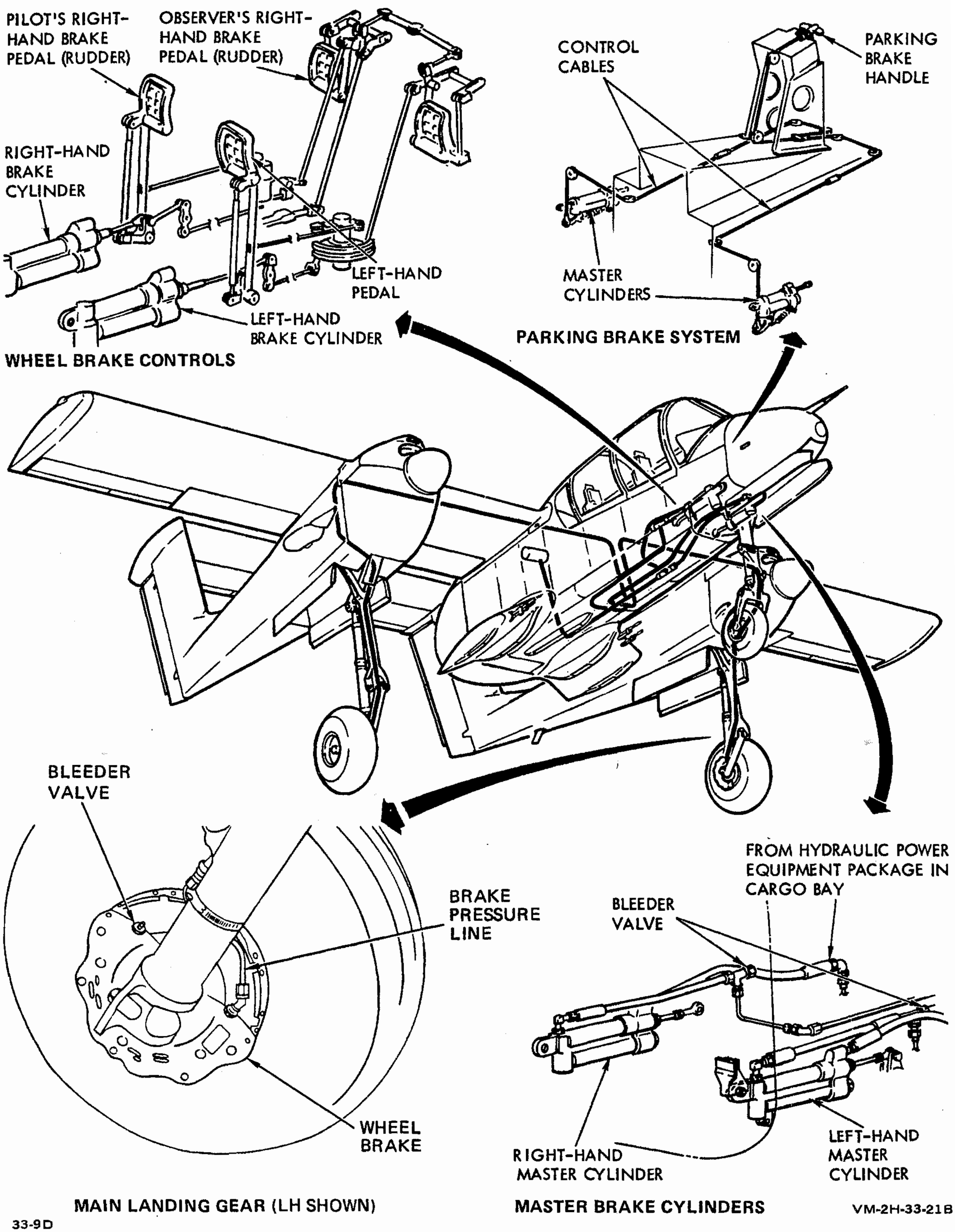


Figure 6-1. Wheel Brake System Unit Locator

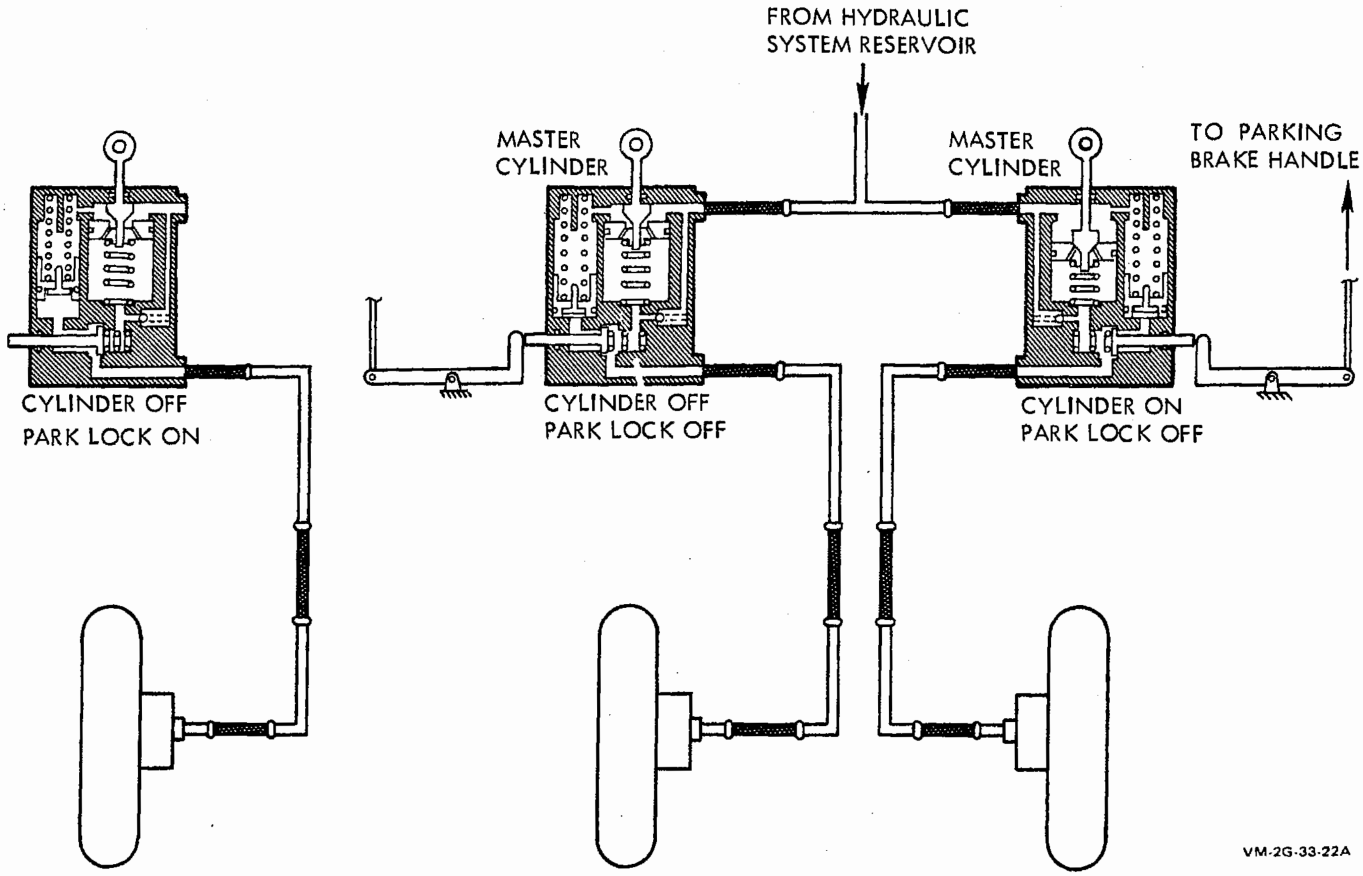


Figure 6-2. Wheel Brake System Hydraulic Schematic

Tools and Equipment List

Bleeder Hose
Clean Container

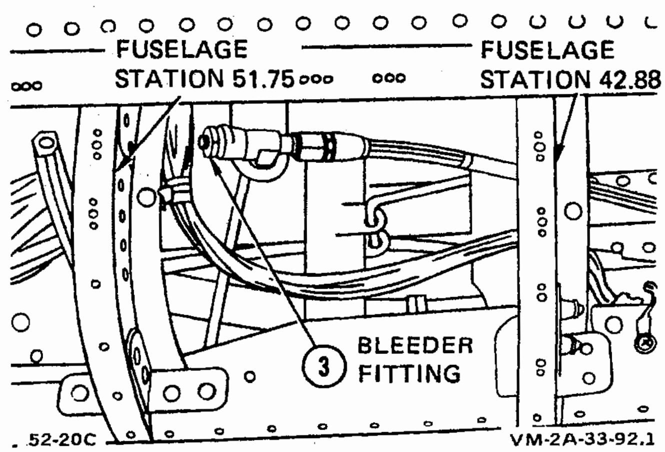
Materials List

Fluid, Hydraulic	MIL-H-5606
Lockwire (0.032-inch diameter steel)	MS20995F32

1. Examine all tubing and connections in the brake system for possible leaks. Tighten or repair, as required.

2. Ensure that the reservoir is full.

3. Remove the cap from the bleeder fitting in the right jowl and attach bleeder hose, placing loose end in clean container.



Step 3—Para. 6-11

Table 6-1. Troubleshooting Wheel Brake System

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: SPONGY BRAKES.		
Air in hydraulic system.	Check for air in the brake system.	Bleed wheel brake system. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).
TROUBLE: BRAKES FAIL TO RELEASE PROPERLY.		
Brake linkage binding.	Inspect linkage system.	Repair or replace bent or broken linkage.
Weak or broken master brake cylinder.	Manually pull on master cylinder rod (disconnected from pedal).	Replace master brake cylinder.
TROUBLE: BRAKES GRAB OR CHATTER.		
Air in hydraulic system.	Check for air in hydraulic system.	Bleed wheel brake system.
Brake disks warped, scored, or galled.	Visually check disks for galling or scoring.	Replace wheel brake assembly.
TROUBLE: EXCESSIVE PEDAL TRAVEL.		
Excessively worn lining.	Check brake wear. Refer to table 6-2.	Replace lining.
Leak in hydraulic system.	Visually check hydraulic system for leakage.	Repair or replace hydraulic components, as required.
TROUBLE: AIRCRAFT PULLS TO RIGHT OR LEFT - BRAKE PEDAL NOT DEPRESSED.		
Main gear tire pressure uneven.	Check for correct tire pressures.	Inflate tires to proper pressure. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).
Warped or distorted brake disks.	Visually check disks for warping or distortion.	Replace brake assembly.
TROUBLE: AIRCRAFT PULLS TO ONE SIDE WHEN PEDALS DEPRESSED.		
Oil or grease on brake disk.	Visually check disk and lining. If oil appears to be hydraulic fluid, check surrounding components for leakage.	Clean disk and replace lining, if necessary. Also repair or replace any leaking components.
Excessive friction in linkage on one side.	Check for rubbing or chafing in linkage system.	Repair or replace broken or bent linkage.
TROUBLE: PARKING BRAKE FAILS TO HOLD AIRCRAFT STATIONARY.		
Broken parking brake cable.	Disconnect from lever and master cylinders and check operation.	Replace cable assembly.
Faulty master cylinder.	Using a pressure gage installed at master cylinder outlet, pump brake pedal until 600 psi registers - pull parking brake handle. Pressure should hold constant when pedal is released.	Replace cylinder.

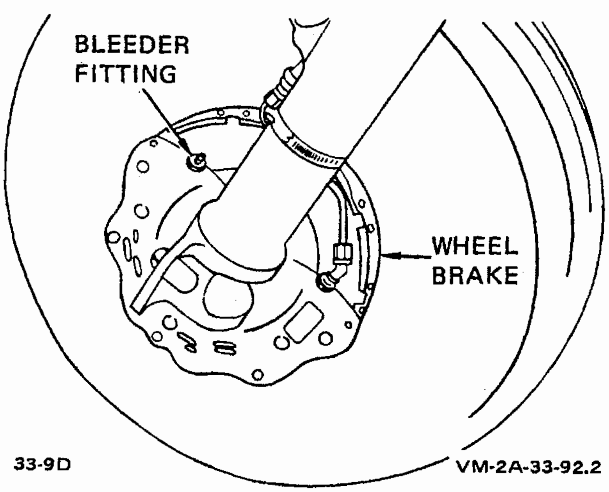
4. Make provisions for keeping reservoir filled with fluid.

5. Loosen bleeder fitting slightly so that fluid will flow when brake is actuated.

6. Have another crew member depress right (brake) rudder pedal with steady pressure until pedal reaches end of stroke. Close bleeder fitting and instruct crew member to release pedal slowly. Repeat operation until fluid flows without any air or bubbles.

7. When fluid flows with no indication of air, close bleeder valve and have helper pump brakes to obtain as full a pedal as possible. While holding pressure on pedal, loosen bleeder on brake housing and permit fluid flow until free of air and then tighten screw. Tighten screw and secure bleeder fitting with lockwire (MS20995F32).

8. Attach bleeder hose to bleeder fitting on right main landing gear and place loosened end in clean container. Open bleeder fitting and repeat step 6.



Step 8—Para. 6-11

9. Attach bleeder hose to bleeder fitting in left jowl and repeat steps 2 through 7.

10. Attach bleeder hose to bleeder fitting on left main landing gear and repeat step 8.

11. Replenish the reservoir after both brakes are bled.

12. Depress each brake several times. Check that pedals do not bottom out and that they feel solid. If sponginess is present, repeat entire bleeding procedures.

13. After brake action is satisfactory, secure bleeder valves with lockwire (MS20995F32).

6-12. ALTERNATE METHOD (PRESSURE METHOD).

If hydraulic test stand or other hydraulic pressure source is available, bleed the wheel brake system in the following manner:

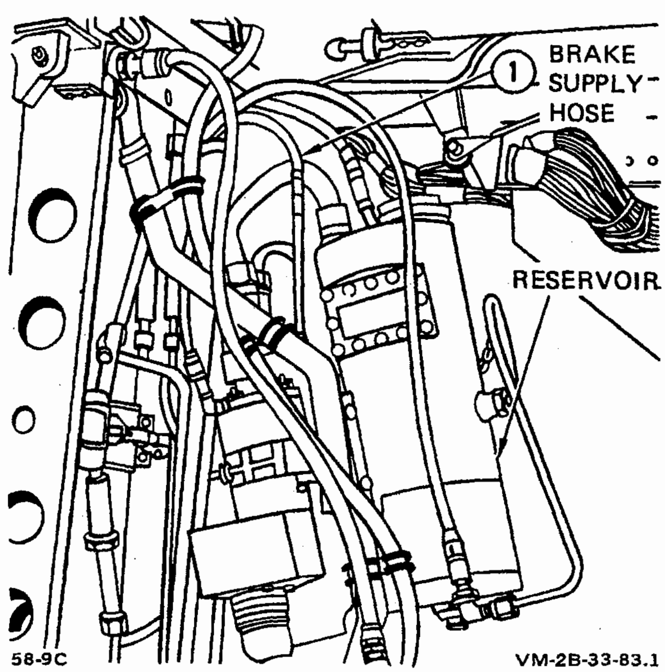
Tools and Equipment List

Test Stand, Hydraulic	S-610 (or equivalent)
Bleeder Hose	(89307)
Clean Container	

Materials List

Fluid, Hydraulic	MIL-H-5606

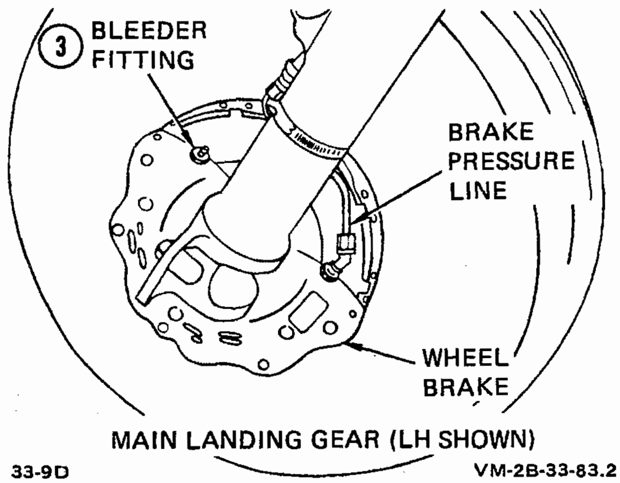
1. Disconnect brake supply hose at reservoir.



Step 1—Para. 6-12

2. Connect a clean hose to brake supply hose and place the loose end of hose in fluid-reservoir of hydraulic source.

3. Connect hydraulic test stand [or other hydraulic pressure source using fluid (MIL-H-5606)] to bleeder fitting on wheel brake.



Step 3—Para. 6-12

4. Apply 400-psi (maximum) hydraulic pressure and slowly open bleeder port to permit fluid to flow back through system.

5. When no air is evident in fluid returning to reservoir (bubble-free), close bleeder port.

6. Check brake operation as follows:

a. Apply 100-pound (approximately) force to brake pedal and check that pedal is firm and does not bottom out.

b. Pull parking brake handle and depress pedal three times. Wheel brakes should be engaged. Release parking brake by depressing brake pedal, noting that parking brake handle and wheel brakes release.

7. Repeat bleeding operation for opposite brake.

8. Fill reservoir in accordance with instruction in General Information and Servicing Manual (NAVAIR 01-60GCB-2-1).

6-13. CHECKING WHEEL BRAKE WEAR. To check wheel brake wear, proceed as follows:

Tools and Equipment List

Jack, Axle	Type A-5

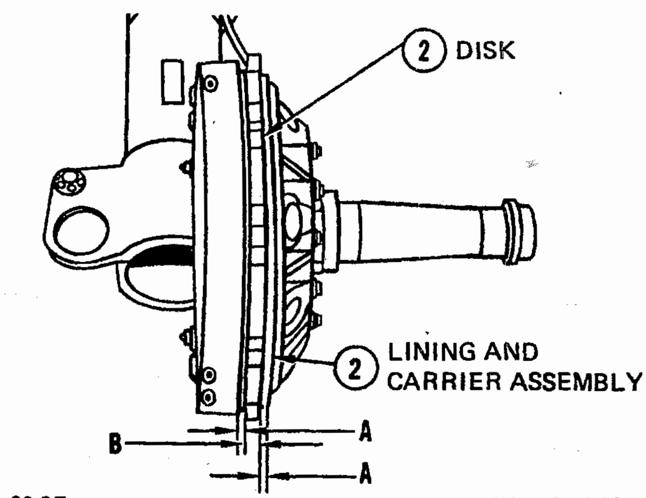
6-14. CHECKING WHEEL BRAKES.

Note

The wheel brakes are self-adjusting and, for this reason, the main landing gear wheels will not turn freely when off ground.

1. Jack aircraft on appropriate strut.

2. Ensure that total thickness of lining and carrier (dimension "A") is not less than 3/16 inch. If total dimension is less than 3/16 inch, it will be necessary to replace the lining carrier assembly.



Step 2—Para. 6-14

3. When disk thickness (dimension "B") is less than 9/32 inch, replace the disk.

4. Recheck dimensions "A" and "B."

5. Remove jacks and jack pads.

6-15. BRAKE CONTROL ACTUATOR REMOVAL AND INSTALLATION.

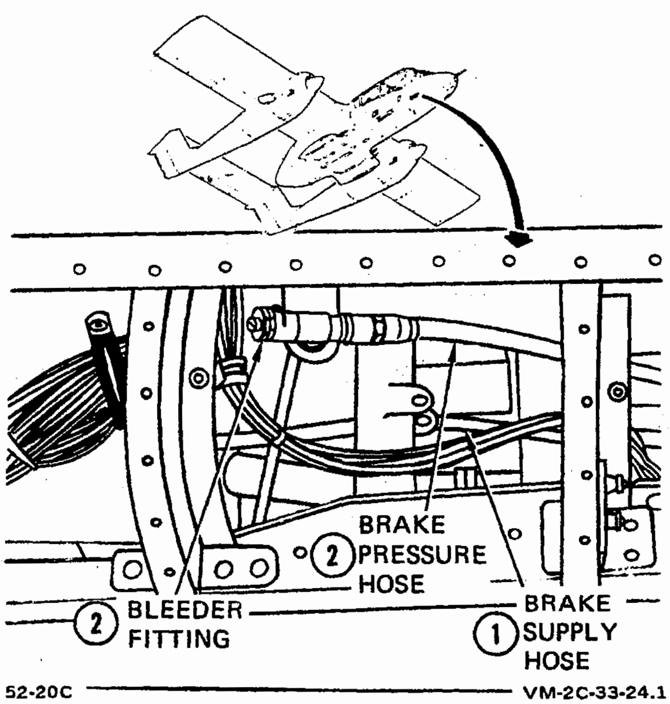
6-16. To remove and install the brake control actuator, proceed as follows:

Note

Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for access panel location. It will be necessary to remove left-hand master brake cylinder access panel (No. 1) if left wheel brake cylinder is being removed, or right-hand master brake cylinder access panel (No. 78) if right wheel brake cylinder is being changed.

6-17. REMOVING BRAKE CONTROL ACTUATORS.

1. Remove brake supply hose at aft fitting on cylinder and cap fitting.



Steps 1 and 2—Para. 6-17

2. Remove brake pressure hose at bleeder fitting cap to prevent leakage.

3. Remove parking brake bell crank cable pin (below forward attach bolt).

4. Remove bolts from forward attach bracket (through cylinder) and rear bell crank.

5. Remove cylinder and supply hose assembly.

6-18. INSTALLING BRAKE CONTROL ACTUATORS.

Materials List

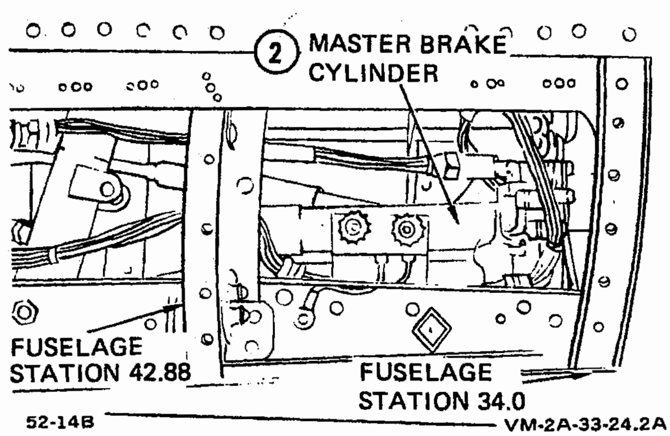
Fluid, Hydraulic	MIL-H-5606
Lockwire (0.032-inch diameter steel)	MS20995F32
Pins, Cotter	MS24665-134

1. Install pressure and supply hoses and fill master cylinder with hydraulic fluid (MIL-H-5606). Cap all ports.

Note

Actuate parking brake arm to ensure that brake control actuator is completely filled with hydraulic fluid.

2. Position brake cylinder in jowl area (with brake pressure fitting in the front of jowl) and install forward bolt torque to 35 ($\pm$5) inch-pounds, and safety with cotter pin (MS24665-134).



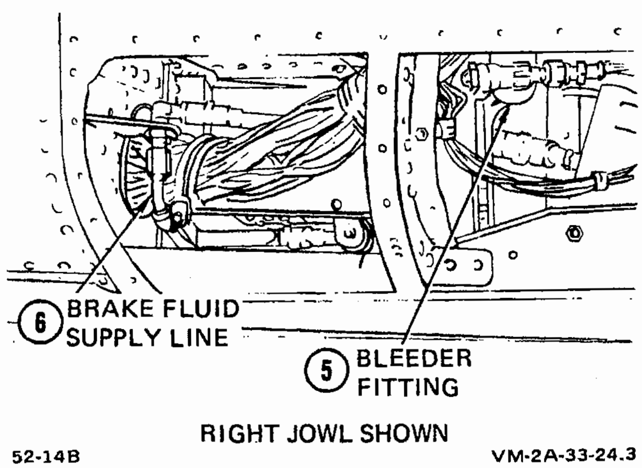
Step 2—Para. 6-18

3. Install aft bolt through actuating bell crank, torque to 35 (±5) inch-pounds, and safety with cotter pin (MS24665-134).

4. Install pin through parking brake cable rod end and bell crank. Install washer and cotter pin (MS24665-134).

5. Attach pressure hose to bleeder fitting.

6. Connect supply hose to supply line from hydraulic reservoir.



Steps 5 and 6—Para. 6-18

7. With bleeder hose attached at bleeder fitting, instruct crew member to operate master cylinder (brake pedal) until a solid stream (air free) of fluid flows from hose into a container.

8. With pedal fully depressed, close bleeder fitting, remove hose, and safety bleeder fitting with lockwire (MS20995F32).

9. Depress both pedals and pull PARK BRAKE handle and release pedals. Release parking brake by depressing pedals.

10. Refill reservoir and check for spongy action. Bleed if required. Refer to paragraph 6-11.

11. Perform operational check of wheel brake system (paragraph 6-5) and reinstall jowl access panels.

6-19. WHEEL BRAKE DISK AND LINING-AND-CARRIER ASSEMBLY REMOVAL AND INSTALLATION.

6-20. To remove and install the wheel brake disk and/or lining-and-carrier assemblies, proceed as follows:

Tools and Equipment List

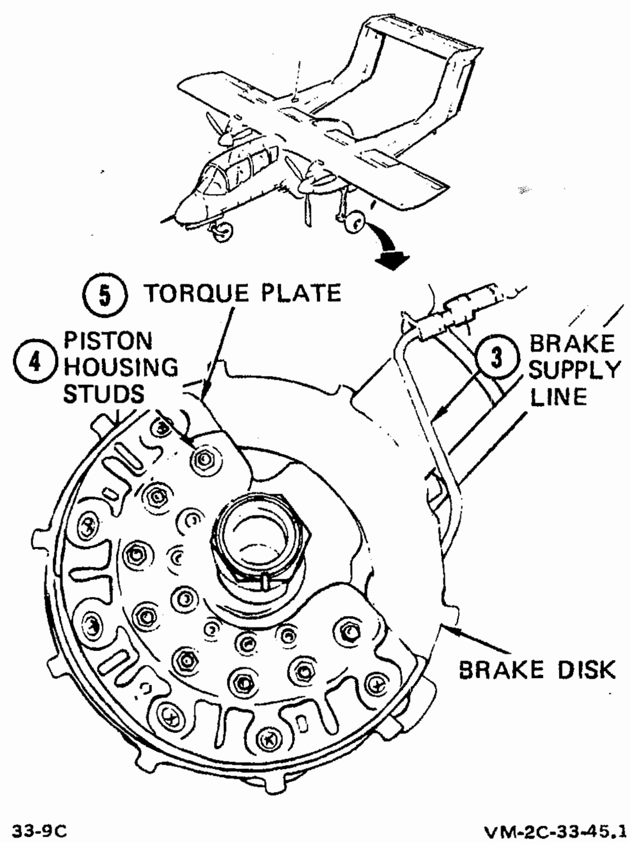
Wrench, Torque	Type A-5
Jack, Axle	

6-21. REMOVING BRAKE DISK AND LINING-AND-CARRIER ASSEMBLY.

1. Using axle jack (Type A-5), jack the appropriate wheel assembly.

2. Remove the main landing gear wheel assembly. Refer to paragraph 5-82.

3. Disconnect and cap brake supply line.



Steps 3 through 5—Para. 6-21

4. Remove retaining nuts from piston housing studs.

5. Remove piston housing from torque plate.

6. Remove insulators, carrier-and-lining assemblies, brake disk, piston assemblies and compression springs.

7. Check thickness of removed carrier-and-lining assemblies. Only the thickness of the carrier-and-lining assemblies is to be measured. If the thickness is 0.180 inch or less, or steel is showing through, replace with new assemblies.

6-22. INSTALLING BRAKE DISK AND LINING-AND-CARRIER ASSEMBLY.

Materials List

Compound, Antiseize	MIL-T-5544A
Packing	MS28775-225*
Packing	68-826† (97153)

*Aircraft not having AFC No. 43 incorporated
†Aircraft having AFC No. 43 incorporated

1. Install springs, piston assemblies, insulators, lining-and-carrier assemblies and brake disk on piston housing. Install new packing (MS28775-225* or 68-826†) as required. See figure 5-66.

2. Install piston housing and components on torque plate.

3. Lubricate threads, washers, and nut with MIL-T-5544A antiseize compound.

4. Install washers and nuts on studs and Lubtork nuts to 230-250 inch-pounds.

5. Install brake supply line.

6. Install main landing gear wheel. Refer to paragraph 5-82.

7. Bleed wheel brake system. Refer to paragraph 6-11.

8. Perform operational check on wheel brake system. Refer to paragraph 6-5.

6-23. WHEEL BRAKE ASSEMBLY REMOVAL AND INSTALLATION.

6-24. To remove and install the wheel brake assembly, proceed as follows:

Tools and Equipment List

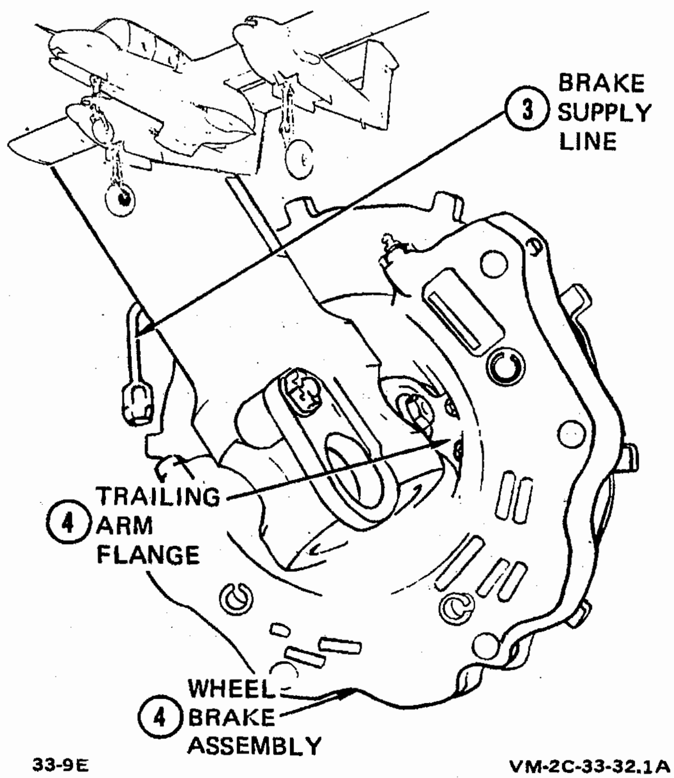
Wrench, Torque	Type A-5
Jack, Axle	

6-25. REMOVING WHEEL BRAKE ASSEMBLY.

1. Using axle jack (Type A-5), jack axle until tire clears ground.

2. Remove main landing gear wheel assembly. Refer to paragraph 5-82.

3. Disconnect brake supply line from brake assembly. Cap to prevent leakage.



Steps 3 and 4—Para. 6-25

4. Remove six internal wrenching bolts from brake assembly and landing gear trailing arm flange and remove wheel brake assembly.

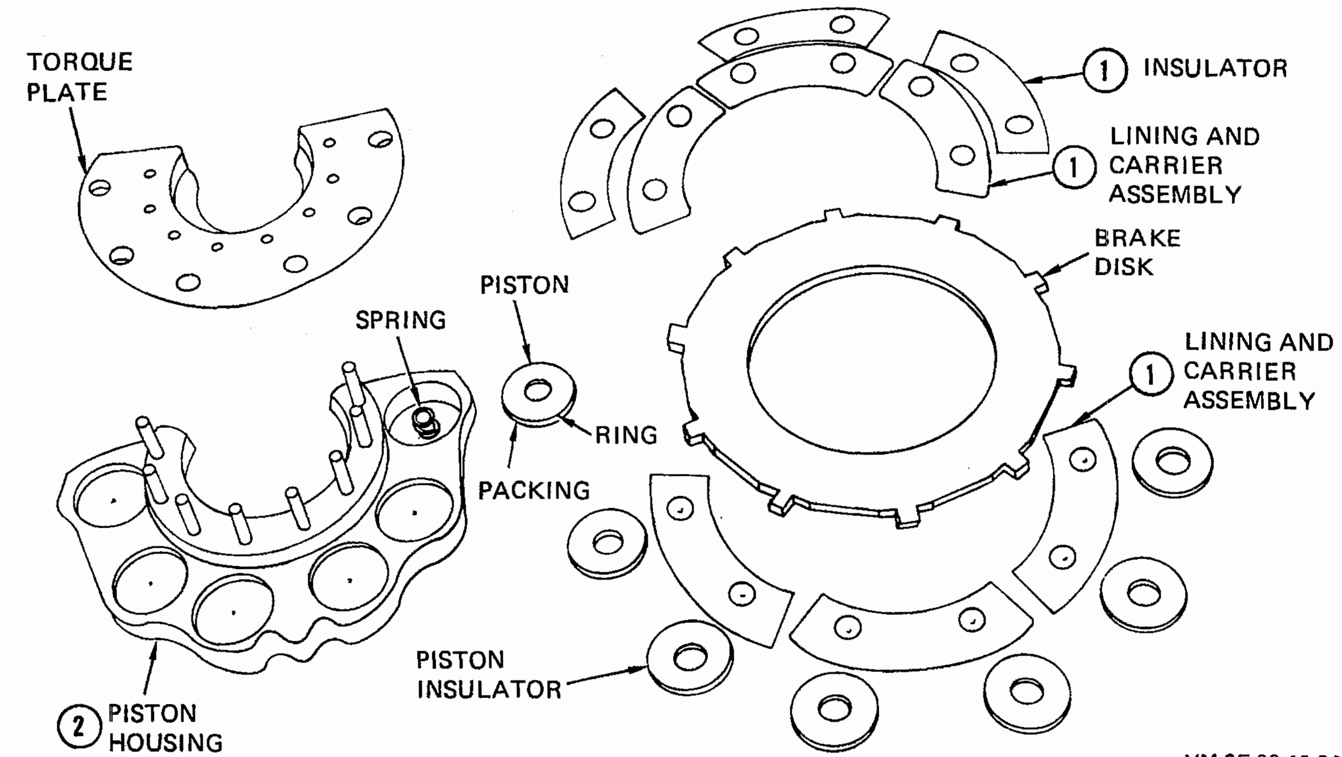


Figure 6-3. Installing Brake Disk and Lining-and-Carrier Assembly

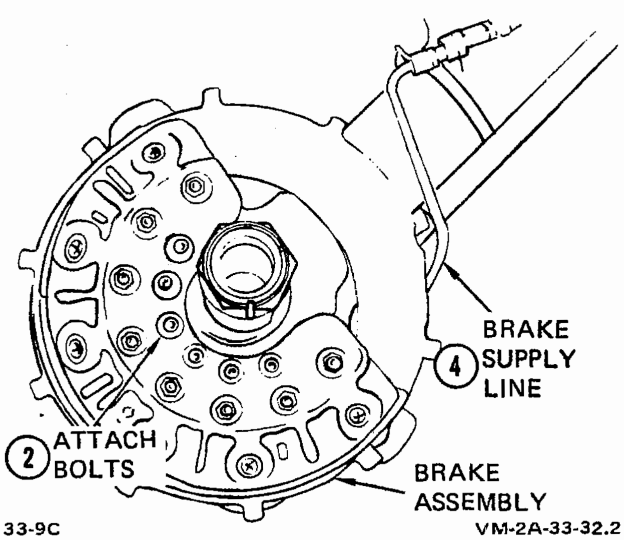
6-26. INSTALLING WHEEL BRAKE ASSEMBLY.

1. Apply MIL-T-5544 grease to bolt threads, underside of nuts and boltheads, and washers.

Note

Ensure brake assembly mounting flange and attach bolt seats are free of paint.

2. Position brake assembly flange on the outboard side of the trailing arm flange, align the attach bolt holes and install the six attach bolts.



Steps 2 and 4—Para. 6-26

3. Torque the brake assembly to the trailing arm flange. Refer to paragraph 6-27.

4. Attach the brake supply line.

5. Fill and bleed the wheel brake system. Refer to paragraph 6-11.

6. Perform operational check of wheel brake system. Refer to paragraph 6-5.

6-27. TORQUING WHEEL BRAKE ATTACH BOLTS.

6-28. To facilitate torquing the wheel brake attach bolts, proceed as follows:

1. Hold nuts 2 and 5 with a box wrench inserted from the wheel side while torque is being applied to the bolt. Torque bolt to 264 inch-pounds.

2. The remaining four nuts are held from the back with a long socket and an angle wrench drive or a short socket with an extension and ratchet. Torque bolts to 264 inch-pounds.

6-29. RIGGING PARKING BRAKE SYSTEM.

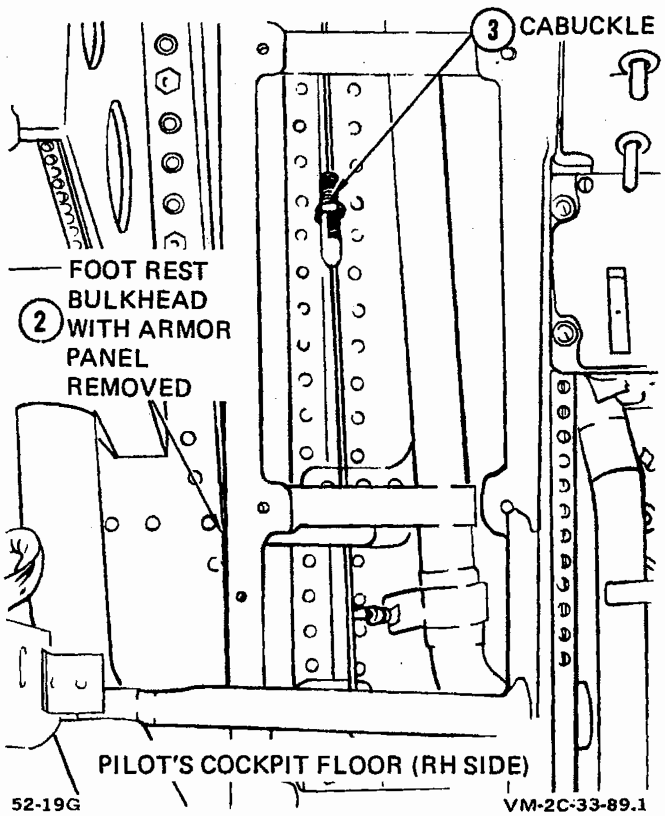
6-30. To rig the parking brake system, proceed as follows:

Materials List

Lockwire (0.032-inch diameter steel)	MS20995F32

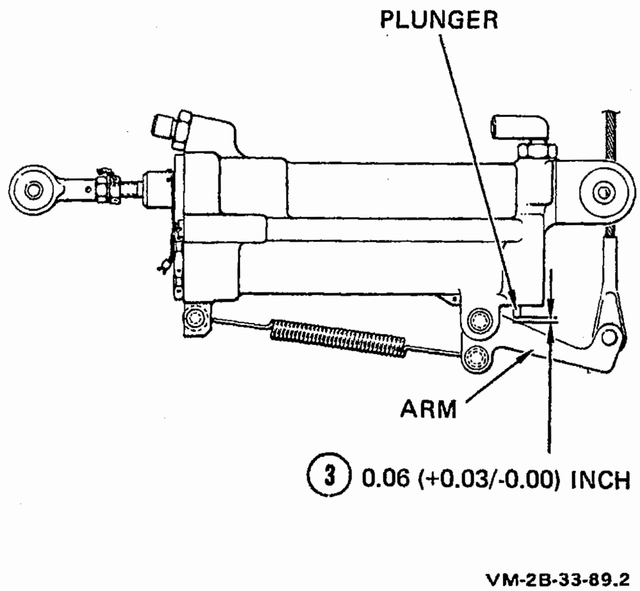
1. Refer to Section II in General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for location, and remove access panel No. 1 (left-hand master cylinder) and access panel No. 8 (right-hand master cylinder).

2. Refer to paragraph 2-135 and remove foot-rest armor plate panels from floor under pilot's rudder pedals.



Steps 2 and 3—Para. 6-29

3. Adjust right and left cabuckles so that a 0.06 (+0.03/−0.00)-inch thick gage will fit between the brake control actuator arm and plunger on both control actuators.



Step 3—Para. 6-29

4. Safety cabuckles with 0.032-inch steel lock-wire (MS20995F32).

5. Refer to paragraph 2-135 and install footrest armor plate panels.

6. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for location, and install access panel No. 1 (right-hand master cylinder) and panel No. 8 (left-hand master cylinder).

SECTION III
INTERMEDIATE MAINTENANCE

6-31. GENERAL.

6-32. Intermediate maintenance of components of the wheel brake system consists of checkout, disassembly, cleaning, inspection, repair, tolerance limits, assembly, adjustment, calibration, preservation, and shipment. Instructions are also given for fabrication of cables. Refer to Chapter 4 for fabrication instructions on tubing and flexible hoses.

6-33. PILOT'S PARKING BRAKE SYSTEM CABLE FABRICATION.

6-34. Specific information necessary for local manufacture of cable assemblies used in the pilot's parking brake system is shown in figure 6-4. Refer to General Structural Repair Manual (NAVAIR 01-1A-1) for specific fabrication methods, Aircraft Structural Hardware Manual (NAVAIR 01-1A-8) for information concerning end fittings, and Illustrated Parts Breakdown (NAVAIR 01-60GCB-4) for specific parts data.

6-35. BRAKE CONTROL ACTUATOR ASSEMBLY (305-586104).

6-36. Intermediate maintenance on the brake control actuator assembly is limited to the replacement of tension spring (4), elbow (14), union (17), arm bushing (9) and their associated parts. See figure 6-5.

6-37. CHECKOUT. Visually check the hydraulic parking brake compensator and wheel brake master cylinder and arm for damage and leakage. If either are damaged or leaking, the assembly should be returned to Supply.

6-38. DISASSEMBLY. See figure 6-5 and disassemble the brake control actuator assembly in the following manner.

1. Position cylinder in a suitable holding device.

2. Remove cotter pin (1), washer (2), and pin (3).

3. Remove cotter pin (5), washer (6), and pin (7). This will permit tension spring (4) to be removed.

4. If pin (12) is worn, remove cotter pin (10), washer (11), and pin (12). Retain arm (8) for reinstallation.

5. Loosen nut (13) and remove elbow (14).

6. Remove packing (15) and ring (16) and plug to prevent leakage.

7. Remove union (17) and packing (18) from cylinder (19) and plug to prevent leakage.

6-39. CLEANING. To clean brake control actuator assembly components, proceed as follows:

Materials List

Solvent, Dry-cleaning	P-D-680, Type II

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

1. Using a brush, clean all parts with dry-cleaning solvent (P-D-680, Type II).

2. Dry all parts with clean, dry air.

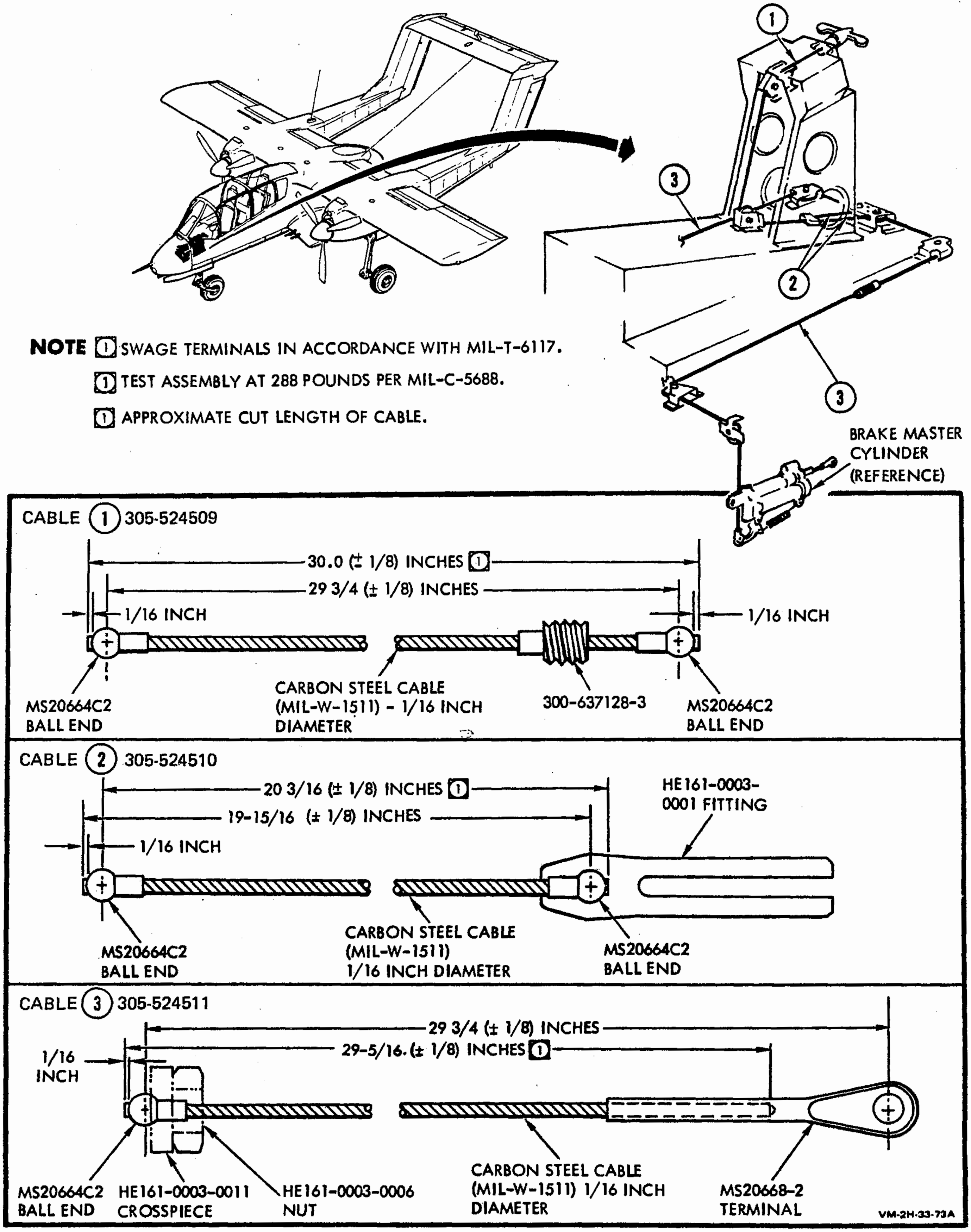
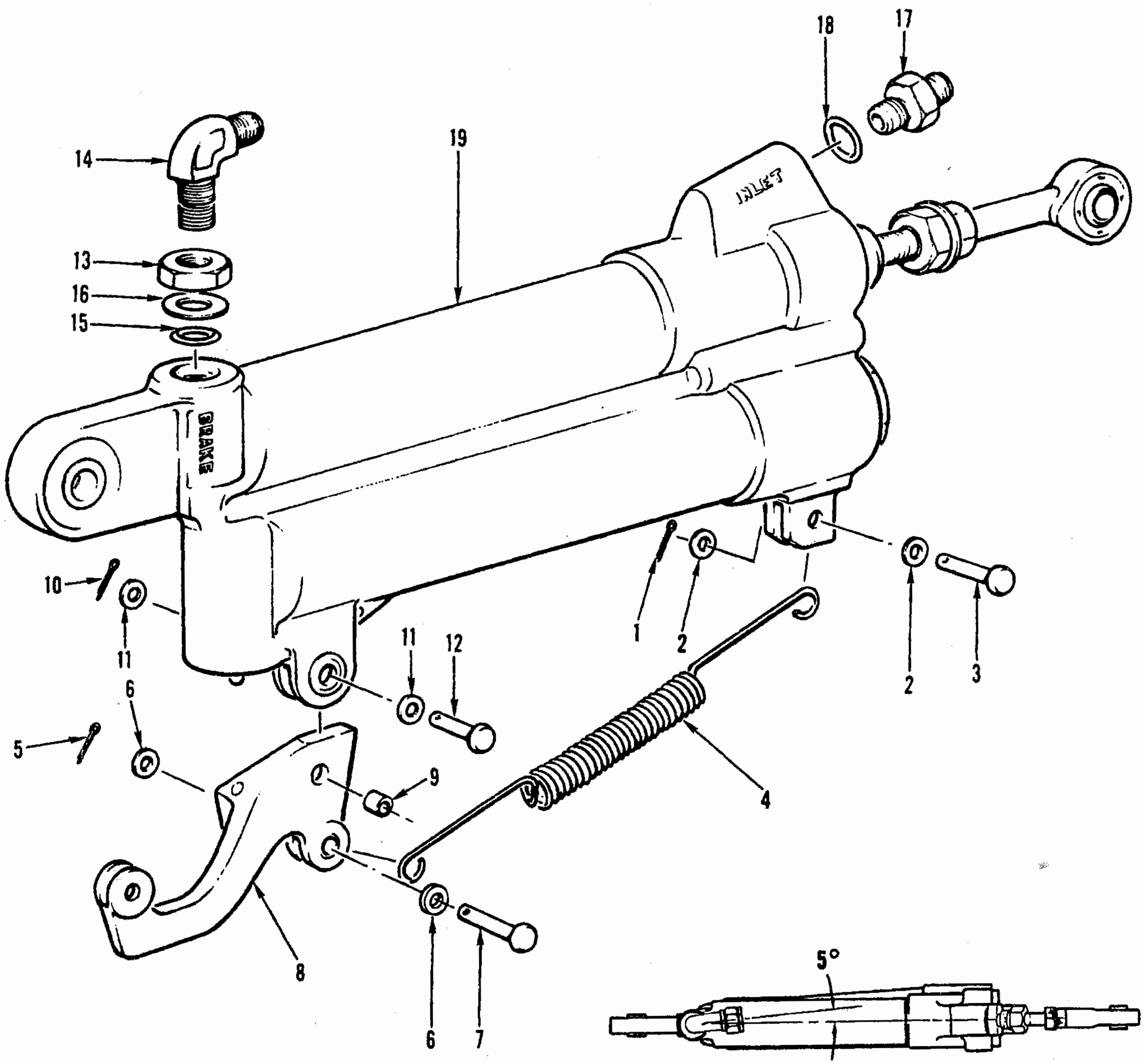


Figure 6-4. Pilot's Parking Brake System Cable Fabrication



1 COTTER PIN	11 WASHER
2 WASHER	12 PIN
3 PIN	13 NUT
4 SPRING	14 ELBOW
5 COTTER PIN	15 PACKING
6 WASHER	16 RING
7 PIN	17 UNION
8 ARM	18 PACKING
9 BUSHING	19 CYLINDER
10 COTTER PIN	

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Figure 6-5. Brake Control Actuator Assembly

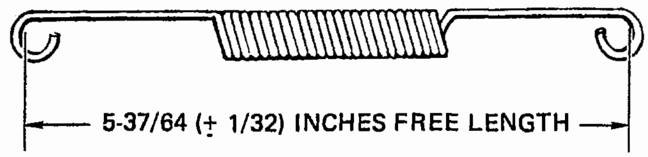


Figure 6-6. Inspecting Brake Control Actuator Spring

6-40. INSPECTION. If a part does not meet the conditions in the following steps, it must be replaced.

Tools and Equipment List

Tester, Spring Resiliency	Type PB4-D (or equivalent)

1. Extend length of tension spring (4) to 6-1/2 inches, release and check for free length of 5-37/64 (± 1/32) inches measured from inside hooks. See figure 6-6.

2. Extend length of spring (4) to 6.00 (± 1/32) inches and check for a load of 11.75 (± 1.2) pounds.

3. Check pins and washers for excessive wear.

4. Check arm bushing (9) for excessive wear (0.2500 +0.005-inch inside diameter).

6-41. ASSEMBLY. To assemble the brake control actuator, see figure 6-5 and proceed as follows:

Materials List

Pins, Cotter	MS24665-134
Packing	MS28778-4
Ring	MS9058-04
Bushing	4B19B4-008

1. Install packing (18) on union (17) and install in cylinder (19).

2. Install nut (13) on elbow (14) along with packing (15) and ring (16) and install in cylinder. Position angle of fitting 5 degrees off center of actuator. See figure 6-5.

3. Remove arm bushing (9) by using an arbor press on a standard bench vise and press out the bushing.

CAUTION

Use care when pressing out or installing the arm bushing, so as not to break or crack the arm.

4. Ream the inside diameter of the arm to 0.3750 (±0.0005) inch.

5. Press in bushing and if necessary ream to 0.2500 (+0.0005/-0.0010)-inch inside diameter.

6. Position arm (8) (with bushing 9 installed), on cylinder (19) and install pin (12), washers (11), and cotter pin (10).

7. Properly position spring (4) and install pin (7), washers (6), and cotter pin (5).

8. With spring (4) aligned on cylinder (18), install pin (3), washers (2), and cotter pin (1).

6-42. TESTING. To test the brake control actuator, proceed as follows:

Tools and Equipment List

Test Stand, Hydraulic	S-610

1. Mount actuator in suitable holding device.

2. Adjust actuator rod end to obtain 12.42 inches between body bearing centerline and rod end bearing centerline when rod is fully extended.

3. Position actuator with rod end down, with brake (outlet) port open, and hydraulic test stand connected at inlet port.

4. Apply sufficient hydraulic pressure to bleed air from cylinder.

5. Plug brake port, depress packing valve arm and apply 300 psig at inlet port. Relieve pressure at inlet port and open brake port.

6. Repeat step 5 until there is no evidence of air in fluid displaced at brake port.

7. Plug brake port (outlet).

8. Depress packing valve arm and apply 300-psig hydraulic pressure at inlet port.

9. Check that there is no evidence of external leakage, failure, or distortion.

10. Drain all fluid from actuator and cap all open fittings.

SECTION IV
DEPOT MAINTENANCE

6-43. GENERAL.

6-44. Depot maintenance of components of the wheel brake system consists of checkout, disassembly, cleaning, inspection, repair, tolerance limits, assembly, adjustment, calibration, preservation, and shipment.

6-45. WHEEL BRAKE ASSEMBLY (2-1128).

6-46. Two types of wheel brake assemblies (figure 6-7) are used on the aircraft: one utilizes a piston housing (19) with three adjuster housings (4) installed and the other does not have this provision. The assembly (2-1128-2* or 2-1128-3†) without the adjuster housing provision supersedes and is interchangeable with the other assembly. The wheel brake assembly is a single disk brake system using hydraulic fluid (MIL-H-5606) and consists of the following parts: A bleeder (8), fitting (9), and packing (10) in one of two piston housing (19) inlet ports. Bleeder screws (5) and seals (6) are located at the end of the piston housing. The large bores in the piston housing contain six pistons (17) with packing (15), backup retainers (14), compression springs (16), and insulators (13). The torque buttons of the carrier-and-lining assemblies (12) are permanently riveted into the insulator holes. The disk (20) fits between the carrier-and-lining assemblies (12) at the piston housing and those separated from the torque plate (3) by insulators (11). The torque plate (3) is attached to the piston housing (19) by eight studs which are integral parts of the housing and fastened in place by eight washers (2) and nuts (1).

*Aircraft not having AFC No. 43 incorporated
†Aircraft having AFC No. 43 incorporated

6-47. DISASSEMBLY. To disassemble the wheel brake assembly, see figure 6-7 and proceed as follows:

1. Remove nuts and washers and detach torque plate from piston housing.

2. Remove brake disk.

3. Remove inner carrier-and-lining assembly and insulator.

4. Remove outer carrier-and-lining assembly.

5. Remove insulator, pistons, and springs from piston housing. Then remove packings and retainers from pistons.

6. Remove bleeder valve, fitting, packing, bleeder screws, and seals from piston housing.

6-48. CLEANING. Clean the components of the wheel brake assembly as follows:

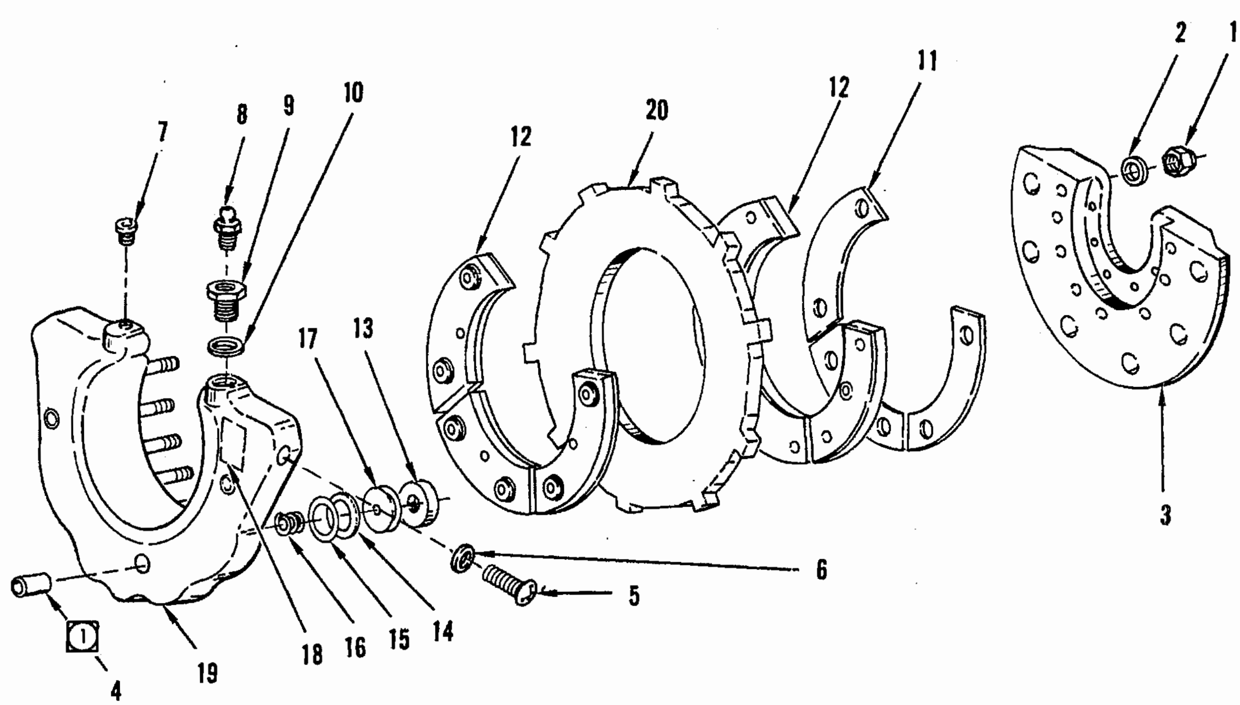
Materials List

Solvent, Dry-cleaning	P-D-680, Type II
Hydraulic Fluid	MIL-H-5606

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

1. Before cleaning parts, remove all chipped, blistered, cracked, or loose paint. All metal parts must be washed in cleaning solvent (P-D-680, Type II) or equivalent.



1 NUT
2 WASHER
3 TORQUE PLATE
[1] 4 HOUSING
5 SCREW
6 DYNA SEAL
7 CAP
8 BLEEDER
9 FITTING, BLEEDER
10 PACKING
11 INSULATORS
12 CARRIER AND LINING ASSEMBLIES
13 INSULATORS, PISTON
14 RETAINER
15 PACKING
16 SPRING
17 PISTON
18 PLATE, IDENTIFICATION
19 HOUSING, PISTON
20 DISK, BRAKE

[1] ADJUSTER HOUSINGS AND HOLES IN PISTON HOUSING ARE INCORPORATED ON THE 2-1128 ASSEMBLY ONLY.

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Figure 6-7. Wheel Brake Assembly

2. Rubber parts are to be washed in hydraulic fluid, (MIL-H-5606).

Note

Replace all seals and packings.

6-49. INSPECTION. Inspect brake components in accordance with table 6-2, see figure 6-7 and proceed as follows:

Materials List

Emery Cloth	Commercial

1. Discard all seals and packings at each disassembly.

CAUTION

Do not attempt any repairs in the piston bore area.

2. If piston housing has slight damage (nicks, gouges, or corrosion), it may be polished in the damaged area with emery cloth providing more than 0.020 inch below original surface is not removed.

6-50. REPAIR. To repair components of the wheel brake assembly, see figure 6-7 and proceed as follows:

Materials List

Emery Cloth	Commercial
Primer, Zinc-chromate	MIL-P-8585 or TT-P-1757

Table 6-2. Wheel Brake Assembly Inspection Table

NOMENCLATURE	PART NO.	TYPE OF INSPECTION	PROCEDURE	ACCEPTABLE DEFECTS
Nuts	MS20364-624C NAS1291-6* MS21042L6*	Visual	Inspect for cracks, corrosion, distortion, and wear.	None
Screws	MS35207-259	Visual	Inspect for cracks, corrosion, distortion, and wear.	None
Washers	MS20002-6	Visual	Inspect for cracks, corrosion, distortion, and wear.	None
Carrier-and-Lining Assembly	244-217	Visual	Inspect for minimum of 0.180-inch thickness and security of torque buttons.	Refer to table 6-3.
Torque Plate	184-285	Visual	Inspect for cracks, corrosion, distortion, and stiffening web damage.	No cracks or distortion.
Brake Disk	133-261	Visual	Inspect for wear.	Replace when worn to 0.300-inch thickness or lug width is 0.375 inch.
Piston	74-526	Visual	Inspect for wear, corrosion, and surface defects.	Refer to table 6-3.
Housing	260-242 OV 266-27	Visual	Inspect for wear, corrosion, and surface defects.	Refer to paragraph 6-50.
Identification Plate	50-273	Visual	Replace, if illegible or missing.	None

*Alternate parts for MS20364-624C nuts

1. Replace all parts obviously damaged beyond repair, especially if a repair would affect proper operation of a component.

2. Replace seals and packings at each reassembly.

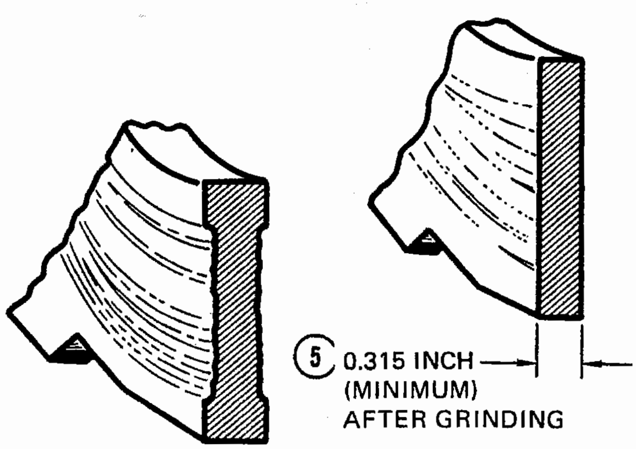
3. Hand-file any minor surface blemishes to relieve all sharp corners. Remove tool marks with emery cloth.

CAUTION

Do not remove more than 0.020 inch below original surface for blending in local areas. Do not attempt to repair piston bore of piston housing.

4. If protective coating has been defaced or scratched to bare metal, sand the damaged area with emery cloth or fine sandpaper. Apply one coat of zinc-chromate primer (MIL-P-8585 or TT-P-1757).

5. Surface grind the disk (20) for surface clean-up. Minimum disk thickness after grinding is 0.315 inch.



Step 5—Para. 6-50

6. Torque plates with stiffening web damage shall be repaired as follows:

a. Locally blend the damaged areas with an aluminum oxide wheel and emery cloth. Paint blistering or discoloration indicative of excessive heating conditions shall be brought to the attention of Engineering for disposition. Remove nicks, scratches, rolled-over metal, and all sharp corners and radii. Original edge radii shall be maintained wherever possible. Maximum depth of blended area shall be 0.140 inch measured from the original web edge. The thickness of the outer flange shall be not less than 0.220 inch after blending.

b. Apply chromate conversion coating (alodine, etc.) MIL-C-5541/MIL-C-81706 per NAVAIR 01-1A-509.

c. Apply MIL-P-23377 epoxy-polyamide primer in accordance with MIL-C-22751 to the reworked areas of the torque plates after alodining.

d. Final finish coating shall be two coats of MIL-C-22750 epoxy-polyamid paint, gloss white, Federal Standard 595 Color No. 17875.

6-51. TOLERANCE LIMITS. The tolerance limits of components of the wheel brake assembly are listed in table 6-3. See figure 6-7.

6-52. LUBRICATION. Lubricate threads and bearing surfaces of nut (1), washers (2, 22), and screw (21). See figure 6-7. Refer to paragraph 6-53 for Lubtork procedures at assembly.

6-53. ASSEMBLY. To assemble the wheel brake assembly, see figure 6-7 and proceed as follows:

Materials List

Dynaseal	110-3/16 (86579)
Packing	MS28775-225*
Packing	MS28778-4
Packing	68-826† (97153)
Retainer	MS28774-225

*Aircraft not having AFC No. 43 incorporated
†Aircraft having AFC No. 43 incorporated

Table 6-3. Wheel Brake Assembly Tolerance Limits

NOMENCLATURE	INDEX NO.	TOLERANCE LIMIT
Spring	16	Using spring resiliency tester (PD4-D or equivalent), minimum load at 0.221-inch solid height equals between 4 and 13 pounds.
Disk	20	Minimum thickness to be 0.330 inch and minimum lug width to be 0.375-inch.
Carrier-and-Lining Assembly	12	Total thickness to be 0.180-inch (minimum).
Piston	17	Diameter of O-ring gland 1.873-inch (minimum) and 0.235-inch (maximum) width.

1. If removed, affix identification plate to piston housing with screw and Dynaseal.

2. If removed, install screw and Dynaseal (110-3/16) into piston housing fluid passage access hole.

3. Install packing (MS28778-4), bleeder fitting, and bleeder.

4. Install spring, packing (MS28775-225* or 68-826†), retainer, piston, and insulator.

5. Install inner carrier-and-lining assembly.

6. Install housing.

7. Install brake disk.

8. Install outer carrier-and-lining assembly.

9. Install insulator and torque plate and fasten to assembly with washer and nut.

Note

Lubtork nut to 230 to 250 inch-pounds with antiseize thread compound (MIL-T-5544A).

*Aircraft not having AFC No. 43 incorporated
†Aircraft having AFC No. 43 incorporated

6-54. TESTING. To test the wheel brake assembly proceed as follows:

Tools and Equipment List

Stand, Test, Hydraulic	S-610 (or equivalent) (89307)
Hose, Flexible	As required

1. Using a suitable size and length of flexible hose, assemble a hydraulic circuit between brake assembly and hydraulic test stand.

2. Apply 600-psi pressure.

3. Check for leakage.

4. Remove hydraulic flex hose, drain fluid from wheel brake, plug hydraulic fittings and store.

6-55. HYDRAULIC PARK BRAKE COMPENSATOR AND WHEEL BRAKE MASTER CYLINDER (71536-1).

6-56. The hydraulic park brake compensator and wheel brake master cylinder is a push-type, pin-mounted hydraulic cylinder with a manual parking brake. It consists of a master cylinder, a three-way, two-position manually operated valve, a spring-loaded hydraulic accumulator, and a relief valve. The unit has an inlet port and a brake port and is designed for use in a 1500-psi system using

MIL-H-5606 hydraulic fluid. Refer to table 6-4 for leading particulars.

Table 6-4. Hydraulic Park Brake Compensator and Wheel Brake Master Cylinder Leading Particulars

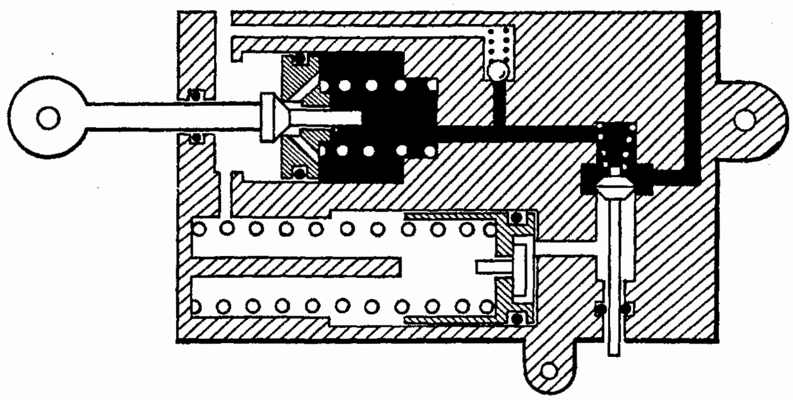
Pressure Data:	
Operating	460 psig (650 psig maximum).
Proof	1300 psig.
Relief Valve:	
Flow	1300 psi (maximum) at 20 cc/minute.
Reseat	950 psi (minimum).
Internal Leakage	with unit harnessed in mid-position (park-lock in normal position) two drops per minute in 2 minutes after the first minute of 25 psig and 900-psig hydraulic pressure is applied at brake port with inlet port open.
Thermal Relief Valve:	
Relieves	10 cc/minute (maximum) flow when compensator displacement exceeds 0.68 cubic inch.
Reseats	0.66 cubic inch (maximum) with leakage in parked condition and 575 to 230 psig at brake port, combined leakage from inlet port shall not exceed five drops in 4 hours after 2-minute wait.
Temperature Range:	
Fluid and Ambient	(-22° to 160°F).
Internal Temperature Compensator:	
Displacement	0.66 cubic inch preload at 0.0 cubic inch 230 psig with inlet at ambient.
Load	0.66 cubic inch 575 psig with inlet at ambient.

Table 6-4. Hydraulic Park Brake Compensator and Wheel Brake Master Cylinder Leading Particulars (Cont)

Pumping:	
Travel	0.04 maximum.
Stroke	0.84 inch.
Dimensions:	
Height	4.62 inches.
Width	1.5625 inches.
Length: Extended	13.542 inches.
Compressed	12.66 inches.
Stroke	0.875 minimum.
Weight:	2.0 pounds (approximate).

6-57. MASTER CYLINDER OPERATION. In normal (deenergized) position (figure 6-8), the rod is extended due to the action of the internal return spring, the brake port is open to inlet port and the accumulator is blocked. When the rod is actuated, the pumping valve closes within the first 0.040 inch of rod travel, locking in the fluid between piston and brake port. Piston movement displaces fluid out the brake port and generator pressure proportional to the force applied. When the rod is released, the piston begins to move due to pressure at the brake port and action of the return spring. As the piston returns to deenergized position, which opens pumping valve, brake pressure stabilizes with inlet pressure. If one stroke of master cylinder does not supply sufficient fluid to accomplish the required braking, additional fluid may be pumped into the system by actuating cylinder rapidly.

6-58. PARK-LOCK OPERATION. In normal (deenergized) position (figure 6-9) the park-lock plunger is extended due to the action of the internal return spring, the brake port is connected to the master cylinder, and the accumulator is blocked. When the park-lock plunger is actuated, the initial movement unseats the valve, which opens the accumulator to the brake port and master cylinder. Within the first 0.19 inch of travel the poppet is moved to its opposite seat, thus blocking the master cylinder and connecting accumulator to



NOTE SHOWN IN MID-STROKE

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Figure 6-8. Brake Master Cylinder Schematic - Normal Operation

the brake port. Further plunger travel is absorbed by a spring-loaded overtravel device.

Note

The master cylinder must be pumped up at least once to fill the park-lock accumulator.

After charging the accumulator, the piston rod is released, and the pressure at the brake port is maintained by the check valve action of the park-lock valve. When the park-lock plunger is released, the poppet will remain seated due to the differential pressure between brake and master cylinder. Maintaining brake port pressure is a characteristic function of the accumulator. When the piston rod is actuated with the unit in the parked condition, the pressure generated by the master cylinder plus the poppet return spring, unseat the park-lock poppet causing the poppet to move to its seat, closing the passage from the brake port to accumulator. When the rod is released, any pressure remaining at the accumulator is released simultaneously with brake pressure, due to the check valve effect of the park-lock poppet.

6-59. THERMAL COMPENSATING OPERATION. When the unit is in the deenergized condition, the brake pressure will be approximately 575 psi (accumulator full). System temperature changes which result in negative volume changes of brake fluid, will be compensated by the accumulator (0.66 cubic inch from 575 to 230 psig). System temperature changes which result in positive volume changes of brake fluid will be compensated by the relief valve which dumps brake pressure in excess of 950 (±25) psig.

6-60. CHECKOUT. There is only one probable mode of failure: high break-out force caused by contaminants in the hydraulic system or extended exposure to high temperatures. For operational checkout of actuating cylinder, see figure 6-10 and proceed as follows:

Tools and Equipment List

Test Stand, Hydraulic,	S-610 (89307)
Fixture, Test (00502)	T-56339
Valve, Relief 100 to 1200 psig (86768)	P670-1-1/4 DP
Filter, Cartridge (90005)	28724 Size 1, T Type Series 2872
Filter Element, Replacement Kit (90005)	035065
Valve, Globe 0 to 3000 psig (97399)	P3004V, Model 300

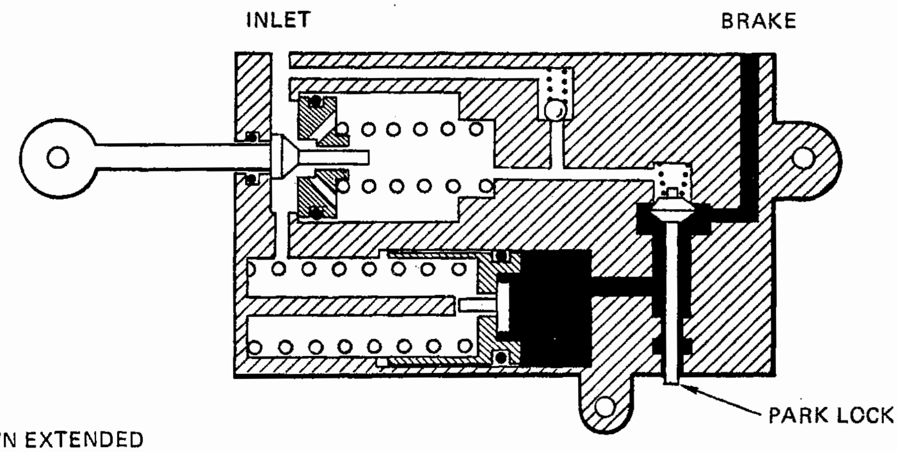

Figure 6-9. Brake Master Cylinder Schematic - Park Lock Operation

Tools and Equipment List (Cont)

Gage, Pressure 0 to 1500 psi (72100)	Commercial
Gage, Pressure 0 to 3000 psig (72100)	Commercial
Scale, Force Measuring	CATL 719-20

Materials List

Fluid, Hydraulic	MIL-H-5606

1. Install cylinder in a suitable test setup as shown in figure 6-10.

2. Adjust rod end to obtain the dimension 12.42 inches when rod is fully extended.

3. With the cylinder positioned with piston rod down, open the brake port.

4. Connect inlet port to a hydraulic pressure source and apply sufficient hydraulic pressure to bleed all air from cylinder.

5. Plug the brake port, depress the parking valve plunger, and apply 300 psig at inlet port. Relieve pressure at inlet port and open brake port. Repeat this operation until there is no evidence of air in the fluid displaced at brake port.

6. Install the cylinder in test fixture (T56339) capable of actuating the piston and restraining the rod in the actuated position.

6-61. PROOF PRESSURE AND EXTERNAL LEAKAGE TEST. Perform the following test two times for a 2-minute period with piston rod restrained at 0.25 inch (maximum).

1. Plug brake port.

2. Depress parking valve plunger and apply 300-psig hydraulic pressure at inlet port.

3. Check that there is no evidence of external leakage or evidence of failure due to distortion or permanent set.

6-62. RELIEF VALVE FLOW TEST. To test flow in the relief valve, proceed as follows:

1. With piston rod restrained at 0.25 inch (minimum), apply increasing pressure to the brake port until fluid flows from inlet port.

2. Flow pressure is the pressure where leakage increases to 20 cubic centimeters (cc) per minute. The relief valve must relieve by 1300 psig (maximum).

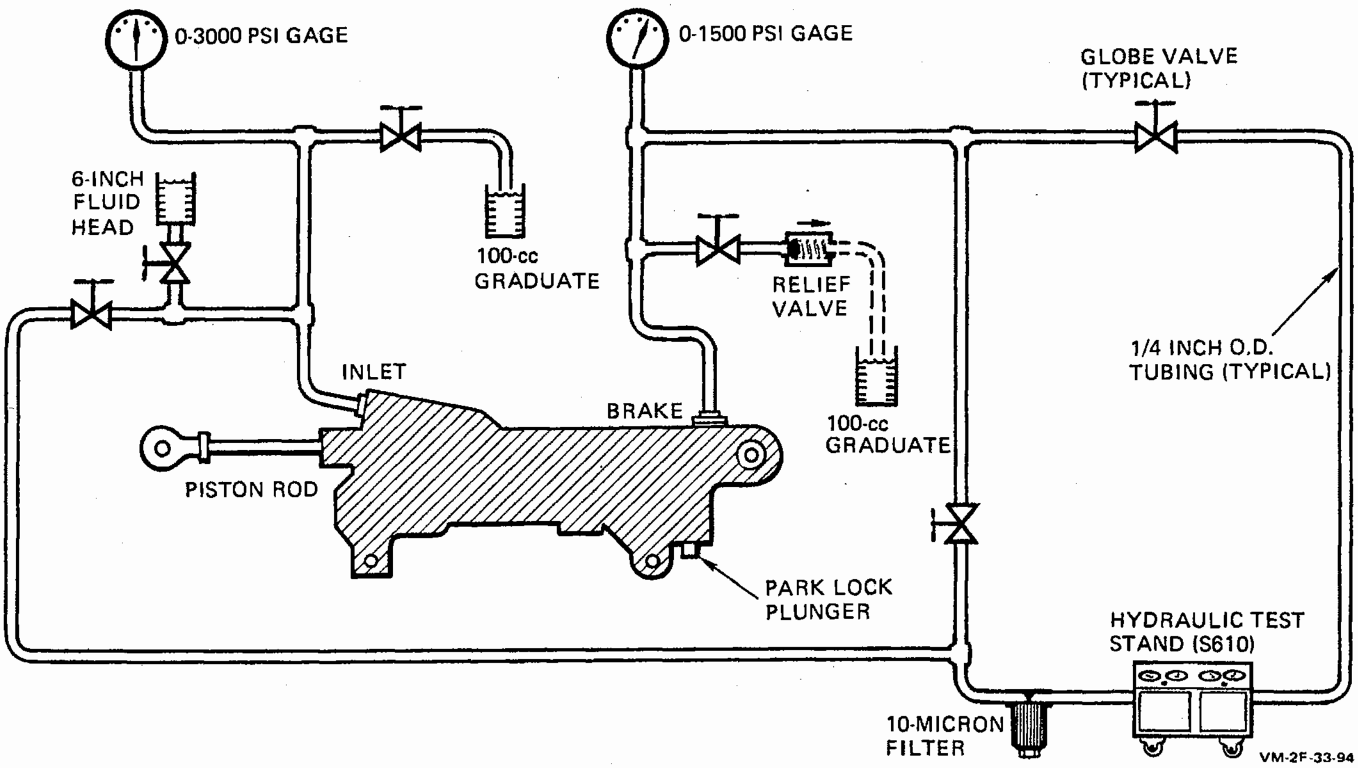

Figure 6-10. Hydraulic Park Brake Compensator and Wheel Brake Master Cylinder - Test Setup

6-63. RELIEF VALVE LEAKAGE TEST. Perform a relief valve leakage test as follows:

1. With the valve flowing at 20 cc per minute (refer to RELIEF VALVE FLOW TEST), increase pressure to 1700 psi and hold for 5 seconds.

2. Quickly reduce pressure to 900 psig and check for leakage. Leakage rate at inlet port must not exceed a rate of two drops per minute.

Note

Measure leakage for 2 minutes and average leakage to determine rate.

3. Reduce pressure from 900 psig to 25 psig. Leakage rate at inlet port must not exceed two drops per minute.

Note

Measure leakage for 2 minutes and average leakage to determine rate.

6-64. THERMAL RELIEF FLOW TEST. To test thermal relief flow, with park-lock plunger depressed, apply pressure at brake port to obtain a flow of 2 to 10 cc per minute. The pressure required should be 750 psig (maximum).

6-65. OPERATIONAL TEST. To perform an operational test of the master cylinder and parking valve compensator, see figure 6-10 and proceed as follows:

1. With the cylinder installed in the test fixture, connect a 6-inch fluid head in inlet port and a relief valve set at 460 (±25) psig at brake port.

2. After bleeding cylinder and test setup, pump fluid through the cylinder by actuation of piston rod five times. There must be no evidence of binding or external leakage while only 0.6 cubic inches (minimum) of fluid is to be required during each complete cycle. Each rod stroke must be 0.875 inch (minimum).

3. Depress park-lock plunger and actuate the piston rod to produce 460 psig at the brake port. Release the piston rod and monitor gage for 5 minutes. The force necessary to initiate valve plunger movement must not exceed 10 pounds as measured with force measuring scale (CATL 719-20). Pressure at brake port must stabilize at a pressure above 420 psig within the first minute of the test.

4. Release parking valve plunger and apply 660 psig, using piston rod. Pressure at brake port must be reduced to zero.

5. If unit meets all test requirements, return to service or drain all fluid from cylinder, plug ports, place cylinder in clean container, and identify with date of testing. If unit fails to meet requirements, refer to paragraph 6-66 for probable causes and remedies of malfunctions.

6-66. TROUBLESHOOTING. See figure 6-11 and refer to table 6-5 to troubleshoot the hydraulic park brake compensator and wheel brake master cylinder.

6-67. DISASSEMBLY. To disassemble the hydraulic park brake compensator and wheel master cylinder, see figure 6-11 and proceed as follows:

Note

Take note of the lockwiring methods used so they may be duplicated during assembly.

Note

Use a vise with padded jaws and do not apply wrenches to any surface other than wrench flats during disassembly.

1. Remove relief valve retainer (1) and remove adjustment screw (3), helical spring (4), spring guide (5), ball (6), body (7), and seat (8).

2. Remove and discard packing (9).

3. Remove lockwire between lock washer (11) and nut (12) and loosen nut sufficiently to permit washer to unseat from slot in rod end bearing (10).

4. Remove bearing (10), washer (11), and nut (12).

WARNING

When nearing end of threads between sleeve bearing (15) and upper bore of cylinder body (47), be prepared for spring action in excess of 70 pounds.

5. Break lockwire between sleeve bearing (15) and end cap (26). Remove sleeve bearing, then remove and discard packing retainers (13) and packing (14) from bearing inner groove and packing (16) from bearing outer groove.

6. Remove rod (17), packing (18), poppet (19), spacer (20), piston (21), packing (22), spring (23), guide (24), and spring (25) from upper bore of cylinder body. Discard packings (18 and 22) removed from master cylinder rod (17) and piston (21), respectively.

WARNING

Prepare for spring action in excess of 155 pounds from compression springs when removing end cap (26) from lower bore of cylinder body (47).

7. Remove end cap (26) from lower bore of cylinder body (47) and remove and discard packing (27). Remove abutment (28), spring (29), and spring (30).

8. Remove pin (31), poppet (32), packing (33), and piston (34) as an assembly and disassemble on the bench.

9. Press out pin (31) from piston (34) to release poppet (32).

10. Remove and discard packing (33).

11. Cut lockwire between retainer nut (35) and cylinder body (47). Remove retainer nut and remove poppet (36), retaining ring (37), sleeve (38), spring (39), plunger (40), packings (41, 42, and 43), bear-

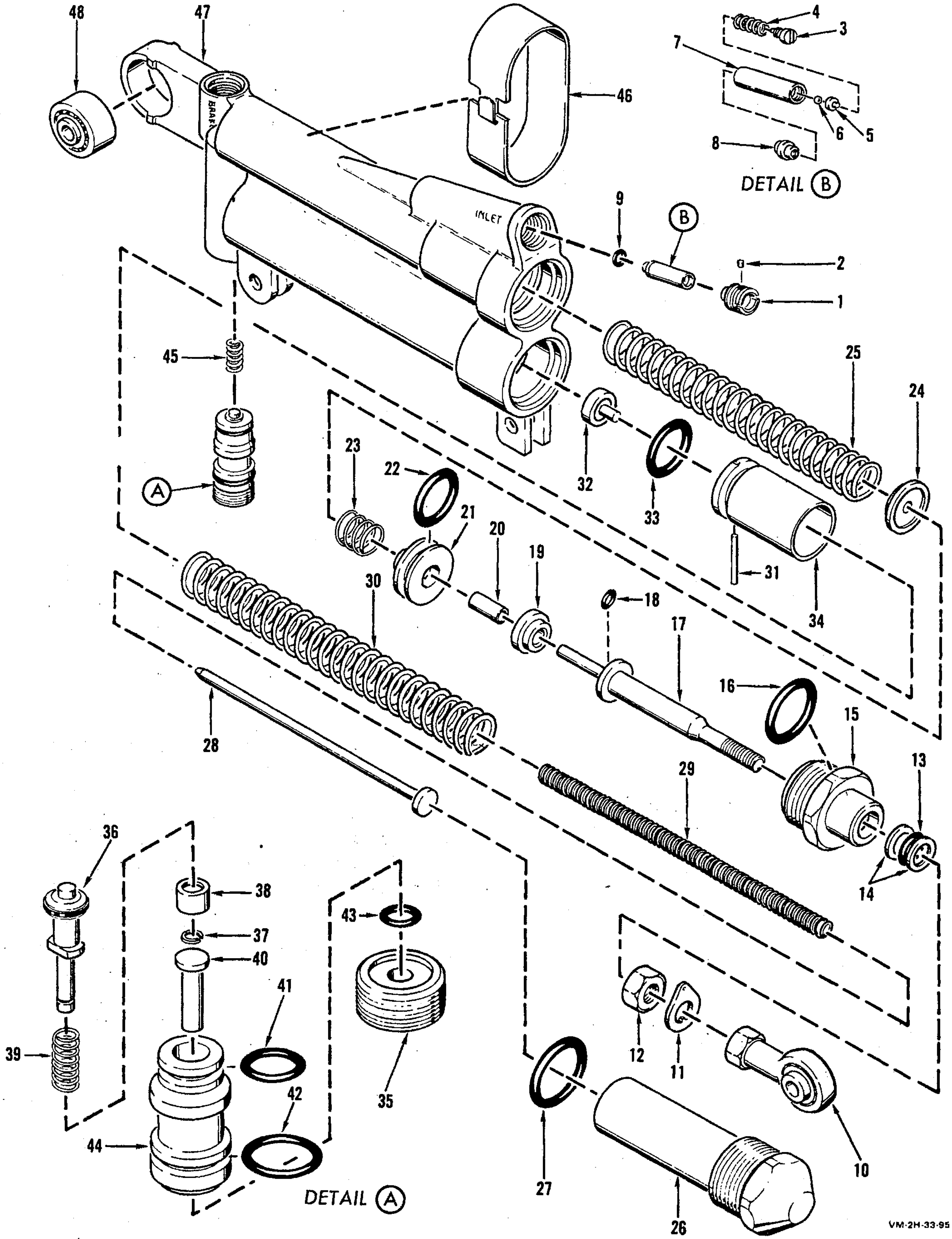

Figure 6-11. Hydraulic Park Brake Compensator and Wheel Brake Master Cylinder (Sheet 1 of 2)

1 RETAINER, RELIEF VALVE
2 PLUG, LOCKING
VALVE, THERMAL RELIEF
3 SCREW, ADJUSTMENT
4 SPRING, HELICAL
5 GUIDE, SPRING
6 BALL
SEAT AND BODY ASSEMBLY
7 BODY
8 SEAT
9 PACKING, PREFORMED
10 BEARING, ROD END
11 WASHER, ROD END LOCKING
12 NUT, DRILLED, JAM
13 RETAINER, PACKING
14 PACKING, PREFORMED
15 BEARING, SLEEVE
16 PACKING, PREFORMED
17 ROD, MASTER CYLINDER
18 PACKING, PREFORMED
19 POPPET, SEAL
20 SPACER, SPRING GUIDE
21 PISTON
22 PACKING, PREFORMED
23 SPRING, HELICAL, COMPRESSION
24 GUIDE, SPRING
25 SPRING, HELICAL COMPRESSION RETURN
26 CAP, END
27 PACKING, PREFORMED
28 ABUTMENT
29 SPRING, HELICAL INTERNAL
30 SPRING, HELICAL EXTERNAL
PISTON AND POPPET ASSY
31 PIN
32 POPPET
33 PACKING, PREFORMED
34 PISTON, ACCUMULATOR

[1] SP-4 PLUG, SHIPPING (60995) (00502 PART NO. 45197-4)

[1] 4 WASHER, PLUG (60995) (00502 PART NO. 43413-3)

35 NUT, RETAINER
36 POPPET
37 RING, RETAINING
38 SLEEVE
39 SPRING, HELICAL
40 PLUNGER
41 PACKING, PREFORMED
42 PACKING, PREFORMED
43 PACKING, PREFORMED
44 BEARING, POPPET
45 SPRING, CONICAL
46 PLATE, IDENTIFICATION
47 BODY, CYLINDER
48 BEARING (77896) (00502 PART NO. 82706)

[1] NOT COMPONENT OF END ITEM. PART USED FOR SEALING AND SHIPPING.

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Figure 6-11. Hydraulic Park Brake Compensator and Wheel Brake Master Cylinder (Sheet 2 of 2)

Table 6-5. Troubleshooting Hydraulic Park Brake Compensator and Wheel Brake Master Cylinder

TROUBLE	PROBABLE CAUSE	REMEDY
External leakage at inlet port	Damaged packing (9)	Replace packing
	Damaged or over-torqued threads on retainer (1) or damaged threads on adjustment screw (3)	Replace cartridge
External leakage at master cylinder bore	Damaged packing (14) or packing retainers (13)	Replace packing and packing retainers
	Damaged packing (16)	Replace packing
	Damaged or distorted threads of sleeve bearing (15)	Replace sleeve bearing
External leakage at accumulator bore	Damaged packing (27)	Replace packing
	Damaged or distorted threads on end cap (26)	Replace end cap
External leakage at park-lock plunger bore	Damaged packings (41, 42, 43)	Replace packings
	Damaged or distorted threads on retainer nut (35)	Replace retainer nut

Table 6-5. Troubleshooting Hydraulic Park Brake Compensator and Wheel Brake Master Cylinder (Cont)

TROUBLE	PROBABLE CAUSE	REMEDY
Unable to apply brake pressure	Damaged spring (39)	Replace spring
Unable to release park brake pressure	Ringed, scored or grooved minor ID of poppet bearing (44)	Replace poppet bearing
No or low brake pressure	Damaged packing (22) not letting pumping valve close	Replace packing
	Broken spring (4) causing internal leakage	Replace spring
	Broken springs (29, 30)	Replace springs
Failure to hold parking brake pressure	Damaged poppets (32, 36)	Replace poppets
Cylinder rod fails to return	Broken spring (25)	Replace spring
Master cylinder pumping valve fails to close	Bent master cylinder rod (17)	Replace cylinder rod
	Piston (21) binding on spacer (20)	Replace piston and/or spacer
	Damaged packing (22)	Replace packing

ing (44), and spring (45) from parking-lock plunger bore of cylinder body (47). Discard packings (41, 42, and 43).

12. It is not necessary to remove identification plate (46) unless it is damaged beyond legibility.

6-68. CLEANING. To clean the components of the hydraulic park brake compensator and wheel brake master cylinder, proceed as follows:

Materials List

Solvent	P-D-680, Type II
Cloth, Crocus	P-C-458

1. Using a stiff-bristled brush, loosen caked-on dirt from exterior surfaces. A piece of soft copper wire is to be used to remove any obstructions from the threaded surfaces, bores. internal passages, and orifices.

WARNING

Solvent (P-D-680, Type II) is flammable and toxic. Use in a well-ventilated area away from flames or hot surfaces. Avoid contact with the skin and do not direct air pressure against solvent in contact with skin. Breathing fumes may cause injury to personnel.

2. Wash all metal parts in solvent (P-D-680, Type II).

3. Thoroughly dry parts with filtered, compressed air at 20 psig (maximum) or with a dry, lint-free cloth.

4. Remove any corrosion from external parts with crocus cloth (P-C-458), using a light polishing motion.

5. Place all washed parts in clean, dust-tight containers.

6-69. INSPECTION. Inspect all parts for deformation, excessive wear, or other damage. Excessive wear is any obvious deformation or deterioration of parts which may render the unit inoperable. If any doubt exists concerning the serviceability of a part, replace the part.

Tools and Equipment List

Tester, Spring Resiliency,	Type PB4-D (or equivalent)
Kit, Fluorescent Penetrant Inspection, Portable	MIL-I-6867 (or equivalent) (81349)

1. Visually inspect all parts for damage, corrosion, pitting, scoring, or excessive wear, using a strong light and magnifying glass.

2. Using a strong light and magnifying glass, inspect all threaded surfaces for damaged threads.

3. Check to ensure that all surfaces which contact performed packings are smooth to 32 microinches RMS.

4. See figure 6-11 and perform all specific inspections, tests, and checks as given in table 6-6 and 6-7.

5. Check fits and clearances as specified in table 6-8.

6. Perform nondestructive inspection in accordance with table 6-9, using fluorescent penetrant inspection kit (MIL-I-6867).

6-70. COMPONENT REPAIR OR REPLACEMENT. Any componnet which does not meet the standards of inspection must be replaced.

Materials List

Cloth, Abrasive Aluminum Oxide	P-C-451
Cloth, Crocus	P-C-458
Powder, Levigated Alumina No. 1557AB	FSCM 09410
Shortening	EE-S-321
Silicon Carbide, No. 1554, No. 600 Grit	FSCM 09410

1. All packings and packing retainers must be replaced at each overhaul.

2. Minor thread damage may be repaired using a tap die unless repairing it results in a loose fit or misalignment; in that case, replace the damaged components.

3. Minor nicks and abrasions on poppets (19 and 32) and seat (8) must be smoothed by lapping, using No. 600 grit silicon carbide [No. 1554, silicon carbide (FSCM 09410) or equivalent], or levigated alumina [No. 1557AB, levigated alumina powder (FSCM 09410) or equivalent] mixed with enough commercial shortening (EE-S-321) to form a light, smooth paste.

CAUTION

Standard engine valve grinding compound should not be used for this precision lapping under any circumstances.

4. Minor scoring, scratches, or minute imperfections in noncritical, nonmating surfaces may be removed by polishing, provided not more than 0.006 inch of material is removed from the area. On ferrous parts use crocus cloth (P-C-458) grade 600 or finer. On nonferrous parts, use aluminum oxide abrasive cloth (P-C-451).

CAUTION

Use abrasive and crocus cloth only as specified or serious corrosion may result.

5. Clean all reworked parts in accordance with paragraph 6-68.

Table 6-6. Hydraulic Park Brake Compensator and Wheel Brake Master Cylinder Inspection Data

PART NAME AND NO.		INDEX NO. (FIGURE 6-11)	PROCEDURE	LIMITS
Seat*	81656	8	Inspect under magnification for nicks and scratches.	Abrasive damage is not permissible. Seating and sealing areas must be free of nicks and scratches. Body bore diameters must not be ringed or scored.
Rod	82699	17		
Poppet	82302	19		
Piston	82696	21		
Poppet	83569	32		
Piston	83568	34		
Bearing	83565	44		
Retainer	83577	1	Inspect for cracks or thread damage.	No cracks are permissible. Threaded areas must not be crossed, stripped, distorted or otherwise damaged. Lockwire holes must not be elongated.
Bearing	82698	15		
End Cap	83571	26		
Nut	83567	35		
Body†	83560	47		
Springs (A11)			Refer to table 6-7.	

*If any of the components of the relief valve (83804) are damaged or are deemed unserviceable, the entire thermal relief valve assembly must be replaced.

†If the body (83560) is damaged, discard entire assembly.

6-71. TOLERANCES AND LIMITS. Refer to table 6-8 and see figure 6-12 for acceptable component tolerances and limits.

6-72. LUBRICATION. Immerse all parts except packings in hydraulic fluid (MIL-H-5606) at assembly. Lubricate all packings with petrolatum (VV-P-236).

6-73. ASSEMBLY. To assemble the unit, see figure 6-11 and proceed as follows:

Tools and Equipment List

Hand Arbor Press	1 1-2 (15746)

CAUTION

Prior to assembly operations, ensure that all surfaces are free of abrasive residuals.

1. Install packing (43) in ID groove and packings (41 and 42) in OD grooves of poppet bearing (44).

Table 6-7. Hydraulic Park Brake Compensator and Wheel Brake Master Cylinder Spring Inspection Data

INDEX NO. (FIGURE 6-11)	FREE LENGTH (INCHES) APPROX	ASSEMBLED LENGTH (INCHES)	TEST LOAD (POUNDS)
4	0.316	0.270	4.50 to 5.58
23	0.733	0.293	3.6 to 4.4
25	8.59	5.329	63 to 75
29	6.82	6.300	33 to 39
30	6.969	6.118	109 to 129
39	0.654	0.440	5.4 to 6.6
45	0.786	0.66	0.9 to 1.1

Note

No deviations from test limits are permissible.

Spring shall not wobble when rolled across a clean, smooth, flat surface.

Springs must return to free length after compression, with no evidence of permanent set.

All tests may be performed with the spring resiliency tester, type PB4-D (or equivalent).

2. Install spring (45) in parking lock plunger bore of cylinder body (47).

3. Assemble the poppet bearing (44), plunger (40), spring (39), sleeve (38), retaining ring (37), and poppet (36) and install in parking lock plunger bore of cylinder body (47).

4. Install retainer nut (35) to a snug seat against poppet bearing.

Note

Use vise with padded jaws and do not apply wrenches to any surface but wrench flats.

5. Bench assemble poppet (32) with piston (34), secure poppet with pin (31) and install packing (33) on OD groove of piston. Install packing (27) on OD groove of end cap (26).

WARNING

Use an arbor press (1 1-2) to overcome spring action in excess of 155 pounds from compression springs (29 and 30) when installing end cap (26).

6. Install piston and poppet subassembly (step 4), springs (30 and 29) and abutment (28) in lower bore of cylinder body (47) and secure by installing end cap (26) to a snug fit against shoulder on ID of body bore.

7. Install packing (22) in OD groove of piston (21), packing (18) on small OD groove of rod (17), packing (16) on OD groove of bearing (15), and packing (14) with packing retainers (13) in ID groove by bearing (15).

WARNING

Use arbor press (1 1-2) to overcome spring action in excess of 70 pounds from compression springs (23 and 25) when installing sleeve bearing (15).

8. Preassemble spring (25), guide (24), spring (23), packing (22), piston (21), spacer (20), poppet (19), packing (18), and rod (17) and install in upper bore of cylinder body (47).

9. Install packing (16) on sleeve bearing (15); install sleeve bearing (15) in upper bore of cylinder body (47) and tighten to a snug fit between bearing flange and face of body port.

10. Install nut (12), washer (11), and bearing (10) on rod (17) protruding through sleeve bearing (15).

11. Bench assemble thermal relief valve by installing ball (6), guide (5), spring (4), screw (3), and seat (8) in body (7). Install packing (9) on body (7) and install subassembly in inlet bore of cylinder body (47).

Note

After final adjustments have been made, secure adjusting screw (3) by staking lip of body (7) into screwdriver slot of adjusting screw. Ensure staking is correct or loss of adjustment could result.

12. Install locking plug (2) in retainer (1) and install retainer in inlet port.

Note

Tighten retainer (1) until it bottoms against relief valve subassembly and then back out 10 to 20 degrees. Do not use excessive torque when bottoming retainer or it will be damaged.

Do not lockwire assembly until after testing assembly.

6-74. TESTING. The procedure for testing the hydraulic park brake compensator and wheel brake master cylinder is the same as checkout. Refer to paragraph 6-60. After the unit has been satisfactorily tested, install lockwire (MS20995F32) as noted during disassembly.

6-75. PRESERVATION. If unit is to be placed in storage, drip drain, plug ports, and place in clean container. Identify container with date of overhaul.

Table 6-8. Hydraulic Park Brake Compensator and Wheel Brake Master Cylinder Fits and Tolerance Limits

INDEX NO. (FIGURE 6-11)	MEASURE (INCHES)	CLEARANCE MAXIMUM	(INCHES) MINIMUM
8	0.1625 (±0.0001) OD must be pressed fit flush with major ID of body (7).	0.0004 (±0.0003) interference	
15	Minor ID must fit 0.372 (±0.001) OD of master cylinder rod (17).	0.005	0.002
17	Minor OD must fit ID of poppet (19).	0.006	0.002
	Minor OD must fit ID of spacer (20).	0.006	0.002
	Minor OD must fit ID of spring guide (24).	0.006	0.002
20	OD must fit minor ID of piston (21).	0.006	0.002
21	Major OD must fit major ID of body (47) master cylinder rod bore.	0.005	0.002
26	Minor OD must fit major ID of body (47) accumulator bore.	0.024	0.012
31	OD must fit pin hole of piston (34).	0.011	0.002
32	Minor OD must fit minor ID of piston (34).	0.0008	0.0002
	Major OD must fit 0.553-0.583 ID of piston (34).	0.098	0.038
34	Major OD must fit minor ID of body (47) accumulator bore.	0.006	0.002
35	Minor ID must fit minor OD of plunger (40).	0.004	0.002
36	Minor OD must fit minor ID of sleeve (38).	0.005	0.001
	0.276-0278 OD must fit major ID of bearing (44).	0.007	0.003
38	Major OD must fit major ID of bearing (44).	0.007	0.003
40	Major OD must fit major ID of bearing (44).	0.043	0.021
44	Major OD must fit major ID of body (47) parking lock bore.	0.005	0.002

Table 6-9. Hydraulic Park Brake Compensator and Wheel Brake Master Cylinder Nondestructive Inspection Data

INDEX NO. (FIGURE 6-11)	TYPE OF INSPECTION	INSPECTION PROCEDURE	ACCEPTABLE DEFECTS
8	Magnetic Particle	Refer to MIL-I-6868.	None
17	Magnetic Particle	Refer to MIL-I-6868.	None

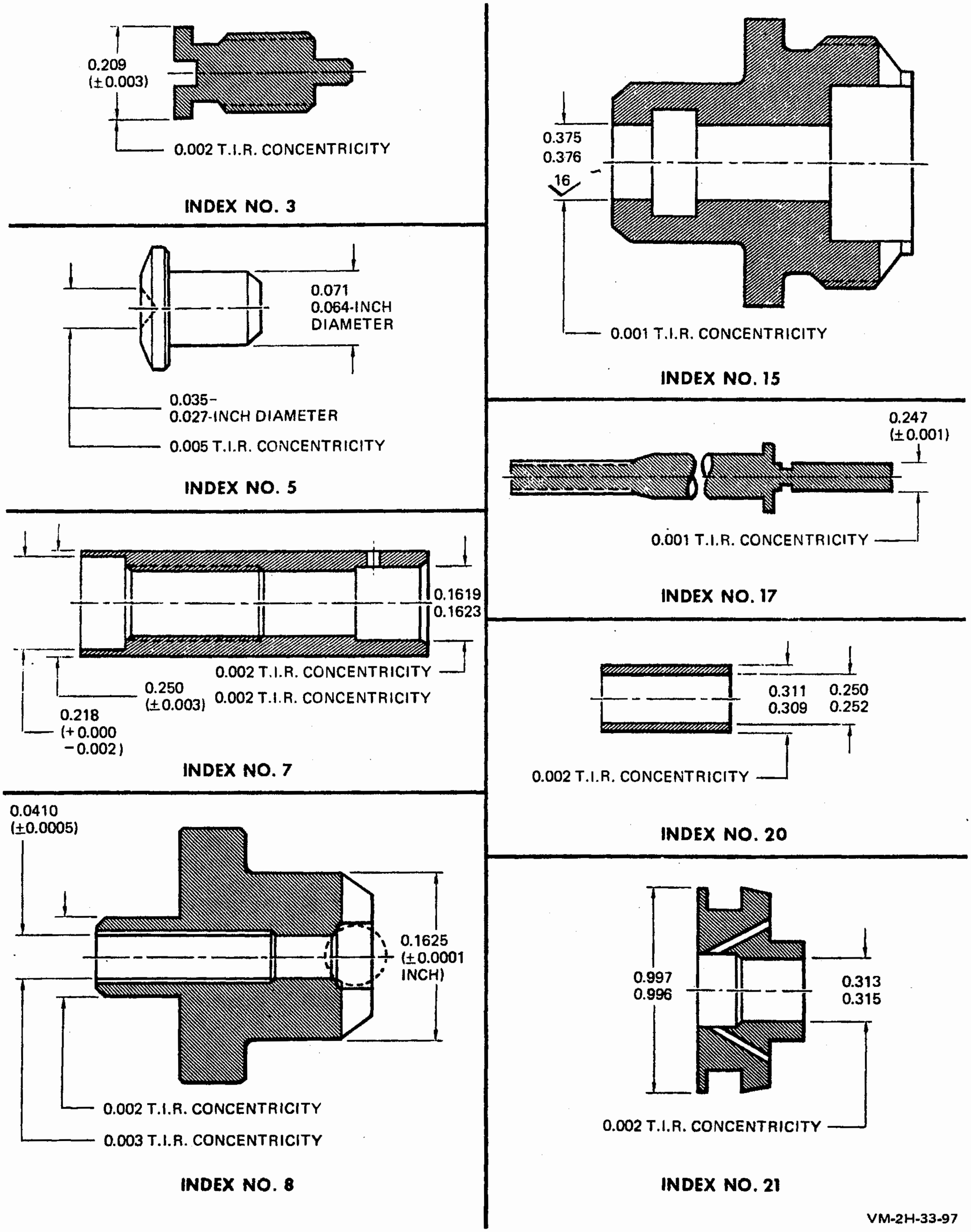


Figure 6-12. Brake Master Cylinder Allowable Wear Limits (Sheet 1 of 2)

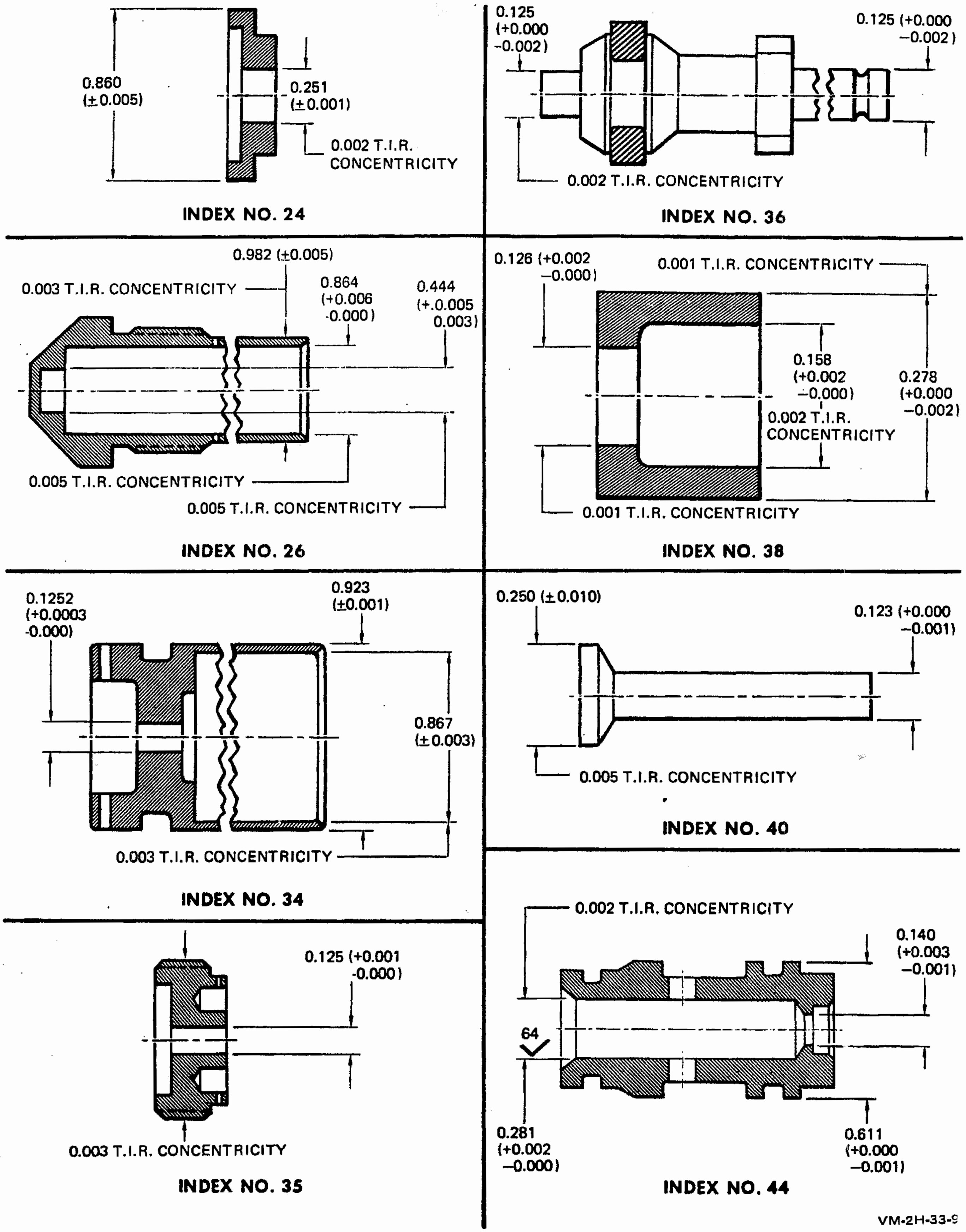


Figure 6-12. Brake Master Cylinder Allowable Wear Limits (Sheet 2 of 2)

CHAPTER 7
NOSE WHEEL STEERING SYSTEM

SECTION I
DESCRIPTION AND OPERATION

7-1. GENERAL.

7-2. The nose wheel steering system (figure 7-1) controls the direction of the aircraft during taxiing, take-off, and landing. The system is engaged and controlled electrically from the pilot's control stick by actuation of the steering control pushbutton switch on the stick grip and movement of the rudder pedals. Normally, hydraulic flow to the actuator is blocked at the selector valve with the actuator (spring loaded to a centered position) acting as a nose wheel shimmy damper. When the STEER button is depressed, an electrical circuit is completed (if aircraft is not airborne, see figure 7-1) that activates the hydraulic pump and opens the steering selector valve, permitting hydraulic flow to the actuator for steering. With the steering actuator hydraulically activated, movement of the rudder pedals will direct internal flow to move the piston from its spring-loaded center position for left or right turn. When the STEER button is released, hydraulic flow to the actuator is again blocked at the valve and the unit reverts back to a spring-loaded shimmy damper. With the weight of aircraft on nose gear, the steer unit will not fully rotate nose gear while it is stationary.

SECTION II
ORGANIZATIONAL MAINTENNACE

7-3. GENERAL.

7-4. Organizational maintenance on the nose wheel steering system includes operational check procedures, system troubleshooting, servicing, rigging, adjusting, and component removal and installation. These procedures provide all necessary information required to maintain the nose wheel steering system within the limits of organizational level tools and facilities.

7-5. OPERATIONAL CHECK.

7-6. To perform an operational check of the nose wheel steering system, proceed as follows:

CAUTION

Hydraulic pump operation should be limited to one duty cycle followed by at least 10 minutes rest. A duty cycle consists of any four operations requiring pump operation (flaps up, flaps down, gear down, gear up) plus 5 minutes of nose wheel steering.

1. Check fluid level in hydraulic reservoir. Indicator on reservoir should read FULL.

2. Connect a 28-volt d-c external power source to external power receptacle SERVICE plug. Refer to General Information and Servicing Manual (NAVAIR 01-60GCB-2-1) for additional information.

3. Depress nose wheel STEER button on pilot's stick grip. The hydraulic pump should operate while the button is depressed and stop when button is released.

4. With the nose wheel centered, the aircraft stationary, and the rudder pedals in the neutral position, depress and hold the nose wheel STEER button.

5. With STEER button and pilot's left-hand rudder pedal depressed, check that nose wheel turns left approximately 10 degrees.

6. With STEER button and pilot's right-hand rudder pedal depressed, check that nose wheel turns right approximately 10 degrees.

Note

The nose wheel will rotate left and right 55 degrees with fuselage on jacks.

7. Release STEER button and return wheel to centered position.

7-7. TROUBLESHOOTING.

7-8. Troubleshooting procedure for the nose wheel steering system is provided in table 7-1.

7-9. SERVICING.

7-10. The nose wheel steering hydraulic system should be bled whenever any component is removed and replaced or disconnected and air is permitted to enter the system. Refer to paragraph 4-9 for filling, bleeding, and checking nose wheel steering components.

7-11. NOSE WHEEL STEERING SELECTOR VALVE REMOVAL AND INSTALLATION.

7-12. To remove and install the nose wheel steering selector valve, proceed as follows:

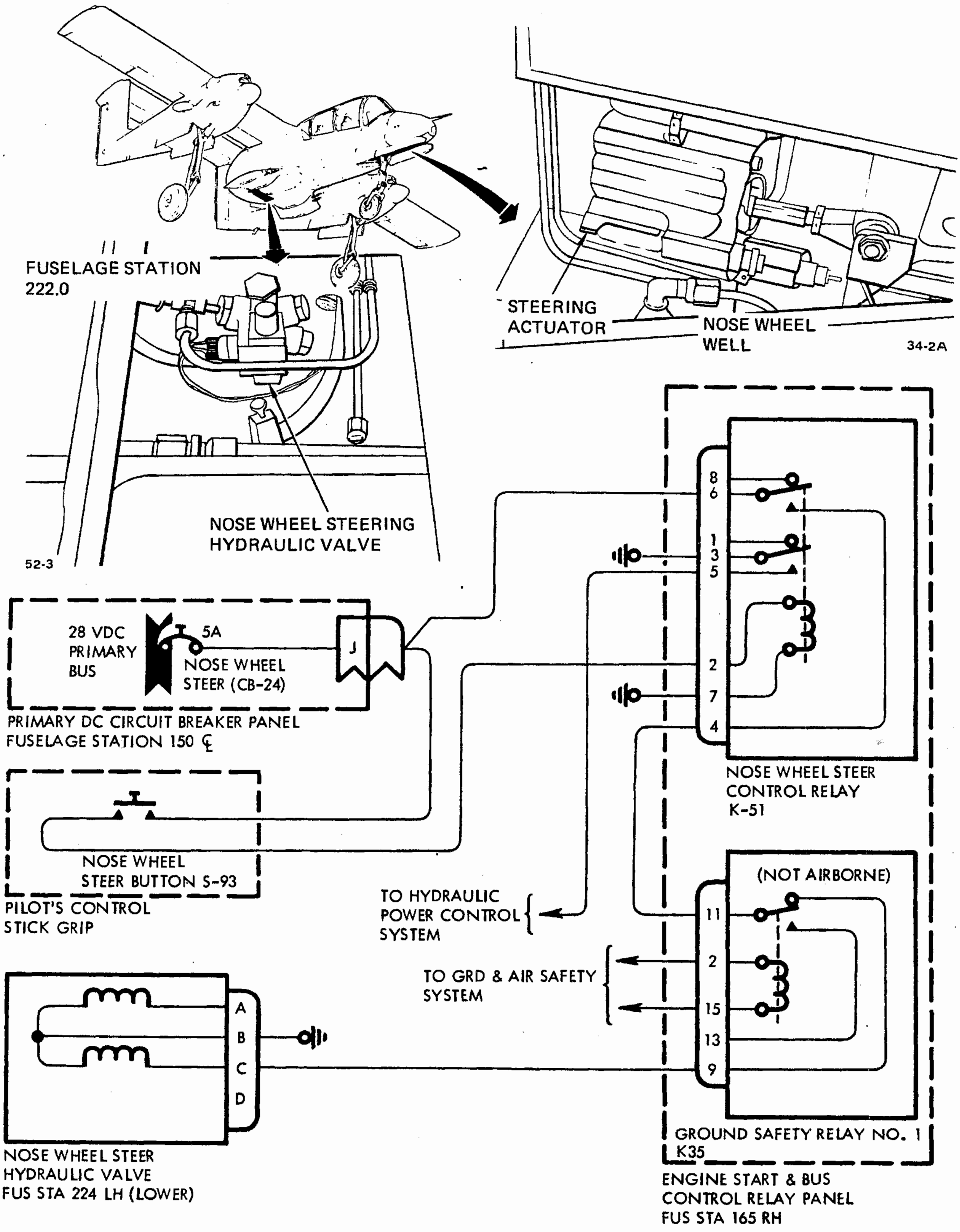
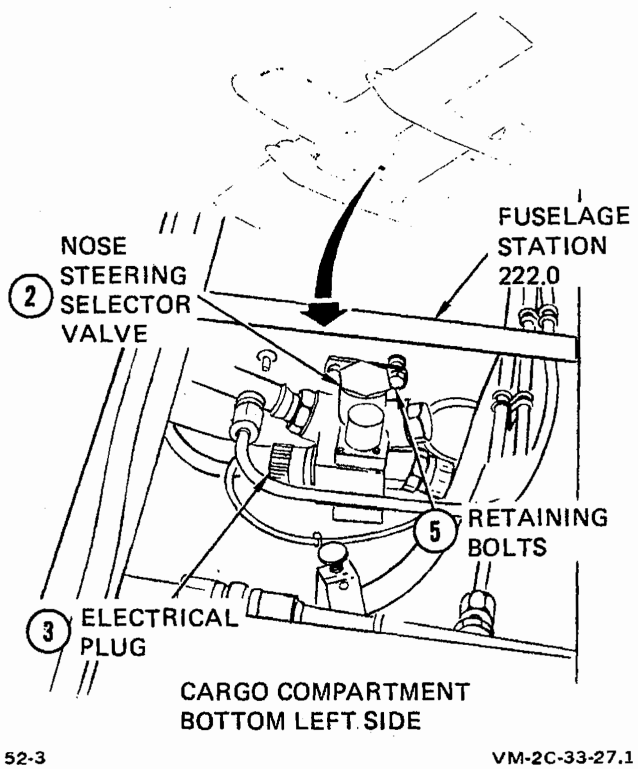


Figure 7-1. Nose Wheel Steering System Unit Locator and Electrical Schematic

7-13. REMOVING NOSE WHEEL STEERING SELECTOR VALVE.

1. Remove cargo compartment floor panels. Refer to paragraph 2-106.



Steps 2, 3, and 5—Para. 7-13

2. Locate valve near frame at fuselage station 222.0 on left-hand side of cargo compartment.

3. Disconnect electrical plug from valve receptacle.

4. Disconnect hydraulic lines from valve fitting nd plug to prevent leakage.

5. Remove retaining bolts and remove valve from aircraft.

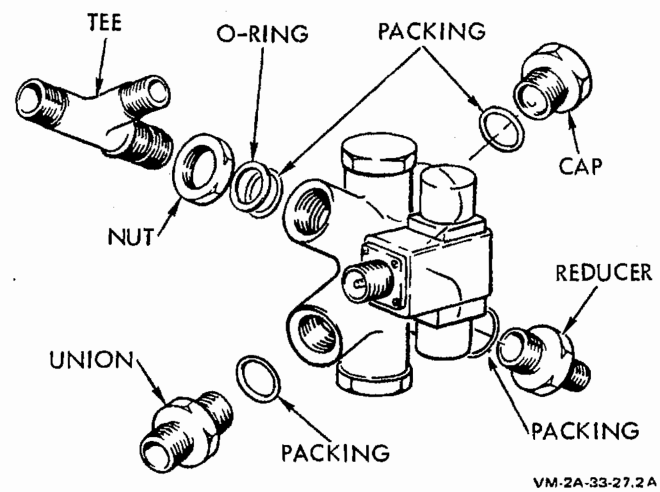
6. Remove three fittings and plug to prevent leakage.

7-14. INSTALLING NOSE WHEEL STEERING SELECTOR VALVE.

Materials List

Lockwire (0.041-inch diameter steel)	MS20995F41
Packing	MS28778-6
Fluid, Hydraulic	MIL-H-5606
O-ring	MS9058-06

1. Install plug, union, reducer, and tee fittings in valve ports, using new packings (MS28778-6) and O-rings (MS9058-06) at each fitting.



Step 1—Para. 7-14

2. Position valve assembly in aircraft and install four retaining bolts. Torque to 22 (±2) inch-pounds.

3. Manually fill valve with hydraulic fluid (MIL-H-5606).

4. Connect hydraulic lines to valve fittings.

5. Connect electrical plug to valve receptacle and safety with lockwire (MS20995F41).

6. Perform hydraulic system bleeding, filling and checking procedures. Refer to paragraph 4-8.

Table 7-1. Troubleshooting Nose Wheel Steering System

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: STEERING SYSTEM INOPERATIVE.		
Ground safety system inoperative.	Check that circuit breaker CB-41 is engaged.	Engage circuit breaker on primary d-c circuit-breaker panel.
	With electrical power and weight of aircraft on landing gear, disconnect left-hand wing disconnect No. 2 at fuselage station 235, left-hand side of cargo compartment.	
	a. Check for 28 volts dc at test point CGA and ground.	Replace relay K-36.
	b. Check for 28 volts dc at test point CGB and ground.	Replace relay K-35.
	c. Check for no continuity between test point CGB and ground.	Replace or adjust switch S-74 on left main landing gear.
	d. Check for continuity between test point CGD and ground.	Replace or adjust switch S-74 on left main landing gear.
Nose wheel steer button defective.	Check that circuit breaker CB-24 is engaged.	Engage circuit breaker on primary d-c circuit-breaker panel.
	Disconnect pilot's control stick, disconnect at fuselage station 69 centerline and check for continuity between test points CGDA and CGDB with nose wheel steer button depressed.	Replace switch S-93 in pilot's stick grip.
Defective nose wheel steer select valve.	Remove cargo compartment floor, disconnect electrical plug at control valve. With electrical power applied and STEER switch depressed, check for 28 volts dc between test point CGDC and ground. If voltage is present, steer valve is defective. If voltage is not present, nose wheel steer control valve is defective.	Replace relay K-51 or nose wheel steer valve.
TROUBLE: AIRCRAFT WILL NOT STEER TO ONE SIDE.		
Relief valve leaking.	Check for approximately 10-degree rotation of nose wheel on dry surface in both directions.	Replace nose wheel steering actuator.
TROUBLE: NOSE WHEEL CANNOT BE TURNED FAR ENOUGH IN ONE DIRECTION.		
Nose wheel out of adjustment.	Jack forward fuselage and check nose wheel travel with marks on trunnion and lower nose gear cylinder.	Readjust nose wheel steering stop bolts and actuator rod end.

Table 7-1. Troubleshooting Nose Wheel Steering System (Cont)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
TROUBLE: FLUID LEAKAGE.		
Defective seal or scored piston.	Wipe clean and actuate 25 cycles or pressurize for 1 minute. Leakage for either check shall not exceed one drop.	Replace seals or actuator.
TROUBLE: EXCESSIVE WHEEL SHIMMY.		
Nose wheel tire worn.	Channel tread should contact ground uniformly first.	Replace tire.
Shimmy damper defective or weak.	Check for play in nose wheel.	Replace nose wheel steering actuator.
TROUBLE: AIRCRAFT TENDS TO STEER TO ONE SIDE.		
Steering linkage out of rig.	Jack aircraft in accordance with General Information and Servicing (NAVAIR 01-60GCB-2-1), install pedal rig pin, depress STEER button on pilot's stick grip and wheel should center.	Rerig linkage.

7. Perform operational check of nose wheel steering system. Refer to paragraph 7-4.

8. Install cargo compartment floor. Refer to paragraph 2-106.

7-15. NOSE LANDING GEAR STEER DAMPER BUNGEE REMOVAL AND INSTALLATION.

7-16. To remove and install the nose landing gear steer damper bungee, proceed as follows:

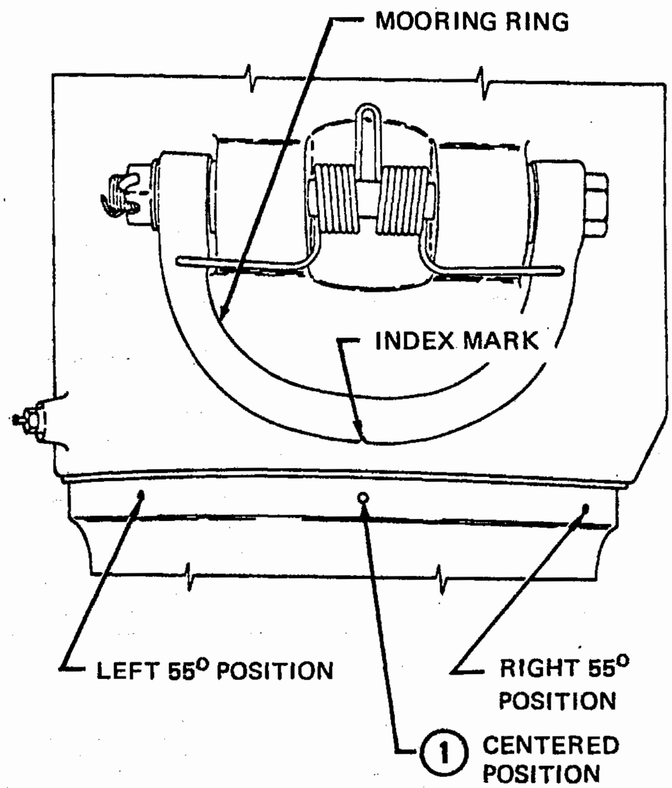
7-17. REMOVING NOSE LANDING GEAR STEER DAMPER BUNGEE.

Note

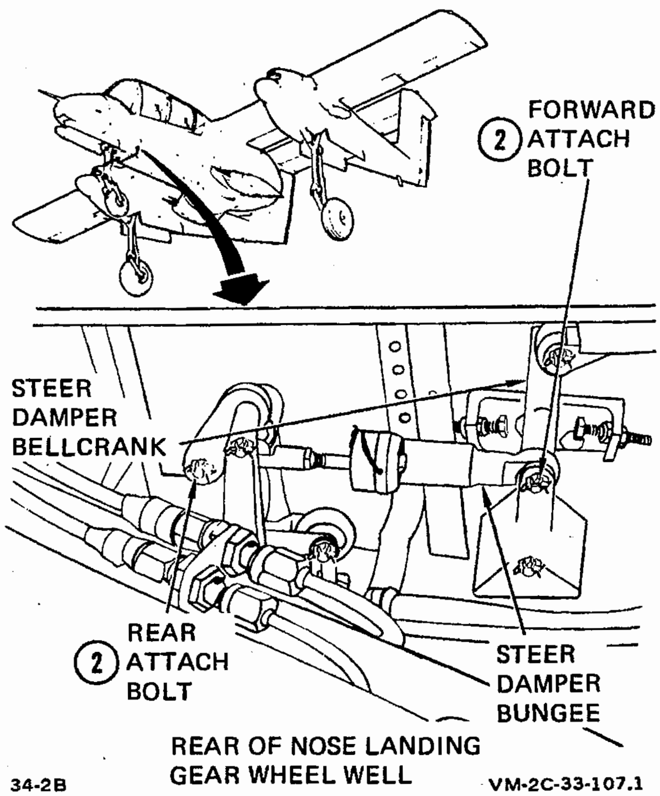
Wheel is centered when index mark on mooring ring aligns with centered position index mark on nose gear cylinder.

1. Ensure that nose wheel is centered to relieve bungee pressure.

2. Remove cotter pins and forward and rear attach bolts.



Step 1—Para. 7-17



Step 2—Para. 7-17

7-18. INSTALLING NOSE LANDING GEAR STEER DAMPER BUNGEE.

Materials List

Pin, Cotter MS24665-132

1. Position bungee in aircraft and install forward attach bolt. Safety with cotter pin (MS24665-132).

2. Adjust bungee in accordance with paragraph 7-23.

3. Install rear attach bolt and safety with cotter pin (MS24665-132).

4. Perform an operational check of the nose wheel steering system. Refer to paragraph 7-5. Check for freedom of movement throughout the complete range of travel.

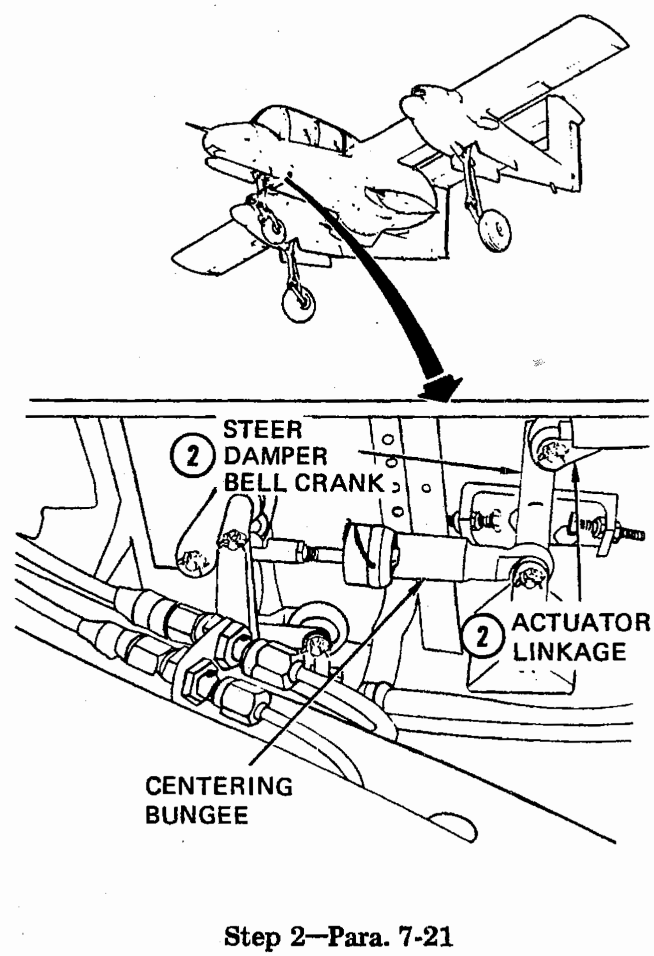
7-19. NOSE WHEEL STEERING ACTUATOR ASSEMBLY REMOVAL AND INSTALLATION.

7-20. To remove and install the nose wheel steering actuator assembly, proceed as follows:

7-21. REMOVING NOSE WHEEL STEERING ACTUATOR ASSEMBLY.

1. With aircraft on jacks, disconnect hydraulic hose assemblies at damper and cap to prevent leakage.

2. Disconnect steer damper bell crank from actuator linkage by removing cotter pin and nut.

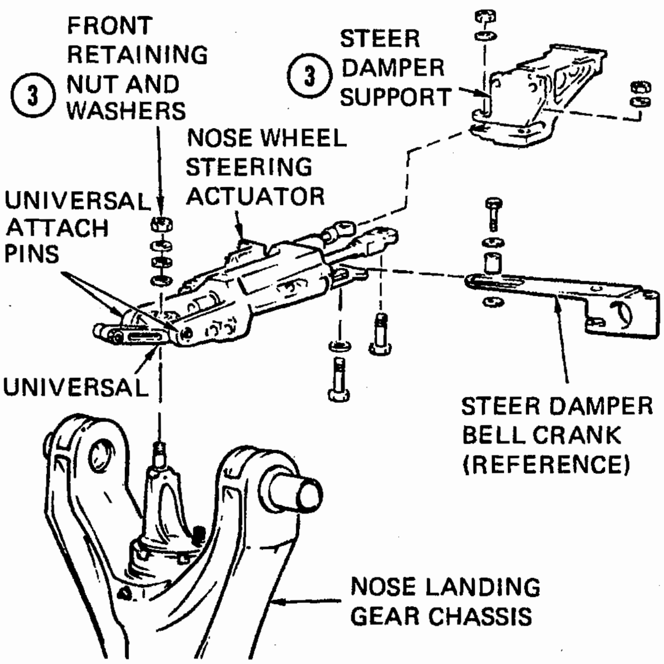


Step 2—Para. 7-21

CAUTION

Universal attach pins are not threaded pins. Each attach pin is secured to the universal by a roll pin. In the following step, do not attempt to remove universal attach pins.

3. Remove retaining nuts from top of nose landing gear chassis assembly and bolt and nut from steering damper support.



Step 3—Para. 7-21.

4. Remove actuator from wheel well.

5. If new actuator is to be installed, remove hydraulic tubing, retaining bracket, and fittings from actuator.

7-22. INSTALLING NOSE WHEEL STEERING ACTUATOR ASSEMBLY.

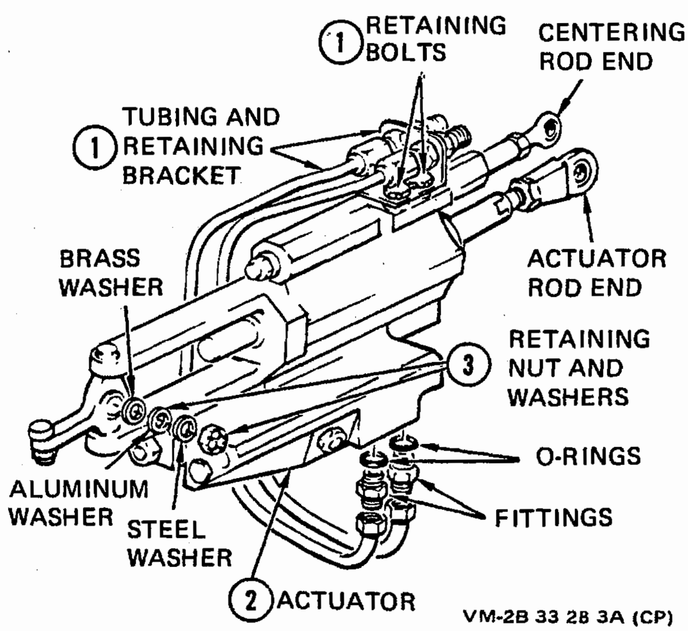
Materials List

Hydraulic Fluid	MIL-H-5606
Lockwire (0.041-inch diameter steel)	MS20995F41
O-ring	MS28778-4
Pins, Cotter	MS24665-285 MS24665-132

Tools and Equipment List

Adapter Bundle, Jacking and mooring	E13710
Bundle, Rig Pin	T3382
Jack, Hydraulic Tripod	556
Jack, Hydraulic Tripod 10-ton	50J25178
External Power Unit	NC-8A

1. If new actuator is being installed, install hydraulic fittings, tubing, and retaining bracket on actuator, using a new O-ring (MS28778-4) at each fitting as shown. Secure retaining bracket mounting screws with lockwire (MS20995F41).



Steps 1 and 2—Para. 7-22

2. Fill actuator with hydraulic fluid, Specification MIL-H-5606, cap open lines and position actuator in aircraft and install retaining hardware.

CAUTION

When actuating universal end of actuator, ensure that the three required washers and cotter pin are installed to prevent back-off of castellated nut and damage to nose landing gear chassis, actuator, and possible loss of nose wheel steering capability.

Note

Wheel is centered when index mark on mooring ring is aligned with centered position index mark on nose gear cylinder.

3. With gear down and wheel centered, attach forward end of steer damper to strut with retained hardware. Safety with cotter pin (MS24665-285).

4. Adjust centering rod end for free fit and install in steer damper support. Safety with cotter pin (MS24665-132).

5. Install actuator rod end in steer damper support with retained hardware. Check for positive security.

6. Disconnect actuator centering bungee from support structure.

CAUTION

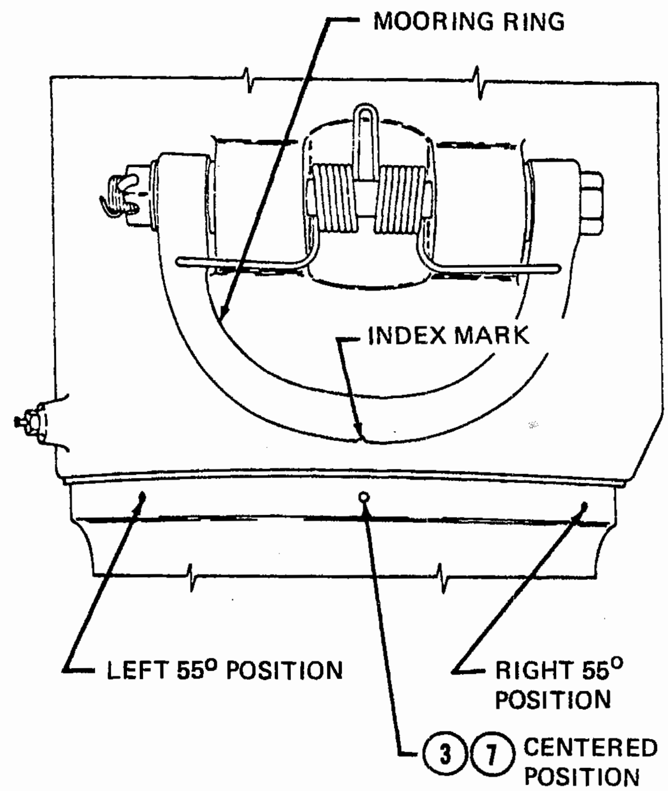
The piston rod end must be adjusted to obtain the following clearances. Relatively small misadjustments can cause failure of the nose gear inner cylinder, (1526A2-10) below the stud where the steering actuator attaches.

Note

The following rig dimension of 1.475 +0.010 -0.000 may be obtained by using rig tool of local manufacture. See figure 7-2.

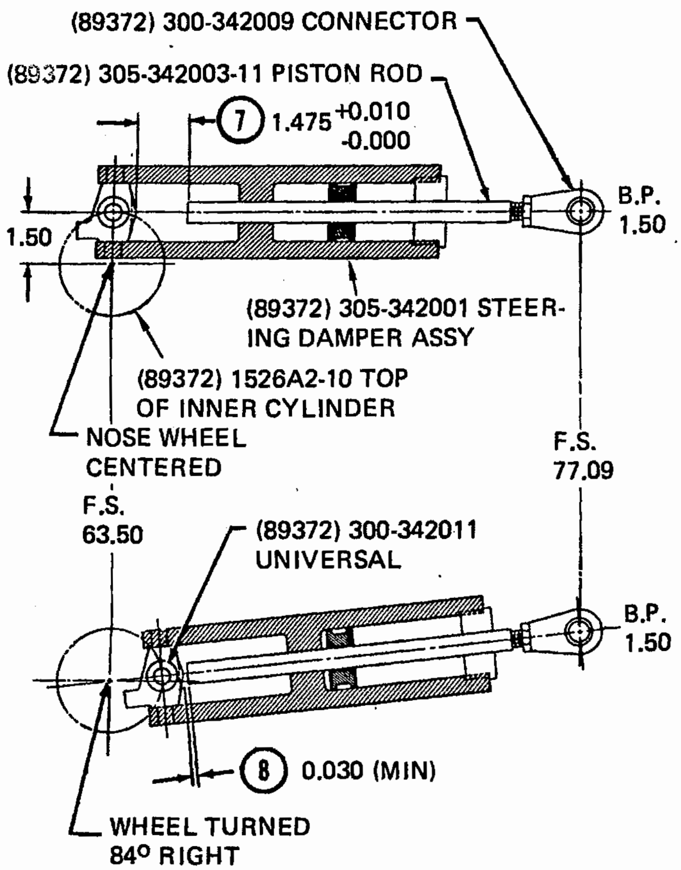
Wheel must be centered when obtaining the 1.475 +0.010 -0.000 rig dimension. Wheel centering may be ensured by align-index mark located on mooring rig with centered position index mark on nose gear cylinder.

7. With nose gear down and wheel centered, adjust actuator rod end to obtain 1.475 +0.010 -0.000 inches when attached to support.



Steps 3 and 7—Para. 7-22

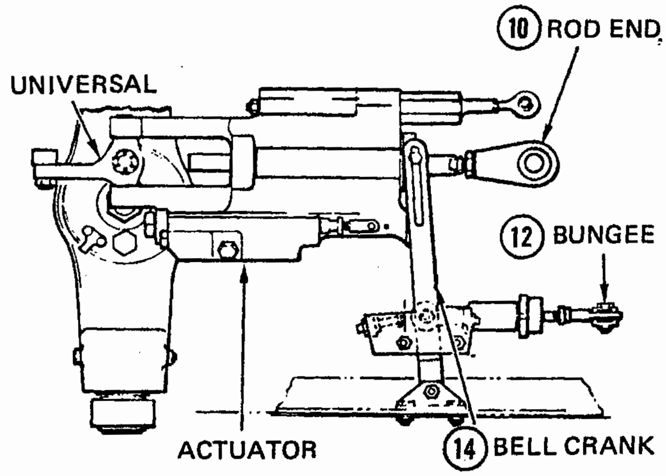
8. Manually swivel gear 84 degrees to right. Check clearance between actuator piston rod and universal. Clearance must not be less than 0.030 inch. Readjust rod end if required.



Steps 7 and 8—Para. 7-22

9. Manually swivel gear slowly 360 degrees and check for free operation. Carefully feel for any slight rotational resistance as wheel is rotated through the 84 degree right turn or 96 degree left turn positions. These positions are encountered when the steering actuator is fully retracted and extended. Any noted resistance to rotation will require readjustment of actuator rod end as required by step 7.

10. Tighten rod and locknut and secure with lockwire (MS20995F41).



Steps 10, 12 and 14—Para. 7-22

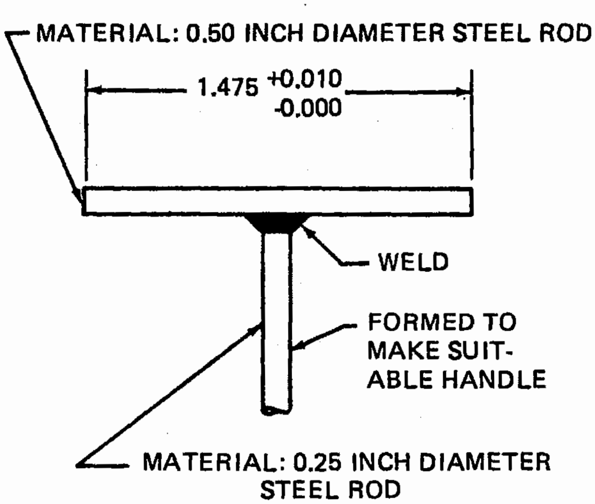
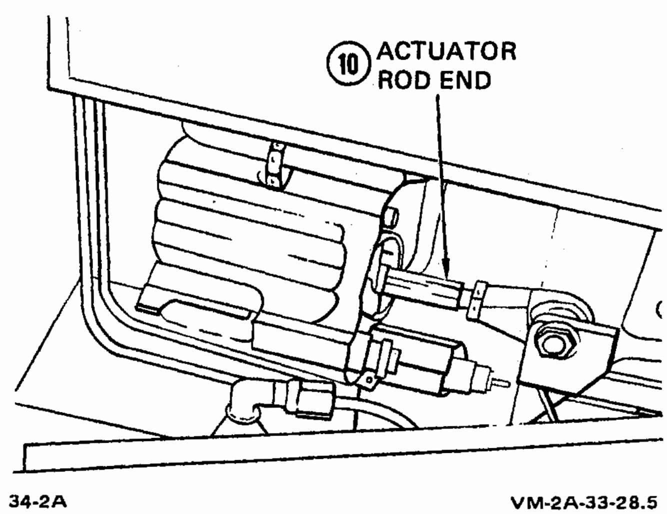


Figure 7-2. Steering Actuator Rod to Universal Rig Tool



Step 10—Para. 7-22

11. Remove plugs and connect hydraulic hose assemblies to actuator tubing.

12. With external power applied, adjust the centering bungee to hold the nose wheel centered when actuating the steer button. When rod is adjusted be sure lock nut is tight.

13. Swivel gear and check for binding.

14. Attach steer damper bell crank to actuator. linkage and safety with cotter pin (MS24665-132).

15. Perform servicing of hydraulic system (paragraph 4-8). Rig and adjust the nose wheel steering system as described in paragraph 7-23.

7-23. ADJUSTING NOSE WHEEL STEERING SYSTEM.

7-24. To adjust the nose wheel steering system, proceed as follows:

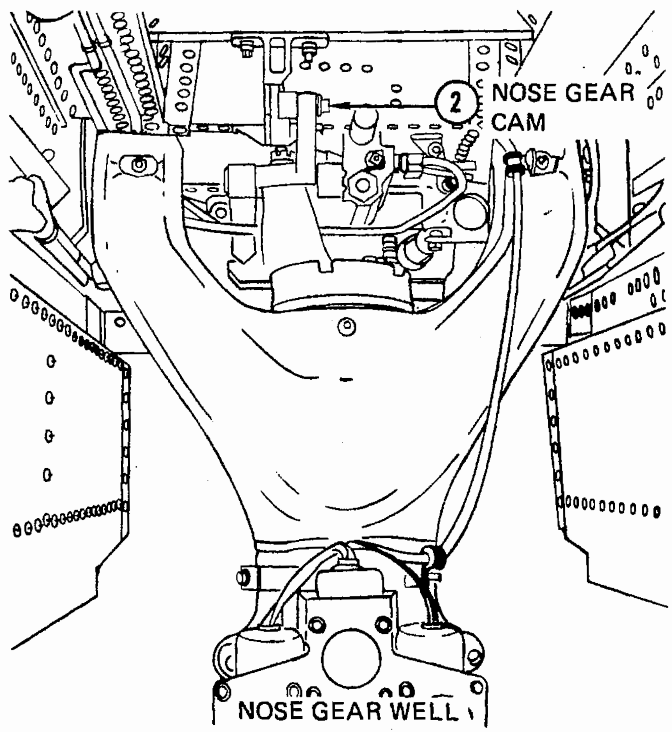
Tools and Equipment List

Adapter Bundle, Jacking and Mooring	E13710
Bundle, Rig Pin	T3382
Jack, Hydraulic Tripod	556
Jack, Hydraulic Tripod, 10-ton	50J25178
External Power Unit	NC-8A

7-25. ADJUSTING.

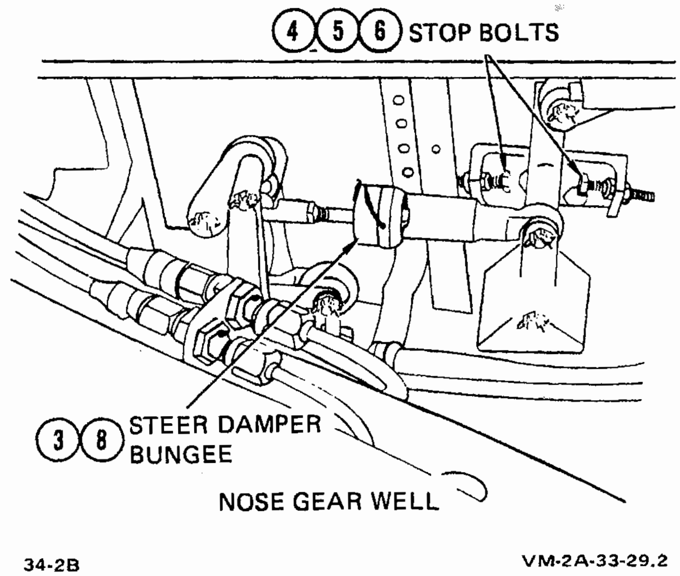
1. With aircraft on jacks and external electrical power applied, place landing gear in DOWN and LOCKED position, center nose wheel and adjust nose wheel steering actuator. Refer to paragraph 7-22.

2. Move landing gear to the UP and LOCKED position and shim nose gear cam to hold nose wheel to the centered position. Extend the gear and check for binding or interference.



Step 2—Para. 7-25

3. Disconnect steer damper bungee at adjustable end.

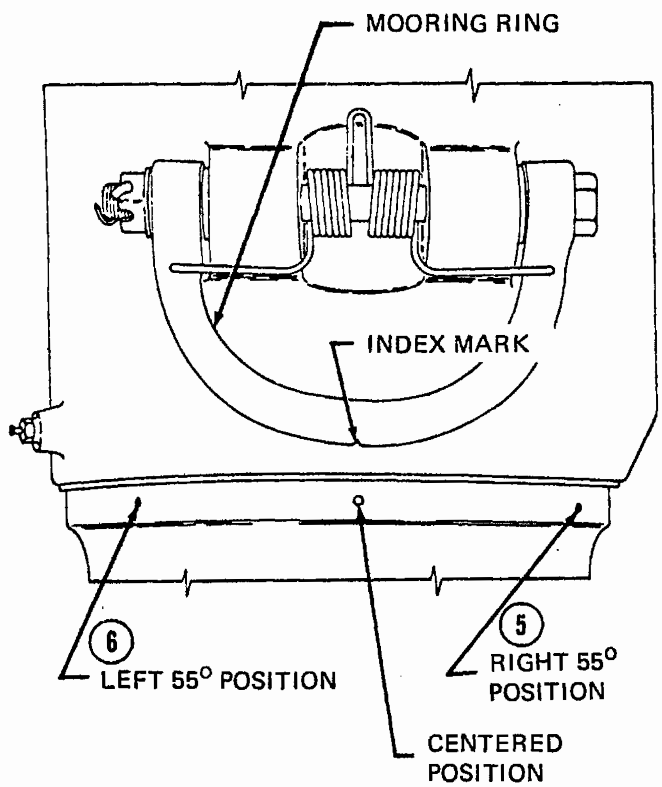


Steps 3, 4, 5, 6, and 8—Para. 7-25

4. Ensure that stop bolts do not contact the bell crank. Adjust stop bolts as required.

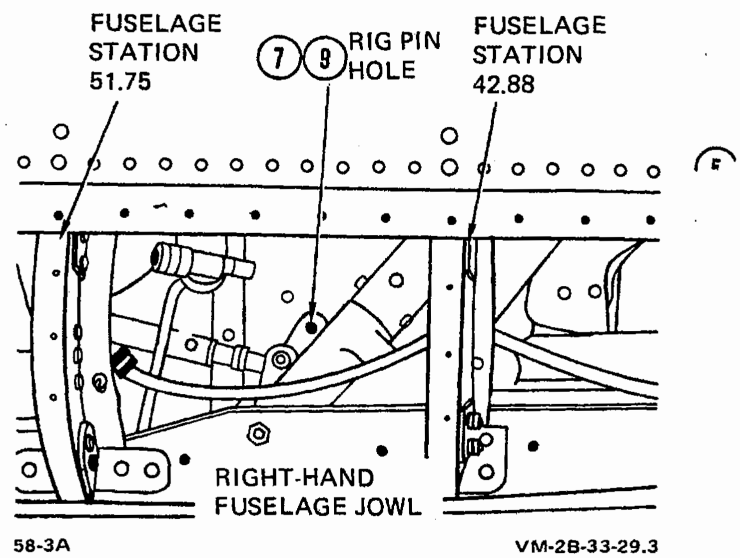
5. Using a protractor or using the wheel centering and 55 degree alignment mark, manually steer nose wheel to 55 degrees right and adjust stop bolt in linkage. Safety stop bolt with lockwire (MS20995F41).

6. Using a protractor or using the wheel centering and 55 degree alignment mark, manually steer nose wheel to 55 degrees left and adjust stop bolt in linkage. Safety stop bolt with lockwire (MS20995F41).



Steps 5 and 6—Para. 7-25

7. Center nose wheel and insert rig pin (T3381-9) in rudder system bell crank.



Steps 7 and 9—Para. 7-25

CAUTION

Do not steer nose wheel or depress rudder pedals while rig pin is installed.

8. With external power applied, adjust the centering bungee to hold the nose wheel centered when actuating the steer button. When rod is adjusted be sure lock nut is tight.

9. Remove rig pin from rudder system bell crank.

10. Operate hydraulic system and check that nose wheel is centered. Readjust if necessary. Refer to step 7.

11. Operate hydraulic system and ensure that nose wheel steers 55 degrees in both directions. Readjust stop bolts as required. Refer to steps 5 and 6.

12. Remove jacks from aircraft.

SECTION III
INTERMEDIATE MAINTENANCE

7-26. GENERAL.

7-27. Intermediate maintenance pertaining to the nose wheel steering system is contained in this section. Materials, special tools, and specifications for performing these maintenance procedures are listed as necessary. Repair of components at this level of maintenance generally includes the installation of items contained in provisioned repair kits, along with standard supply items.

7-28. HYDRAULIC SOLENOID SELECTOR VALVE (NOSE WHEEL STEER SELECTOR VALVE)—300-586101.

7-29. The hydraulic solenoid selector valve (figure 7-3) has an operating pressure of 1500 psi, using hydraulic fluid (MIL-H-5606). The hydraulic solenoid selector valve is utilized in the wing flap system and nose wheel steering system as a selector valve and is operated by two solenoids. The sequence of operation of the valve begins with pressure entering the pressure port. With no connector pins energized, cylinder port 1 and cylinder port 2 are open to return and the pressure port is blocked. When connector pins C and B are energized, pressure directs flow out of cylinder port 1 and cylinder port 2 remains open to return. When connector pins A and B are energized, pressure directs flow

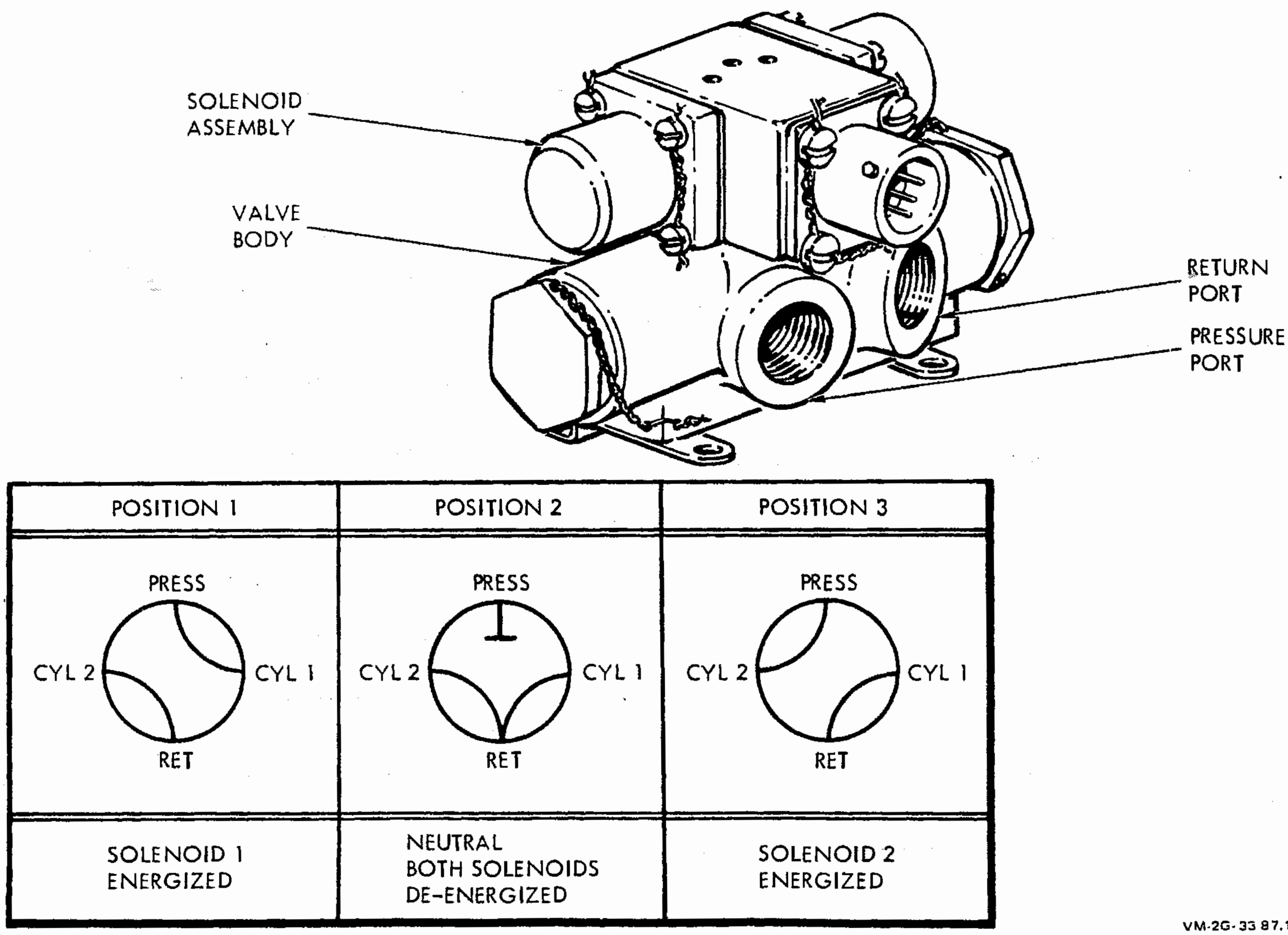


Figure 7-3. Hydraulic Solenoid Selector Valve and Flow Diagram

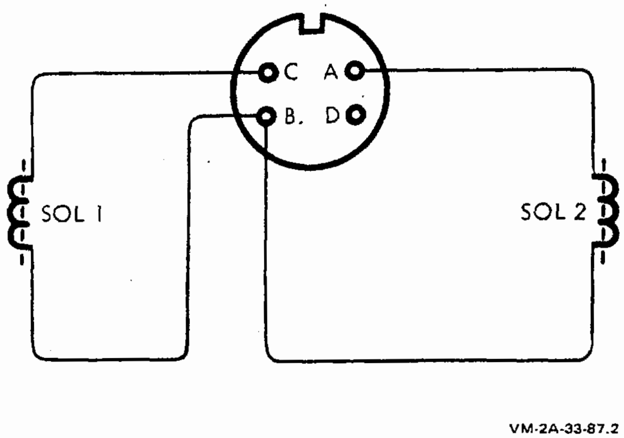


Figure 7-4. Hydraulic Solenoid Selector Valve Electrical Schematic

out of cylinder port 2 and cylinder port 1 remains open to return.

7-30. CHECKOUT. To check out the hydraulic solenoid selector valve, see figure 7-4 and proceed as follows:

Tools and Equipment List

Multimeter	AN/PSM-4C

1. Check for electrical continuity between pins A and B.

2. Check for electrical continuity between pins B and C.

3. Check that there are no internal shorts between pin A and case, pin B and case, and pin C and case.

4. Replace solenoid if test indicates shorts or opens.

7-31. DISASSEMBLY. To disassemble the valve, see figure 7-5 and proceed as follows:

1. Remove electrical connector (2) and gasket (4) by cutting safety wire and removing attaching screws (3).

2. Remove mounting feet (5) by removing attaching screws (6).

3. Remove solenoid cover (7), solenoid gasket (9), and solenoid assembly (10) from body (31) by removing attaching screws (8).

4. Remove solenoid plunger (11), solenoid spring (12), O-ring (15), and backup ring (16) from solenoid assembly (10).

5. Unscrew push rod (14) from solenoid plunger (11).

6. Remove pilot body (22) from body (31).

7. Unscrew retainer seats (18) from pilot body (22) and remove threadlocks (17) from retainer seats (18).

8. Remove disk filter (19), seats (20), and ball (21) from pilot body (22).

9. Unscrew plug (23) from body (31) and remove O-ring (24) and backup ring (25) from plug (23).

10. Remove centering spring (26) and spring guide (27) from body (31).

11. Remove spool and sleeve assembly (28, 29) from body (31); then remove spool (28) from sleeve (29).

12. Remove O-rings (30) from body (31).

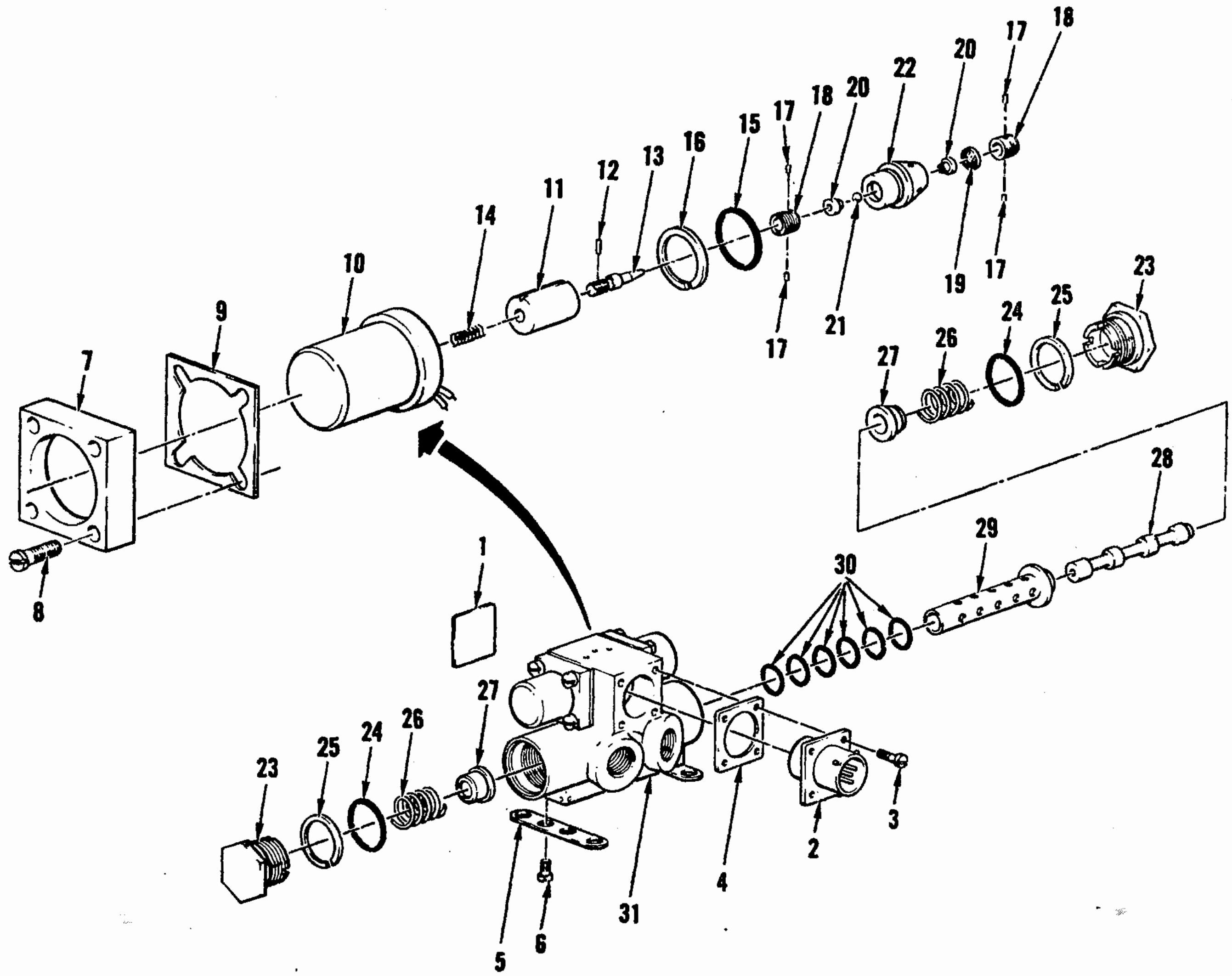
7-32. CLEANING. To clean the components of the valve, use the following listed material and proceed as follows:

Materials List

Trichlorotrifluoroethane	MIL-C-81302

WARNING

When using trichlorotrifluoroethane, keep away from open flame and do not inhale fumes for prolonged periods.



1 PLATE, IDENTIFICATION
2 CONNECTOR, ELECTRICAL
3 SCREW
4 GASKET, RECEPTACLE
5 FOOT, MOUNTING
6 SCREW
7 COVER, SOLENOID
8 SCREW
9 GASKET, SOLENOID
10 SOLENOID ASSEMBLY
11 PLUNGER, SOLENOID
12 SPRING, SOLENOID
13 THREADLOCK
14 PUSHROD
15 PACKING, O-RING
16 RING, BACKUP
17 THREADLOCK
18 SEAT, RETAINER
19 DISC, FILTER
20 SEAT
21 BALL, PRECISION
22 BODY, PILOT
23 PLUG
24 PACKING, O-RING
25 RING, BACKUP
26 SPRING, CENTERING
27 GUIDE, SPRING
28 SPOOL
29 SLEEVE
30 PACKING, O-RING
31 BODY

Figure 7-5. Hydraulic Solenoid Selector Valve - Exploded View

CAUTION

Chlorinated solvents such as trichloroethane, MIL-T-81533; and trichlorotrifluoroethane (freon 113), MIL-C-81302, may be hydrolyzed in contact with free water and form highly corrosive acids. Free water is often found in hydraulic systems, therefore the use of chlorinated solvents should be restricted to external surfaces of hydraulic systems. Chlorinated solvents may be applied to internal surfaces of disassembled hydraulic components for cleaning purposes provided none of the liquid solvent is allowed to remain in the component after cleaning.

1. Wash all metal parts in trichlorotrifluoroethane (MIL-C-81302) and dry with filtered, compressed air.

CAUTION

Do not immerse solenoid in solvent.

2. Ensure that all internal bores and mating surfaces are free from dirt, rust, and corrosion. Place all cleaned parts in a dust-free airtight container with a bag of desiccant (MIL-D-3464) until reassembly.

7-33. INSPECTION. To inspect the components of the valve, proceed as follows:

Tools and Equipment List

Tester, Spring Resiliency	Type PB4-D

Materials List

Penetrant Solution	Type ZL-2
Developer	Type ZP-5

1. Inspect all threaded parts for crossed, stripped, or worn threads.

2. Inspect all parts for evidence of scoring, burrs, and corrosion.

3. Inspect connector (2) for evidence of cracks in insulation and bent or broken pins.

4. Inspect solenoid assembly (10) for evidence of exposed or frayed wires.

5. Inspect springs (12, 26) for evidence of wear or distortion of coils and that they meet requirements of table 7-2.

6. Inspect body (31) as indicated in table 7-3.

7-34. REPAIR. To repair the components of the valve, use the following listed materials, and proceed as follows:

Materials List

Cloth, Crocus	P-C-458

1. Minor thread damage may be repaired with careful use of a fine file. If thread repair results in a loose fit or misalignment of mating parts, replace with a new component.

Table 7-2. Hydraulic Solenoid Selector Valve Spring Inspection Data

PART NAME	FREE LENGTH (INCHES)	COMPRESSED LENGTH UNDER TEST LOAD
Solenoid Spring (12)	0.394	0.322 inch at 4.0 pounds (± 5%)
Centering Spring (26)	0.613	0.436 inch at 10 pounds (± 5%) 0.272 inch at 19.3 pounds (±10%)

Table 7-3. Nondestructive Inspection Data for Hydraulic Solenoid Selector Valve

PART NAME	TYPE OF NONDESTRUCTIVE TEST	PROCEDURE FOR PERFORMING NONDESTRUCTIVE TEST	ACCEPTABLE DEFECTS
Body Assembly (31)	Type I fluorescent method per MIL-H-6866	1. Clean part thoroughly. 2. Submerge in penetrant solution, Type ZL-2 for a period of 7 to 10 minutes. 3. Remove item. 4. Submerge in emulsifier solution for a period of 2 minutes. 5. Remove and rinse part. 6. Submerge in developer Type ZP-5 for 7-10 minutes. 7. Remove item. 8. Place in oven for a period of 7-10 minutes or until dry. 9. Inspect under black (ultra-violet) light.	None

2. Nicks and abrasions on noncritical surfaces may be smoothed with crocus cloth (P-C-458).

3. Replace all packings, backup rings, worn and distorted parts, marred threadlocks, or any component which does not meet inspection requirements.

7-35. ASSEMBLY. To assemble the valve, see figure 7-5 and proceed as follows:

Materials List

Loctite, Grade HV (1-10)	NSN 8030-00-680-0889 (05972)
Lockwire (0.032-inch diameter steel)	MS20995F32
Fluid, Hydraulic	MIL-H-5606
Kit, Cure-date	HP8486 (84685)
Retainer	MS28774-013
Retainer	MS28774-018
Packing	MS28775-013
Packing	MS28775-018
Gasket	HP848115 (84685)

Note

When installing the O-rings (24, 30) in plug (23) and body (31), surfaces must not be marred or scratched. Carefully place O-rings in proper grooves, using an O-ring tool for this operation.

1. Install O-rings (30) into body (31). Ensure O-rings are installed in their proper grooves and do not slip into flow passages.

2. Install spool (28) onto sleeve (29); then install sleeve (29) into body (31).

3. Install spring guide (27) and centering spring (26) into body (31); then install backup ring (25) and O-ring (24) onto end cap (23); and then screw end cap (23) into body (31).

4. Install ball (21), retainer seats (20), and disk filter (19) into pilot body (22); then install threadlocks (17) into retainer seats (18); and then screw retainer seats (18) into pilot body (22).

5. Install pilot body (22) into body (31).

Note

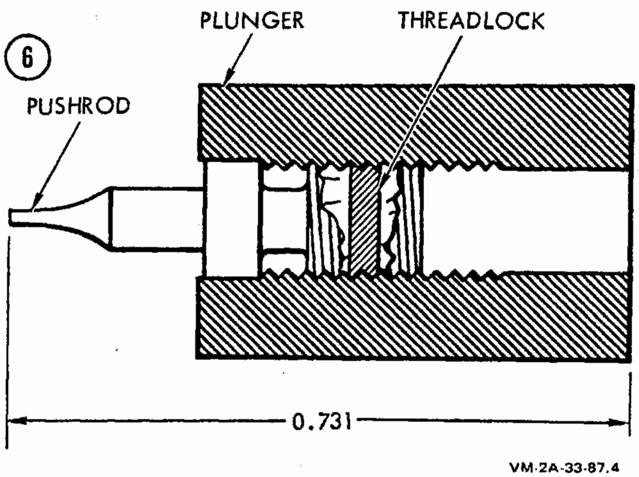
Before installing push rod (14) with thread-lock (17) into solenoid plunger (11), apply a small amount of Loctite, Grade HV (1-10) on push rod threads. Cure Loctite per manufacturer's instructions.

6. Screw push rod (14) into solenoid plunger (11), setting the dimension of both push rod (14) and solenoid plunger (11) to 0.731 inch.

CAUTION

If push rod (14) is threaded too far into solenoid plunger (11), the operating voltage will be higher than the specified 14 to 30 volts. If push rod (14) is not threaded in far enough, internal leakage will result.

Align push rod (14), plunger (11), and solenoid (10) carefully to assure proper contact with seat (20) and ball (21).



Step 6—Para. 7-35

7. Install solenoid spring (12) and solenoid plunger (11) into solenoid assembly (10).

CAUTION

Use particular care in solenoid installation to assure even seating. Cover screws (8) must be secure.

8. Install backup ring (16) and O-ring (15) on each solenoid assembly (10); then install solenoid gasket (9) and solenoid cover (7) on each solenoid assembly (10), by replacing attaching screws (8).

9. Attach mounting feet (5) by replacing attaching screws (6).

10. Install electrical connector (2) by replacing attaching screws (3) and safety wire attaching screws (3). Safety attaching screws (3) with lockwire (MS20995F32).

7-36. TESTING. To test the hydraulic solenoid valve, use a suitable hydraulic (MIL-H-5606) source and 28-volt d-c electrical source and proceed as follows:

1. Apply 1800-psi hydraulic pressure at inlet, with outlet ports plugged against leakage.

2. Using available power supply, energize each solenoid alternately with 18 volts dc.

Note

If solenoid fails to energize at 18 volts dc, check adjustment of push rod and solenoid plunger. Refer to paragraph 7-35, step 6. Increase overall length of solenoid plunger and push rod in 0.002-inch increments until correct voltage is reached.

3. Check that there is no external leakage, evidence of binding, lagging, or other malfunction.

7-37. NOSE GEAR STEER DAMPER BUNGEE (300-342022).

7-38. Intermediate maintenance for the nose gear steer damper bungee consists of disassembly, inspection, repair and/or replacement, assembly and adjustment. Refer to paragraphs 7-39 through 7-42.

7-39. DISASSEMBLY. To disassemble the bungee, see figure 7-6 and proceed as follows:

1. Cut lockwire, loosen check nut and remove end cap, rod, and spring.

Note

Removal of rod end and disassembly of rod components may not be necessary, subject to inspection conditions in paragraph 7-40.

7-40. INSPECTION. If a part does not meet the following conditions, it must be replaced. See figure 7-6 and proceed as follows:

Materials List

Crocus Cloth	P-C-458
Lubricant (Silicon, 200 centistokes)	VV-D-1078
Lubricant	MIL-L-7870
Primer, Zinc Chromate	MIL-P-8585 or TT-P-1757
Solvent, Dry-cleaning	P-D-680, Type II

1. Examine exterior of bungee for general condition. If any serious damage exists, discard bungee. Check rod end (9) bolt hole for excessive radial wear. Maximum allowable radial wear is 0.250 (+0.025) inch. If worn beyond tolerance, discard bungee.

2. Check end fitting bearing (1) for wear. Maximum allowable radial wear is 0.250 (+0.025) inch. If worn, press out old bearing and stake in new. Inspect cylinder locknut (6) and check nut (8) for cracks and worn threads.

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

Note

Clean end fitting bearing (1) with dry-cleaning solvent (P-D-680, Type II) and lubricate with MIL-L-7870.

3. Spot-paint any nicked or scratched surfaces with zinc chromate primer (MIL-P-8585 or TT-P-1757).

4. Check interior of bungee for general condition. If serious damage or corrosion exists, discard bungee.

5. Check spring for corrosion or pitting.

Note

Spring free length should be 3 inches.

6. Lubricate or replace spring, as necessary. If additional lubrication is required, remove dry film lubricant from spring using crocus cloth (P-C-458) and coat spring with VV-D-1078 200 centistokes silicon lubricant.

7-41. ASSEMBLY. To assemble the bungee, see figure 7-6 and proceed as follows:

Materials List

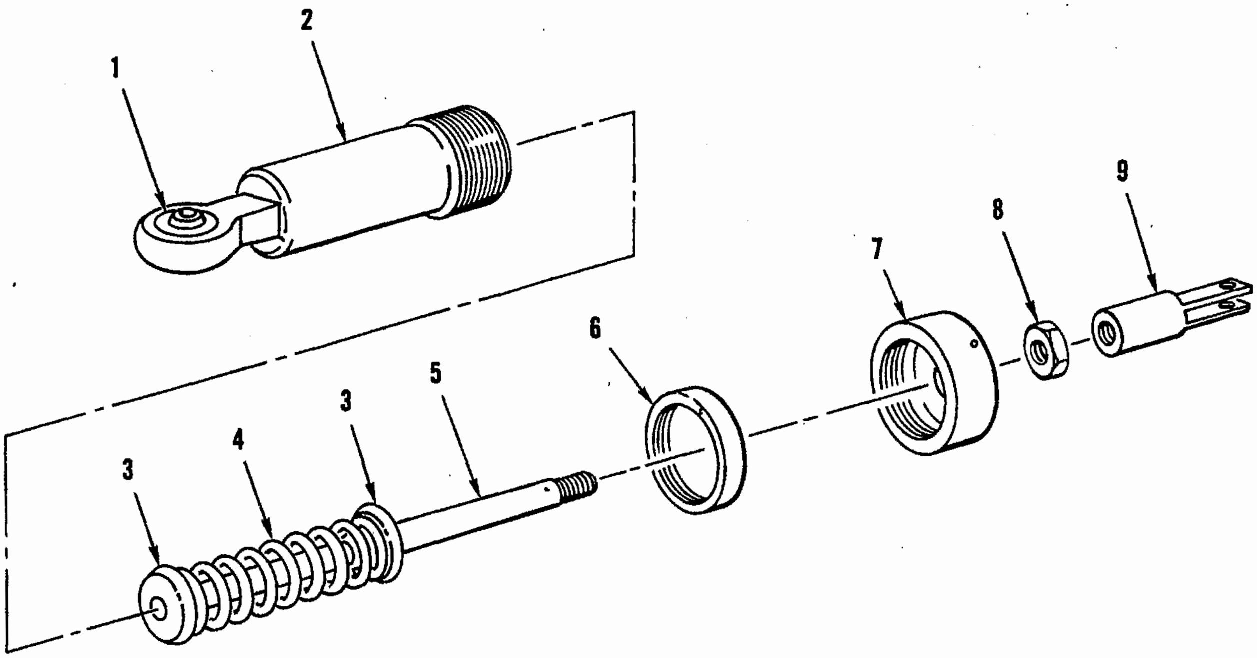
Lockwire	MS20995F32

1. Assemble spring, keepers, end cap, check nut, and rod end on rod.

2. Tighten end cap by hand to ensure seating against keepers and elimination of end play.

3. Test to assure axial load of 70 to 110 pounds to initiate compression or extension of bungee.

4. Tighten locknut against end cap and safety with lockwire (MS20995F32).



1 END FITTING BEARING
2 HOUSING
3 KEEPER
4 SPRING
5 ROD
6 CYLINDER LOCK NUT
7 END CAP
8 CHECK NUT
9 ROD END

VM-2G-33-55A

Figure 7-6. Nose Landing Gear Steer Damper Bungee

7-42. ADJUSTMENT. The only adjustment made on this bungee is on the rod end. See figure 7-6 and adjust the rod end until the free length from the center of the end fitting bolt hole to the center of the rod end bolt hole is 6.4 inches. Tighten check nut against rod end.

7-43. NOSE LANDING GEAR STEER DAMPER ASSEMBLY (305-342001 AND 305-342001-1).

7-44. The steer damper assembly transforms hydraulic pressure into a mechanical force to steer the aircraft.

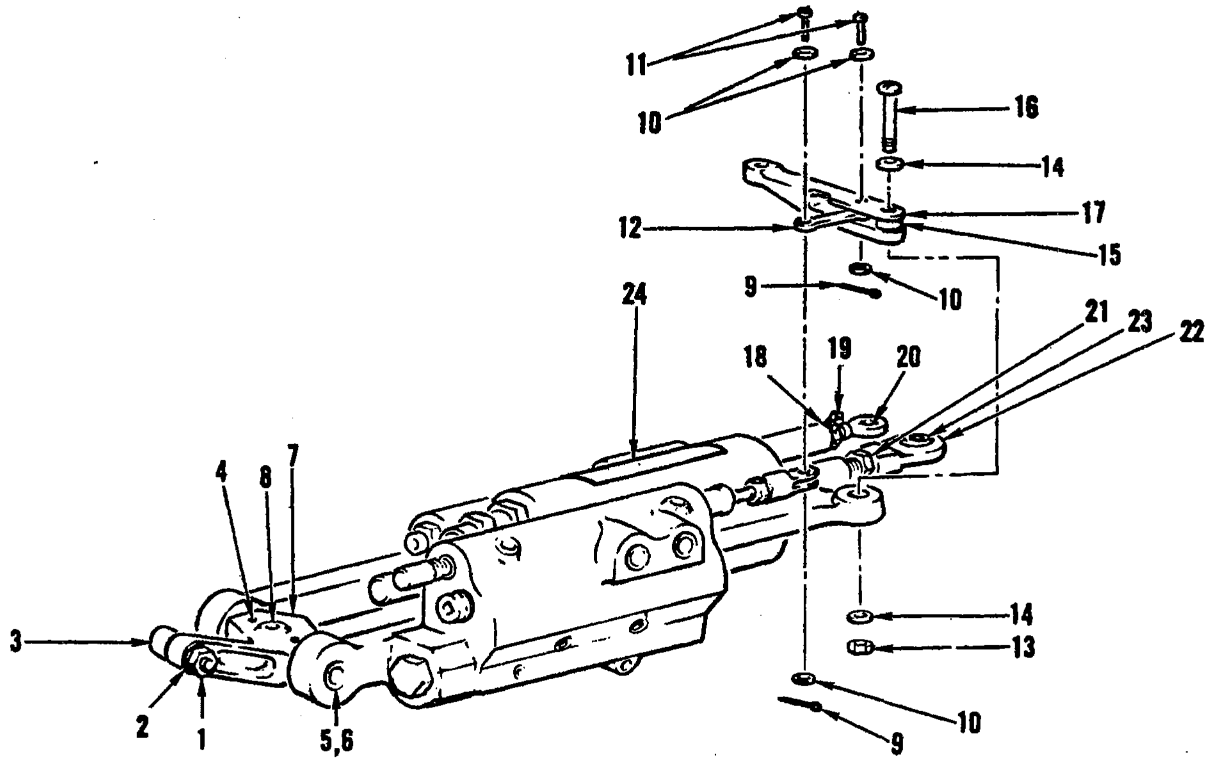
7-45. DISASSEMBLY. To disassemble the steer damper assembly, see figure 7-7 and proceed as follows:

Note

Do not remove press fit plugs unless leaking or damaged. Replace with new plugs if removed.

Do not remove bearing (23) or bushing (87) unless damaged or worn. Replace with new bearing and/or bushings if removed and stake as required.

Sleeve assemblies (53 and 77) contain matched parts and must be retained as assemblies. If replacement is required, the entire sleeve assembly must be replaced.



1 NUT (MS21053L6)
2 WASHER
3 ROLLER
4 PIN
5 PIN
6 WASHER [3]
7 UNIVERSAL
8 BEARING
9 COTTER PIN (MS24665-149)
10 WASHER
11 PIN
12 LINK
13 NUT (AN320-4)
14 WASHER
15 SPACER (NAS 43DD4-12)
16 BOLT (AN24-23)
17 ARM
18 NUT
19 LOCK
20 ROD END
21 NUT
22 CONNECTOR
23 BEARING
24 NAME PLATE
25 NUT (MS21042L6)
26 BUSHING
27 ROD
28 CAP
29 WASHER
30 SPRING
31 CAP
32 PISTON (300-342003-11) [3]
32A PISTON (397-342003-3) [4]
33 O-RING (MS28775-325) [5]
33A O-RING (MS28775-222) [6]
34 RETAINER (MS24774-325) [5]
34A GLYD RING (S12547-223N) [6]
35 SNAP RING (MS16625-1106)
36 SCRAPER (MS28776M2-3)
37 RETAINER
38 WASHER
39 FELT WASHER
40 RETAINER (MS28774-114)
41 O-RING (MS28775-114)
42 O-RING (MS28775-325)
43 VALVE
44 O-RING (MS28778-10)
45 O-RING (MS28775-113)
46 GUIDE
47 O-RING (MS28775-012)
48 SPRING
49 BALL (MS150455)
50 ORIFICE
51 PLUG
52 SPRING
53 SLEEVE ASSY
54 SLEEVE [1]
55 SPOOL [1]
56 RETAINER (MS28774-010)
57 O-RING (MS28775-010)
58 O-RING (MS28775-014)
59 PLUG (AN814-2DL)
60 O-RING (MS28775-009)
61 ROD END
62 LOCK
63 NUT
64 STEER DAMPER SUBASSY
65 CAP
66 O-RING (MS28775-015)
67 INSERT
68 LOCKNUT
69 COTTER PIN (MS24665-22)
70 NUT
71 SPACER
72 PISTON
73 SPRING
74 GUIDE
75 HOUSING
76 SHAFT
77 SLEEVE ASSY
78 SLEEVE [2]
79 SPOOL [2]
80 LOCKNUT
81 RETAINER
82 O-RING (MS28775-112)
83 O-RING (MS28775-010)
84 O-RING (MS28775-014)
85 HOUSING
86 BEARING
87 BUSHING

[1] ITEM 54 AND 55 ARE MATCHED, AND MUST BE PROCURED AS ITEM 53.

[2] ITEM 78 AND 79 ARE MATCHED, AND MUST BE PROCURED AS ITEM 77.

[3] USED ON STEER DAMPER ASSEMBLY, (305-342001).
[4] USED ON STEER DAMPER ASSEMBLY, (305-342001-1).
[5] USED ON PISTON, (300-342003-11).
[6] USED ON PISTON, (397-342003-3).

VM-2H-33-76

Figure 7-7. Nose Gear Steer Damper Assembly (Sheet 1 of 2)

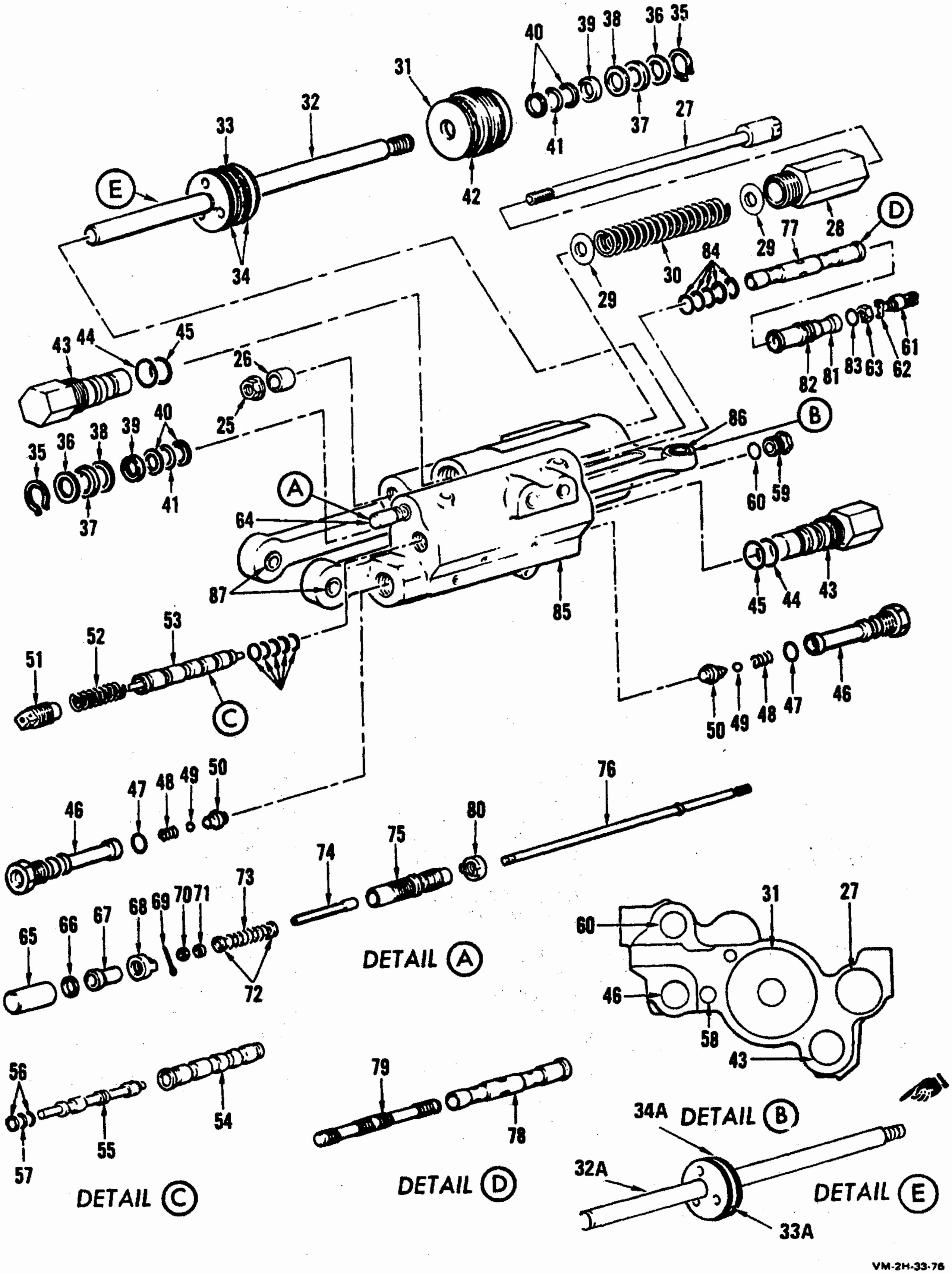


Figure 7-7. Nose Gear Steer Damper Assembly (Sheet 2 of 2)

1. Remove nut (1), washer (2), and roller (3).

2. If universal is bent or otherwise damaged, it will be necessary to return the complete steer damper assembly to Supply.

3. If link (12) is damaged, return complete steer damper assembly to Supply.

4. Remove cotter pins (9), washers (10), and pins (11), and remove link (12).

5. Remove nut (13), washers (14), and bolt (16). This will permit removal of bushing (15) from arm (17).

6. Cut lockwire and loosen nut (18). This will permit removal of rod end (20) and lock (19).

7. Loosen nut (21) and remove connector (22).

Note

Bearing (23) is staked in connector (22) and does not need to be removed unless defective.

8. Nameplate (24) need not be removed.

9. Remove nut (25) and washer (26) from rod (27).

10. Remove cap (28), washer (29), spring (30), and second washer (29). Remove rod (27).

11. Remove cap (31) from piston (32) and housing (85).

12. Pull piston (32) or (32A) from housing (85) and remove O-rings (33) or O-ring (33A) and re-retainers (34) or Glyd ring (34A).

13. Remove snap ring (35), scraper (36), retainer (37), washer (38), felt washer (39), retainer (40), O-ring (41), and retainer (40) from cap (31).

14. Remove O-ring (42) from outside of cap (31).

15. Remove valve (43) and O-rings (44, 45) from valve.

16. Remove guide (46) from housing (85).

17. Remove O-ring (47), spring (48), ball (49), and orifice (50) from housing (85).

18. Remove plug (51) from housing (85).

19. Remove spring (52), sleeve assembly (53), and O-rings (58) from housing (85).

Note

Sleeve assembly (53) consists of sleeve No. 1 (54), spool No. 1 (55), two retainers (56), and an O-ring (57). The sleeve (54) and spool (55) are a matched set and must be kept together.

20. Remove plug (59) and O-ring (60) from housing (85).

21. Remove rod end (61), lock (62), and nut (63) from steer damper subassembly (64).

22. Disassemble the steer damper subassembly in the following manner:

a. Remove cap (65) by unscrewing it from housing (75).

b. Remove O-ring (66) from inner surface of cap (65).

c. Remove insert (67).

d. Cut lockwire and unscrew locknut (68) from housing (75).

e. Remove cotter pin (69), nut (70), and spacer (71).

f. Slide piston (72), spring (73), and piston (72) from guide (74).

g. Remove guide (74), housing (75), and shaft (76).

23. Remove sleeve assembly (77) comprised of sleeve (78) and spool (79).

Note

Sleeve (78) and spool (79) are matched parts and should be kept together.

24. Remove locknut (80) from housing (75).

25. Remove retainer (81) from sleeve assembly (77) and remove O-rings (82, 83, 84).

26. Check general condition of bearing (86), and bushings (87) which are installed in housing (85).

7-46. CLEANING. Clean all metallic components in the following manner.

Materials List

Solvent, Dry-cleaning	P-D-680, Type II

WARNING

Use dry-cleaning solvent only with adequate ventilation. Avoid prolonged breathing of vapors, and keep away from open flames.

1. Wash all metallic components in dry-cleaning solvent (P-D-680, Type II).

2. Dry with a clean, lint-free cloth or compressed air.

3. Ensure that all ports and passages are clean and free of obstruction.

7-47. INSPECTION. Inspect all parts for obvious damage and defects and proceed as follows:

Note

If any component is damaged, scratched, or nicked, it should be replaced.

1. Check all threads for sharp edges, burrs, and cleanliness.

2. Check bores of housing (85) for scores and scratches.

3. Check piston (32) for scratches and scores.

4. Check sleeve assemblies (53 and 77) for scratches and scores.

5. Check bearings for binding, rough operation, and excessive axial and radial play.

6. Check all springs in accordance wih table 7-4, using PB4-D spring resiliency tester (or equivalent).

7. Lubricate or replace spring (30) (305-342001-7) as necessary. If additional lubrication is required, remove dry film lubricant from spring using crocus cloth (P-C-458) and coat spring with VV-D-1078 200 centistokes silicon lubricant.

7-48. ASSEMBLY. To assemble the steer damper assembly, see figures 7-7 and 7-8 and proceed as follows:

Materials List

Fluid, Hydraulic	MIL-H-5606
Lockwire (0.032-inch diameter steel)	MS20995F32
Glyd Ring	S12547-223N
Lubricant	MIL-L-8937
Packing	MS28775-009
Packing	MS28775-010
Packing	MS28775-012
Packing	MS28775-014
Packing	MS28775-015
Packing	MS28775-112
Packing	MS28775-113
Packing	MS28775-114
Packing	MS28775-222
Packing	MS28775-325
Packing	MS28778-10
Pins, Cotter	MS24665-149

Table 7-4. Nose Landing Gear Steer Damper Assembly Coil Spring Test Procedures and Limits

STEP	LIMITS			
	SPRING (48)	SPRING (73)	SPRING (30)	SPRING (52)
1. Compress to solid length - inches	0.240 (+0.004/ -0.001)	0.880 (+0.007/ -0.001)	4.43 (+0.010/ -0.001)	DNA
2. Release to free length - inches	0.90 (±0.030)	1.96 (±0.030)	8.00 (±0.030)	1.00 (±0.030)
3. Load spring - pounds	1 (±0.1)	14.6 (±1.5)	200 (±2)	19 (±0.5)
4. Compressed length (loaded) - inches	0.350 (±0.030)	1.38 (±0.030)	2.25 (±0.010)	0.35 (±0.010)
If springs do not conform to these requirements, replace with new part.				

Note

Coat all O-rings, felt washers, retainers and sliding surfaces with hydraulic fluid (MIL-H-5606) at the time of assembly.

Replace all O-rings, packings, felt washers, cotter pins, and safety with lockwire at assembly.

If any component of sleeve assembly (53 or 77) is damaged, entire assembly must be replaced.

1. Install O-rings (84) and sleeve (78) into housing (85).

2. Assemble O-rings (82 and 83) on retainer (81) and install in housing (85). Tighten nut and safety with lockwire (MS20995F32).

3. Assemble spool (79), guide (74), housing (75), pistons (72), spring (73), and spacer (71) on shaft (76) and secure with nut (70). Tighten nut until assembly is bottomed; further tighten nut to next slot and install cotter pin (69).

Note

Cotter pin (69) must not interfere with inside diameter of insert. (67).

4. Assemble insert (67), locknut (68), O-ring (66), and cap (65). Turn cap until it bottoms on insert; tighten locknut and safety with lockwire (MS20995F32).

Note

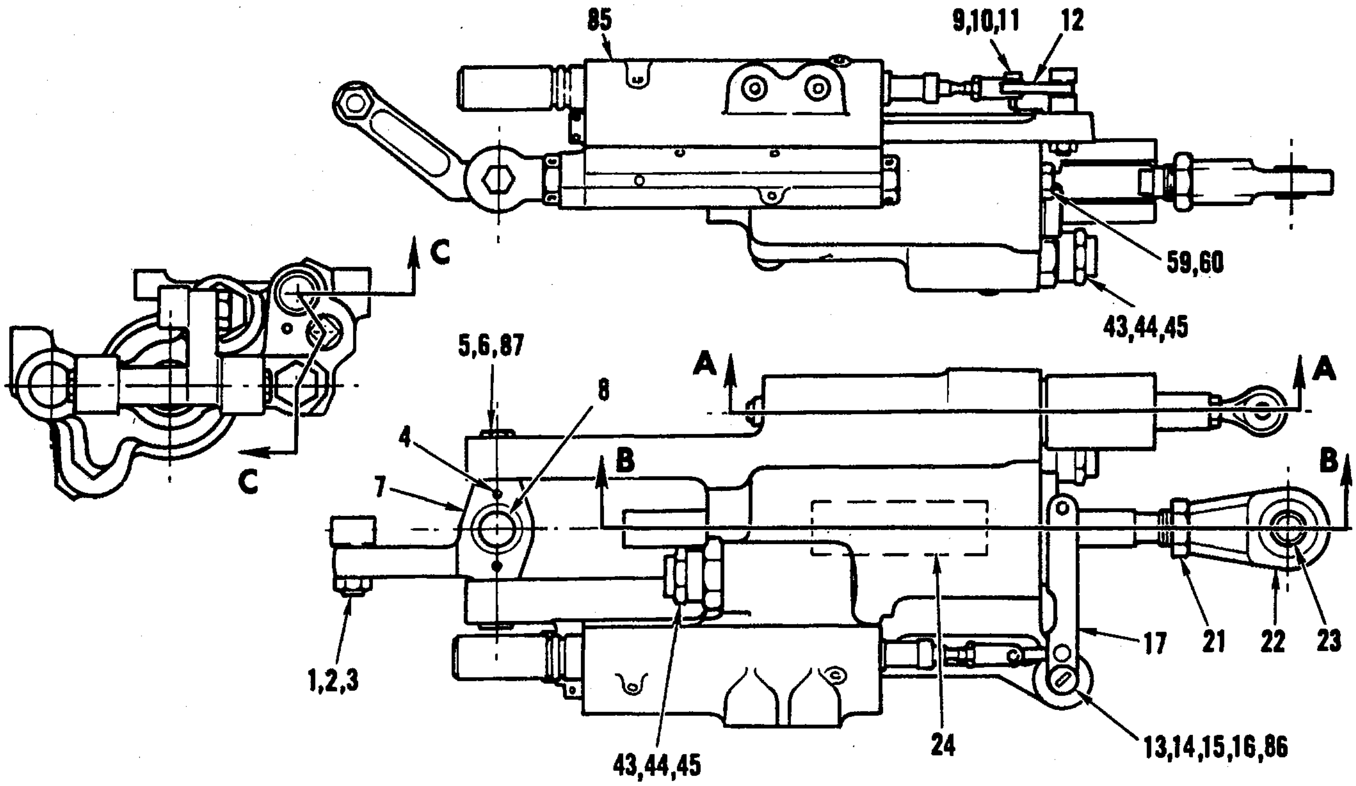
The detail assemblies in steps 3 and 4 shall be referred to as the steer damper subassembly (64).

CAUTION

Exercise extreme care not to damage edges of spool (79) and sleeve (78).

5. Install steer damper subassembly (64) with locknut (80) into housing (85).

6. Turn steer damper subassembly (64) into housing (85) until approximately 0.38 inch of 0.250-inch diameter portion of shaft (76) protrudes beyond retainer (82). Snug-tighten locknut (80); do not lockwire.



1 NUT (MS21053L6)
2 WASHER
3 ROLLER
4 PIN
5 PIN
6 WASHER [3]
7 UNIVERSAL
8 BEARING
9 COTTER PIN (MS24665-149)
10 WASHER
11 PIN
12 LINK
13 NUT (AN320-4)
14 WASHER
15 SPACER (NAS 43DD4-12)
16 BOLT (AN24-23)
17 ARM
18 NUT
19 LOCK
20 ROD END
21 NUT
22 CONNECTOR
23 BEARING
24 NAME PLATE
25 NUT (MS21042L6)
26 BUSHING
27 ROD
28 CAP
29 WASHER
30 SPRING
31 CAP
32 PISTON (300-342003-11) [3]
32A PISTON (397-342003-3) [4]
33 O-RING (MS28775-325) [5]
33A O-RING (MS28775-222) [6]
34 RETAINER (MS24774-325) [5]
34A GLYD RING (S12547-223N) [6]
35 SNAP RING (MS16625-1106)
36 SCRAPER (MS28776M2-3)
37 RETAINER
38 WASHER
39 FELT WASHER
40 RETAINER (MS28774-114)
41 O-RING (MS28775-114)
42 O-RING (MS28775-325)
43 VALVE
44 O-RING (MS28778-10)
45 O-RING (MS28775-113)
46 GUIDE
47 O-RING (MS28775-012)
48 SPRING
49 BALL (MS150455)
50 ORIFICE
51 PLUG
52 SPRING
53 SLEEVE ASSY
54 SLEEVE [1]
55 SPOOL [1]
56 RETAINER (MS28774-010)
57 O-RING (MS28775-010)
58 O-RING (MS28775-014)
59 PLUG (AN814-2DL)
60 O-RING (MS28775-009)
61 ROD END
62 LOCK
63 NUT
64 STEER DAMPER SUBASSY
65 CAP
66 O-RING (MS28775-015)
67 INSERT
68 LOCKNUT
69 COTTER PIN (MS24665-22)
70 NUT
71 SPACER
72 PISTON
73 SPRING
74 GUIDE
75 HOUSING
76 SHAFT
77 SLEEVE ASSY
78 SLEEVE [2]
79 SPOOL [2]
80 LOCKNUT
81 RETAINER
82 O-RING (MS28775-112)
83 O-RING (MS28775-010)
84 O-RING (MS28775-014)
85 HOUSING
86 BEARING
87 BUSHING

[1] ITEM 54 AND 55 ARE MATCHED, AND MUST BE PROCURED AS ITEM 53.

[2] ITEM 78 AND 79 ARE MATCHED, AND MUST BE PROCURED AS ITEM 77.

[3] USED ON STEER DAMPER ASSEMBLY, (305-342001).

[4] USED ON STEER DAMPER ASSEMBLY, (305-342001-1).

[5] USED ON PISTON, (300-342003-11).

[6] USED ON PISTON, (397-342003-3).

VM-2H-33-77

Figure 7-8. Steer Damper Assembly - Cutaway View (Sheet 1 of 2)

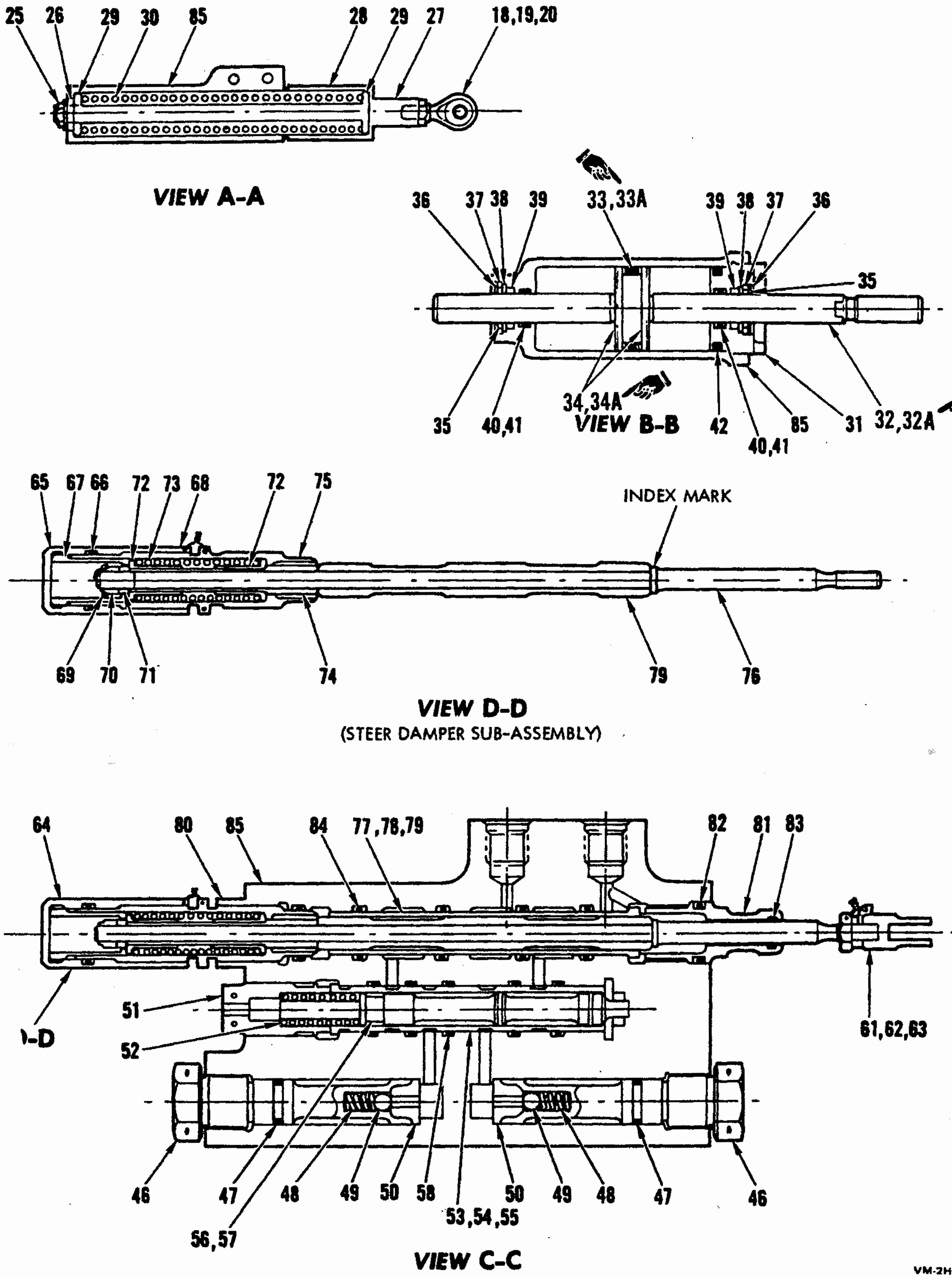


Figure 7-8. Steer Damper Assembly - Cutaway View (Sheet 2 of 2)

Note

Locknut (80) will be tightened and lockwired following spool null adjustment.

7. Install O-rings (58), sleeve assembly (53), spring (52), and plug (51) in housing (85). Tighten plug and safety with lockwire (MS20995F32).

8. Install orifice (50), ball (49), spring (48), O-ring (47), and guide (46) in housing (85). Tighten guide and safety with lockwire (MS20995F32).

Note

Step 8 is to be accomplished at both ends of housing (85).

9. Install retainers (40), O-ring (41), felt washer (39), washer (38), retainer (37), scraper (36), and snap ring (33) in housing (85), and cap (31).

10. Assemble O-ring (42) on cap (31) and O-ring (33) or (33A) and retainers (34) or Glyd ring (34A) (34A) on piston (32) or (32A). Install piston and cap in housing (85). Tighten cap.

11. Install rod (27), washers (29), spring (30), cap (28), bushing (26), and secure with nut (25).

12. Adjust centering bungee to eliminate lateral movement in rod (27). Tighten nut (25) and cap (28). Safety cap with lockwire (MS20995F32).

13. Test bungee to assure axial load of 140 to 185 pounds to initiate compression or extension of bungee.

14. Install nut (18), lock (19), and rod end (20) on shaft (27). Tighten and safety with lockwire (MS20995F32).

15. Install O-ring (60) and plug (59) in housing (85). Tighten plug and safety with lockwire (MS20995F32).

16. Assemble O-ring (44 and 45) on valve (43) and install in housing.(85). Tighten valve; do not lockwire.

Note

Valve (43) will be lockwired after completion of pressure test.

Step 15 to be accomplished in both ends of housing (85).

17. Install nut (21) and connector (22) on piston (32); tighten nut.

Note

Connector (22) will be adjusted when steer damper assembly is installed in aircraft.

18. Install arm (17) to housing (85) with bolt (16), washers (14), spacer (15), and nut (13); tighten nut.

19. Assemble link (12) to arm (17) with pin (11), washers (10), and cotter pin (9). Do not attach link to rod end (61).

Note

Link (17) will be attached to rod end (61) following spool null adjustment.

20. Assemble roller (3), washer (2), and nut (1) to universal (7).

21. Install universal (7) on housing (85), using pin (5), washer (6), and pin (4).

7-49. ALIGNMENT AND ADJUSTMENT. To align and adjust steer damper assembly, proceed as indicated in paragraphs 7-50 and 7-51.

7-50. SPOOL NULL ADJUSTMENT. To adjust the spool null, see figure 7-9 for test equipment setup and proceed as follows:

Materials List

Lockwire (0.020-inch diameter steel)	MS20995F20

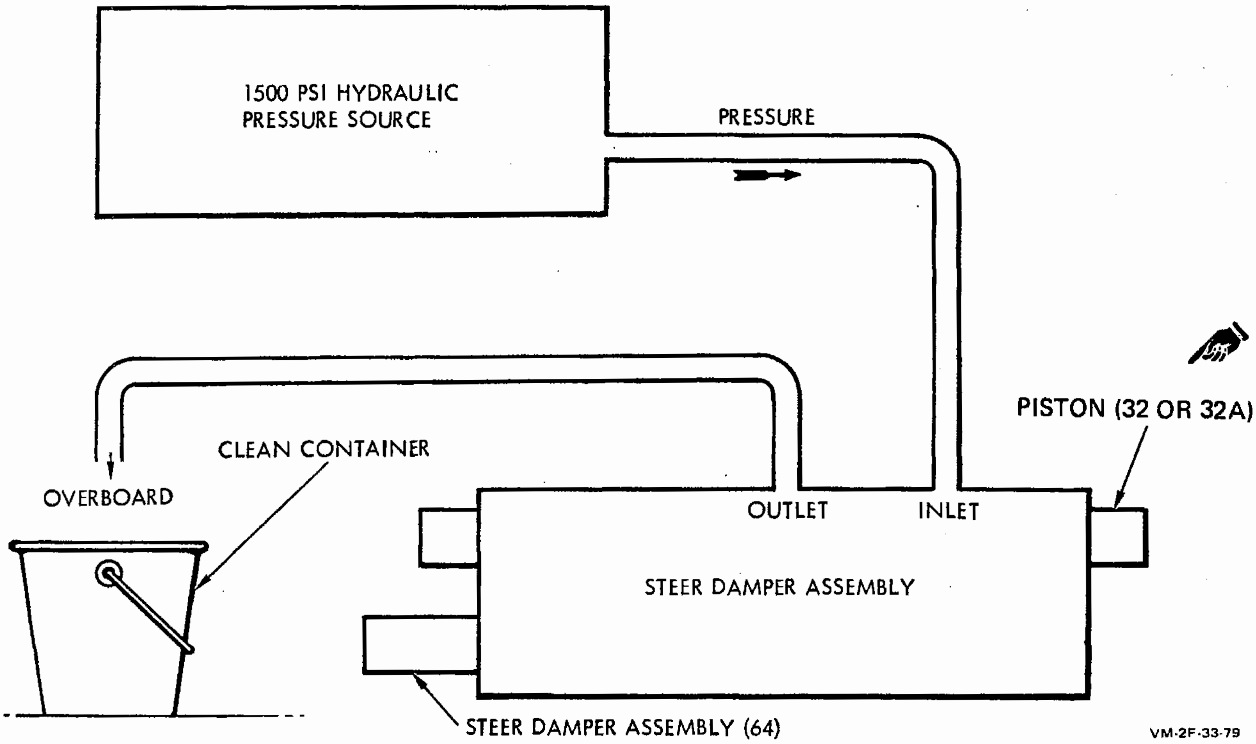


Figure 7-9. Steer Damper Spool Null Adjustment - Test Setup

1. With 1500 psi applied at pressure port, turn steer damper subassembly (64) until piston (32) motion stops. Continue turning in same direction until piston motion resumes. Note number of revolutions required to cross dead band.

Note

These measurements should be made with locknut (80) snug-tight.

2. Position the steer damper subassembly (64) halfway between the dead band limits, tighten locknut (80), and safety with lockwire (MS20995F20).

7-51. ROD END ADJUSTMENT. To adjust rod end (61), proceed as follows:

Materials List

Lockwire (0.020-inch diameter steel)	MS20995F20

1. Turn rod end (61) until rigging hole in housing (85) and hole in rod end are aligned, allowing a 0.125-inch diameter pin to pass through.

2. Tighten nut (63) and safety with lockwire (MS20995F20). Connect link (17) to rod end (61), using pin (11), washer (10), and cotter pin (9).

7-52. PRESSURE TESTING. To pressure test the steer damper assembly, see figure 7-10 for test equipment setup and proceed as follows:

Tools and Equipment List

Hydraulic Test Stand	S-610 (89307)

Materials List

Lockwire (0.032-inch diameter steel)	MS20995F32

Note

This test must be made with steer damper universal turned so that it will not interfere with full travel of piston.

1. Apply 1500 psi at inlet port with return port open.

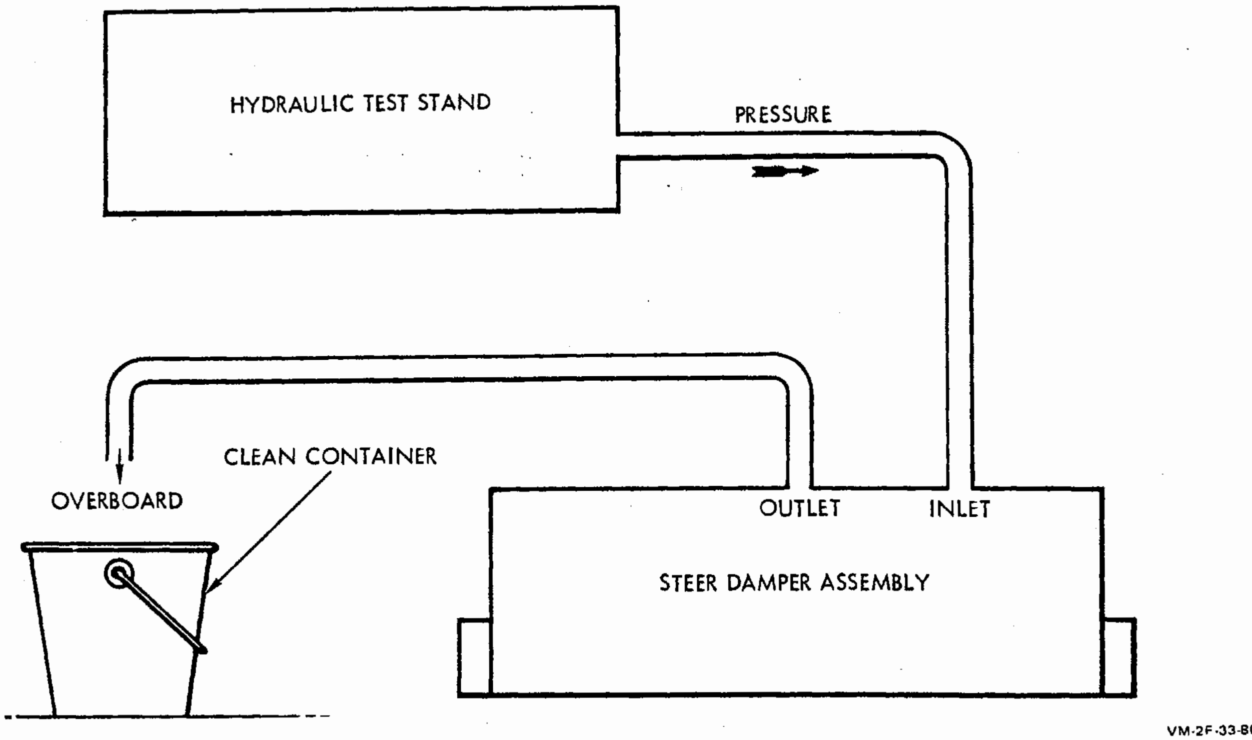


Figure 7-10. Steer Damper Assembly Pressure Test - Test Setup

2. Cycle control valve for full travel in both directions and check for external leakage in neutral, extended, and compressed positions.

3. Ensure that valves (43) are tightened and safetied with lockwire (MS20995F32).

4. Install plug in return port and pressurize inlet port to 100 psi.

5. Actuate control valve spool and check for external leakage.

SECTION IV
DEPOT MAINTENANCE

7-53. GENERAL.

7-54. Depot maintenance for components of the nose wheel steering system consists of checkout, disassembly, cleaning, inspection, repair, tolerance limits, assembly, adjustment, calibration, preservation, and shipment. In some instances, depot maintenance may include manufacture of parts, modification, testing, and reclamation of assemblies or subassemblies of the hydraulic system components.

7-55. HYDRAULIC SOLENOID SELECTOR VALVE (HP848430-620).

7-56. The valve assembly has a designed operating pressure of 1500 psi. The thermal operating range is between −30° to +71°C (−22° to +160°F), utilizing hydraulic fluid (MIL-H-5606) as the operating medium. The valve is operated by two solenoids. Overall dimensions are 3.31 inches long by 2.44 inches high by 2.43 inches wide. The power supply needed to operate the two solenoids on the valve must be capable of producing 18 volts dc at 1800 psi and 28 volts dc at 250 psi. Refer to table 7-5 and see figure 7-11 for valve assembly characteristics.

7-57. CHECKOUT. If valve malfunctions, test the solenoids before disassembling the valve. Using dielectric tester, perform the test on both solenoids as follows:

Tools and Equipment List

Dielectric Tester	411 (FSCM 04327)
Power Supply	LH125 (FSCM 80103)

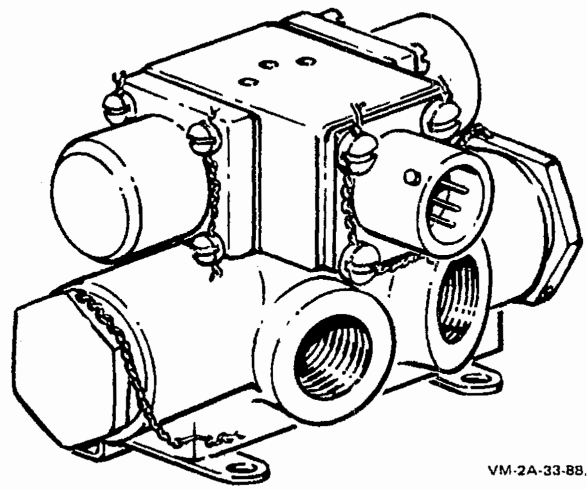

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Figure 7-11. Hydraulic Solenoid Selector Valve Assembly

7-58. DIELECTRIC STRENGTH TEST.

1. Apply a test voltage of 1000 volts RMS between solenoid windings and ground for 1 second.

2. Check that there is no evidence of arcing, flashover, or a noticeable decrease in insulation resistance.

3. Replace solenoid(s) if this test indicates solenoid defect.

7-59. DISASSEMBLY. To disassemble the valve, refer to paragraph 7-31 and see figure 7-5.

7-60. CLEANING. To clean the components of the valve, refer to paragraph 7-32.

Table 7-5. Hydraulic Solenoid Selector Valve Assembly Characteristics

Operating Pressure	1500 psi (rated for 3000 psi)
Proof Pressure	2250 psi (rated for 4500 psi)
Burst Pressure	3750 psi (rated for 7500 psi)
Minimum Operating Pressure	250 psi
Temperature Range	-30° to +71°C (-22° to +160°F) (rated for -55° to +135°C) (-65° to +275°F) Ambient and Fluid
Hydraulic Fluid	Per MIL-H-5606
Valve Pressure Drop at Rated Flow	25 psi Maximum with cylinder ports looped at 19° to 43°C (70° to 110°F)
Response Time	0.25 second maximum energizing or deenergizing
Weight	0.97 pound (actual)
Overall Dimensions	3.31 inches length by 2.44 inches height by 2.43 inches width
Rated Flow	3.5 gpm
Solenoid Data:	
Type	Continuous duty
Design	Per MIL-S-4040
Current	0.75 amperes at 30 volts dc at 19°C (70°F)
Voltage	14 to 30 volts dc
Leakage:	With 1500 psi at pressure port and temperature of -30° to 71°C (-22° to 160°F) the internal leakage will not exceed 10 cc/minute under the following conditions: a. From cylinder port 1 and cylinder port 2 with both solenoids deenergized. b. From cylinder port 2 with solenoid 1 energized. c. From cylinder port 1 with solenoid 2 energized.

7-61. INSPECTION. Refer to table 7-6, perform inspection of disassembled parts for wear tolerances and/or surface conditions requiring replacement of damaged parts.

7-62. REPAIR. Minor thread damage may be repaired on parts with the careful use of a fine file. If thread repair results in a loose fit or misalignment of mating parts, replace with new part. Nicks and abrasions appearing on noncritical surfaces may be smoothed with crocus cloth (P-C-458). Replace all worn and distorted parts, marred threadlocks, and any part that does not fall within the limits of table 7-6.

7-63. ASSEMBLY. Using overhaul kit (HP8484), new packings, rings, and gaskets, reassemble the valve in accordance with paragraph 7-35.

Materials List

Kit, Overhaul	HP8484

7-64. TESTING. Connect the valve to the hydraulic test stand. See figure 7-12. Connect the dc power supply to solenoids on valve and perform tests as follows:

Tools and Equipment List

Power Supply	LH125 (80103) (or equivalent)
Hydraulic Test Stand	S610 (89307)
Tester, Dielectric	Type 411 (04237)

Materials List

Hydraulic Fluid	MIL-H-5606 or MIL-H-6083

CAUTION

The test and flush fluids shall be continuously filtered by a 10-micron absolute non-bypass filter located upstream of the test unit.

Note

All tests must be conducted at a temperature of 21.1°C (+70°F) to 43°C (+110°F). Use either hydraulic fluid MIL-H-5606 or MIL-H-6083. If MIL-H-5606 is used, flush with MIL-H-6083 after test and drip drain. If MIL-H-6083 is used, drip drain after test. Flush valve thoroughly to remove air before testing and cap all ports immediately after testing.

Table 7-6. Hydraulic Solenoid Selector Valve Inspection Data

PART NAME AND INDEX NO. (FIGURE 7-11)	CRITICAL SURFACE OR DIMENSION (INCHES)	TOLERANCE OR ALLOWABLE WEAR (INCHES)	CONDITION REQ. REPLACEMENT OF PART
Seat (20)	0.0310/0.0312 diameter 16	0.0001 (roundness and sharpness)	Any burrs or scratches
Ball (21)	0.0625 diameter (±0.0002)	0.0002 dimension 0.00005 sphericity	Deformation or visible score marks
Spool and Sleeve Assembly (28, 29)	Spool O.D. with Sleeve I.D.	0.00005 to 0.000075 Spool clearance	Any scratches or score marks on lapped surface

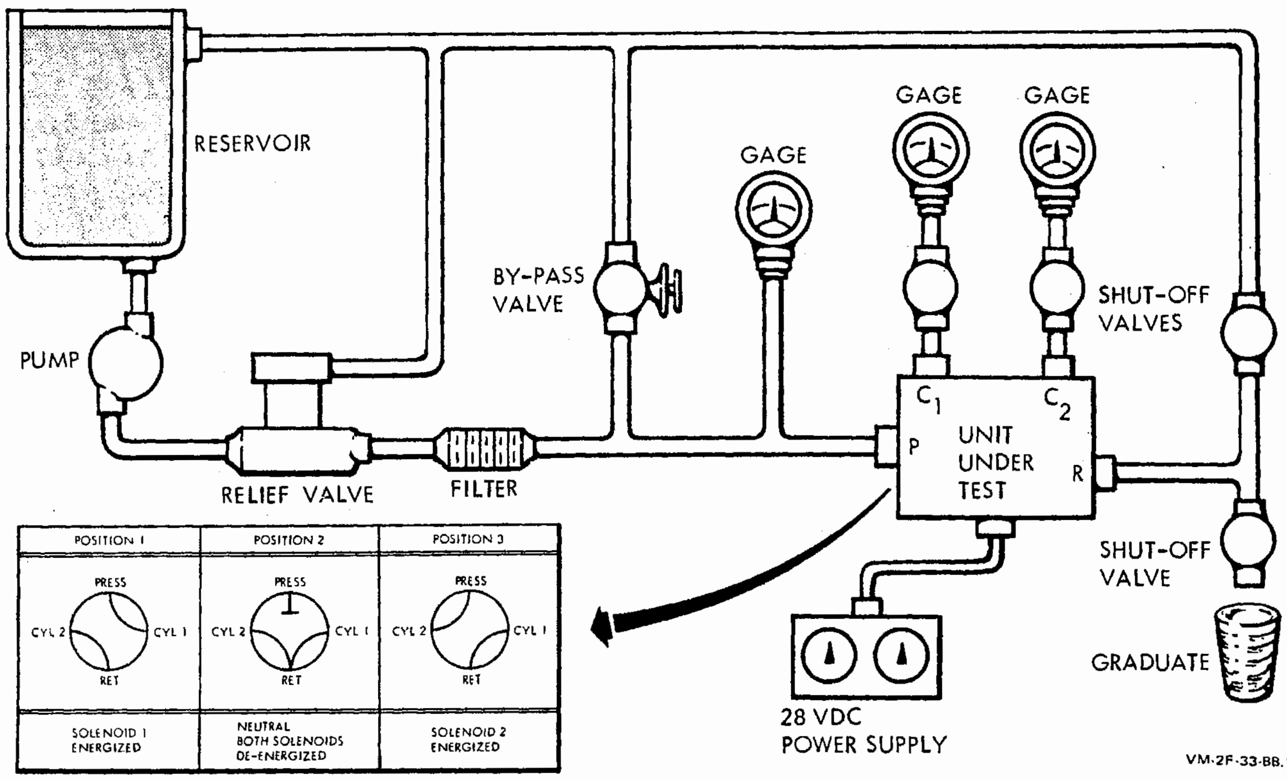

Figure 7-12. Hydraulic Solenoid Selector Valve - Test Setup

Use 18 volts dc to energize solenoids at 1800 psi and 28 volts dc to energize solenoids at 250 psi. If solenoid fails to energize at 18 volts dc, check adjustment of push rod and solenoid plunger. Refer to step 6, paragraph 7-35. Increase overall length of solenoid plunger and push rod in increments of 0.002 inch until correct voltage is reached. Solenoid temperature must not exceed 27°C (80°F).

1. Connect pressure gages to cylinder 1 and cylinder 2 ports, with return port open to drain.

2. Apply 1800-psi inlet pressure to valve. Using power supply, alternately energize each solenoid with 18 volts dc and subject valve to 25 cycles of electrical operation. During this test, general functioning of the valve, correlation between connector pin energized, and direction of flow shall be observed and shall be as shown in table 7-7.

7-65. PROOF PRESSURE TEST 1.

WARNING

The operator shall be shielded from the valve under test.

1. Using the hydraulic test stand (1395-100) with the valve in neutral position, and cylinder ports capped, apply a pressure of 2250 psi to pressure and return port for 2 minutes.

2. Check that there is no evidence of external leakage, failure, or permanent set.

7-66. PROOF PRESSURE TEST 2.

1. Using the hydraulic test stand (1395-100) with the valve in neutral position, and cylinder ports capped, apply a pressure of 2250 psi to pressure port, with the return port open to drain.

2. Leakage from the return port shall not exceed 10cc/minute.

7-67. ACTUATION TEST 1.

Using the hydraulic test stand (1395-100) and power supply (LH125), perform the following test:

Note

One cycle consists of energizing solenoid 1, deenergizing solenoid 1, energizing solenoid 2, and deenergizing solenoid 2.

1. Connect pressure gages to cylinder 1 and cylinder 2 ports, with return port open to drain.

2. Apply 1800-psi inlet pressure to valve. Using power supply, alternately energize each solenoid with 18 volts dc and subject each valve to 25 cycles of electrical operation. During this test, general functioning of the valve, correlation between connector pin energized, and direction of flow shall be observed and shall be as shown in table 7-7.

3. Check that during operation, there is no evidence of binding, lagging, or other malfunctions.

4. Check that there is no evidence of external leakage.

7-68. ACTUATION TEST 2.

Using the hydraulic test stand (1395-100) and power supply (LH125), perform the following test:

1. Connect pressure gages to cylinder 1 and cylinder 2 ports, with return port open to drain.

2. Apply 200-psi inlet pressure to valve. Using power supply, alternately energize each solenoid with 28 volts dc and subject each valve to 25 cycles of electrical operation. During this test, general functioning of the valve, correlation between connector pin energized, and direction of flow shall be observed and should be as shown in table 7-7.

3. Check that during operation, there is no evidence of binding, lagging, or other malfunction.

4. Check that there is no evidence of external leakage.

7-69. LEAKAGE TEST.

1. Using the hydraulic test stand (1395-100) cap cylinder 1 and cylinder 2 ports and apply 1500 psi to pressure port; measure leakage from return port in each position.

Table 7-7. Hydraulic Solenoid Selector Valve Actuation Test Chart

CONNECTOR PIN ENERGIZED	PORTS TO PRESSURE	PORTS TO RETURN	PORTS BLOCKED
None	None	C1 and C2	P
Pin C and B	C1	C2	None
Pin A and B	C2	C1	None

Note

Leakage at +71°C (+160°F) shall not exceed 10 cc/minute. If solenoid temperature exceeds 26°C (80°F), increase applied voltage to 20 or more volts dc.

2. Check that leakage does not exceed 4.0 cc/minute when measured after a 2-minute waiting period.

7-70. DIELECTRIC STRENGTH TEST.

1. Using dielectric tester (NSN 6625-00-788-8882), apply a test voltage of 1000 volts RMS between solenoid windings and ground for 1 second.

2. Check that there is no evidence of arcing, flashover, or a noticeable decrease in insulation resistance.

7-71. TROUBLESHOOTING. If valve fails any of the tests listed in paragraph 7-64, refer to table 7-8 to determine probable causes and remedial maintenance actions.

7-72. PRESERVATION. Preserve the valve in accordance with directions contained in Preservation of Naval Aircraft for Shipment and Storage (NAVAIR 15-01-500).

Table 7-8. Troubleshooting Hydraulic Solenoid Selector Valve

TROUBLE	PROBABLE CAUSE	REMEDY
Solenoid(s) (10) does not energize; slow response.	Improper soldering or frayed wires, defective solenoid; worn parts in pilot section; maladjustment of push rod (14) and plunger (11).	Repair wiring, resolder or replace solenoid. Replace pilot section parts. Check adjustment of push rod and plunger **Refer to paragraph 7-57.**
	Bent or broken pins on connector (2) or otherwise defective condition.	Replace connector.
	Defective spring (12).	Replace spring.
External leakage between body (31) and plugs (23).	Defective packing (24).	Replace packing.
External leakage between body (31) and cover (7).	Defective packing (15).	Replace packing.
Internal leakage.	Defective packing (30). Maladjustment of push rod (14) and plunger (11) causing interference between pushrod (14) and ball (21).	Replace packing. Check adjustment of push rod and plunger. Refer to **paragraph 7-57. Reduce overall** dimension in increments of 0.002-inch until leakage and voltage are within limits.
Binding, lagging, or other malfunction or operation of valve.	Defective spool and sleeve assembly (28, 29).	Replace spool and sleeve assembly.
	Defective spring (26).	Replace spring.

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