AD-2B

AN 01-245FBC-1

Flight Handbook

NAVY MODEL

F2H-3 • F2H-4

AIRPLANES

FBC-1

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AN 01-245FBC-1

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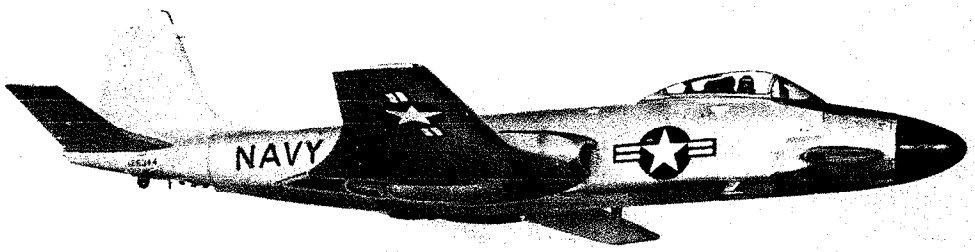
F2H-3 • F2H-4 AIRPLANES



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1 May 1955

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INTERIM REVISION SUMMARY

The following Interim Revisions have been either canceled or incorporated in this Flight Handbook:

Canceled or Previously Incorporated	*Incorporated in This Revision on Pages Indicated*	
Nos. 1, 2 and 3	No. 4	Page 42
	No. 5	Page 88
	No. 6	Page 14*
	No. 7	Page 72
	No. 8	Pages 52 and 58
	No. 9	Page 70
	No. 10	Page 14*

* Denotes pages in publication CO 01-245FBC-1A

INTERIM REVISIONS OUTSTANDING: (to be maintained by custodian of Flight Handbook)

Number	*Date*	*Purpose*

Revised 1 August 1957

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IMPORTANT

In order that you will gain the maximum benefits from this handbook, it is imperative that you read this page carefully.

FOREWORD This handbook in conjunction with publication CO 01-245FBC-1A, contains the information necessary for the operation of the airplane during normal and emergency flight. The descriptions and instructions are designed to provide the pilot with a knowledge of the airplane and its related equipment, the flight characteristics and limitations, and the techniques and procedures to be followed under all conditions of flight. The information contained herein is kept current by frequent revisions, but since revisions take time to prepare and distribute, it is imperative that the pilot keep up-to-date on technical directives covering new flight restrictions and techniques which have not yet been incorporated in this handbook. The handbook is divided into nine sections and an appendix as follows:

SECTION I — DESCRIPTION This section contains a description of the airplane and all of the systems and controls which contribute to the physical act of flying the aircraft. All emergency equipment which is not a part of the auxiliary equipment is also discussed in this section.

SECTION II — NORMAL PROCEDURES This section contains, in proper sequence, the steps of procedure to be accomplished from the time the aircraft is approached by the pilot until it is parked on the ramp after accomplishing one complete non-tactical flight under normal conditions.

SECTION III — EMERGENCY PROCEDURES This section describes the procedures to be followed in meeting any emergency that may reasonably be expected to occur. Emergency procedures relating to auxiliary equipment are described in Section IV.

SECTION IV — DESCRIPTION AND OPERATION OF AUXILIARY EQUIPMENT This section describes the equipment which, while not contributing directly to flight, enables the airplane to perform certain specialized functions. Both normal and emergency operating procedures are given for this equipment. A portion of this section is presented in publication CO 01-245FBC-1A.

SECTION V — OPERATING LIMITATIONS This section covers all limitations which must be observed during normal operation of the airplane. This section presented in publication CO 01-245FBC-1A.

SECTION VI — FLIGHT CHARACTERISTICS This section describes the flight characteristics of the airplane together with any special techniques to be employed within the range of such characteristics. This section presented in publication CO 01-245FBC-1A.

SECTION VII — SYSTEMS OPERATION This section describes the special problems which must be considered in the operation of the various aircraft systems.

SECTION VIII — CREW DUTIES This section is not applicable.

SECTION IX — ALL WEATHER OPERATION This section sets forth the techniques and procedures to be followed under instrument flight, turbulent air, cold weather and hot weather operating conditions.

APPENDIX I — OPERATING DATA Operating data for preflight and in-flight planning is presented in publication CO 01-245FBC-1A.

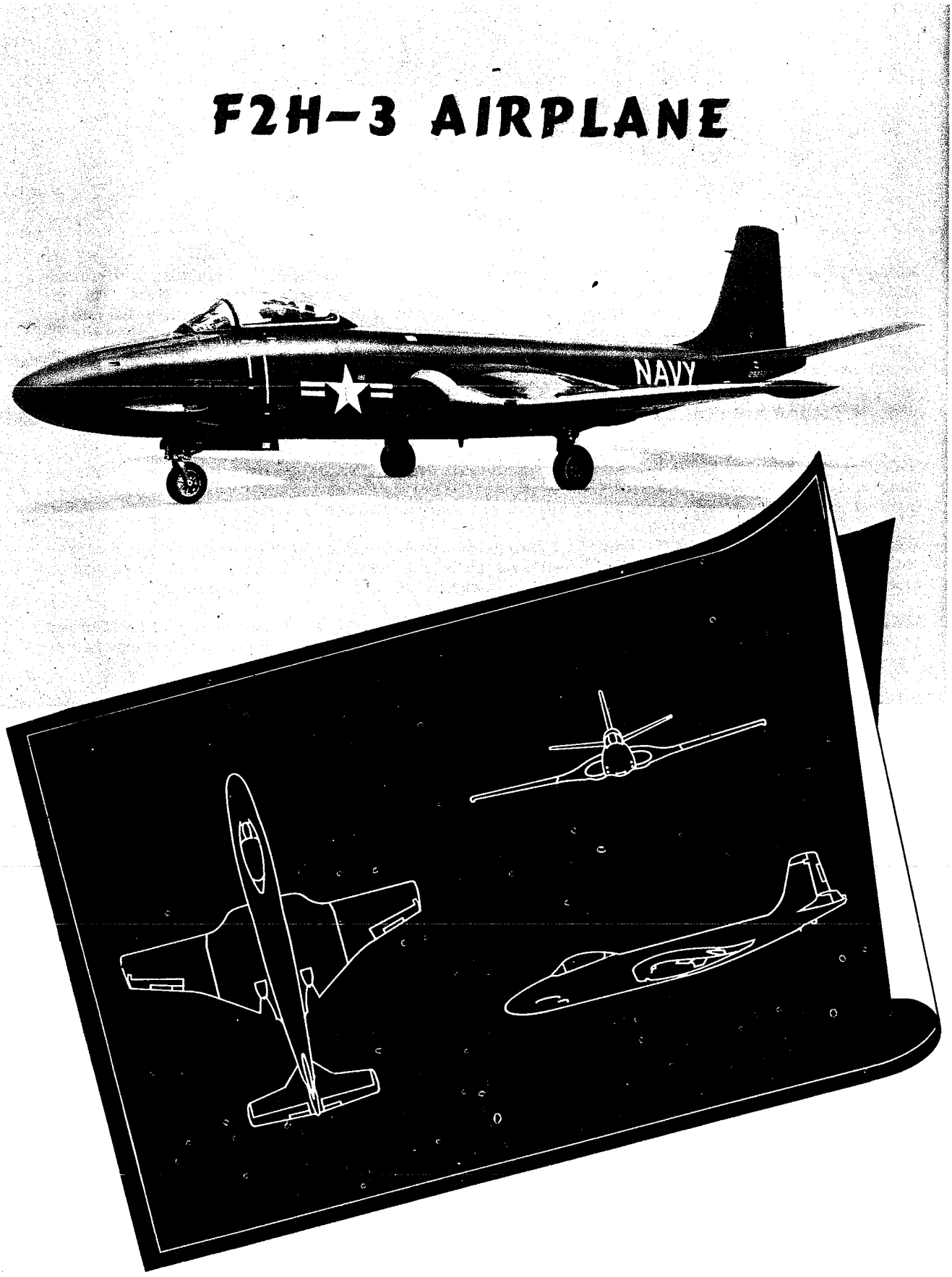


Figure 1-1.

SECTION I
DESCRIPTION

F2H-3 AIRPLANE

The McDonnell F2H-3 airplane is a single place, twin jet fighter, designed for land or carrier operation. It is propelled by two Westinghouse Model J34-WE-34 turbo-jet engines installed in the wing roots. Characteristic of Navy fighter aircraft, the F2H-3 is provided with arresting gear, catapult equipment and folding wings. A long range fuel system incorporating the use of in-flight refueling and droppable wing tip tanks provides an optional radius of action. The airplane is armed with four forward firing fixed 20 mm aircraft guns mounted in the forward fuselage. Radar equipment is installed in the nose. Provisions are made on the bottom of the wings to accommodate rockets, bombs and special external stores. The main difference that distinguishes the F2H-3 from its predecessor, the F2H-2 airplane, is that it has been lengthened from 40 feet to 48 feet and the horizontal stabilizer is lower, further aft and incorporates dihedral.

ENGINES

GENERAL

The airplane is powered by two Model J34-WE-34 Westinghouse turbo-jet engines installed in the wing center section. The engines consist essentially of an axial flow eleven-stage compressor, a double fuel manifold, a double annular combustion chamber, a two-stage turbine and a fixed-area exhaust nozzle. The engine rotor, comprising the rotors of the turbine and the compressor, is supported on three anti-friction bearings. The starter is mounted in line to, and separated from, the engine rotor by a clutch assembly. An auxiliary gearbox is located at the leading lower housing section and is driven, through suitable reduction gearing, from the shaft of the main engine rotor.

ENGINE FUEL CONTROL SYSTEM

Each engine is supplied with a fuel control unit mounted aft of the engine fuel pump on the aft right auxiliary drive gearbox pad. The unit fulfills the function of metering fuel to the combustion chambers as the thrust demand varies according to flight requirements. The fuel control is connected to the throttle lever by a cable system encased in conduit. For any change in the position of the throttle lever, the engine will increase or decrease speed to arrive at the speed called for by the throttle position. Engine response will be rapid. Should the fuel requirement vary due to changes in temperature or increasing altitude, the fuel control will automatically adjust itself internally to maintain a constant engine speed. Therefore, a selected throttle lever position results in maintaining one engine speed regardless of temperature, altitude, or flight speed variations due to air turbulence.

THROTTLE QUADRANT

Two throttle levers are mounted on the left-hand console. (See Figure 1-3.) The levers enable the pilot to independently control the fuel flow to each engine by adjusting the fuel control units. The levers are laterally spring-loaded and slide back and forth in cutouts. Four positions, OFF, IDLE, NORM, and MIL., are marked adjacent to the cutouts. A detent is located at the IDLE mark which insures that the pilot will not inadvertently move the lever completely to the OFF position when rapidly moving the lever from NORM to IDLE. The lever is moved from the IDLE to the OFF position by overcoming the lever spring and then sliding the lever aft. Each lever actuates a cutoff switch inside the quadrant which insures that the throttle is completely in the OFF position before the air duct valves may be closed. Because of the ease at which pilot may reach and operate the throttle levers, several control switches are mounted on the lever handles. The left lever has an ignition switch and a gun

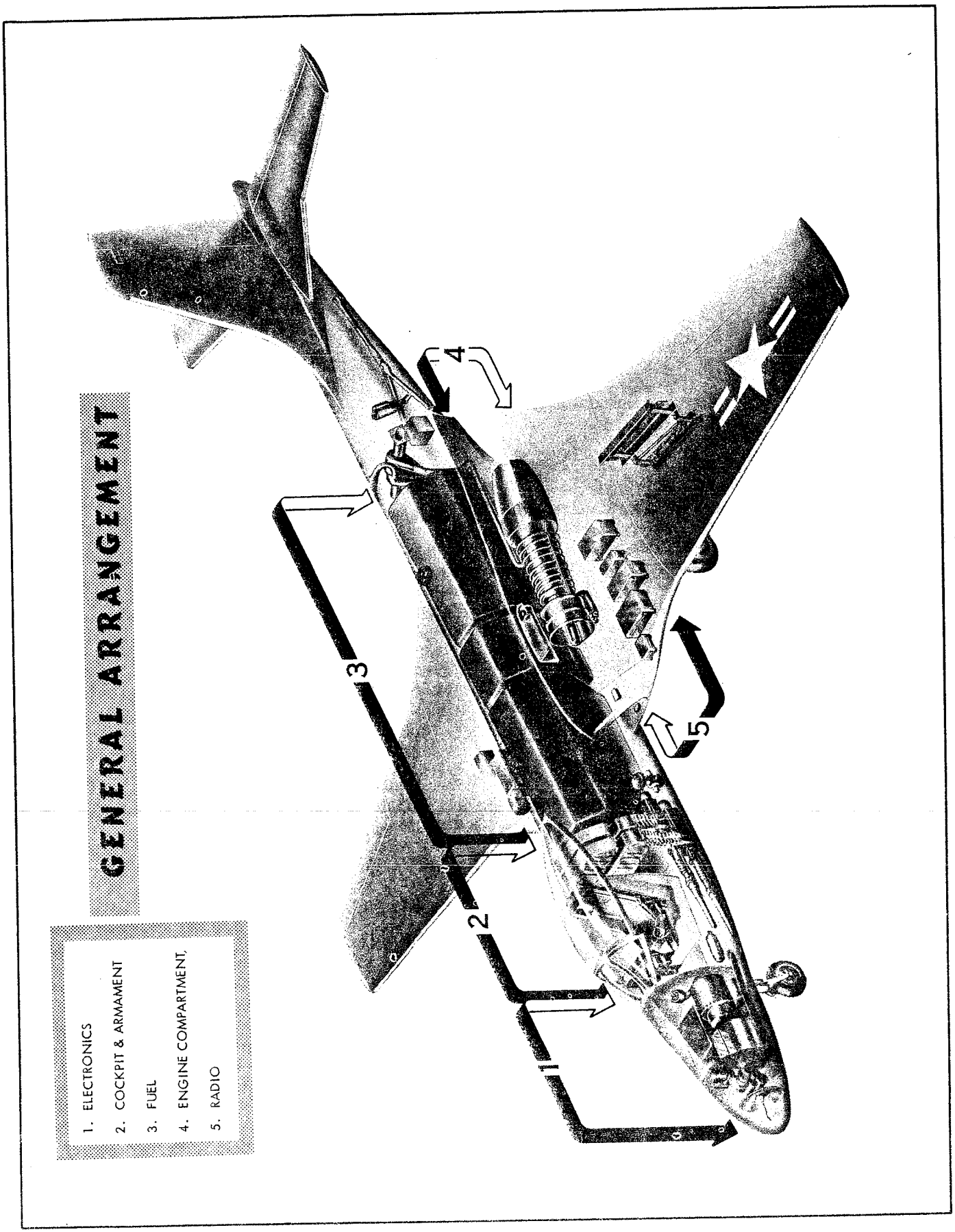

GENERAL ARRANGEMENT
1. ELECTRONICS
2. COCKPIT & ARMAMENT
3. FUEL
4. ENGINE COMPARTMENT
5. RADIO
1
2
3
4
5

Figure 1-2.

sight range grip. The right lever handle incorporates ignition, antenna, and speed brake switches.

AIR DUCT VALVES

An air duct valve is located in each of the air ducts which funnel air to the engine compressors. The valve is driven to the OPEN and CLOSED positions by a 28 volt d-c electric actuator. The valve is of all-metal construction and rotates about a horizontal shaft. The valve serves the function of keeping foreign matter out of the engine while the engine is not in operation, as well as reducing drag during single engine operation. The valves are controlled from the cockpit by the engine master switch and the cutoff switch at the throttle lever.

IGNITION SYSTEM

The ignition system for each engine is made up of an ignition switch, ignition coils, two spark plugs and the necessary wiring. The manual, spring-loaded, ignition button is located on the throttle lever and may be depressed with the thumb for as long as ignition may be desired. Two coils are attached to and used on each engine to provide the spark plugs with the high voltage required for ignition. Each engine is supplied with two spark plugs which supply the air and fuel mixture with the necessary spark to initiate self-sustaining combustion.

STARTING SYSTEM

An external starting receptacle is located on each side of the fuselage in the lower wing surface. External power may be supplied to either receptacle, which will furnish both the left and right engine starter motors with a 28 volt d-c power source. Effective Airplanes 126351 and up, the external power source brackets and receptacles are changed to accommodate Air Force and British starting equipment. Both starter motors are controlled by a single ENG. CRANK switch located just aft of the throttle quadrant on the switch panel. The crank switch is a four-position switch, momentary in the L. ENG. and R. ENG. positions and maintaining in the OFF and STOP CRANK positions. Each engine has a two-position, OFF ON, engine master switch located on the switch panel which opens the air duct valves (provided the throttle lever is in the full OFF position) and also supplies a power source of the starting and ignition system. The air duct valve must be fully opened before the starting and ignition circuits are completed.

OIL SYSTEMS

GENERAL

A separate, variable pressure type, circulating oil system is provided for each engine. Each system is located between the engine and the fuselage, in the upper portion of the engine compartments. Oil, Specification MIL-O-6081, Grade 1010, is used in the system which lubricates the accessories gearbox, power take-off gearbox and the three main bearings that support the engine rotor. Each system consists of an oil tank, oil supply and scavenge pump, an oil cooler, a check valve, a thermostatic by-pass valve, an oil filter, a temperature thermoswitch, a pressure switch, and the necessary supply, return and vent lines. A check relief valve is installed in the vent line from each tank to insure a steady oil supply to the inlet of the oil pump. Each oil tank incorporates an internal baffle with flapper valves and a swivel type oil pick-up assembly. In this manner, oil can be supplied to the pump while the airplane is in any attitude. The tanks have sufficient oil capacity to allow 30 seconds of inverted flight without damage to the engines. The temperature thermoswitch and the pressure switch insures that the pilot has sufficient information to determine if the system is operating properly. The temperature should not exceed 145 ± 5° C. A pressure of 36 psi or more insures sufficient oil pressure at the engines.

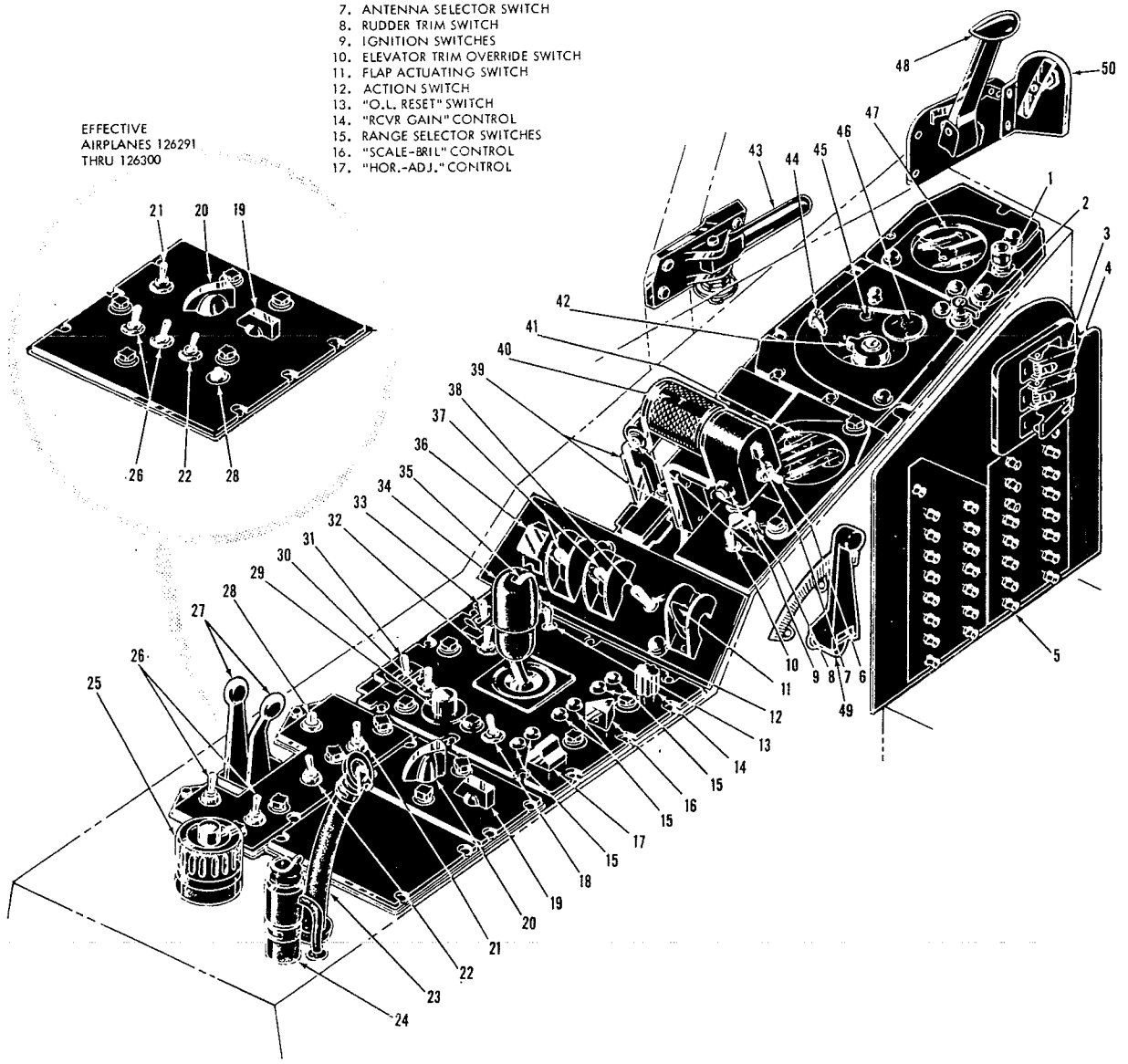
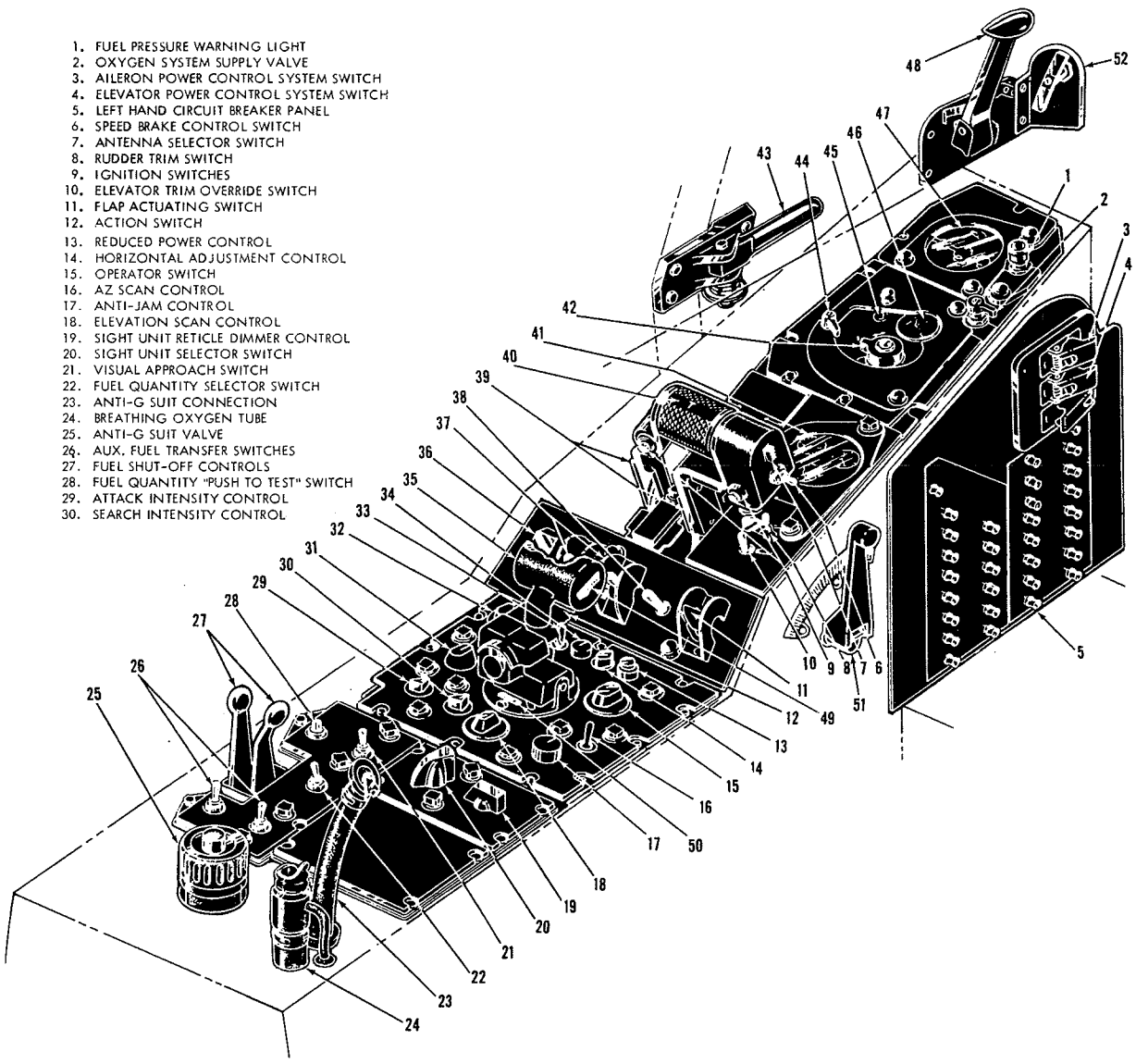


Figure 1-3. Cockpit - Left Side

Effective F2H-3 Airplanes



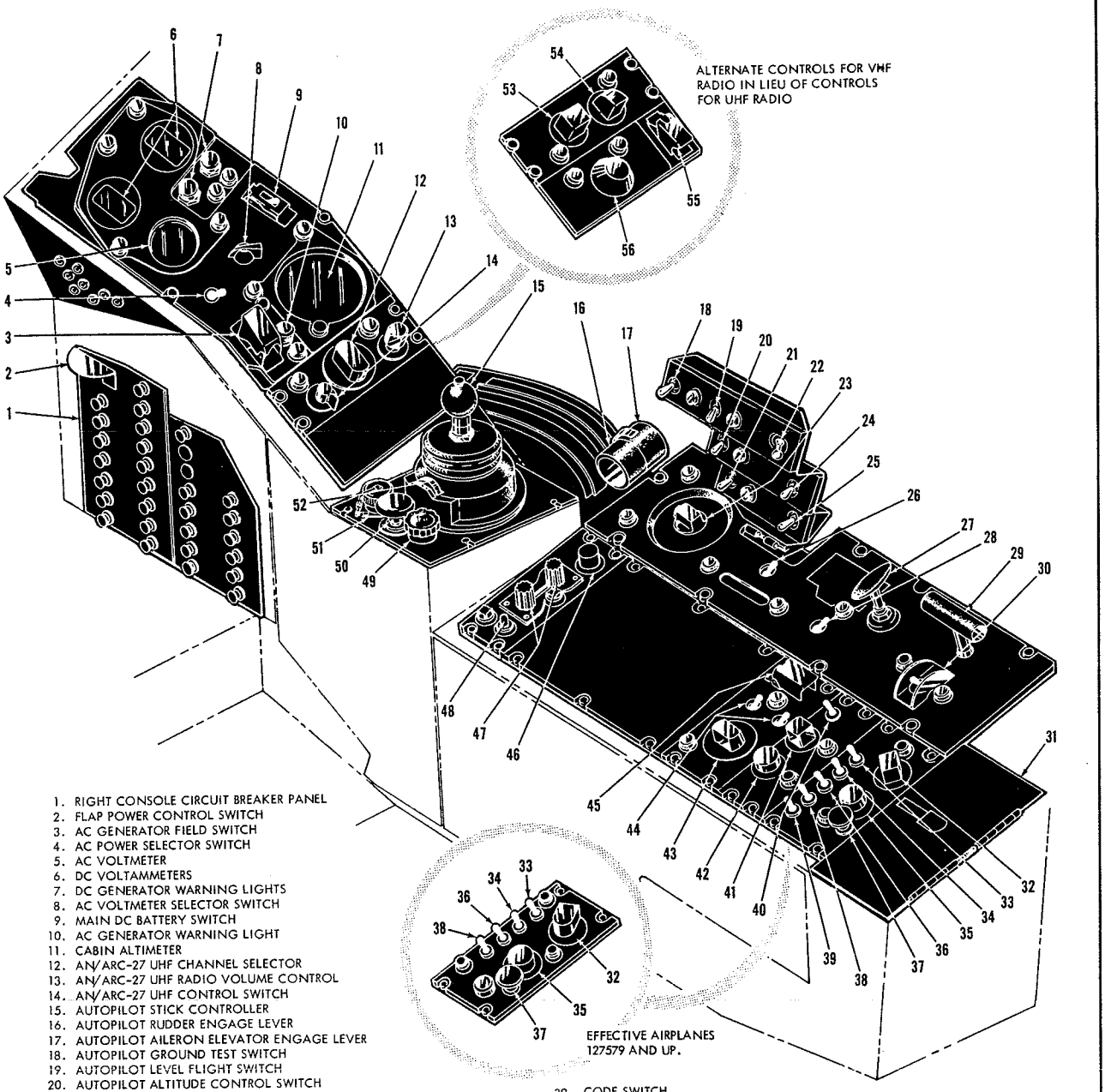
1. FUEL PRESSURE WARNING LIGHT
2. OXYGEN SYSTEM SUPPLY VALVE
3. AILERON POWER CONTROL SYSTEM SWITCH
4. ELEVATOR POWER CONTROL SYSTEM SWITCH
5. LEFT HAND CIRCUIT BREAKER PANEL
6. SPEED BRAKE CONTROL SWITCH
7. ANTENNA SELECTOR SWITCH
8. RUDDER TRIM SWITCH
9. IGNITION SWITCHES
10. ELEVATOR TRIM OVERRIDE SWITCH
11. FLAP ACTUATING SWITCH
12. ACTION SWITCH
13. REDUCED POWER CONTROL
14. HORIZONTAL ADJUSTMENT CONTROL
15. OPERATOR SWITCH
16. AZ SCAN CONTROL
17. ANTI-JAM CONTROL
18. ELEVATION SCAN CONTROL
19. SIGHT UNIT RETICLE DIMMER CONTROL
20. SIGHT UNIT SELECTOR SWITCH
21. VISUAL APPROACH SWITCH
22. FUEL QUANTITY SELECTOR SWITCH
23. ANTI-G SUIT CONNECTION
24. BREATHING OXYGEN TUBE
25. ANTI-G SUIT VALVE
26. AUX. FUEL TRANSFER SWITCHES
27. FUEL SHUT-OFF CONTROLS
28. FUEL QUANTITY "PUSH TO TEST" SWITCH
29. ATTACK INTENSITY CONTROL
30. SEARCH INTENSITY CONTROL

31. SCALE ILLUMINATION CONTROL
32. MASTER CONTROL
33. CLUTTER RANGE MARKER SWITCH
34. CLUTTER RANGE MARKER CONTROL
35. ANTENNA HAND CONTROL
36. CATAPULT POSITIONING SWITCH
37. ENGINE MASTER SWITCHES
38. ENGINE CRANK SWITCH
39. ENGINE THROTTLES
40. SIGHT UNIT RANGE GRIP
41. TRIM TAB POSITION INDICATOR
42. OXYGEN REGULATOR AIR VALVE
43. CATAPULT THROTTLE HAND GRIP
44. OXYGEN SAFETY PRESSURE LEVER
45. OXYGEN FLOW INDICATOR
46. OXYGEN SYSTEM PRESSURE GAGE
47. LANDING GEAR AND FLAP POSITION INDICATOR
48. CANOPY EMERG. RELEASE
49. RANGE IN-OUT SWITCH
50. HAND CONTROL LIMIT SWITCH
51. THROTTLE FRICTION ADJUSTMENT
52. EMERGENCY PNEUMATIC BRAKE RELEASE HANDLE

FH23-6H

Figure 1-4. Cockpit - Left Side

Effective F2H-4 Airplanes



1. RIGHT CONSOLE CIRCUIT BREAKER PANEL
2. FLAP POWER CONTROL SWITCH
3. AC GENERATOR FIELD SWITCH
4. AC POWER SELECTOR SWITCH
5. AC VOLTMETER
6. DC VOLTAMMETERS
7. DC GENERATOR WARNING LIGHTS
8. AC VOLTMETER SELECTOR SWITCH
9. MAIN DC BATTERY SWITCH
10. AC GENERATOR WARNING LIGHT
11. CABIN ALTIMETER
12. AN/ARC-27 UHF CHANNEL SELECTOR
13. AN/ARC-27 UHF RADIO VOLUME CONTROL
14. AN/ARC-27 UHF CONTROL SWITCH
15. AUTOPILOT STICK CONTROLLER
16. AUTOPILOT RUDDER ENGAGE LEVER
17. AUTOPILOT AILERON ELEVATOR ENGAGE LEVER
18. AUTOPILOT GROUND TEST SWITCH
19. AUTOPILOT LEVEL FLIGHT SWITCH
20. AUTOPILOT ALTITUDE CONTROL SWITCH
21. AUTOPILOT RATIO CHANGE SWITCH
22. PITOT HEATER AND ANGLE OF ATTACH PROBE HEATER SWITCH
23. AN/APN-1 RADIO ALTIMETER ALTITUDE LIMIT SWITCH
24. STAND-BY COMPASS LIGHT SWITCH
25. CABIN EMERGENCY FLOOD LIGHTS
26. CABIN PRESSURE SWITCH
27. CABIN EMERGENCY VENT CONTROL
28. CABIN TEMPERATURE CONTROL SWITCH
29. WING PIN LOCK CONTROL
30. WING FOLD ACTUATING SWITCH
31. MAP & DATA CASE
32. EXTERIOR LIGHTS MASTER SWITCH
33. FORMATION LIGHTS SWITCH
34. TAIL LIGHT SWITCH
35. CODE SELECTOR SWITCH
36. WING LIGHT SWITCH
37. CODE KEYING BUTTON
38. FUSELAGE LIGHT SWITCH
39. CODE SWITCH
40. CABIN FLOOD LIGHT CONTROL SWITCH
41. CABIN LIGHT BRILLANCE CONTROL
42. INSTRUMENT LIGHT BRILLANCE CONTROL
43. AN/APX-6 IFF MASTER CONTROL
44. AN/APX-6 IFF MODE SWITCHES
45. AN/APX-6 IFF DESTRUCTION SWITCH
46. AN/ARN-21 NAVIG. RADIO VOLUME CONTROL
47. AN/ARN-21 NAVIG. RADIO CHANNEL SELECTORS
48. AN/ARN-21 NAVIG. RADIO FUNCTION SELECTOR SWITCH
49. YAW TRIM CONTROL
50. AUTOPILOT DISCONNECT SWITCH
51. UTILITY RECEPTACLE
52. AUTOPILOT PITCH TRIM WHEEL
53. AN/ARC-1 RADIO CONTROL SWITCH
54. AN/ARC-1 RADIO CHANNEL SELECTOR
55. RADIO MASTER CONTROL SWITCH
56. RADIO MASTER VOLUME CONTROL

Figure 1-5. Cockpit - Right Side

Effective F2H-3 Airplanes 126291 thru 126300

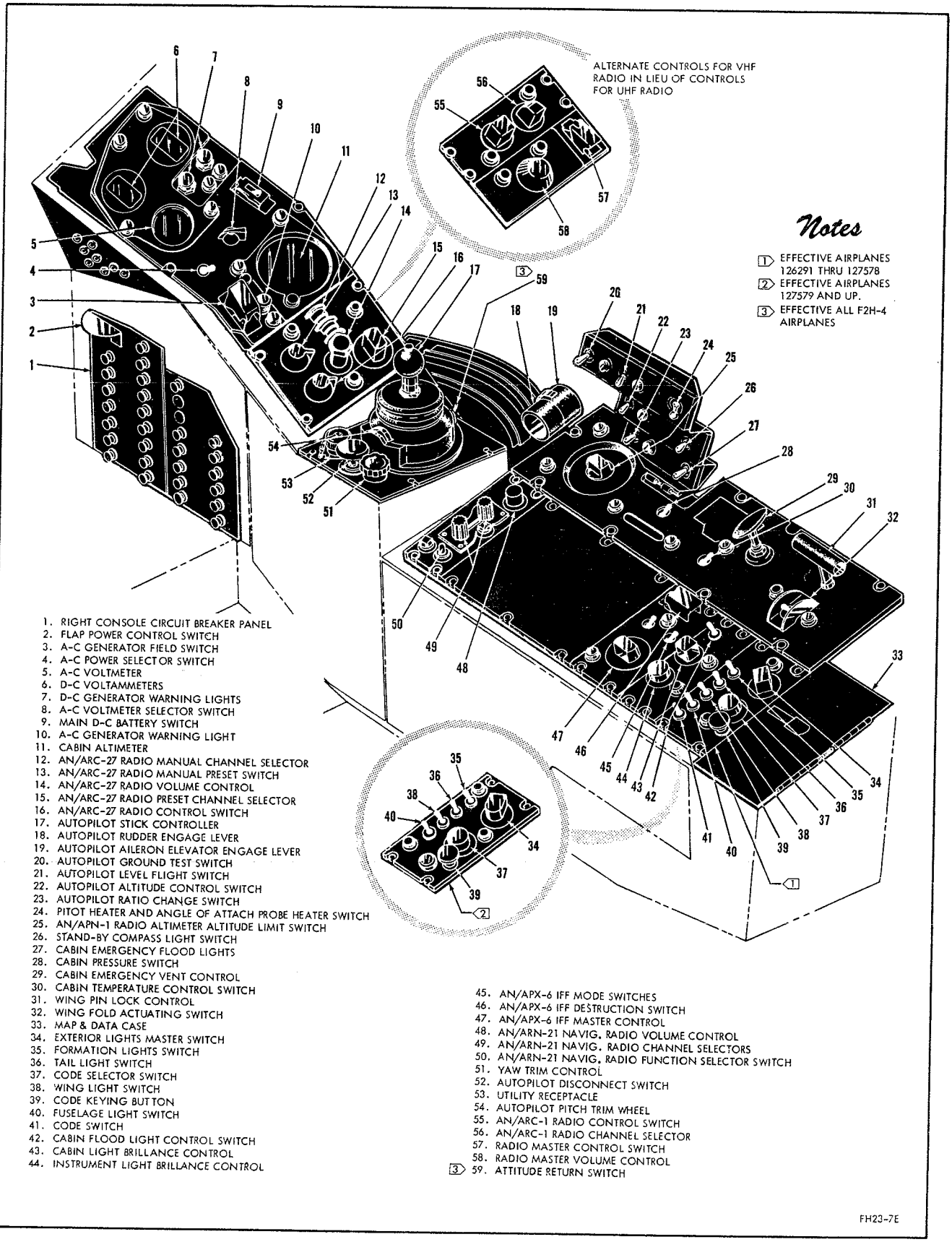


Figure 1-6. Cockpit - Right Side

Effective F2H-3 and F2H-4 Airplanes 126301 and up

FUEL SYSTEM

GENERAL

The fuel system is composed of three major self-sealing type cells located in the fuselage directly aft of the cockpit. Fuel is supplied to both engines from the center cell sump by means of two booster pumps. With both boost pumps inoperative, engine power should not be permitted to go below 50% rpm for ground or air operation because of very slow acceleration from low rpm. The forward and aft tanks feed the center cell either by gravity or by transfer pumps. When the major portion of the fuel has been expended in the center tank, the transfer pumps are automatically energized and supply fuel to the center cell. The transfer pumps maintain the fuel level in the center cell between 84 and 154 gallons. Fuel flow is routed from the center cell aft to the fuel manifold, through two independently operated shutoff valves to the fuel filters. From the filters, two lines go outboard to the engine fuel connection at the engine compartments. All tanks have internally mounted capacitor type fuel tank gaging units. The fuel system has provisions for either gravity or pressure fueling. The fuselage cells are interconnected by a vent system which is routed aft through the fuselage to the mast assembly located on the right side of the fuselage just forward and below the empennage. Transfer lines are provided through the wings as part of the provisions included for the installation of auxiliary fuel wing tip tanks. Transfer switches and indicators are also provided in the cockpit for control of transferring operations. (See Figures 1-3, 1-4 and 1-8.) Refer to Section VII for fuel system management.

FUEL SHUTOFF CONTROLS

Two fuel shutoff control levers are located on the left console. (See Figures 1-3, 1-4.) Each lever controls the fuel flow to each engine at the fuel manifold. Flexible cables run aft from the shutoff levers along the left side of the fuselage and then inboard to the shutoff valves mounted on each end of the fuel manifold. The levers have two positions, OPEN and CLOSED.

Note

Should either fuel shutoff valve 'stick' in the CLOSED position, momentarily move the corresponding throttle to IDLE and back to OFF. This action should permit the fuel shutoff valve to be opened without undue strain.

FUEL QUANTITY DATA

USABLE FUEL TOTALS	PRESSURE REFUELED	GRAVITY REFUELED
FUSELAGE TANKS ONLY	1086	1108
FUSELAGE AND TIP TANKS*	1424	1446

* TIP TANKS MUST BE GRAVITY REFUELED

FIGURES (GALLONS) ARE APPROXIMATE

TANKS	NO. OF TANKS	USABLE FUEL (EACH)		UNUSABLE FUEL AIRCRAFT LEVEL (EACH)	EXPANSION SPACE (EACH)		TOTAL VOLUME (EACH)
		PRESSURE REFUELED	GRAVITY REFUELED		PRESSURE REFUELED	GRAVITY REFUELED	
FORWARD FUSELAGE	1	503	512	0	9	0	512
CENTER FUSELAGE	1	180	184	3	4	0	187
AFT FUSELAGE	1	403	412	1	9	0	413
RIGHT WING TIP	1		169	1		6.5	170
LEFT WING TIP	1		169	1		6.5	170

Figure 1-7.

TIP TANK RELEASE CONTROL

The tip tank release control tee handle is located just left of the main instrument panel. (See Figure 1-18.) The PULL TO RELEASE handle is connected to the two release mechanisms (when tip tank kits are installed) at the wing tips by the release cable system. The cable runs aft and separates at the wings. At this point, each cable runs outboard to the wing tips. The system is used for removing the tip tanks while on the ground or for jettisoning the tanks while in flight. In order to reduce the tension necessary to release the tanks, the cable is attached to a drum assembly which gives the pilot a mechanical advantage of approximately 2.6. During flight, the airplane should be in a straight level attitude if possible, when tip tanks are dropped.

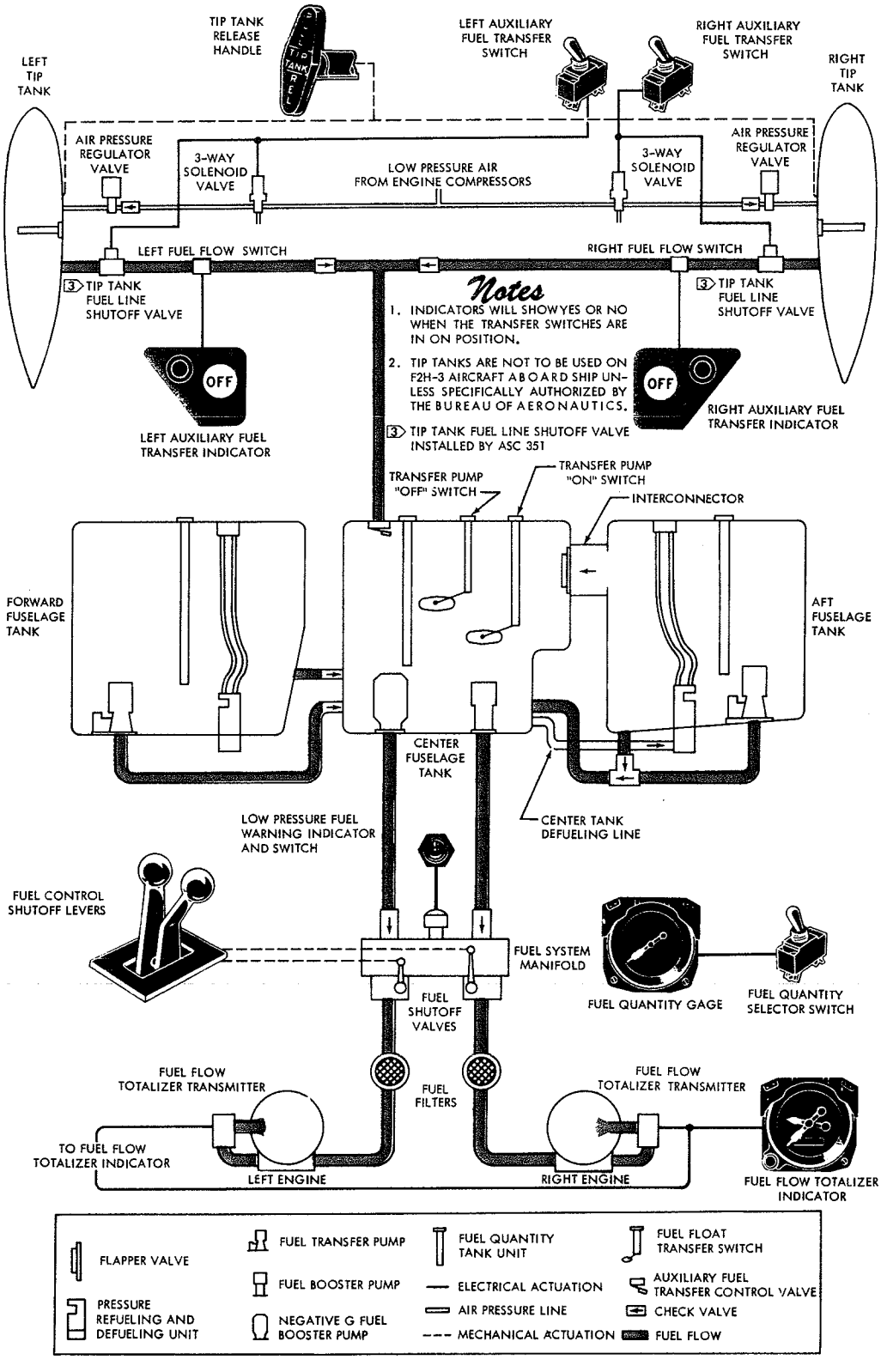


Figure 1-8. Fuel System Schematic Diagram

FUEL QUANTITY INDICATOR SYSTEM

A capacitance type fuel quantity gaging system is installed. The system registers, in pounds, the amount of fuel in the tanks, including tip tanks when installed. The fuel quantity indicator is mounted near the bottom and to the right on the main instrument panel. (See Figure 1-18.) The indicator dial is calibrated in pounds times 1000 with a range of 0 to 10,200 pounds. The fuel quantity system switches are located on the left console just outboard of the sight unit control box. (See Figures 1-3, 1-4.) The two-position switch marked FUSELAGE ONLY and TOTAL, spring-loaded to TOTAL, controls the indicator reading. When the switch is held in the FUSELAGE ONLY position, only the quantity of fuel in the fuselage tank will register on the indicator. When tip tanks are installed and the switch is in the TOTAL position, the indicator will register the combined tip tank and fuselage fuel.

WARNING

Because the switch is spring loaded to the TOTAL position, the pilot must exercise care in fuel management. Tip tank fuel will be included in the gage reading even though it is not being transferred. It is therefore possible to experience a flameout due to internal fuel exhaustion while 2000 lbs. of fuel are available in the tips.

TEST SWITCH

A PUSH TO TEST switch, located adjacent to the tank switch, is used to check the fuel quantity system for operation. Pressing this switch down will cause the indicator pointer to rotate in a counterclockwise direction. When the PUSH TO TEST button is released, the indicator pointer should return to its original position within ± 25 lbs. The capacitance type fuel quantity system is accurate to within 3% of the full scale reading.

FUEL FLOW TOTALIZER

The fuel flow totalizing system is designed to furnish a continuous indication of the rate of fuel flow in pounds per hour as well as a continuous indication of the number of pounds of fuel remaining in the tanks. The system is calibrated for JP-3 fuel and the use of other fuels of different densities will result in inaccurate indications. The rate of flow is shown by pointers moving over a calibrated scale. An indication of the fuel remaining is provided by a counter recessed in the indicator dial. A setting knob is located in the lower left corner of the indicator so that the amount of fuel in the tanks can be set into the indicator. The indicator, regardless of an inoperative engine, will indicate the fuel flow of the operating engine. It does not operate when the A-C generator is inoperative, or with the A-C power switch on STAND-BY. (See Figure 1-12.)

FUEL PRESSURE WARNING LIGHT

A low pressure warning indicator light is located on the extreme forward portion of the left console. (See Figures 1-3, 1-4.) The indicator is controlled by the pressure switch located on the fuel manifold assembly. (See Figure 1-8.) If the pressure should drop to 6 ± .25 psi, the indicator element is illuminated, thus warning the pilot of booster pump failure. Should the pressure build up to 8.5 psi or more, the pressure switch then de-energizes the warning indicator light.

AUXILIARY FUEL TRANSFER INDICATOR AND SWITCHES

The purpose of the auxiliary fuel transfer indicators is to indicate the transfer of fuel from the wing tip tanks. An indicator for each tip tank is located on the pedestal panel. (See Figure 1-18.) The indicator system consists of the indicator and a fuel flow switch located in the fuel transfer line from the wing tip tank. Three positions, YES, NO and OFF, are stamped on the indicator drum. Only one position will appear in the indicator window at a time. Moving the battery switch to energize the aircraft electrical system will cause the auxiliary fuel transfer indication to change from OFF to NO. Throwing the auxiliary fuel transfer switch to the ON position will initiate transfer operations and force fuel through the fuel flow switch, causing the transfer indication to change from NO to YES if the engine is operating so as to supply the air pressure necessary for tip tank transfer. The indicator will continue to show fuel being transferred until the tank is empty or a malfunction occurs in the transfer system. At the time fuel fails to flow in the system, the fuel flow switches energize the indicator to show NO, indicating fuel is not being transferred. Moving the battery switch to OFF, or an open circuit breaker, will cause the indicator to show OFF. Two toggle type transfer switches are located on the left console just aft of the fuel shutoff levers. Each switch independently controls transfer operation of its respective tip tank. The transfer switches have ON and OFF positions only. When the switch is placed in the ON position, a solenoid valve in the air line opens to allow compressed air to displace the fuel in the tip tank and a shutoff valve in the fuel line opens to permit the fuel to flow into the center fuselage tank. Transfer operations are stopped by moving the switch to the OFF position.

ELECTRICAL POWER SUPPLY SYSTEMS

GENERAL

The majority of the power operated equipment in the airplane is electrically operated and supplied by the d-c power system. The a-c power system supplies power for the electronic systems.

D-C POWER SUPPLY SYSTEM

The d-c power supply system consists primarily of a 24 volt battery and two 300-ampere engine-driven generators. The output voltage of the generators is maintained at 28 volts automatically by the voltage regulators. Normally, while either of the airplane engines are operating, the generators supply the d-c system and keep the battery charged. The battery is held in reserve to supply power when generator output is low, or in emergency, upon failure of both generators. The reverse current relays automatically connect the battery to the generator output for charging when needed and disconnect the generator when the generator voltage falls below normal, thereby leaving the battery to supply d-c power. Power is distributed to the individual circuits by means of the primary, secondary, and monitor buses. The secondary and monitor buses are automatically de-energized to conserve the battery in the event of failure of both generators while in flight. All three buses may be energized for ground check by connecting an external power source of d-c power to the d-c external power receptacle.

Note

The primary bus distributes power to the circuits essential to flight, the secondary bus distributes power to circuits essential to safe flight and the monitor bus distributes power to the nonessential circuits. For the conditions under which the various buses are energized, see table on Figure 1-9. The canopy circuit, IFF destructor circuit and the gun camera test circuit are connected directly to the battery and therefore may be energized regardless of conditions in table on Figure 1-9.

ELECTRICAL POWER SWITCH

The electrical power switch is located on the generator control panel in the forward part of the right console. It has three positions, BATT ONLY, OFF and BATT-GEN, and exercises control of the d-c power system as shown in table, Figure 1-9.

VOLTAMMETERS

Two voltammeters are located on the generator control panel in the forward portion of the right console. Each instrument has a voltage scale which indicates primary bus voltage and an ampere scale. The ampere scale of the inboard voltammeter indicates the current output of the left generator and the ampere scale of the outboard voltammeter indicates the current output of right generator.

CIRCUIT BREAKER PANELS

The d-c circuits are protected by push-pull circuit breakers. Three circuit breaker panels are located in the cockpit. The right and left circuit breaker panels are located in the forward side panels of the right and left consoles. The right aft circuit breaker panel is located above the aft portion of the right console. Five spare lamps are stored in a tube mounted in the top outboard edge of the right aft circuit breaker panel and five spare light assemblies are mounted in the edge of the panel below the spare lamps.

GENERATOR WARNING LIGHTS

A right and a left generator warning light is located on the generator control panel in the forward portion of the right console. When either generator is inoperative or its output is below normal, the corresponding warning light on the generator control panel will be energized and will remain on unless output of generator returns to normal.

A-C POWER SUPPLY SYSTEM (Effective prior to incorporation of ASC 294)

The a-c power supply system consists primarily of a 208 volt, three phase, 400 cycle a-c generator, a 115 volt, three phase, 400 cycle stand-by inverter, a 208 to 115 volt, three phase transformer and a 115 to 26 volt, single phase transformer. (See Figure 1-12.) The a-c generator supplies power to all a-c equipment during normal operation. Being independent of the airplane's d-c power system, the a-c generator is driven by a constant speed air turbine powered by bleed air from each engine compressor section.

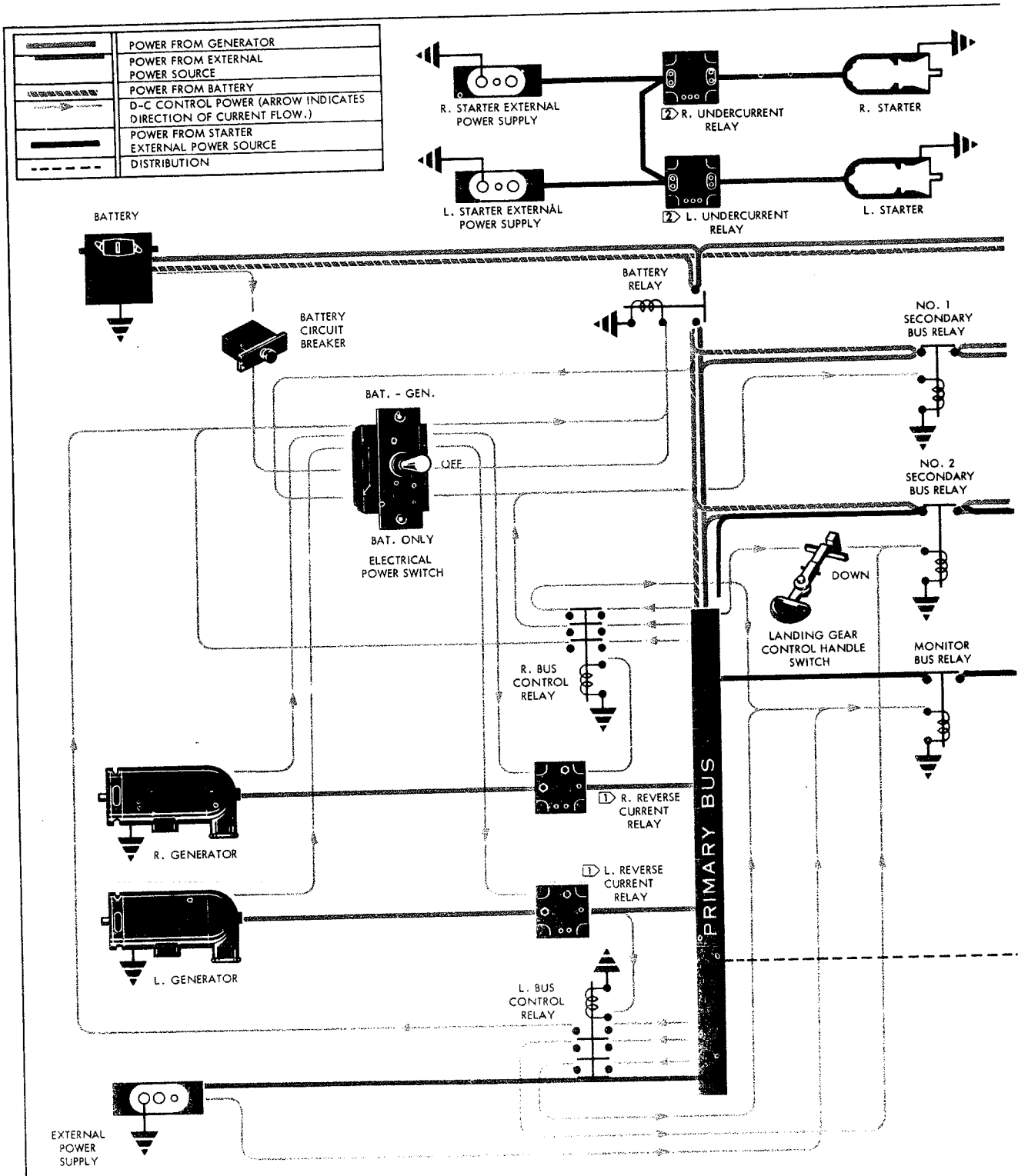
CAUTION

The a-c generator becomes inoperative and the stand-by inverter is automatically energized, if the RPM of both engines drops below approximately 60%. Nonessential a-c circuits also become de-energized. The a-c generator automatically becomes operational again when at least one engine is advanced beyond approximately 60% RPM. Altitude has a negligible effect upon operation.

The stand-by inverter supplies power only to a-c equipment essential to flight, when the a-c generator is not operating properly, and when both engines are operating below approximately 60% RPM. The stand-by inverter is powered by the airplane's 28 volt d-c power system.

A-C POWER SUPPLY SYSTEM (Effective upon incorporation of ASC 294)

The a-c power supply system consists primarily of a 208 volt, three phase, 400 cycle a-c generator, a 115 volt, three phase, 400 cycle stand-by inverter, a 208 to 115 volt, three phase transformer and a 115 to 26 volt single phase transformer. The a-c generator supplies power to all a-c equipment other than the a-c instrument circuits during normal operation. The a-c generator may be selected to power the a-c instrument circuits in an emergency, such as failure of the stand-by inverter. Being independent of the airplane's d-c



Notes

1 With R. or L. generator operating, placing electrical power switch in BAT.-GEN. position energizes the respective R. or L. reverse current relay. The reverse current relays then function automatically to connect their respective generator to the primary bus and energize their respective bus control relay when generator voltage output reaches the proper value. The reverse current relay will disconnect the generator from primary bus and de-energize bus control relay should excess reverse current flow from bus to generator.

2 When left air duct valve is open and right engine starter circuit is in de-energized condition, left undercurrent relay is energized by holding engine crank switch in left position, allowing current to flow from external source to starter. (Right undercurrent relay and starter is energized in the same manner.) Undercurrent relay automatically de-energizes starter when engine LIGHTS OFF.

Figure 1-9. D-C Power System Schematic (Sheet 1 of 2 Sheets)

	CONDITION	ELECTRICAL POWER SWITCH POSITION	GENERATORS	LANDING GEAR CONTROL HANDLE POSITION	EXTERNAL POWER	PRIMARY BUS	SECONDARY BUS	MONITOR BUS
WITHOUT EXTERNAL POWER	1	BAT-GEN	OPERATING	UP OR DOWN	OFF	HOT	HOT	HOT
	2	BAT-GEN	NOT OPER.	UP	OFF	HOT	OFF	OFF
	3	BAT-GEN	NOT OPER.	DOWN	OFF	HOT	HOT	OFF
	4	BAT ONLY	NOT OPER.	UP OR DOWN	OFF	HOT	HOT	OFF
	5	OFF	NOT OPER.	UP OR DOWN	OFF	OFF	OFF	OFF
WITH EXT. PWR	6	OFF	NOT OPER.	DOWN	ON	HOT	HOT	HOT
	7	OFF	NOT OPER.	UP	ON	HOT	OFF	HOT

BAT. BUS

1. CANOPY
2. IFF DESTRUCTOR
3. GUN CAMERA TEST

SECONDARY BUS

		APPROX. LOAD AMPS.
7	1. COMPRESSOR	60.00
	2. GUN CHARGING & FIRING	51.75
	3. BOMB & ROCKET FIRING	26.59
	4. UHF RADIO (AN/ARC-27)	18.00
	5. SEAT ADJUSTMENT	9.00
	6. EXTERIOR LIGHTS	8.04
	7. VHF RADIO (AN/ARC-1)	8.00
	8. AUTO PILOT	7.50
	9. RADIO COMPASS (AN/ARN-6)	5.50
	10. GUN SIGHT	4.50
	11. TRAINING CAMERAS	3.75
	12. AUTOMATIC DIRECTION FINDER (AN/ARA-25)	2.50
	13. NAVIGATION RADIO (AN/ARR-2A)	2.20
	14. GUN CAMERA	2.00
7	15. CABIN TEMPERATURE	2.00
	16. APPROACH LIGHT	1.30
7	17. ARRESTING HOOK WARNING LIGHT	.40
7	18. LANDING GEAR WARNING LIGHT	.04
	19. WING FOLD AND PIN PULL	

MONITOR BUS

6	1. E-10 FIRE CONTROL RADAR SYSTEM	17.85
5	2. FIRE CONTROL RADAR SYSTEM (AN/APG-41)	10.00
	3. GUN CAMERA HEATER	2.00
	4. GUN GAS DOOR	1.00

	1. WING FLAP	126.10 (EXTEND) 70.00 (RETRACT)
	2. SPEED BRAKE	86.52
	3. FUEL BOOST AND TRANSFER	85.80
	4. MAIN GEAR & DOOR	36.52 (EXTEND) 107.12 (RETRACT)
	5. NOSE GEAR	16.27 (EXTEND) 18.99 (RETRACT)
	6. A-C POWER CONTROL	15.86
	7. STAND-BY INVERTER	14.55
	8. AIR DUCT VALVE ACTUATING, STARTING & INGITION	11.87 AIR START
	9. ELEVATOR TRIM	10.70
7	10. HYDRAULIC CYLINDER HEATERS	5.53
	11. INTERIOR LIGHTS	5.46
	12. PITOT HEATER	4.50
	13. FUEL QUANTITY INDICATING	3.06
	14. HYDRAULIC SURFACE CONTROL	3.00
	15. RADIO ALTIMETER (AN/APN-1)	2.95
	16. ANGLE OF ATTACK	2.00
	17. ARRESTING HOOK RETRACTION	2.00
	18. CABIN PRESSURIZATION	2.00
	19. EMERGENCY BOMB SALVO	2.00
	20. IFF RADAR (AN/APX-6)	1.46
7	21. STALL WARNING	1.20
	22. RUDDER TRIM	.96
	23. AILERON TRIM	.75
7	24. D-C GENERATOR WARNING LTS.	.42
	25. OIL TEMP. & OIL PRESS. INDICATING	.24
7	26. A-C GENERATOR WARN. LT.	.21
7	27. FUEL BOOST PUMP LOW PRESS. WARN. LT.	.21
	28. WARNING LIGHTS TEST	.21
3 7	29. ELEVATOR FEEL TRIM 120 KNOT POSITION INDICATOR WARN. LT.	.21
	30. LANDING GEAR & FLAP POSITION INDICATING	.20
7	31. ALTITUDE WARNING LIGHT	.17
7	32. FIRE DETECTOR WARNING LT.	.17
	33. AUXILIARY FUEL TRANSFER INDICATING	.03
	34. FIRE DETECTOR	.01
	35. CATAPULT POSITIONING	
	36. GROUND ATTITUDE	
4	37. EXTERNAL STORES SYSTEM	8
4	38. REFUELING	

3 Effective F2H-4 airplanes 126321 and up; also effective 126291 thru 126320 upon incorporation of A.S.C. No. 184.

4 Effective F2H-3 airplanes 126301 and up.

5 Effective F2H-3 airplanes only.

6 Effective F2H-4 airplanes only.

7 Loads considered intermittant.

8 Used only when external stores system is installed.

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Figure 1-9. D-C Power System Schematic (Sheet 2 of 2 Sheets)

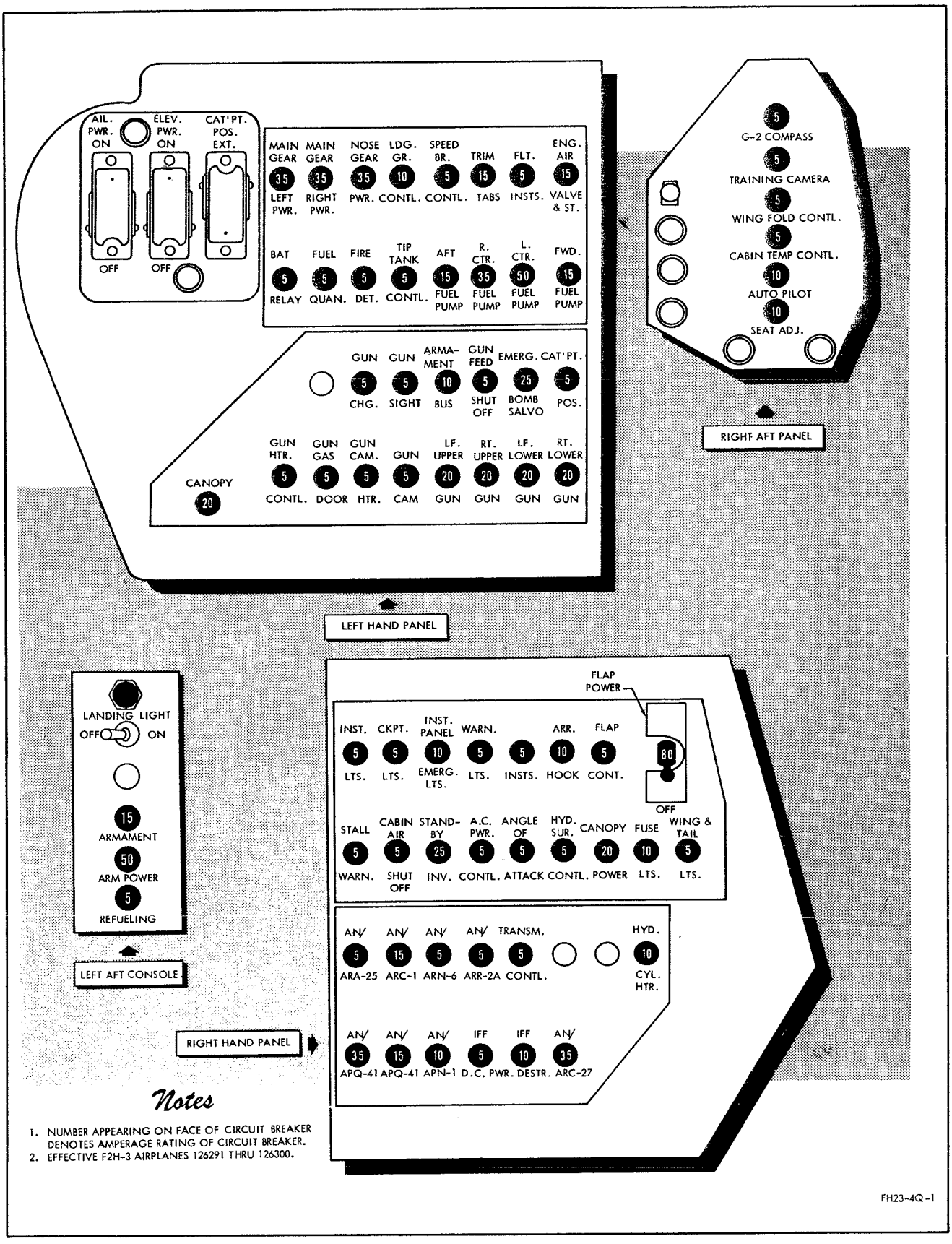
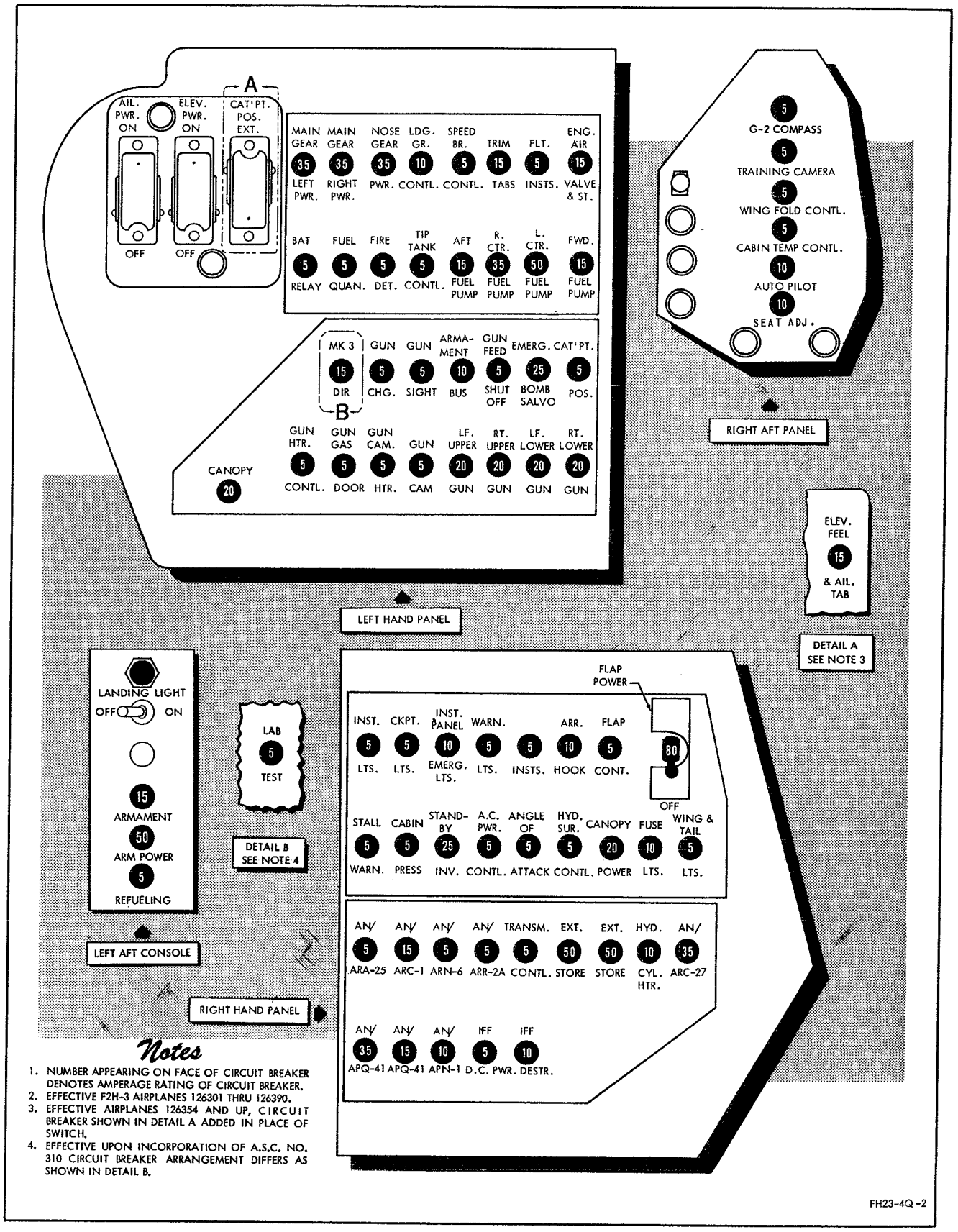


Figure 1-10. Circuit Breaker Panels (Sheet 1 of 4 Sheets)



Notes

1. NUMBER APPEARING ON FACE OF CIRCUIT BREAKER DENOTES AMPERAGE RATING OF CIRCUIT BREAKER.
2. EFFECTIVE F2H-3 AIRPLANES 126301 THRU 126390.
3. EFFECTIVE AIRPLANES 126354 AND UP, CIRCUIT BREAKER SHOWN IN DETAIL A ADDED IN PLACE OF SWITCH.
4. EFFECTIVE UPON INCORPORATION OF A.S.C. NO. 310 CIRCUIT BREAKER ARRANGEMENT DIFFERS AS SHOWN IN DETAIL B.

Figure 1-10. Circuit Breaker Panels (Sheet 2 of 4 Sheets)

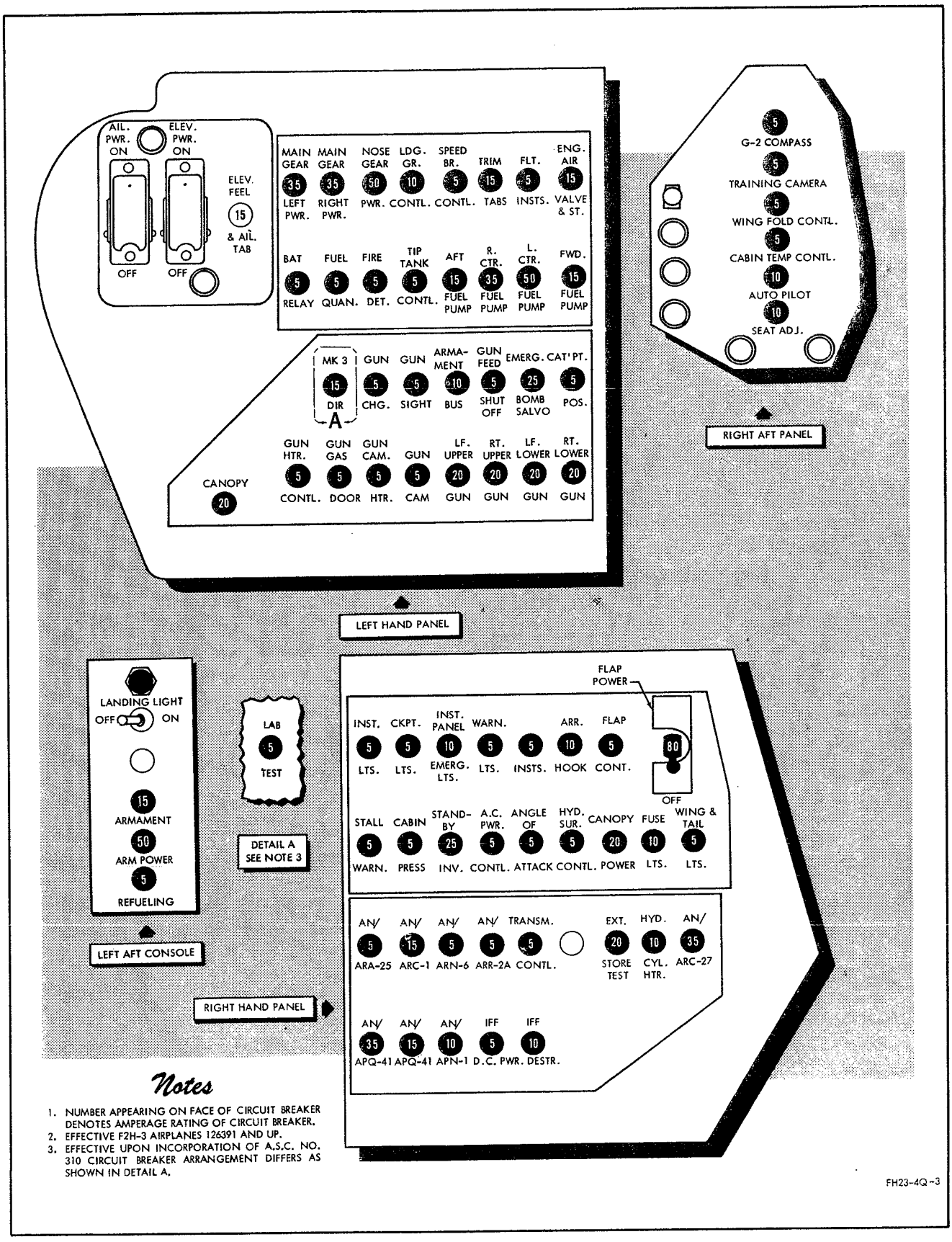


Figure 1-10. Circuit Breaker Panels (Sheet 3 of 4 Sheets)

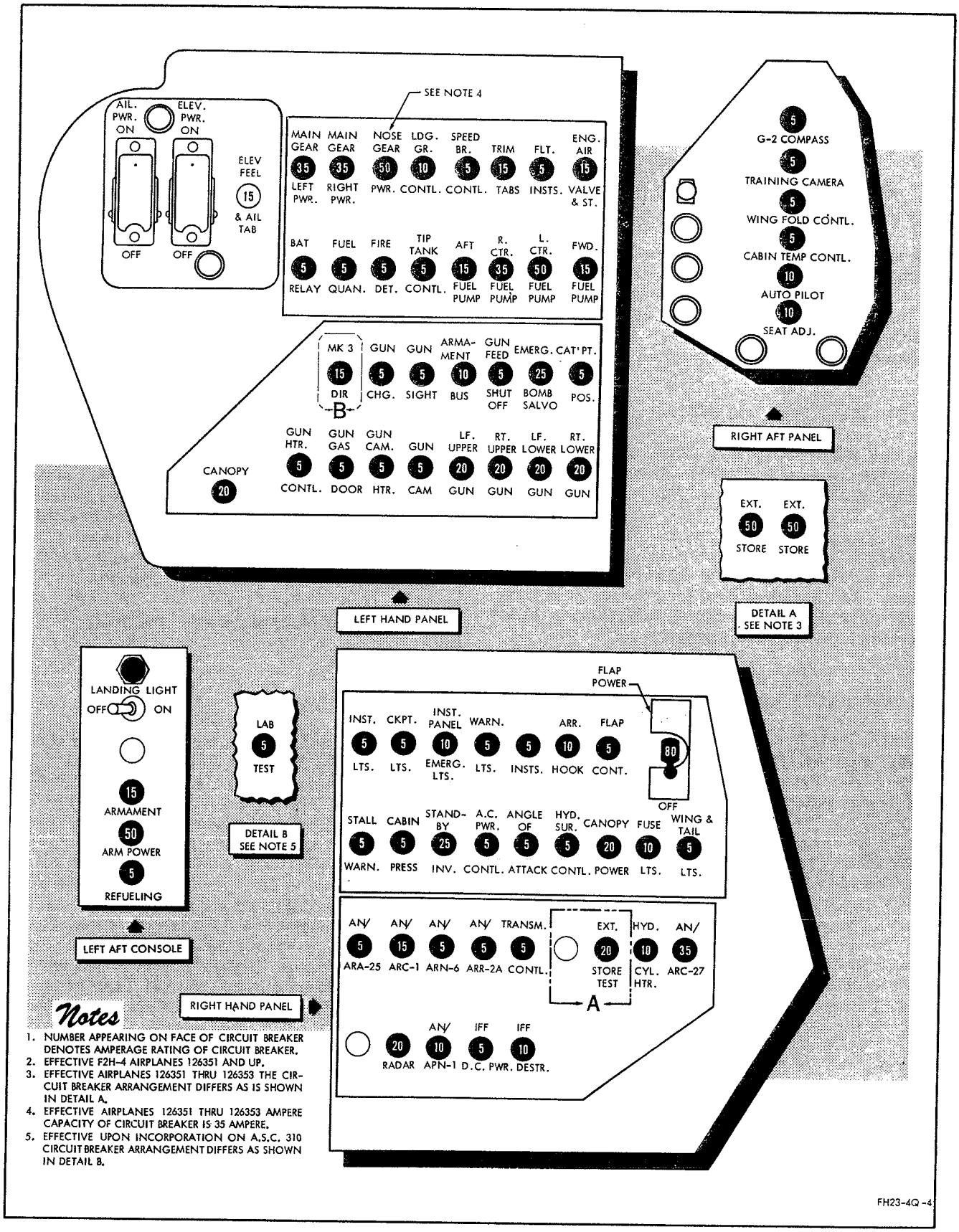


Figure 1-10. Circuit Breaker Panels (Sheet 4 of 4 Sheets)

power system, the a-c generator is driven by a constant speed air turbine powered by bleed air from each engine compressor section. The stand-by inverter is the normal supply for the a-c instrument circuits. The inverter is powered by the airplane's 28 volt d-c power system.

A-C POWER SELECTOR SWITCH (Removed upon incorporation of ASC 294)

A three-position a-c power selector switch is installed on the generator control panel located at the forward end of the right console. The three switch positions are A-C GEN., STAND-BY and EXT., enabling the selection of a-c power from either the a-c generator, the stand-by inverter or an external source.

A-C GENERATOR FIELD SWITCH

(Effective F2H-3 Airplanes 126291 thru 126350 prior to incorporation of ASC 244) (Removed upon incorporation of ASC 294)

An a-c generator field switch with an ON and an EMERGENCY position is installed on the generator control panel located at the forward end of the right console. The switch is used for opening the a-c generator field circuit, to prevent damage when the a-c generator fails to function properly.

A-C GENERATOR FIELD SWITCH

(Effective F2H-3 and F2H-4 Airplanes 126351 thru 127666; also effective F2H-3 Airplanes 126291 thru 126350 upon incorporation of ASC 244) (Removed upon incorporation of ASC 294)

The a-c generator field switch is installed on the generator control panel located at the forward end of the right console. The switch may be placed in EMERGENCY position to open the generator field circuit in order to prevent possible damage to a-c generator upon failure of generator; also with the a-c power selector switch in the A-C GEN position, the a-c generator field may be flashed to compensate for loss of residual magnetism by placing the a-c generator field switch in the EMERGENCY position.

A-C POWER SWITCH (Effective upon incorporation of ASC 294)

A three-position a-c power switch is installed on the generator control panel located at the forward end of the right console. The three switch positions are NORMAL, OFF and EXTERNAL. The switch affords a means of de-energizing the a-c generator (OFF), applying external power to the a-c system after it has been plugged into the a-c external power receptacle (EXTERNAL) or turning the a-c generator on (NORMAL).

INSTRUMENT POWER SWITCH (Effective upon incorporation of ASC 294)

The instrument power switch is mounted on the generator control panel located at the forward end of the right console. It is a two-position toggle switch. The switch is used to select the power source for the a-c instrument circuits. The switch is guarded to remain in INVERT position while guard is down and may be placed in GEN or EXT position by raising the guard.

A-C GENERATOR WARNING LIGHT

The a-c generator warning light is installed on the generator control panel located at the forward end of the right console. The warning light will light when the a-c generator fails to function properly.

A-C VOLTMETER AND SELECTOR SWITCH

An a-c voltmeter and a voltmeter selector switch are installed on the generator control panel located at the forward end of the right console. The voltmeter is calibrated to read from 0 to 150 volts. The voltmeter is used to read the phase voltage of any single phase of the three phase a-c system. The phase is selected on the voltmeter selector switch, which has three positions, A phase, B phase, and C phase.

HYDRAULIC POWER SUPPLY SYSTEM

GENERAL (See Figure 1-14.)

The hydraulic system is the closed center type operating at 1500 psi. The major components of the hydraulic system, with the exception of the actuators and pumps, are located in the right center section wing hydraulic compartment. Fluid flows from the 2.4 gallon reservoir to the engine-driven piston type hydraulic pumps. Each pump is regulated to deliver hydraulic fluid to the system at 1300 to 1500 psi. The use of two pumps, one for each engine, insures adequate fluid supply and pressure during single engine operation. A pressure relief valve, installed between the main pressure line and the return line, opens when fluid pressure exceeds 1750 psi. The accumulator, which is downstream from the pressure relief valve in the main pressure line, serves to absorb pressure surges and to supply an auxiliary volume of fluid during short periods when system demand is in excess of pump delivery capacity. Fluid is then routed to the selector valves which direct the fluid to the actuating cylinders.

HYDRAULIC OPERATED EQUIPMENT

Hydraulic pressure is employed in the operation of the following units:

Aileron Power Cylinders
Elevator Power Cylinders
Wing Fold Actuating Cylinders

HYDRAULIC PRESSURE GAGE

The remote indicating hydraulic pressure gage has a range of 0 to 2000 psi. During normal operation of the system, the gage will indicate 1300 to 1500 psi.

EXTERNAL POWER SOURCE

Two external hydraulic power connections are accessible through door 35R under the right center section wing. Provided for ground operation and testing purposes, the smaller connection is joined with the pressure side of an external hydraulic pump, while the larger is connected to the intake side of the pump.

CAUTION

Do not use an external pressure supply which is greater than 1500 psi.

PNEUMATIC POWER SUPPLY SYSTEM

GENERAL (See Figure 1-17.)

The pneumatic system utilizes an electrically driven air compressor and five air bottles to supply the pneumatically operated units with compressed air. The system is charged from an external source to 1500 psi and the air compressor, which is supplied with engine compressor air at 15 psi, is regulated to maintain system pressure during flight. The primary bottle, located downstream from the air compressor, acts as a pressure sensing element for the system. The air compressor turns off automatically when system pressure reaches 1500 psi and turns on when pressure drops to 1300 psi. Each air bottle is located downstream from a check valve and is charged to 1500 psi. Units which operate at pressures which are less than system pressure utilize pressure regulators, downstream from their respective air bottles, which reduce pressure to the desired value.

PNEUMATIC PRESSURE SWITCH

When the electrical power switch is in the BATT ONLY OR BATT-GEN position or when an external power source is connected, the compressor is energized by turning the pneumatic pressure switch, located on the pedestal, to the ON position. Turn the pneumatic pressure switch to the ON position after starting the engines.

PNEUMATIC OPERATED EQUIPMENT

The following units operate from the high pressure pneumatic supply:

Arresting Gear Actuator-Retraction
Brake Cylinder-Air Boost
Nose Gear-Emergency Extension Cylinder
Nose Gear-Catapult Positioning
Canopy Emergency Operation Air Motor
Gun Chargers
Gun Feeders
Gun Gas Doors

PNEUMATIC PRESSURE GAGE

The pneumatic system pressure gage, located on the pedestal, is a direct reading gage with a range of 0 to 2000 psi. System pressure will normally be 1300 to 1500 psi. An additional gage, located left of the ejection seat, indicates pressure in the canopy air motor bottle, which is 1500 psi. Only the pedestal mounted gage indicates system pressure.

LOW PRESSURE PNEUMATIC SYSTEM

The low pressure pneumatic system routes air at 15 to 40 psi (absolute pressure) from each engine compressor to the following units:

Turn-and-Bank Indicator
Anti-G Suit
Cabin Pressurization
Canopy Seal
Pneumatic System Compressor
Hydraulic Reservoir
Tip Tanks

An air turbine, a-c generator unit in the aft fuselage is driven by a separate low pressure pneumatic system operating from engine compressor air.

FLIGHT CONTROL SYSTEM

The primary flight control system consists of the conventional arrangement of ailerons, elevators and rudder. The ailerons and elevators are actuated by irreversible power control systems. Mechanical linkage from the control stick operates the power control systems, and also provides for manual surface actuation in event of a power control system malfunction. Rudder operation is manual through direct cable and push-pull rod linkage.

ELEVATOR CONTROL SYSTEM

The elevators are normally actuated by an irreversible, hydraulically operated power control cylinder, located in the aft fuselage. The cylinder contains an integral servo valve which is actuated by pilot effort through conventional mechanical linkage. When the servo valve is in neutral position, both sides of the power control cylinder are subjected to full hydraulic system pressure, and the output end of the cylinder is virtually irreversible. As a result, the elevators can not be moved by air loads, and these loads will not 'feed back' to the control stick. As the control is moved, the servo valve is positioned so as to direct hydraulic pressure to one end of the cylinder and open the opposite end to system return, giving desired elevator movement. When the elevators reach the position desired, the servo valve is again neutralized, with hydraulic pressure directed to both ends of the cylinder. The cylinder incorporates a 'slow bleed'

feature which prevents a rapid bleed-off of pressure within the power cylinder should the pressure supply system fail or be turned OFF. This provides a smoother transition from POWER ON to POWER OFF operation and minimizes the effect of a change in trim. However, the pressure may be 'dumped' and the 'slow bleed' features nullified by slight stick movements. Dual spring-loaded, by-pass valves in the cylinder open during POWER OFF operation of the elevators, allowing fluid displacement around the piston, thereby reducing system friction. The power control cylinder then functions as another 'link' in the system.

Note

During POWER OFF operation, a slight amount of lost motion (play) will be noticed when moving the control stick. This is a normal condition, caused by the servo valve which must 'bottom out' before stick movement will be transferred to the surface.

ELEVATOR POWER SWITCH

The ELEV PWR switch (see Figure 1-14) is provided to turn the power control system ON or OFF. Before placing the ELEV PWR switch in the OFF or ON position, the pilot should make certain the ELEV TRIM OVERRIDE switch is in the AUTO position, and the ELEV TRIM TAB is within the normal operating range (see Figure 1-11). A firm grip should be maintained on the stick during the switch-over.

CAUTION

Do not turn the power control system OFF at high speeds.

ELEVATOR ARTIFICIAL FEEL SYSTEM

Conventional stick forces are a result of the air loads acting on the control surface. In the power control system, these forces are not 'fed back' to the control stick because of the irreversibility of the power cylinder. To give the control system a natural 'feel, these stick forces are simulated by the artificial feel system. This system consists of three major units; the bellows, the balance springs, and the trim bell crank, all mechanically connected to the elevator system. One side of a diaphragm within the bellows is exposed to ram air pressure. The resulting force is balanced at the trim bell crank by the balance springs. When the control stick is moved, this balanced condition is upset, causing a stick force, proportional to airspeed and stick deflection. A change in airspeed will also upset the balanced condition between the bellows force and balance springs. 'Retrimming' to zero stick force is accomplished from the control stick trim switch. Movement of this switch operates the feel trim bell crank actuator, which repositions a portion of the bell crank until the bellows and balance spring forces are again in balance. A viscous damper, in conjunction with the feel trim bell crank, restricts abrupt fore and aft stick movement, and thereby tends to prevent the pilot from exceeding the G limitations of the airplane. An elevator 'bob' weight, located on the control stick yoke, provides satisfactory maneuvering stick forces. See Figure 6-3 in CO 01-245FBC -1A for Elevator Maneuvering Stick Forces.

ELEVATOR FEEL TRIM POSITION LIGHT

Effective Airplanes 126291 thru 126320 after incorporation of ASC 184, and Airplanes 126321 and up, an elevator feel trim position warning light is installed above the instrument panel to the left of the sight unit. (See Figure 1-18.) This light is energized by a microswitch on the elevator feel trim bell crank, when the elevator feel system is trimmed for 110-135 knots. Prior to catapult take-off, the elevator feel system must be 'trimmed' until the position light is energized.

ELEVATOR TRIM TAB SYSTEM

Each elevator incorporates a hinged tab section that is mechanically connected to a common electrical actuator. Since the elevators are immovable by air loads, due to the irreversibility of the power control system, the trim tabs have a negligible effect during POWER ON operation of the elevators. However, when the power control system is OFF and the power control cylinder is no longer irreversible, the trim tabs are effective and will position the elevator to obtain zero hinge moments. For this reason, it is necessary to keep the elevator hinge moments at or near zero during POWER ON operation of the elevators to prevent a serious trim change when the power control system is turned OFF or fails. Maintenance of zero or near zero elevator hinge moments is accomplished through automatic operation of the trim tabs by the elevator equalizer idler.

Note

The ELEV TRIM OVERRIDE switch must be in the AUTO position to permit automatic operation of the elevator trim tabs.

The equalizer idler, located between the elevator power cylinder and the elevator, is sensitive to any unbalanced air loads (hinge moments) acting on the elevator. When this unbalanced condition exceeds a preset amount, the deflection beam within the idler actuates one of two microswitches. The trim tab then operates to a position where the hinge moments are again nearly zero, at which time the microswitch is released. To prevent excessive operation of the elevator trim tab actuator, a narrow 'dead band' is 'built in' the equalizer idler. As a result of this 'dead band' the elevator hinge moments may not be exactly zero at all times. This will cause an out of trim stick force up to 35 pounds, depending on air speed, when the elevator power control system is turned OFF. Figure 1-11 shows normal operating range of elevator trim tab during automatic operation.

CAUTION

Do not turn the power control system OFF at high speeds.

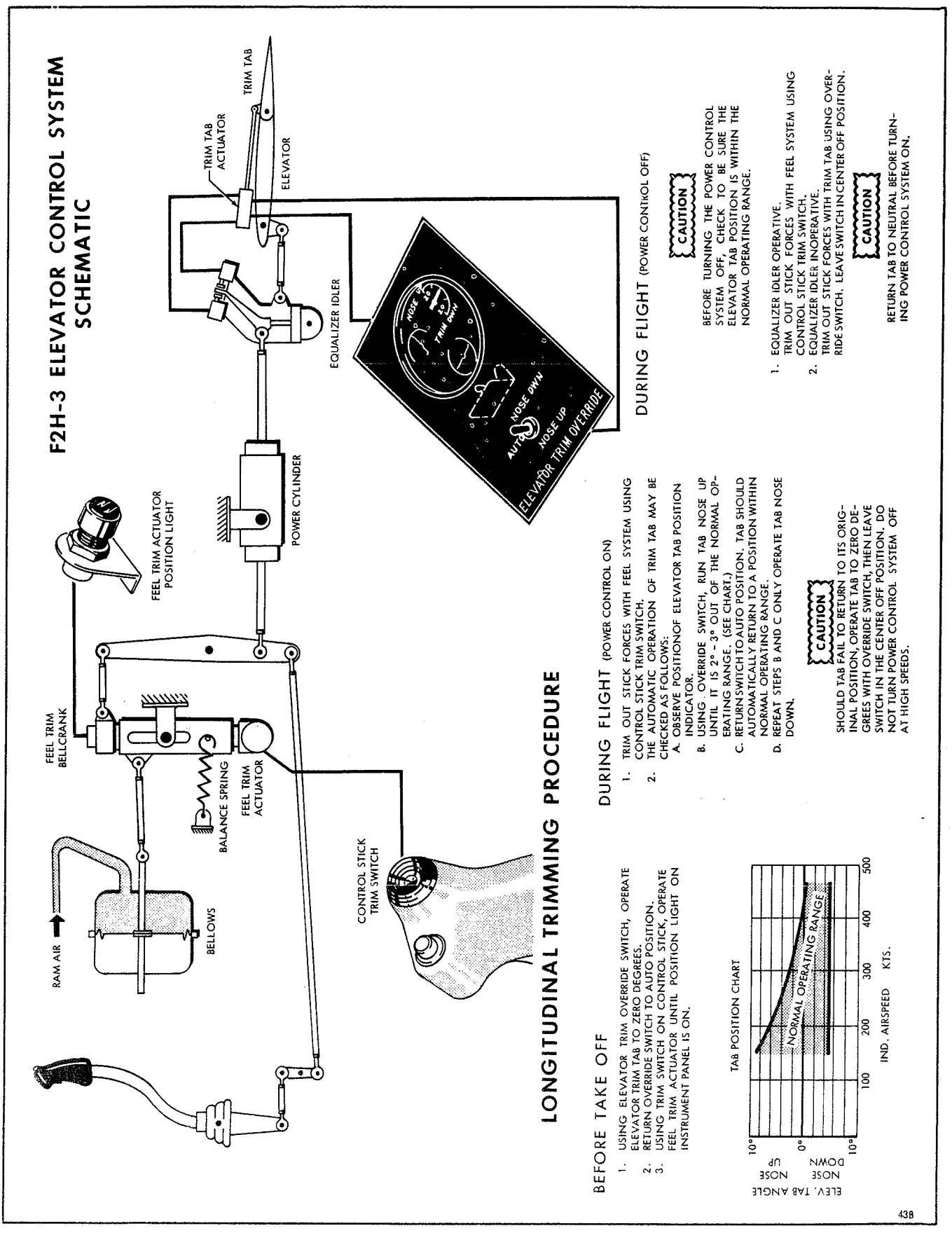


Figure 1-11. Elevator Control System Schematic

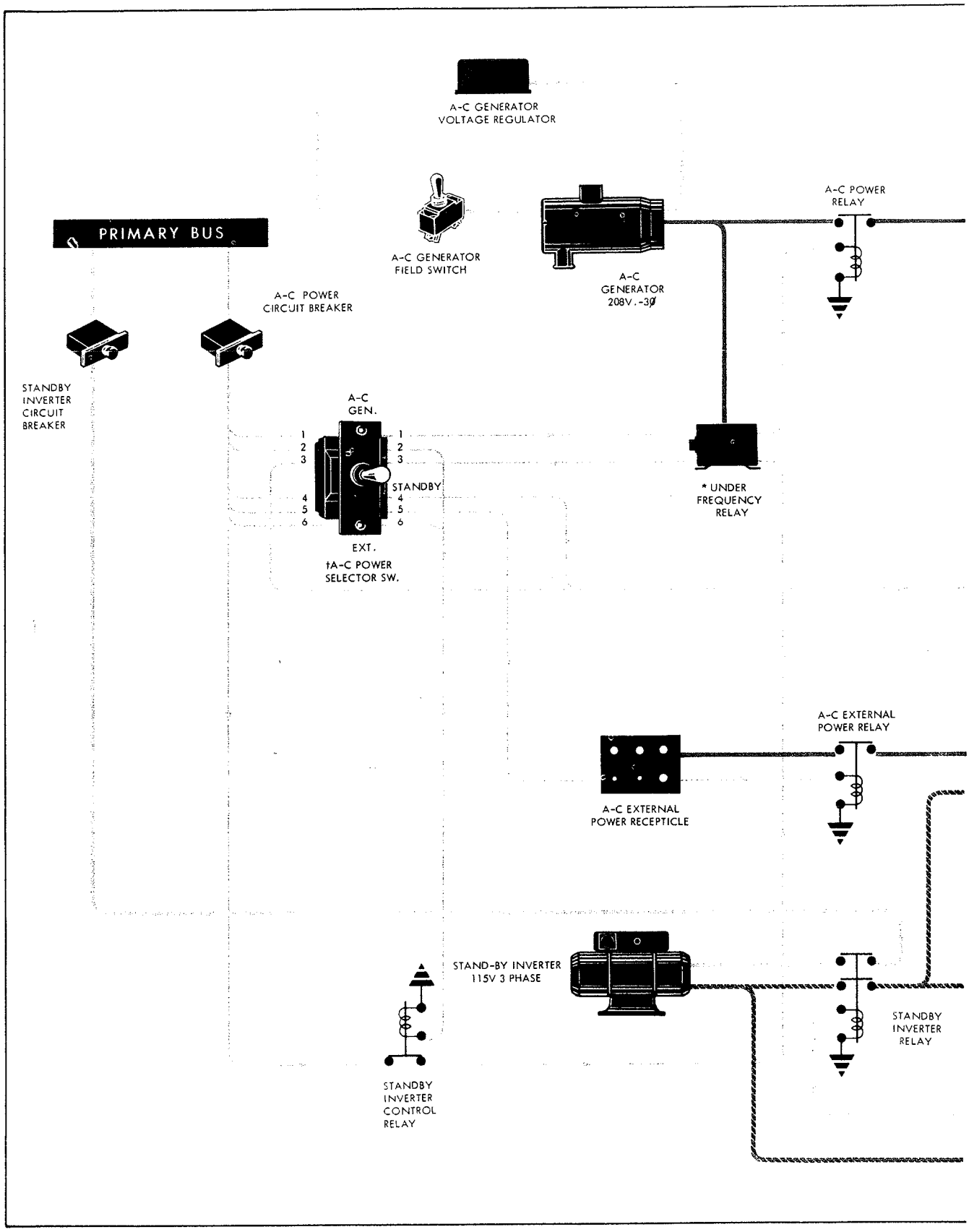


Figure 1-12. A-C Power System Schematic (Sheet 1 of 2 Sheets)

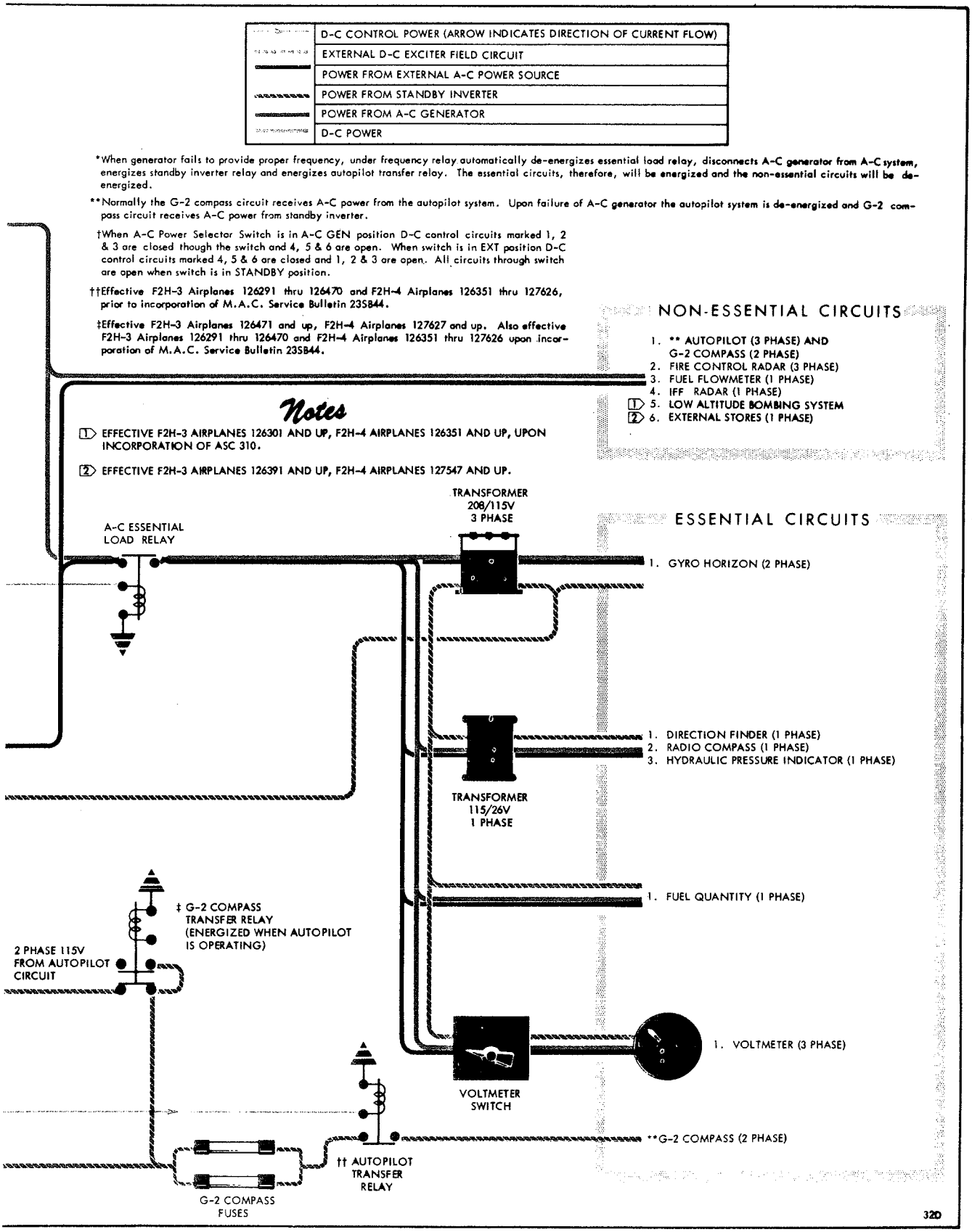


Figure 1-12. A-C Power System Schematic (Sheet 2 of 2 Sheets)

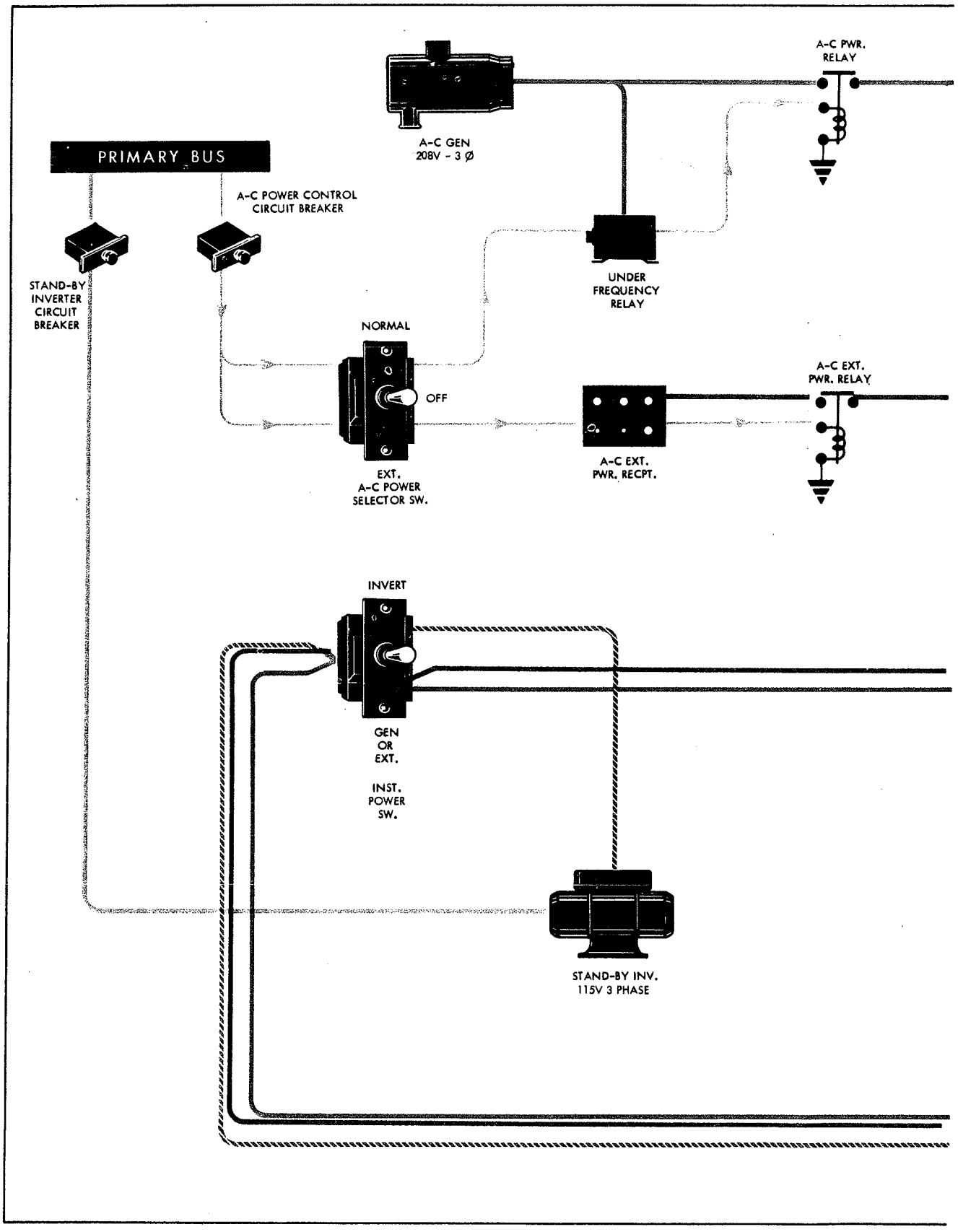


Figure 1-13. Electrical System Schematic (Sheet 1 of 2 Sheets)

Effective F2H-3, -4 Airplanes Upon Incorporation of ASC No. 294

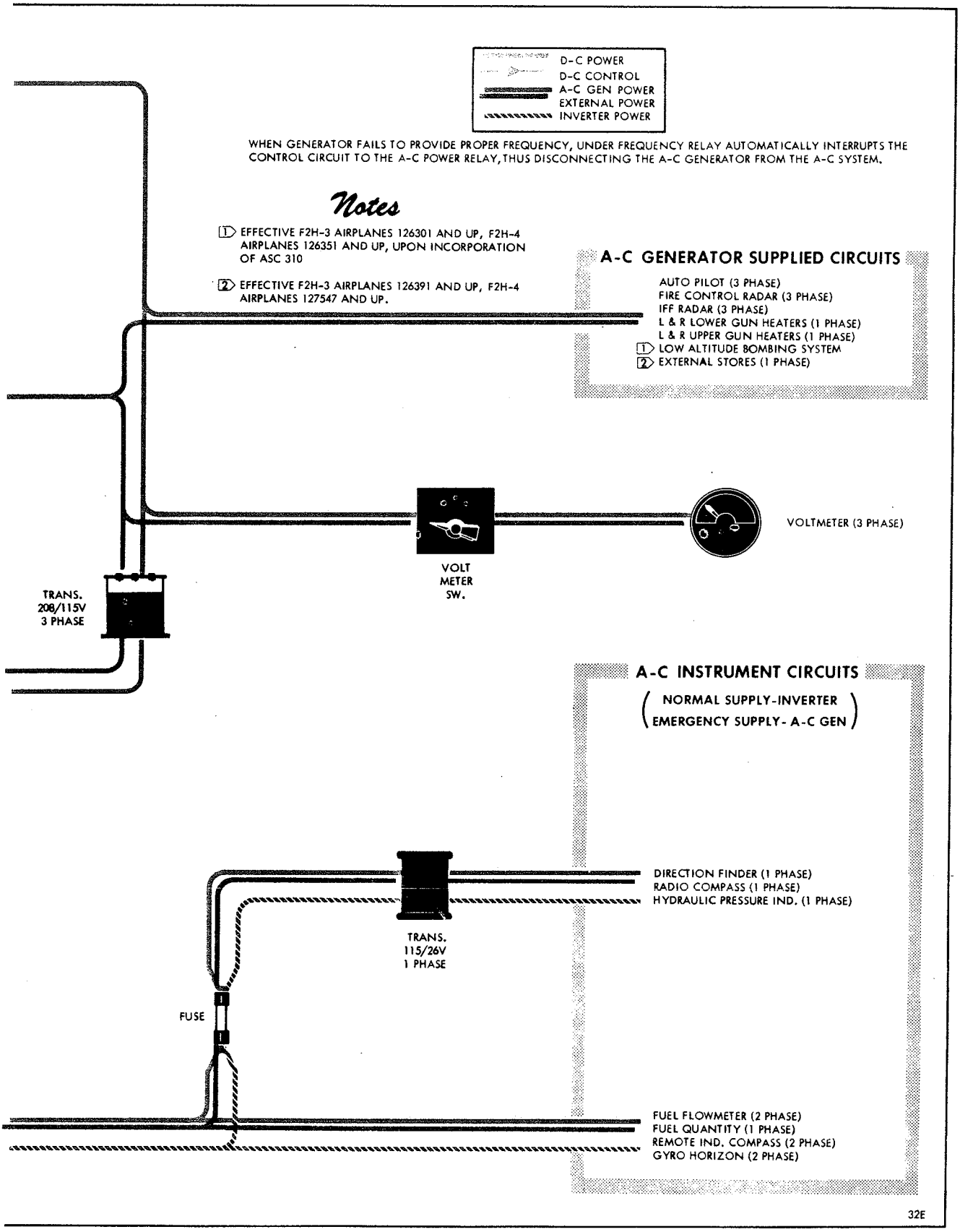


Figure 1-13. Electrical System Schematic (Sheet 2 of 2 Sheets)

Effective F2H-3, -4 Airplanes Upon Incorporation of ASC No. 294

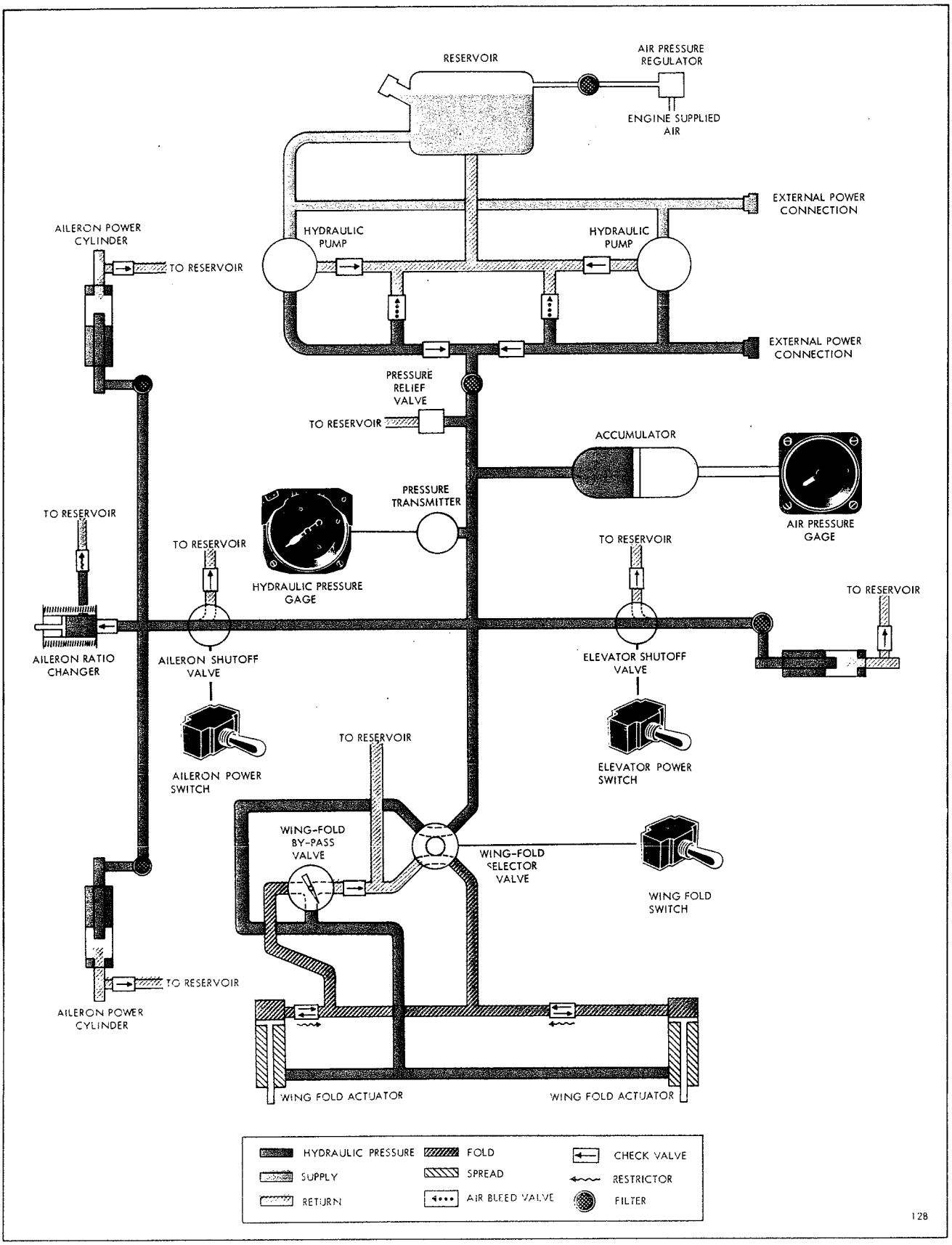


Figure 1-14. Hydraulic System Schematic Diagram

ELEVATOR TRIM OVERRIDE SWITCH

The ELEV TRIM OVERRIDE switch located on the left console is provided to permit manual positioning of the elevator trim tabs. The switch has the following positions: AUTO, momentary NOSE UP and NOSE DOWN, with the vertical position being OFF.

Note

The elevator equalizer idler is operative only when the ELEV TRIM OVERRIDE switch is in the AUTO position.

The ELEV TRIM OVERRIDE switch should be used for manual trim tab positioning ONLY in event of failure of the equalizer idler, and prior to take-off. At all other times, the ELEV TRIM OVERRIDE switch MUST be in the AUTO position to permit automatic operation of the elevator trim tab.

AILERON CONTROL SYSTEM

AILERON POWER CONTROL SYSTEM

The ailerons are normally actuated by irreversible, hydraulically operated power control cylinders, with one cylinder located in each outer wing panel. The operation of these cylinders is identical to the operation of the elevator power cylinder.

AILERON ARTIFICIAL FEEL SYSTEM

Since the aerodynamic forces acting on the ailerons are not 'fed back' to the control stick during POWER ON operation, an artificial feel system is incorporated to provide a reference stick force. In the aileron system, this force is supplied by a double-acting spring cartridge. The 'feel' induced by the spring cartridge is independent of air speed.

AILERON RATIO CHANGER

To assist the pilot in overcoming high aileron stick forces when the hydraulic pressure fails, or is turned OFF, a ratio changer is provided in the forward fuselage which increases the stick to aileron mechanical advantage. The device functions automatically by spring action whenever the hydraulic pressure in the aileron power control system drops to 300 psi. Accompanying the increase in mechanical advantage is a corresponding decrease in aileron throw from ± 20° to ± 10°.

AILERON BALANCE TAB

A ground adjustable balance tab is provided on each aileron to reduce lateral stick forces during POWER OFF operation of the ailerons. The balance tabs are ineffective during POWER ON operation due to the irreversibility of the power control system.

LATERAL TRIMMING

Lateral trimming of the airplane may be accomplished in the normal manner, by means of the trim switch on the control stick grip. This switch controls an electric actuator that is common to both the trim tab and the artificial feel system. Therefore, both systems are actuated simultaneously to reduce lateral stick forces to zero for any desired aileron position. However, since the trimming effect of the tab on the airplane is negligible during POWER ON operation, the feel system is the trimming medium with the trim tab balancing out air loads on the aileron. This feature prevents a radical change in trim requirement in the event of a hydraulic system failure. During POWER OFF operation, the trim tab and feel system work in conjunction to provide zero stick force.

AILERON POWER SWITCH

The aileron power control switch (see Figure 1-14) controls a motor-operated shutoff valve. Placing the switch in the ON position directs hydraulic pressure to the aileron power control cylinder from the main hydraulic system. Placing the switch in the OFF position shuts off pressure to the cylinder and opens the cylinder pressure line to the return system.

RUDDER CONTROL SYSTEM

RUDDER PEDALS

Two suspended type pedals are provided for pilot control of the rudder. The pedals are connected to the rudder through a conventional cable and push-pull rod system. Individual brake master cylinders are connected to the pedals in such a manner that toe pressure on the pedals will operate the wheel brakes. Also incorporated in each pedal linkage is a force link which is used in conjunction with the automatic pilot.

RUDDER PEDAL ADJUSTMENT

The rudder pedals may be adjusted fore and aft as required for pilot comfort, by a crank on the pedestal. Rotating the crank clockwise moves both pedals forward and counterclockwise moves them aft.

DIRECTIONAL TRIMMING

A combination trim and anti-balance tab on the trailing edge of the rudder is employed for directional trimming. It is positioned by an electric actuator which is controlled by the rudder trim switch.

RUDDER TRIM SWITCH

A separate switch for rudder trim tab operation is provided on the left console (see Figure 1-3). It has momentary NOSE LEFT and NOSE RIGHT positions, and center OFF.

CONTROL STICK

A tubular, S-type control stick is provided for pilot control of the ailerons and elevators. A stall warning vibrator and a plastic grip are attached to the control stick. Located on the grip are the following switches: lateral and longitudinal trim switch, gun trigger switch, and the bomb and rocket switch. The thumb-operated trim switch also serves as an automatic pilot servo disconnect switch. An elevator 'bob' weight is connected to the control stick yoke.

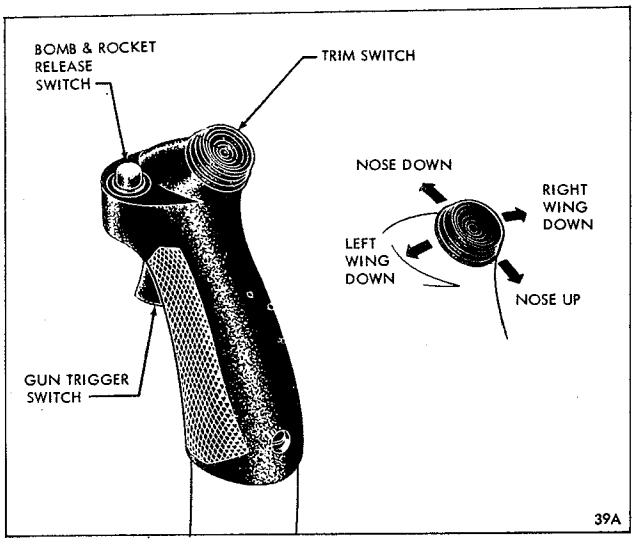


Figure 1-15. Control Stick Grip

SURFACE CONTROL LOCK

A surface control lock is provided to lock ailerons, elevator, and rudder in the neutral position. The lock consists of a yoke and pin which are attached to the control stick, a hook which fits in the yoke and the left console structure, and two cables which join each rudder cable arm with the yoke. The lap belt is fastened around the control stick.

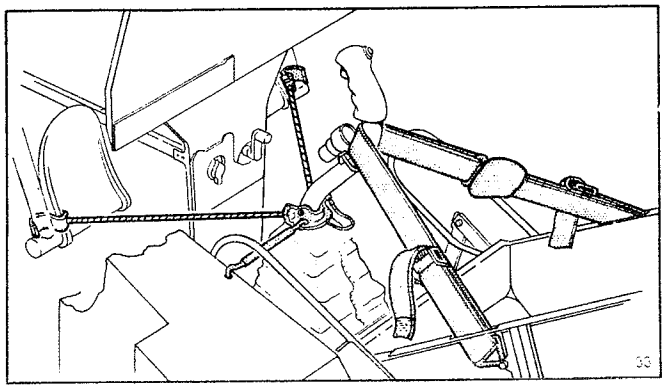


Figure 1-16. Surface Control Lock

STALL WARNING SYSTEM

The stall warning system warns the pilot of an approaching stall by a strong vibration of the control stick. The vibrator is attached to the control stick just below the grip. The transmitter is located near the leading edge of the right outer wing panel and contains a heater element to prevent icing. The heater operates continuously during flight.

Note

The stall warning system is inoperative with the wing flaps full UP.

Note

The stall warning system is reliable under accelerated flight, but the warning margin increases with acceleration. Refer to Section VI in CO 01-245FBC-1A.

TRIM TAB POSITION INDICATOR

The trim tab position indicator is mounted in the left console just inboard of the throttle quadrant (see Figure 1-3). This indicator shows the position of the rudder, aileron and elevator tabs in relation to their neutral position, each operating as a separate unit on an individual scale. Each unit is connected to its appropriate transmitter built into the trim tab actuator.

WING FLAPS

Four split type flaps, installed under the wing between the ailerons, are operated throughout their cycle of angular movement by eight synchronized screw jacks which are driven through a torque tube system by an electric motor. Microswitches that are contacted by flap structure control the angular limits of operation. The flaps operate DOWN through a total angular movement of 60° from full UP position. Since the flaps are controlled electrically, position selectivity is infinite. A pressure operated flap control switch installed in the instrument pitot system prevents lowering of the flaps at air speeds exceeding 169 ± 5 knots.

FLAP CONTROL SWITCH

The flap control switch (see Figure 1-3) has three positions, UP, OFF (center), and DOWN. Flaps may be stopped in any position by moving the switch to the OFF position.

FLAP POSITION INDICATOR

The wing flap position indicator is combined with the landing gear position indicator and is located on the forward panel of the left console. (See Figure 1-3.) The indicator, working with a position transmitter at the right center section flap, gives the exact position of the wing flaps at all times.

SPEED BRAKES

The speed brakes are installed in the outer panel wings forward of the outboard flap. The operation of the speed brake assembly is similar to a parallel bar linkage. The upper and lower plates have two arms at each end which pivot about a shaft during extension and retraction of the brakes. An electric actuator drives a torque tube system operating the screw jack at each speed brake assembly. Retraction of the screw jacks causes the arms and perforated plates of each speed brake assembly to extend from the upper and lower surfaces of the outer wing panels. Microswitches, located at the left speed brake, control the OPEN and CLOSED position of the speed brakes.

SPEED BRAKE CONTROL SWITCH

The speed brake control switch, located on the right throttle grip, has two positions, CLOSE (forward) and OPEN.

LANDING GEAR SYSTEM

GENERAL

The tricycle landing gear consists of two main gears and a nose gear. All gears are electrically actuated and are entirely covered by flush doors when retracted.

MAIN GEAR

Each main gear is retracted and extended by an electric actuator. The gear is locked down by the side brace which is held in an overcenter position by a telescoping spring-loaded tube. The actuator also acts as a lock to aid the side brace in holding the gear in either the up or the down position. The main gears retract outboard into the center and outer panels, and when retracted are enclosed by fairing doors that are flush with the contour of the underside of the wing. The outboard doors are operated by electric actuators that are wired to operate in sequence with the main gearactuators. Thus the outboard doors are fully closed when the main gears are extended as well as when the gears are retracted.

NOSE GEAR

The nose gear is retracted and extended by an electric actuator. The strut is mechanically compressed as the gear retracts and automatically extends to its fully extended position when the gear is let down. The nose gear is locked down by a mechanical lock that holds the drag brace links in an overcenter position. The lock is automatically released when the gear is being retracted. Overcenter travel of the retracting mechanism aided by the actuator, locks the nose gear in the up position. The nose gear retracts aft into the fuselage and is covered by doors that are flush with the contour of the underside of the fuselage. The nose wheel is equipped with a shimmy damper and is turned by differential main wheel braking. The nose gear down lock may be safetied for maintenance operation only.

NOSE GEAR CATAPULT EXTENSION

In order to catapult the airplane in a flight attitude, the nose gear strut is extended approximately 16 1/2 inches beyond its normal extension or equivalent to the no load extended strut, by pneumatic pressure. This is accomplished by operating a toggle switch. (See Figure 1-3.) The added pneumatic pressure is automatically bled from the strut when the airplane is airborne, through operation of a limit switch on the left main gear torque scissors.

A minimum pneumatic pressure of 1400 psi is required for nose gear strut to fully react catapult loads and prevent pitching during catapulting.

EMERGENCY FREE FALL

Emergency free fall of the landing gear is accomplished through a cable release system that is operated by the landing gear control handle. Pulling the control handle aft to the emergency position, rotates the release arms on the landing gear and outboard door actuators, allowing the landing gear and outboard doors to free fall. At the same time, the nose gear pneumatic emergency extension system control valve is operated to actuate a pneumatic cylinder which insures extension of the nose gear to the lock down position. The landing gear control handle is held in the emergency position by a spring-loaded latch located above the handle. Depressing the latch and pushing the control handle forward, returns the control handle to the normal operating position.

LANDING GEAR CONTROL

Operation of the landing gear is controlled by a handle located at the left side of the main instrument panel. The handle has a wheel shaped knob for identification and is placed in the UP or DOWN position to retract or extend the landing gear. This actuates a limit switch in the forward end of the control handle assembly.

Inadvertent operation of the landing gear while the airplane is on the ground is prevented by a safety switch on each main gear torque scissors which render the landing gear circuit inoperative when the main gear struts are compressed. A red warning light is located in the knob of the landing gear control handle. Refer to table below for description of control handle light operation. The landing gear control handle may be operated to the emergency position by pulling the control handle smartly aft. (Refer to Paragraph on EMERGENCY FREE FALL.)

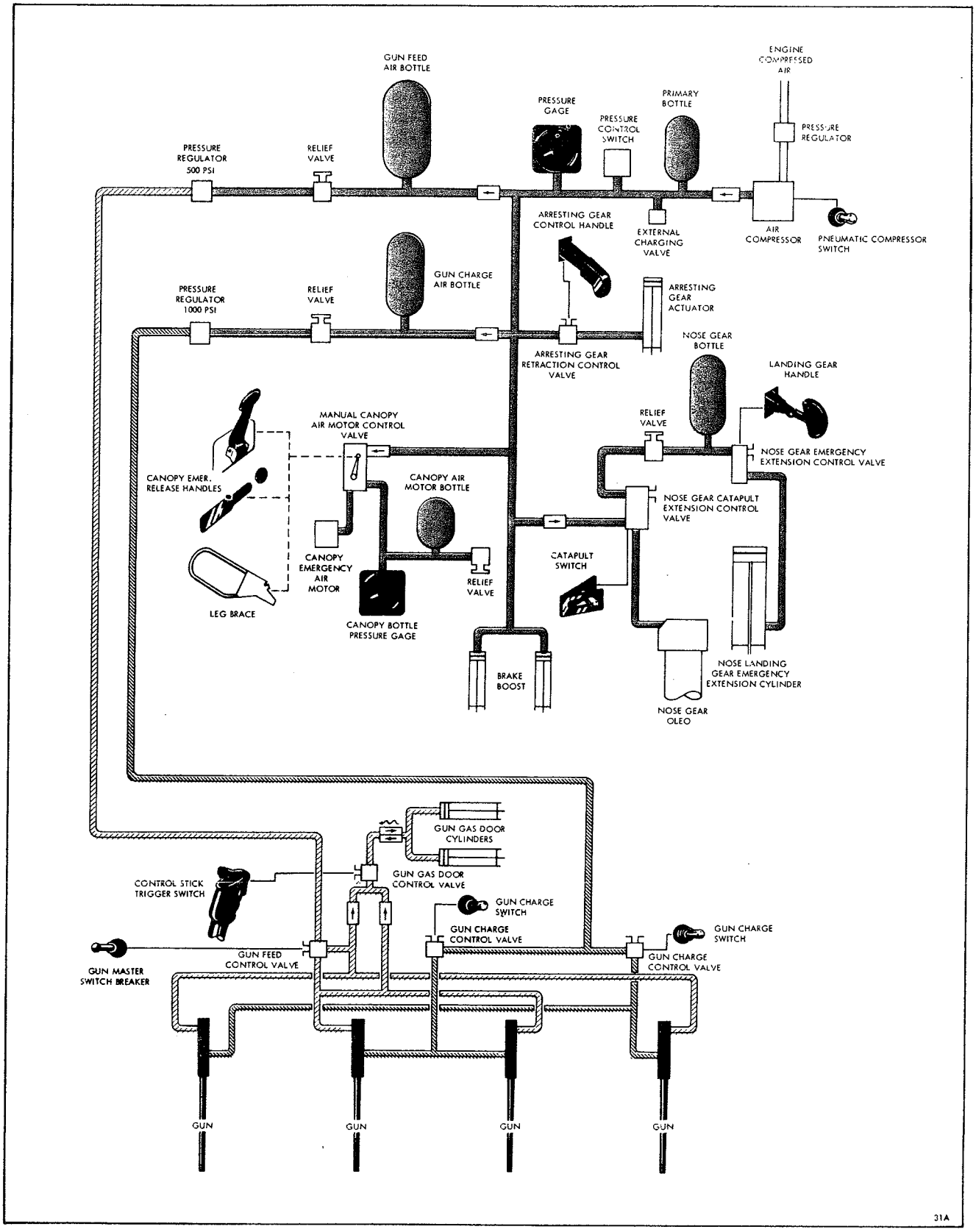


Figure 1-17. Pneumatic System Schematic Diagram (Sheet 1 of 2 Sheets)

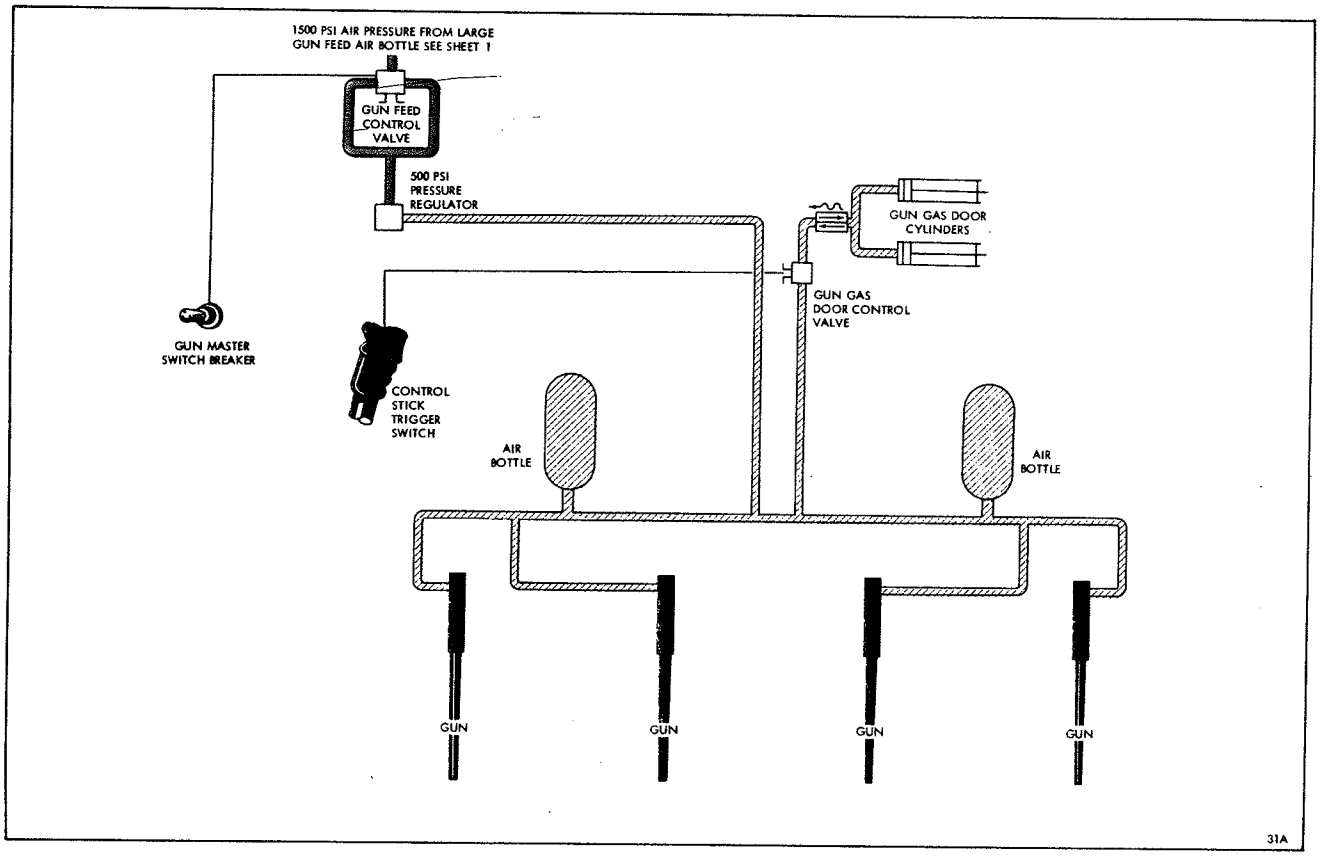


Figure 1-17. Pneumatic System Schematic Diagram (Sheet 2 of 2 Sheets)

NOSE GEAR CATAPULT EXTENSION SWITCH

Extension of the nose gear strut for catapulting is controlled electrically by the nose gear catapult extension switch. The strut is extended by momentarily placing the switch in the CAT'PT POS. EXT. position. (See Figure 1-3 for switch location.)

CAUTION

Do not operate CAT'PT POS. EXT. switch with landing gear retracted. Operating the switch may result in damage to the nose gear installation.

CAUTION

Effective on F2H-3 Airplanes 126471 and up, and on F2H-4 Airplanes 127547 and up, the CAT'PT POS. EXT. switch is inoperative when the landing gear handle is in the UP position.

LANDING GEAR WARNING LIGHT

The landing gear warning light is located in the knob of the landing gear control handle. Placing the control handle in the UP position illuminates this warning light. The light remains on until all landing gear are FULL UP and all gear doors are FULL CLOSED. Placing the control handle in the DOWN position illuminates the warning light and it remains ON until all landing gear are FULL DOWN. The position of the gear doors will not affect the warning light when extending the gear.

LANDING GEAR POSITION INDICATOR

The landing gear position indicator and the flap position indicator are combined in a single instrument that is mounted on the forward panel of the left console. The unit contains four elements. Three of the four elements are used for landing gear wheel position indication and operate in conjunction with position switches actuated by the landing gear. The position of the landing gear wheels is indicated by the wheel drum dials as viewed through the cutouts in the front scale plate of the instrument. The following table describes NORMAL indications of this instrument.

ITEM	INDICATION	REASON FOR INDICATION
LANDING GEAR CONTROL HANDLE LIGHT	OFF With handle DOWN	NOSE GEAR FULL DOWN AND BOTH MAIN GEAR FULL DOWN. (Position of main gear doors have no effect on light in this condition.)
	OFF With handle UP	NOSE GEAR FULL UP AND BOTH MAIN GEAR FULL UP AND BOTH MAIN GEAR DOORS FULL CLOSED.
	ON With handle DOWN	NOSE GEAR NOT FULL DOWN OR EITHER MAIN GEAR NOT FULL DOWN. (Position of main gear doors have no effect on light in this condition.)
	ON With handle UP	NOSE GEAR NOT FULL UP OR EITHER MAIN GEAR NOT FULL UP OR EITHER MAIN GEAR DOOR NOT FULL CLOSED.
NOSE GEAR POSITION INDICATOR	DOWN	NOSE GEAR FULL DOWN.
	UP	NOSE GEAR FULL UP.
	BARBER POLE	NOSE GEAR IN ANY POSITION EXCEPT FULL UP OR FULL DOWN.
MAIN GEAR POSITION INDICATOR	DOWN	MAIN GEAR FULL DOWN. (Position of main gear door has no effect on instrument in this condition.)
	UP	MAIN GEAR FULL UP AND MAIN GEAR DOOR FULL CLOSED AND LANDING GEAR SAFETY RELAY IN SAFE POSITION (relay energized).
	BARBER POLE	MAIN GEAR IN ANY POSITION EXCEPT FULL UP OR FULL DOWN OR MAIN GEAR FULL UP AND DOOR FULL CLOSED BUT LANDING GEAR SAFETY RELAY NOT IN SAFE POSITION (relay energized) OR MAIN GEAR FULL UP AND LANDING GEAR SAFETY RELAY IN SAFE POSITION (energized) BUT DOCR NOT FULL CLOSED.
APPROACH LIGHT (Position of main gear doors have no effect on this light in any condition.)	OFF	ANY GEAR NOT FULL DOWN. (Position of arresting hook has no effect on this light if any gear is not full down.)
	FLASHING	ALL GEAR FULL DOWN EXCEPT ARRESTING HOOK (Exterior lights master switch must be in any position except OFF, otherwise approach light will be off in this condition.)
	ON STEADY	ALL GEAR AND ARRESTING HOOK FULL DOWN.

ARRESTING GEAR AND CRASH BARRIER HOOKS

The arresting gear and the crash barrier hook are released simultaneously by means of a cable linkage which is actuated when the arresting gear control handle is pushed DOWN. The arresting gear is extended by gravity and the spring action of the dashpot while the crash barrier hook is extended by a spring. The primary purpose of the arresting gear dashpot is to dampen hook bounce and hold the hook on the carrier deck. When the arresting gear control handle is pushed UP, the arresting gear latch is positioned to receive the hook and a limit switch is actuated which energizes a solenoid valve, permitting compressed air from the pneumatic system to operate the arresting gear actuator. The pneumatic actuator raises the arresting gear to the retracted position. The crash barrier hook cannot be retracted from the cockpit.

ARRESTING GEAR CONTROL

The arresting gear control handle, located on the right side of the main instrument panel, has two positions, UP and DOWN. When the control handle is pushed DOWN, a red warning light in the handle is lit and will remain on until the arresting gear is fully extended.

BRAKES

The main landing gear wheels are provided with hydraulically operated disc-type brakes. The brakes are actuated individually by an air boosted master

brake cylinder operated by toe pressure on each rudder-brake pedal. A small hydraulic reservoir is incorporated in each master brake cylinder.

EMERGENCY BRAKE SYSTEM

The aircraft is equipped with pneumatic emergency brakes which are independent of the normal pneumatic system. The emergency braking system consists of an air bottle, charged to 1500 psi pressure, a pilot's "T" release handle, shuttle valves and necessary lines. Pulling the release handle directs air pressure through the shuttle valves, by-passing the brake master cylinders, into the normal brake hydraulic lines and wheel cylinders.

Note

The emergency brake system will not provide braking action when failure of the normal system is due to any malfunction which occurs between the shuttle valves and the wheel cylinders.

Actuating the emergency brakes discharges all of the air pressure into the brake lines. This action locks the brakes immediately, independent of the position of the brake pedals. The air bottle and pressure gage are installed in the nose wheel well, enabling the pilot to check that the system is properly charged during the external inspection. The release handle is located just forward of the canopy emergency release handle on the left cockpit sill.

INSTRUMENTS

The instruments installed in the aircraft are conventional in design and operation. All instruments with exception of the position indicators (gear, flap and trim), the electrical instruments (ammeter and voltmeter), and the cabin altimeter are grouped in front of the pilot on either the main instrument panel or the pedestal panel directly below the main panel. Individual light shields are installed over each instrument for increased luminosity and clarity of reading. The instruments and their source of power are listed below.

DIRECT CURRENT ELECTRICAL INSTRUMENTS

Oil Pressure Indicator
Oil Temperature
Auxiliary Fuel Transfer Indicator
Gear and Flap Position Indicator
Trim Tab Position Indicator
Angle-of-Attack Indicator

ALTERNATING CURRENT ELECTRICAL INSTRUMENTS

Fuel Quantity Indicator
Fuel Flow Totalizer
Gyro Horizon
G-2 Compass
Hydraulic Pressure Indicator
Hydraulic Pressure Transmitter

SELF-GENERATING ELECTRICAL INSTRUMENTS

Tachometer
Turbine Outlet Temperature

PITOT-STATIC INSTRUMENTS

Airspeed Indicator
Altimeter
Rate-of-Climb Indicator

LOW PRESSURE COMPRESSED AIR SYSTEM

Turn-and-Bank Indicator

DIRECT PRESSURE INSTRUMENTS

Pneumatic Pressure Indicator

SELF-CONTAINED INSTRUMENTS

Accelerometer
Clock

RADIO INDICATORS

Radio Altimeter
Radio Compass

RADAR INDICATOR

AN/APQ-41 Flight Indicator

TURBINE OUTLET TEMPERATURE INDICATOR

The turbine outlet temperature indicator (Figure 1-18) indicates the temperature of the exhaust gas as it leaves the turbine unit. Ten thermocouples are installed in the exhaust collector casing on each engine. Nine of these thermocouples are connected in parallel to a balance box on the engines. The tenth thermocouple furnishes a potential against which the other nine are balanced to obtain an average temperature which is transmitted to the indicator. The leads from both engines are connected to one dual type indicator located on the pedestal panel. The indicator is calibrated in degrees of temperature centigrade times 100 and has a scale range of from 0 to 1000 degrees. Temperature limitations are indicated by markings placed on the instrument glass over the scale for each engine. The system is self-contained and requires no aircraft electrical power.

TACHOMETER INDICATOR

The electric tachometer system is composed of the dual tachometer indicator and a generator mounted on each engine. The system is completely self-contained and requires no electric power. The dual type tachometer indicator is mounted in the main instrument panel, (Figure 1-18). The scale of the indicator is calibrated in percent, scale range 0 to 110, the equivalent rpm for 100 percent engine speed being 12,500. The

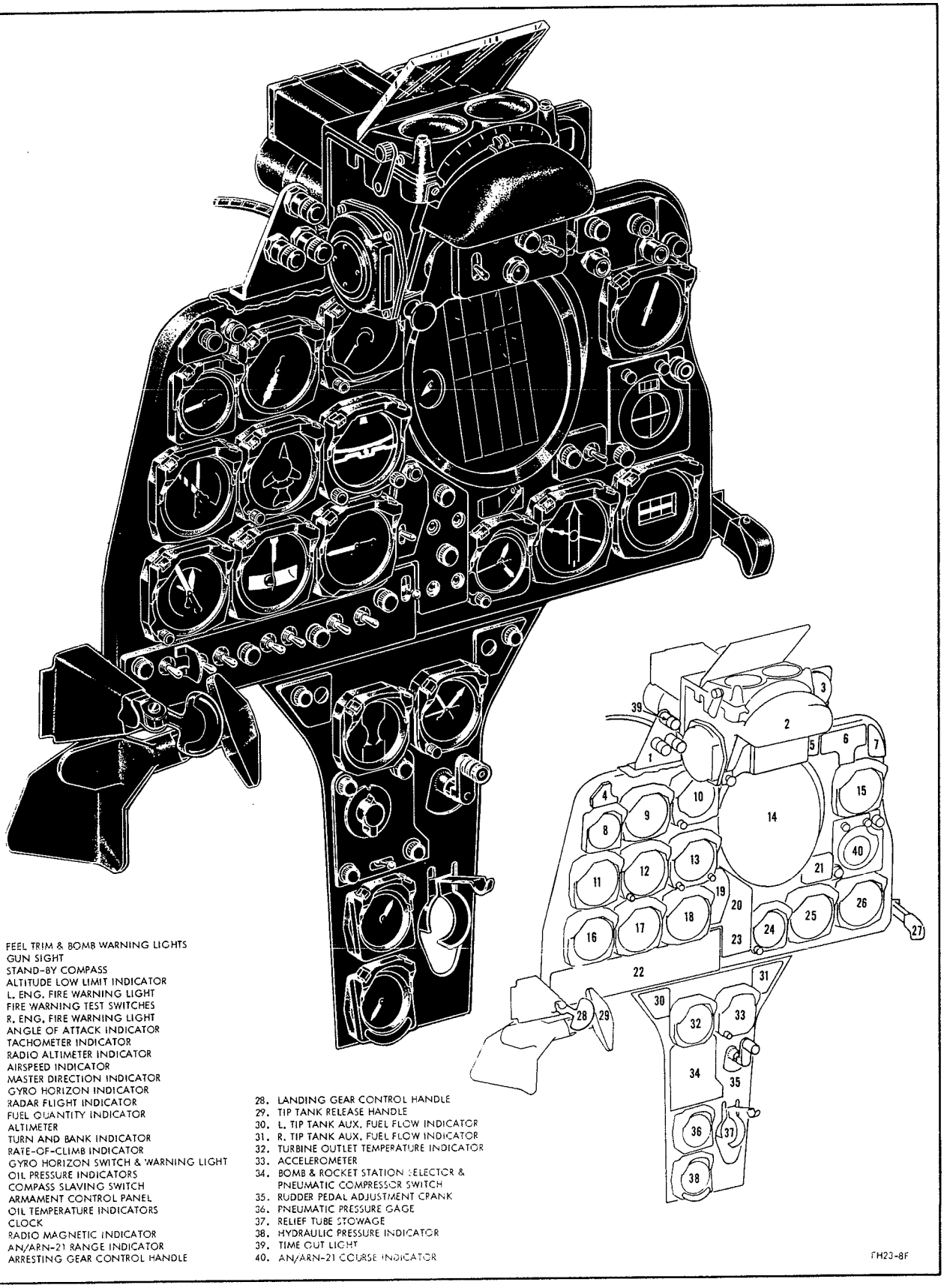


Figure 1-18. Main Instrument and Pedestal Panels

pointers of the indicator are marked to denote the left and right engine. Each pointer operates independently of the other.

OIL PRESSURE INDICATOR

An oil pressure indicator for each engine is located on the main instrument panel (Figure 1-18). The indicator system consists of the indicator and a pressure switch connected into the oil pressure line on the engine. Two conditions of oil pressure and an OFF position are stamped on a circular drum within the indicator. The drum rotates to align the existing condition in the window of the indicator. The normal oil pressure range is indicated by the letters O.K. stamped on a green background. A low or unsafe oil pressure condition appears as a red and white BARBER POLE. The pressure switch determines the pressure under which oil is being forced to the engine and completes circuits energizing the indicator to show the existing pressure of the lubricating oil. The OFF position will appear on the indicator when the aircraft electrical system is not energized. Moving the battery switch to the ON position will cause the BARBER POLE (unsafe) indication to appear on the indicator. Starting the engine and obtaining an oil pressure of 36 psi will cause the indicator to show an O.K. or normal operating oil pressure. If at any time, the oil pressure drops below 30 ± 2 psi, the indicator will show BARBER POLE to indicate an unsafe oil pressure.

Note

The oil pressure indicators will barber pole after 10 seconds of inverted flight, although engines can run inverted for 30 seconds without damage.

OIL TEMPERATURE INDICATOR

An oil temperature indicator for each engine is located on the main instrument panel (Figure 1-18). The indicator system consists of the indicator and a thermoswitch located in the oil outlet line on the engine. Two conditions of oil temperature and an OFF position are stamped on a circular drum within the indicator. The drum rotates to align the existing condition in the window of the indicator. The normal oil temperature range is indicated by the letters O.K. stamped on a green background. A high or unsafe temperature condition appears as a red and white barber pole. The thermoswitch determines the temperature of the oil and completes circuits energizing the indicator to show the existing temperature of the lubricant. The OFF position will appear on the indicator when the aircraft electrical system is not energized. Moving the battery switch to ON will cause the O.K. (normal) indication to appear on the indicator. This normal condition will continue to appear on the indicator until the temperature of the oil exceeds 145 ± 5° C. The thermoswitch will then move to energize the temperature indicator to show the BARBER POLE (unsafe) oil temperature condition.

AIRSPEED INDICATOR

The airspeed indicator is mounted in the main instrument panel. The instrument has two pointers: one pointer, finished in solid yellow, registers 'indicated' airspeed; the other pointer, finished in barber pole strips, indicates the airspeed corresponding to .85 Mach number. The latter pointer will not exceed the maximum permissible airspeed. (Refer to Section V of CO 01-245FBC-1A.) Full range temperature compensation is provided for both pointers. An airspeed correction card is located in a holder attached to the right canopy sill.

AIRSPEED INDICATOR (Effective upon incorporation of ASC 396)

The combination airspeed and Mach indicator shows airspeed readings at low speeds and includes Mach number readings at high speeds. Both readings are provided by a single pointer moving over a fixed airspeed scale, graduated from 0 to 650 knots, and a rotatable Mach number scale, graduated from Mach .5 to Mach 2.2. A movable "bug" is included as a landing speed reference and can be positioned by the knob on the face of the instrument. The same knob can position another "bug" on the Mach number scale, for maximum indicated airspeed reference. The airspeed indicator pointer and the Mach number scale are synchronized so that a proper relationship between the two is assured throughout all altitude changes. Thus, at sea level under standard conditions, the pointer will indicate Mach 1 at approximately 660 knots. Under the same conditions at 50,000 feet, if the same true airspeed is maintained, the pointer will indicate approximately 292 knots and a Mach number of 1.15.

ALTIMETER

A pressure sensitive altimeter is located on the main instrument panel. The altitude scale is graduated in 50 foot units with major divisions from 0 to 10; the pointers, reference markers, and barometric scale rotate and indicate with reference to this scale. The range of the barometric scale is 28.0 and 31.0 inches of mercury with unit graduations of 0.02 inches. If the limit of the barometric scale range is exceeded at either extreme, the barometric pressure may be read from the position of the reference markers by computation. A setting knob is located in the lower left corner of the altimeter for adjusting the barometric scale. A temperature compensator unit minimizes temperature changes in the altimeter and maintains accuracy to within very close limits throughout temperature variations of from -30° to +50° centigrade at any altitude.

RATE-OF-CLIMB INDICATOR

The rate-of-climb indicator is an extremely sensitive instrument which will indicate a rate of gain or loss in altitude too small to cause a noticeable change in the altimeter reading. The rate-of-climb indicator is connected to the static pressure system of the aircraft and measures the change in atmospheric pres-

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sure as the aircraft climbs or dives. The pointer of the instrument indicates this change in pressure in terms of 'feet per minute' operating over a scale range of from 0 to 6000 fpm. The rate-of-climb indicator is mounted in the main instrument panel.

TURN-AND-BANK INDICATOR

The turn-and-bank indicator is conventional in design and operation, with the exception that the rotor of the turn indicator is driven by air pressure supplied by the low pressure pneumatic system. A pressure control valve is installed in the pneumatic system to reduce and regulate the pressure delivered to the turn-and-bank indicator. This valve is calibrated to maintain an outlet pressure to within a range of 1.8 to 2.2 inches of mercury as specified for the instrument. Excessive air is exhausted into the cockpit.

CLOCK

A standard aircraft clock is installed in the main instrument panel of the F2H-3. The clock contains a conventional eight day movement and twelve hour scale. A winding and setting knob is located on the front of the instrument. Setting of the minute and hour hand is accomplished by pulling out and holding the setting knob against the tension of the spring while turning one way or the other as required.

ACCELEROMETER

The accelerometer is a self-contained instrument used to check the forces imposed on the aircraft structure during maneuvers. Three indicating pointers respond to the accelerations of the aircraft. The main pointer indicates both positive and negative G's while the maximum indicating hand will remain at the highest plus G reached during any particular maneuver. The minimum indicating hand will stay at the most advanced minus G indication. These two pointers hold their maximum position until reset by the knob located in the lower left corner of the instrument. The accelerometer is mounted in the pedestal panel.

ATTITUDE INDICATOR (Effective upon incorporation of ASC 294)

The attitude indicator, Type J-8, shows the attitude of the aircraft in relation to the earth's horizontal plane during any aircraft maneuver throughout 360 degrees. The position of the sphere, which is visible to the pilot during level flight and in dives and climbs up to 27 degrees, is unmarked. Relative motion of the aircraft is indicated on the face of the instrument by movement of the horizontal bar with respect to the miniature airplane in the center of the dial. Angular displacement of the horizontal bar with respect to the miniature airplane indicates the degree of roll. The actual amount of roll is indicated by the position of the bank index relative to the 10, 20, 30, 60 and 90-degree roll markings on the bezel mask. When the aircraft exceeds 27 degrees of dive, the horizontal bar is held in its extreme (27 degree) position. At this point, the word DIVE on the upper portion of the sphere becomes visible. As the angle of dive increases, graduations become visible toward the pole of the sphere which indicates the angle of dive as they coincide with the trim indicator on the dial. These graduations are placed at the 70, 75, and 80 degree intervals; the 85 degree dive indication is reached when the trim indicator coincides with the edge of the bullseye. When the aircraft exceeds 27 degrees of climb, the horizontal bar is held in its extreme (27 degree) downward position and any increase in climb is indicated on the sphere. The lower portion of the sphere is marked similarly to the upper with the word CLIMB substituted for DIVE. After a loop or during a turn, displacement of the horizontal bar in excess of five degrees in pitch and/or bank may result. The J-8 indicator will immediately begin to correct these errors once true gravitational forces are sensed. This characteristic error is commonly called 'sluggishness' or 'lag' by pilots. In successive loops, the above described error may become increasingly greater and may cause the horizon bar to reach the limit of its movement. This is normal in successive loops and is not indicative of a defective instrument. The J-8 attitude indicator may be caged manually by means of a gyro centering device operated by pulling the cage knob. To cage the gyro, the PULL TO CAGE knob is drawn smoothly away from the face of the instrument. A momentary stop will be felt when the bank caging mechanism is engaged; as the cage knob is pulled further out, the pitch caging mechanism is engaged. As soon as the caging knob reaches the limit of its travel, it should be released quickly.

CAUTION

A violent or hard pull on the caging knob when caging the attitude indicator may damage the instrument. Remember that the indicator cages to the attitude of the aircraft and not to the true vertical. Therefore, the instrument should never be caged to correct in-flight errors unless the aircraft is in straight and level flight by visual reference to a true horizon.

GYRO HORIZON INDICATOR (Effective prior to incorporation of ASC 294)

The gyro horizon indicator is an electrically driven flight indicator with a fast erecting element designed within the instrument. The gyro horizon is non-tumbling and has no caging knob; it provides unlimited indications in bank. Rolls may be made through 360°. Pitch indications are limited to ± 27°, but the gyro will not tumble, even during a complete loop. The gyro rotor will erect to within 3 degrees in roll and pitch in 25 to 40 seconds. When the gyro is functioning properly, a warning flag is observed through a hole in the face of the indicator.

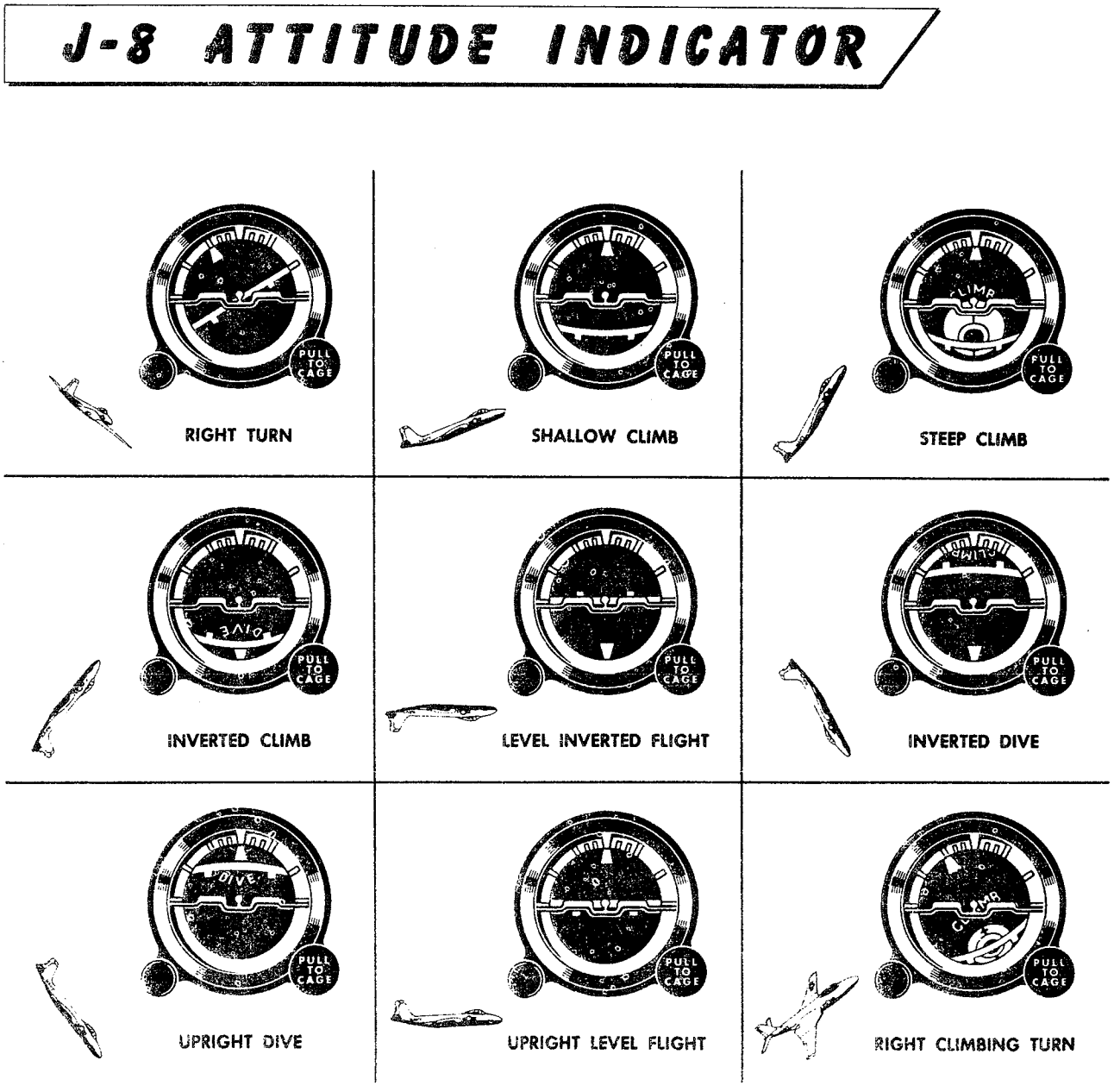
Note

Failure of the warning flag to oscillate is an indication that some part of the system is malfunctioning.

To prevent the quick erection electromagnet on the indicator from remaining energized continuously as a result of a malfunction in the system, a warning light and switch (normally closed) is installed on the main instrument panel just below the gyro horizon instrument. The warning light will remain on as long as the erection coil is in operation (sufficient time to bring the gyro rotor up to operating speed). The instant operating speed is attained, the warning light will go off.

CAUTION

If the warning light remains on longer than ONE MINUTE, turn switch OFF, otherwise serious damage to the instrument may occur.



EFFECTIVE UPON INCORPORATION OF ASC 294

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Figure 1-19.

G-2 COMPASS SYSTEM

The G-2 compass is a compass slaved directional gyro system consisting of a master direction indicator (MDI), an amplifier, and a remote transmitter. These components operate together to secure the advantages of both the compass type and gyro type of direction indicator. The long-period accuracy of the average compass heading is retained and also the short-time accuracy of the gyro, while the short-period oscillation of the compass and the long-time drift error of the gyro are eliminated. The G-2 compass system indicates any heading of the aircraft through the entire 360 degrees of azimuth. System operation is not affected by maneuvers which the aircraft may be expected to perform. The magnetic heading of the aircraft is detected by the transmitter. Direction signals are transmitted through the amplifier to a torque motor in the indicator. The torque motor precesses the gyro element in the indicator until agreement between the master direction indicator and the compass transmitter occurs. 'THE SLAVING RATE OF THE GYRO ELEMENT IS APPROXIMATELY FOUR DEGREES PER MINUTE WITH A RESULT THAT IT DOES NOT FOLLOW EVERY MOVEMENT OF THE COMPASS TRANSMITTER, BUT GIVES A STABILIZED AVERAGE INDICATION OF THE COURSE OF THE AIRCRAFT.' Located in the dial center of the master direction indicator is the correspondence indicator which is directly connected to the remote transmitter. The corresponding indicator is always in agreement with the compass transmitter and provides an unstable indication of the course of the aircraft. A slaving switch is incorporated to disconnect the gyro element from the compass system. This switch is located on the main instrument panel just below and to the right of the flight indicator scope. With the slaving switch in the FREE position, the gyro operates as a free directional indicator subject to drift, but has the advantage of giving the heading of the aircraft in magnetically unreliable regions, such as near the north and south magnetic poles and on the decks of aircraft carriers.

Note

On F2H-3 Airplanes 126291 thru 126470 and F2H-4 Airplanes 126351 thru 126353 and 127547 thru 127626 prior to incorporation of ASC 242, G-2 compass slaving action stops upon failure of the a-c generator or auto pilot amplifier. On later aircraft and aircraft incorporating ASC 242, the slaving action will continue as long as either the a-c generator or stand-by inverter is functioning. ASC 242 also provides for the replacement of the master direction indicator with an improved model used in later aircraft. The improved MDI incorporates a microswitch that prevents transmission of any compass signal to the auto pilot while the MDI is being caged and reset.

PROCEDURE FOR SETTING THE MASTER DIRECTION INDICATOR

An accurate indication cannot be taken until the gyro has reached its full speed.

Note

At moderate temperatures, it takes three minutes for the gyro in the master direction indicator to reach full speed. At very low temperatures, it may take up to 15 minutes to reach operating speed.

To properly set up the compass for operation before flight, the following steps are essential to correctly align the master direction indicator with the compass transmitter:

1. Turn the power supply on. Allow at least 3 minutes for the gyro to come up to speed.
2. Depress the reset knob located at the lower left on the instrument case. Turn the master direction indicator to the heading indicated by the correspondence indicator.
3. Keep setting knob fully depressed at the new heading for at least two seconds.
4. Release the setting knob straight out, avoiding any twisting motion.

STAND-BY COMPASS

The stand-by compass is mounted above the main instrument panel and to the right of the sight unit. This is an emergency compass to be used in the event the remote indicating compass fails. The stand-by compass is a short-period magnetic compass indicating continuously the heading of the aircraft with reference to the earth's magnetic field. A correction card for the stand-by compass is located in a card holder attached to the right canopy sill.

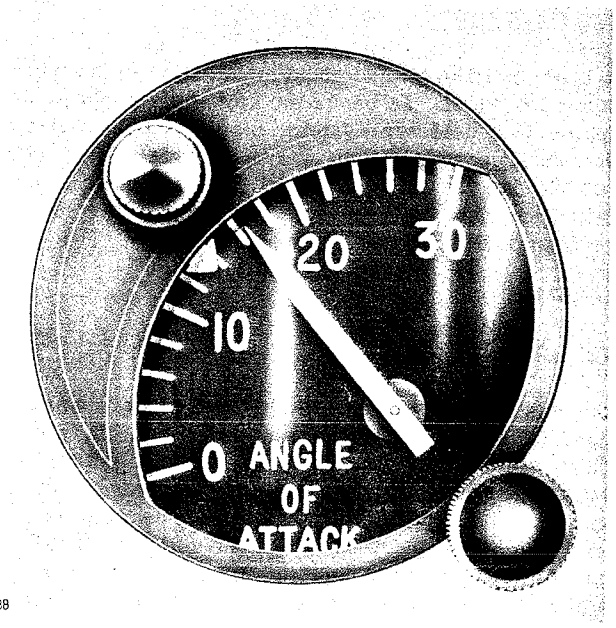

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Figure 1-20. Angle-of-Attack Indicator

ANGLE-OF-ATTACK INDICATOR

The angle-of-attack indicator system is a highly sensitive system which provides the pilot with a continuous visual indication of the angle of attack of his aircraft. The system components include the air stream direction detector, the relay unit, and the indicator. The air stream direction detector is located on the right side of the aircraft just forward of the cockpit. A portion of this unit, called the probe, extends through the skin and is exposed to the air stream. The probe contains two slots which are vented to the inside of the detector unit. A change in angle of attack will cause a differential pressure through the probe slots, moving a mechanism in the detector unit. This movement is transmitted as an electric signal, through the relay unit, to the indicator which converts the signal to a visual indication in degrees of angle of attack. The indicator scale range is from 0 to 30 degrees to correspond with the 30 degree travel of the probe mechanism. The knurled knob on the indicator adjusts the movable BUG to a desired angle of attack. The BUG should be set, prior to landing, at the optimum approach angle of attack.

INSTRUMENT CIRCUIT PROTECTORS ACCESSIBLE DURING FLIGHT

CIRCUIT	SIZE	LOCATION
Fuel Quantity	5 AMP Cir. Brkr.	L.H. Cir. Brkr. Panel
Aux-Fuel Transfer	5 AMP Cir. Brkr.	L.H. Cir. Brkr. Panel (with fuel warning light)
Trim Tab Position Indicator	5 AMP Cir. Brkr.	L.H. Cir. Brkr. Panel (marked flight instr.)
Angle-of-Attack Indicator	5 AMP Cir. Brkr.	R.H. Cir. Brkr. Panel

ENGINE FIRE DETECTOR SYSTEM

WARNING LIGHTS

Two light assemblies are mounted on the upper right corner of the main instrument panel. One light is for the right engine section circuit, the other for the left engine section circuit. In case of fire, either the right or left light will glow red as a warning, indicating a fire in one of the engine sections. The lights are operated by the 28 volt d-c system and are actuated by rate of temperature increase on one or more of the fire detector thermocouples in each of the engine sections.

TEST SWITCH

A push button test switch is mounted on the main instrument panel. To check the continuity of the entire engine fire detector system, place the test switch in the TEST position; both warning lights should glow red. If one or the other light fails to glow, it is an indication that its respective circuit for the left or right engine is not functioning properly.

CANOPY

GENERAL

The canopy consists of an ultraviolet ray absorbing plastic bubble over the cockpit zone which is normally moved fore and aft by a rack and pinion type mechanism that employs an electric motor, a geared track and a gearbox. An air motor is also incorporated on the gearbox to aid the electric motor to open or jettison the canopy in an emergency. The air motor does not close the canopy. An internal and external switch is used to normally open and close the canopy. An internal and external release handle is provided to open the canopy in an emergency. Because of the meshing characteristics of the gears within the canopy gearbox, it is not necessary to lock the canopy in the open or closed positions. Upward movement of the ejection seat leg braces jettisons the canopy. A strip of aluminum is secured to the outer side of the canopy, down the center fore and aft, to provide lightning protection for the pilot. The sense antenna for the radio compass is fastened to the inner aft side of the canopy glass. The canopy electrical circuit is designed so the secondary bus supplies the source of canopy power when the secondary bus is energized. However, the battery bus automatically supplies the power when the secondary bus becomes de-energized. This enables the canopy to be opened or closed by the external switch when the main power switch is in the OFF position. Canopy secondary bus power is through a circuit breaker on the right circuit breaker panel. Also, the canopy battery bus power is through a circuit breaker on the left panel. Air is stored in a bottle for the canopy air motor. This is an insurance that air pressure will always be available to open or jettison the canopy in an emergency. A pressure gage for the canopy air bottle is attached to the radio compass loop antenna bracket just aft of the pilot's seat.

INTERNAL CANOPY SWITCH

Normal opening and closing of the canopy from within the cockpit is performed by actuating the canopy switch located just beneath the left cockpit sill. This operation uses only the electric motor as the actuator. Limit switches are actuated at the full CLOSE and full OPEN positions of the canopy to cut off power to the motor. The canopy switch is spring-loaded to the OFF

position. Releasing the switch when opening and closing the canopy allows the canopy to be stopped at an intermediate position. The pilot should keep his head and shoulders clear of the rear view mirrors when the canopy moves fore and aft. These mirrors are secured to the canopy arch and move with the canopy.

WARNING

Under no condition shall personnel outside the cockpit reach into the cockpit and actuate the internal canopy switch. Use this switch only when sitting in the pilot's seat; otherwise, a serious injury may result.

EXTERNAL CANOPY SWITCH

The external canopy switch is located inside the first step on the left side of the airplane. The canopy can be opened and closed by personnel standing on the ground with this switch. The internal and external canopy switches are of the same type and both perform exactly the same operation.

INTERNAL EMERGENCY RELEASE HANDLE

Pulling this handle aft during an emergency will cause both the air motor and electric motor to open the canopy. (This operation does not jettison the canopy.) The handle is painted red and is located just below the left cockpit sill. Returning the handle to the forward position DOES NOT CLOSE THE CANOPY, therefore, the canopy can be closed only by the canopy switch after the internal emergency release handle is returned to the forward position. To return this handle to the forward position, the pilot must push forward on the handle with the left hand while using the thumb and forefinger of the right hand to pull inboard on the ratchet release levers located at the axis point of the handle. PREFLIGHT INSPECTION BY THE PILOT MUST NOTE IF THE INTERNAL EMERGENCY RELEASE HANDLE FOR THE CANOPY IS IN THE FULL FORWARD POSITION. It must be in this position at all times except during an emergency.

EXTERNAL EMERGENCY RELEASE HANDLE

The external canopy emergency release handle performs exactly the same operation as the internal emergency release handle. The external handle provides a means of emergency opening of the canopy from the outside. The external handle is located just beneath the cockpit sill on the left side of the airplane. In its normal position, this handle lays flush with the fuselage skin. Pushing the button just aft of the handle will raise the handle enough to get a handhold. The canopy emergency controls must be returned to their normal position by the internal handle because the external handle does not perform this operation. Also, returning either handle does not close the canopy.

CAUTION

Use the internal and external canopy emergency release handles only during a real emergency. Pulling either handle aft supplies current to the electric motor which BY-PASSES the canopy open limit switch. The load imposed on the gearbox by both the air motor and electric motor when the canopy reaches the open position will damage the gearbox and electric motor. DO NOT OPERATE THE CANOPY AT ANY TIME BY THE EMERGENCY HANDLES FOR CHECKING PURPOSES.

CAUTION

If for any reason, either canopy emergency handle is operated, return the internal canopy emergency handle to its forward normal position, only when the canopy motors are completely stopped. Returning this handle forward while the gearbox is turning will strip the gearbox locking gear.

Note

If canopy air pressure and electrical power is not available and the canopy fails to open by normal or emergency controls, the canopy can be pulled or pushed open by hand from within the cockpit. Also in this same situation personnel outside the cockpit may manually push or pull the canopy open. Either canopy emergency control handle must be pulled first to permit canopy to be manually opened. The canopy cannot be closed manually.

CANOPY JETTISON

Upward movement of the ejection seat leg braces jettisons the canopy. See description of ejection seat leg braces in this section and also bail-out procedure in Section III.

CAUTION

Before each flight, the pilot must visually note if the canopy stop stripper cam is rotated aft and down. The stripper cam is located just forward of the canopy gearbox and below the canopy track. Also, the internal canopy emergency release handle must be in the full forward position. Make certain the ejection seat leg braces are full down and safety wired on left side only with a single strand of copper wire according to ASC 94A. Visually check if the canopy stop is installed on forward end of canopy track. It is possible to lose the canopy in flight if these items are not positioned as described.

CANOPY PRESSURE GAGE

A pressure gage for indicating the pressure in the canopy air bottle is attached to the radio compass loop antenna bracket just aft of the pilot's seat. Before a flight, the pilot should note that the gage reads at least 1000 psi and not more than 1800 psi. The gage cannot be seen during flight.

PILOT'S EJECTION SEAT

GENERAL

The pilot's seat is designed so that the pilot and seat may be catapulted from the airplane during an emergency. The seat catapult uses a powder charge which provides sufficient force to insure clearance of the airplane tail structure. The seat bucket, the seat frame and the track assembly make up the three basic units of the seat assembly. Only the track assembly remains in the cockpit after the seat is ejected. The seat uses a standard Navy quick-fit seat type parachute, type BP-1 back pad, type SP-1 seat pan and a PK-2 pararaft kit. The seat headrest may be moved fore or aft (ground adjustment) as desired by the pilot. Leg braces are incorporated on the seat for jettisoning the canopy and a face curtain for firing the seat catapult. Foot stirrups are provided to hold the pilot's feet in place to clear the instrument panel during ejection. The seat is equipped with a conventional lap belt and an inertia reel type shoulder harness. The pilot's trunk line is clamped to the left side of the seat and automatically breaks at the console during ejection. However, the pilot must disconnect his oxygen mask line and headset plug from the trunk line before separation from the seat. (Refer to bail-out procedure in section III.) The anti-G suit line is automatically disconnected during ejection.

SEAT POSITIONING SWITCH

The seat bucket may be raised or lowered 6 inches vertically by actuating the switch provided on the right side of the seat. The pilot may adjust the seat height as desired during flight. It is NOT necessary to adjust the seat height to any certain position before ejection.

SEAT INERTIA REEL

The pilot's shoulder harness is connected by a cable to an electromagnetic inertia reel secured to the seat. The reel is electrically released when the secondary bus is energized which permits the reel cable to unwind and rewind as the pilot leans fore and aft. If the airplane encounters an impact force in any longitudinal direction, an inertia switch mounted on the seat will instantaneously cut off power to the reel. With power off the reel, it is locked and the cable can not unwind. This prevents the pilot from being thrown into the instrument panel. Also, upon ejection of the seat, the reel will be locked because the plug supplying power to the reel will be automatically disconnected at the instant the seat starts up the guide rails.

INERTIA REEL MANUAL CONTROL HANDLE

As an added safety feature, a manual control handle for the inertia reel is furnished on the left side of the seat bucket. The inertia reel is LOCKED with handle forward and RELEASED with handle aft. Refer to various emergency procedures in Section III which requires the pilot to preset this handle to the reel LOCKED position. AN ELECTRICAL POWER FAILURE TO THE INERTIA REEL WILL ALLOW REEL TO BE LOCKED WHEN THE MANUAL CONTROL HANDLE IS FORWARD OR AFT. Therefore, in this situation, the pilot must hold the handle at the CENTER position when it is necessary to lean forward.

LEG BRACES

Leg braces are located on each side of the pilot's seat. Upward movement of the leg braces jettisons the canopy and locks the pilot's shoulder harness inertia reel. The leg braces are designed so as to form braces for the legs to prevent spreading of the legs due to wind blast during ejection.

EJECTION SEAT

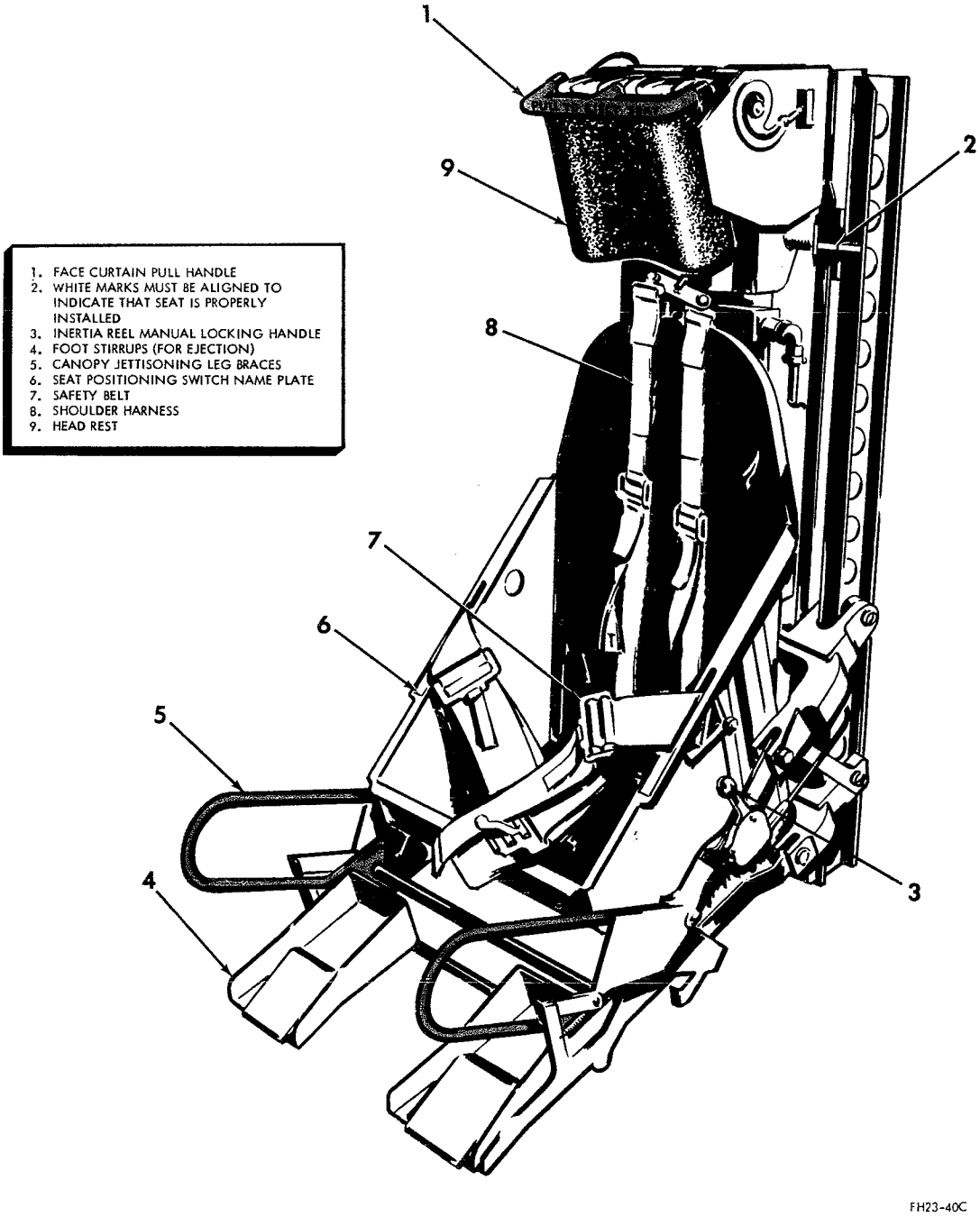


Figure 1-21.

FACE CURTAIN PULL HANDLE

The pull handle for the face curtain is located just above the seat headrest. Pulling the face curtain over the pilot's face fires the seat and pilot from the airplane. The first few inches of face curtain travel arms the catapult firing mechanism while the last three inches of travel actuates it. The primary purpose of the rubber impregnated nylon face curtain is to assure correct body positioning during ejection; it also serves to prevent the pilot's oxygen mask and helmet from being blown off. The face curtain is folded in such a manner so as to cup around the pilot's face when pulled down. The face curtain will rewind onto the roller assembly when released after ejection.

WARNING

If upward movement of the seat leg braces fails to jettison canopy, do not attempt ejection through canopy unless it remained completely CLOSED. At a partially open or full open position, the canopy frame will cause severe personal injury. The canopy CANNOT be re-closed if leg braces are up. Climbing over side is the only means of escape in this situation.

AUTOMATIC-OPENING SAFETY BELT

An automatic opening safety belt assembly (MS 16036), bolted to the ejection seat, permits automatic separation of the pilot from the seat after the seat clears the aircraft during ejection. A two-piece adjustable belt and a belt actuator comprise the belt assembly. A manually operated buckle is incorporated on the free end of the left belt half, and a cable locked automatic buckle is incorporated on the free end of the right belt half. For normal use, the belt is manually fastened and unfastened by a left and right movement of the manual latch on the left belt. The belts are locked by a link, with the right end of the link normally retained at all times in the automatic latch. The left end of the link locks or unlocks into the manual latch. Shoulder harness loops are positioned over the link before the belt is locked. If the automatic parachute is being used, the parachute lanyard anchor (ring shaped) is inserted over the link after the shoulder harness loops.

Note

The MS 16036 belt assembly was designed as a "one-shot" installation. In the event of inadvertent actuation of the firing mechanism with cartridge installed, the actuating assembly will distort due to powder pressure. Once the firing mechanism has been actuated, the MS 16036 belt assembly cannot be reused and must be replaced with a new assembly.

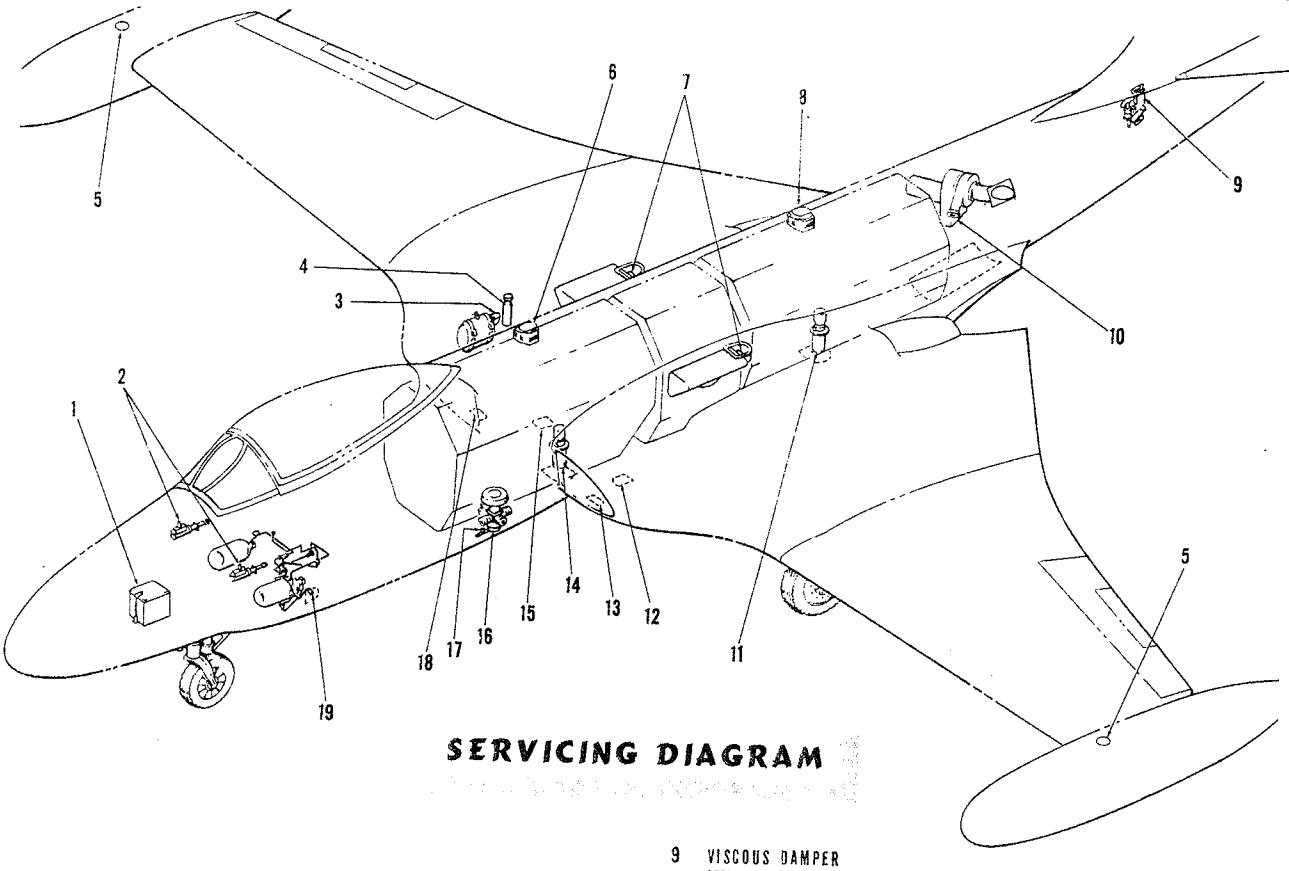
AUTOMATIC OPENING SAFETY BELT OPERATION

During seat ejection, the upward movement of the seat causes the firing pin to release and strike a powder cartridge primer. Expanding gases from cartridge discharge forces a small piston to move upward. The piston pulls the cable assembly leading to the automatic release lock and unlocks the belt. Tension on the belt will then cause it to separate easily. The shoulder harness will release with belt separation. The parachute lanyard anchor is retained by the seat belt as the pilot leaves the seat. The resulting pull on the lanyard will deploy the parachute.

AUXILIARY EQUIPMENT

The auxiliary equipment listed below is discussed in Section IV.

Cabin, pressurization and air conditioning system
Light equipment
Communication equipment
Oxygen system
Armament equipment
Tow Target equipment
Anti-G provisions
Data case
Check lists
Mooring provisions
Pilot's relief tube
Covers



SERVICING DIAGRAM

1 BATTERY
SERVICE PER MAINTENANCE INSTRUCTION HANDBOOK.

2 BRAKE MASTER CYLINDER
SERVICE THROUGH ACCESS DOORS 64L/R WITH HYDRAULIC FLUID MIL-O-5606, CHECK DAILY.

3 HYDRAULIC RESERVOIR
SERVICE THROUGH ACCESS DOOR 44 WITH HYDRAULIC FLUID SPECIFICATION MIL-O-5606. FILLER CAPACITY 2 U.S. GALLONS. CHECK FLUID LEVEL DAILY.

4 HYDRAULIC ACCUMULATOR
CHARGE WITH AIR TO 600 ± 50 PSI THROUGH ACCESS DOOR 44 WITH HYDRAULIC PRESSURE AT ZERO. CHECK DAILY.

5 WING TIP TANKS
SERVICE WITH FUEL SPECIFICATION MIL-F-5572 LOWEST GRADE AVAILABLE OR MIL-F-5624 (GRADE JP-3) CAPACITY 170 U.S. GALLONS.

WARNING
DO NOT USE GRADE JP-4 FUEL

CAUTION
ALWAYS SERVICE TIP TANKS TO FULL CAPACITY TO PREVENT UNDERSIRABLE TRIM CONDITION.

NOTE
ALL FUEL FILLER OPENINGS ARE PROVIDED WITH NOZZLE GROUNDING RECEPTACLES.

6 FORWARD FUSELAGE TANK
SERVICE THROUGH DOOR 51 WITH FUEL SPECIFICATION MIL-F-5572 LOWEST GRADE AVAILABLE OR MIL-F-5624 (GRADE JP-3) CAPACITY 508 U.S. GALLONS.

7 ENGINE OIL TANK LEFT AND RIGHT
SERVICE THROUGH DOOR 48L/R WITH MIL-O-6081 GRADE 1010. CAPACITY 3.25 U.S. GALLONS EACH. CHECK DAILY.

8 CENTER AND AFT FUSELAGE TANKS
SERVICE THROUGH DOOR 40 WITH FUEL SPECIFICATION MIL-F-5572 LOWEST GRADE AVAILABLE OR MIL-F-5624 (GRADE JP-3) CAPACITY CENTER TANK 185 U.S. GALLONS, AFT TANK 409 U.S. GALLONS.

9 VISCOUS DAMPER
SERVICE THROUGH ACCESS DOOR 125 WITH HYDRAULIC FLUID SPECIFICATION MIL-O-5606. CHECK FLUID DAILY THROUGH ACCESS DOOR 70.

10 AIR TURBINE
SERVICE THROUGH ACCESS DOOR 30 WITH MIL-L-7808 CAPACITY 950CC (1 QT.). CHECK OIL LEVEL AT PREFLIGHT.

11 AFT PRESSURE FUELING UNIT
CENTER AND AFT FUEL TANKS SERVICED THROUGH ACCESS DOOR 29 WITH FUEL SPECIFICATION MIL-F-5572 LOWEST GRADE AVAILABLE OR MIL-F-5624 (GRADE JP-3). CAPACITY CENTER TANK 185 U.S. GALLONS, AFT TANK 409 U.S. GALLONS.

12 LEFT EXTERNAL STARTING POWER RECEPTACLE
POWER RECEPTACLE ACCESSIBLE THROUGH DOOR 10L.

13 EXTERNAL POWER RECEPTACLE GROUND CHECK
DOOR NO. 35L FOR ACCESS TO A-C AND D-C POWER RECEPTACLES. CLOSE DOOR BEFORE STARTING ENGINES.

14 FORWARD PRESSURE FUELING UNIT
FORWARD FUEL TANK SERVICED THROUGH ACCESS DOOR 34 WITH FUEL SPECIFICATION MIL-F-5572 LOWEST GRADE AVAILABLE OR MIL-F-5624 (GRADE JP-3) CAPACITY 508 U.S. GALLONS.

15 RIGHT EXTERNAL STARTING POWER RECEPTACLE
POWER RECEPTACLE ACCESSIBLE THROUGH DOOR 10R.

16 AIR COMPRESSOR
SERVICE THROUGH ACCESS DOOR 63L WITH MIL-O-6085 OIL. CHECK OIL LEVEL DAILY.

17 PNEUMATIC SYSTEM EXTERNAL CHARGE VALVE
CHARGE SYSTEM TO 1500 PSI THROUGH DOOR 63L. CHECK PRESSURE AT PREFLIGHT.

WARNING
DO NOT USE OXYGEN TO CHARGE PNEUMATIC SYSTEM.

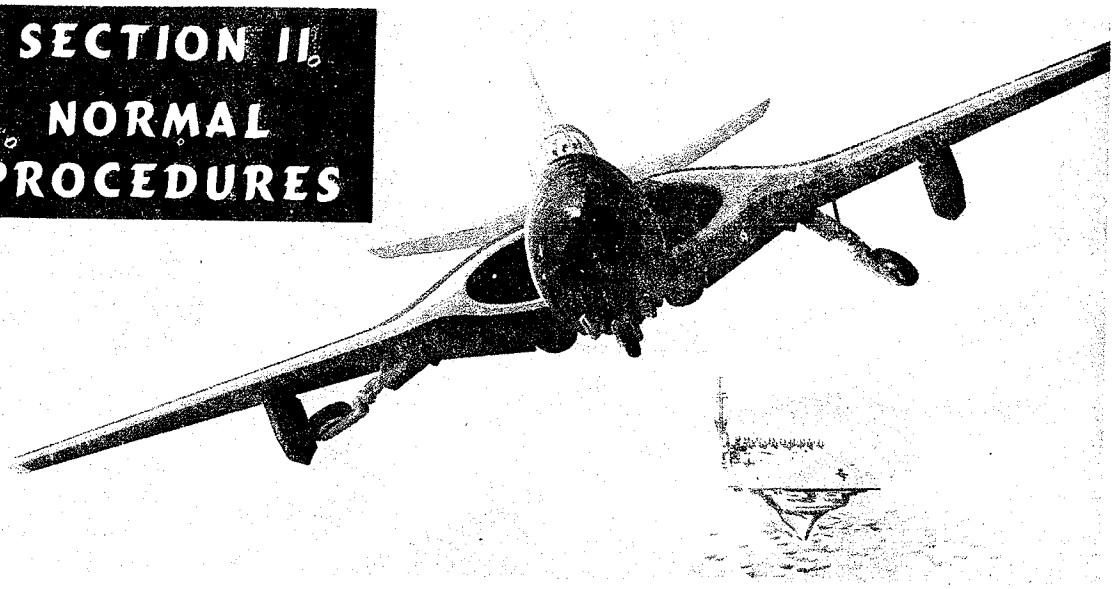
18 EXTERNAL HYDRAULIC CONNECTIONS GROUND CHECK
EXTERNAL HYDRAULIC CONNECTIONS ACCESSIBLE THROUGH DOOR 35R. CLOSE DOOR BEFORE STARTING ENGINES.

19 OXYGEN SUPPLY
CHARGE TO 1800 PSI (1028 CU. IN.) THROUGH ACCESS DOOR 69. CHECK AT PREFLIGHT.

SC

Figure 1-22.

SECTION II
NORMAL PROCEDURES



AIRCRAFT STATUS

Check yellow sheet to determine flight status of airplane before beginning preflight inspection.

FLIGHT RESTRICTIONS

Refer to Section V in CO 01-245FBC-1A for information on flight operating restrictions and limitations pertaining to the various airplane configurations and loading schedules.

WEIGHT AND BALANCE

Check the take-off weight and balance and the estimated landing weight and balance scale. Refer to the Handbook of Weight and Balance Data, AN 01-1B-40, for complete loading information. In addition ascertain that fuel quantity, oil, armament loading, oxygen supply, and special equipment is adequate for the particular mission contemplated.

WARNING

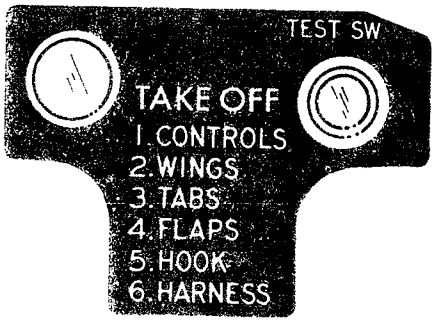
Check type fuel for density and gross weight effect on aircraft.

CRUISE CONTROL

Operating data required for preflight and in-flight planning may be found in Appendix in CO 01-245FBC-1A.

CHECK LISTS

The check lists in Figure 2-1 are reproductions of the take-off and landing check lists located on the main instrument panel. Since these lists indicate only major items and in general terms, the pilot must be thoroughly familiar with the procedures outlined in this handbook so as to know how all items should be checked.



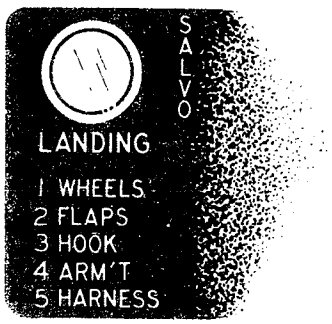
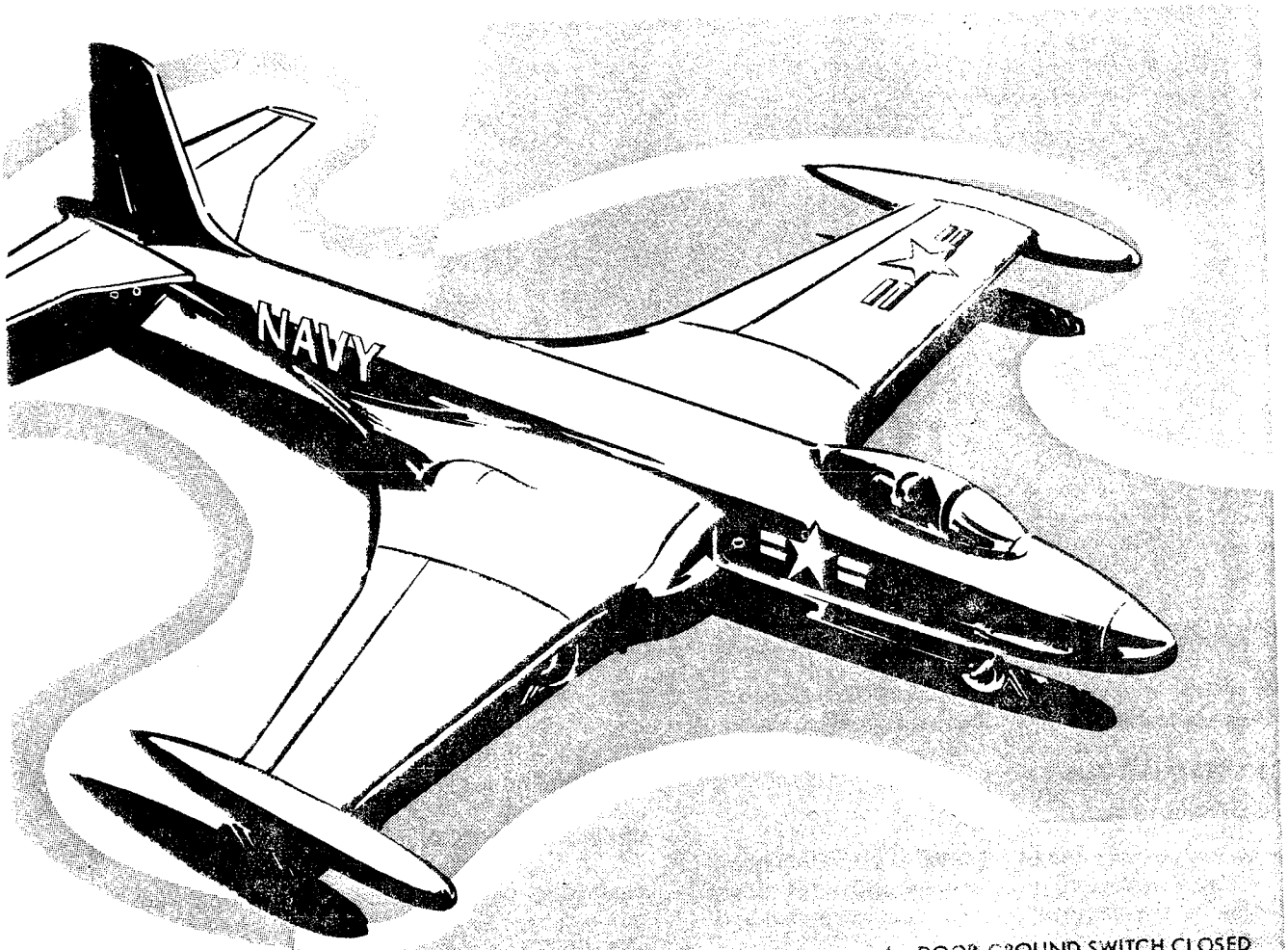


Figure 2-1.



NOSE WHEEL WELL

1. STRUT EXTENSION (2.57 ± .25).
2. TIRE INFLATION (150 PSI). GREASE, OIL.
3. DOWN LOCK PIN REMOVED.
4. DOORS SECURE.
5. SHIMMY DAMPER FLUID LEVEL.
6. ACCESS DOORS SECURE.

FUSELAGE-STB'D FWD

1. REMOVE ANGLE OF ATTACK PROBE COVER.
2. REMOVE PITOT TUBE COVER.
3. AMMUNITION DOORS SECURE.

CENTER WING-STB'D FWD

1. REMOVE AIR INLET DUCT GUARD AND PLUG.
2. AIR INLET DUCT FOR LOOSE OBJECTS.
3. INSPECT FOR HYDRAULIC LEAKS.

WHEEL WELL STB'D

1. STRUT EXTENSION (2.35 INCHES).
2. TIRE INFLATION (170 PSI LAND - 245 PSI CARRIER), SLIPPAGE, GREASE, OIL.
3. GROUND STATIC WIRE FOR PROPER CONTACT.
4. DOOR GROUND SWITCH CLOSED POSITION.
5. DOORS SECURE.
6. CHOCK IN PLACE.

STB'D WING-LEADING EDGE, TIP

1. REMOVE JURY STRUTS (IF WINGS ARE FOLDED).
2. STALL WARNING TRANSMITTER.
3. WING SURFACE.
4. TIP TANK AND FUEL CAP SECURE.
5. POSITION LIGHT.
6. ACCESS DOOR SECURE.

STB'D WING-TRAILING EDGE

1. FORMATION LIGHT - LOWER WING SURFACE.
2. REMOVE CONTROL LOCKS.
3. AILERON CONTROL AND FLAP.
4. TRIM TABS.
5. CHECK FOR EXCESSIVE HYDRAULIC FLUID ON LOWER WING SURFACE.

CENTER WING -

1. REMOVE ENGINE EXHAUST COVERS.
2. EXHAUST FOR GAS, OIL AND LOOSE OBJECTS.

Figure 2-2. (Sheet 1 of 3 Sheets)

FUSELAGE-STB'D AFT

1. REMOVE A-C GENERATOR PLUG.
2. FOR EXCESSIVE HYDRAULIC FLUID -LOWER SURFACE.

TAIL SECTION

1. REMOVE ELEVATOR AND RUDDER LOCKS.
2. ELEVATOR AND RUDDER CONTROLS.
3. ELEVATOR AND RUDDER TRIM TABS.
4. POSITION LIGHT.
5. CHECK FUEL VENT MAST.
6. FEEL SYSTEM RAM AIR INLET CLEAR. (THIS FEATURE MAY BE REMOVED, PENDING COMPLETION OF FLIGHT TESTS.)

FUSELAGE-PORT AFT

1. REMOVE TURBINE EXHAUST COVER.

CENTER WING -PORT AFT

1. REMOVE ENGINE EXHAUST COVER.
2. EXHAUST FOR GAS, OIL AND LOOSE OBJECTS.

PORT WING-TRAILING EDGE

1. REMOVE AILERON CONTROL LOCKS.
2. AILERON CONTROL AND FLAPS.
3. AILERON TRIM TABS.
4. FORMATION LIGHT - LOWER WING SURFACE.
5. CHECK FOR EXCESSIVE HYDRAULIC FLUID ON LOWER WING SURFACE.

PORT WING TIP,LEADING EDGE

1. TIP TANKS AND FUEL CAP SECURE.
2. POSITION LIGHT.
3. ACCESS DOORS SECURE.
4. WING SURFACE.
5. REMOVE JURY STRUTS (IF WINGS ARE FOLDED).

WHEEL WELL-PORT

1. STRUT EXTENSION (2.35 INCHES).
2. TIRE INFLATION (170 PSI LAND - 245 PSI CARRIER), SLIPPAGE, GREASE, OIL.
3. DOOR GROUND SWITCH CLOSED POSITION.
4. DOORS SECURE.
5. CHOCK IN PLACE.

CENTER WING-PORT FWD

1. REMOVE AIR INLET DUCT GUARD AND PLUG.
2. AIR INLET DUCT FOR LOOSE OBJECTS.

FUSELAGE-PORT FWD

1. REMOVE REFRIGERATION COOLING INLET COVER.
2. PNEUMATIC PRESSURE GAGE (1500 PSI).
3. AMMUNITION DOORS SECURE.

EXTERIOR INSPECTION

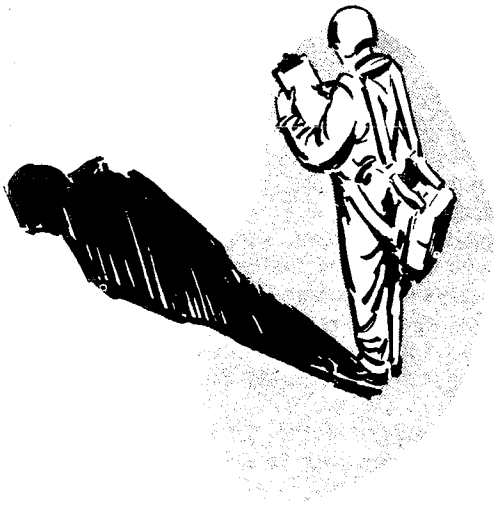


Figure 2-2. (Sheet 2 of 2 Sheets)

EXTERIOR INSPECTION

See Figure 2-2 for external check.

ACCESS TO COCKPIT (See Figure 2-3.)

A retractable boarding step, a hand grip and two kick-in steps are located on the left side of the forward fuselage. A canopy actuator switch and a boarding step lever are located in the bottom kick-in step. The boarding step must be manually retracted.

BEFORE ENTERING COCKPIT

Perform the following checks:

1. External canopy handle locked flush with fuselage.
2. White index marks aligned between top left side of seat frame and seat track.
3. Canopy air pressure gage. (1500 psi)
4. Cockpit canopy handle full forward to insure complete locking of canopy gearbox.
5. Leg braces safety wired down on left side only with a single strand of copper wire (ASC 94A).
6. Oxygen trunk line bolted to seat.
7. Safety pin installed in catapult firing mechanism.
8. Stop assembly firmly latched to forward end of canopy geared track.
9. CANOPY STOP STRIPPER HOOK ROTATED FULL AFT AND DOWN.
10. Using canopy switch, operate canopy from closed to OPEN. This checks stop and stripper hook.

BEFORE STARTING ENGINES

Jet engines do not require warming up, and since fuel consumption during ground operation is extremely high, the following cockpit check should be performed before starting the engines:

1. Unlock flight controls and check freedom of travel and sense of displacement.
2. Internal canopy emergency release handle in full FORWARD position.
3. Adjust rudder pedals.
4. Adjust seat belt, harness, radio gear; connect emergency oxygen bottle and fasten the main oxygen line clip to the shoulder harness sufficiently high on the chest to permit free movement of the head without stretching the mast tube.
5. Set landing gear control to DOWN position, arresting gear UP.
6. Place all armament switches OFF.
7. Signal deck crew to plug in external power and check all circuit breakers IN.
8. A-c power selector switch -OFF or STANDBY.

Using external power perform the following:

1. A-c power selector switch -EXT.
2. Adjust seat elevation.
3. Cycle all trim control and check trim tabs and indicators.
4. Set trim controls to take-off position. A red elevator trim light will come on when the elevator trim is set for 110 to 135 knots (IAS) take-off speed.
5. Set flaps for take-off (1/2 flaps) and speed brakes IN.
6. Check warning indicator lights.
7. Pitot heater switch OFF.
8. Auto pilot levers DISENGAGED. (See Section IV for auto pilot ground check.)
9. Set G-2 compass switch to COMP CONTROL.
10. Set altimeters, clock, accelerometer, and cabin temperature control.
11. Electrical power switches to BATT-GEN.
12. Engine master switches OFF.
13. Throttles OFF.
14. Fuel valve controls OFF.
15. Lights OFF.
16. Auxiliary fuel transfer switches OFF.
17. Set anti-G suit regulator as required.
18. Check fuel quantity gage and test check fuel boost pumps.
19. Check pressure and operation of oxygen system and set regulator as required.
20. Pneumatic pressure switch ON.
21. Check communication equipment.
22. Radar controls OFF.
23. Cockpit temperature controls and cabin pressurization controls set. (See Section IV - Cabin Pressurization and Air Conditioning.)

BEFORE NIGHT FLIGHTS

In additon to the above, check the following:

1. Check all interior lights.
2. Operate dimming switch.
3. Perform P-3 auto pilot ground check. (See Section IV.)
4. Test each external light individually.
5. Carry flashlight aboard for emergency lighting.

STARTING THE ENGINES

The airplane should be headed into the wind in an area where no loose objects can be drawn into the engines and where the jet blast will cause no damage. (See Figure 2-4.)

WARNING

Before starting engines, be sure that fore and aft engine danger areas are clear of personnel.

EXTERNAL POWER

Field experience has demonstrated that satisfactory engine starting is obtained by the following power sources:

1. A 35 volt d-c generator having a constant power

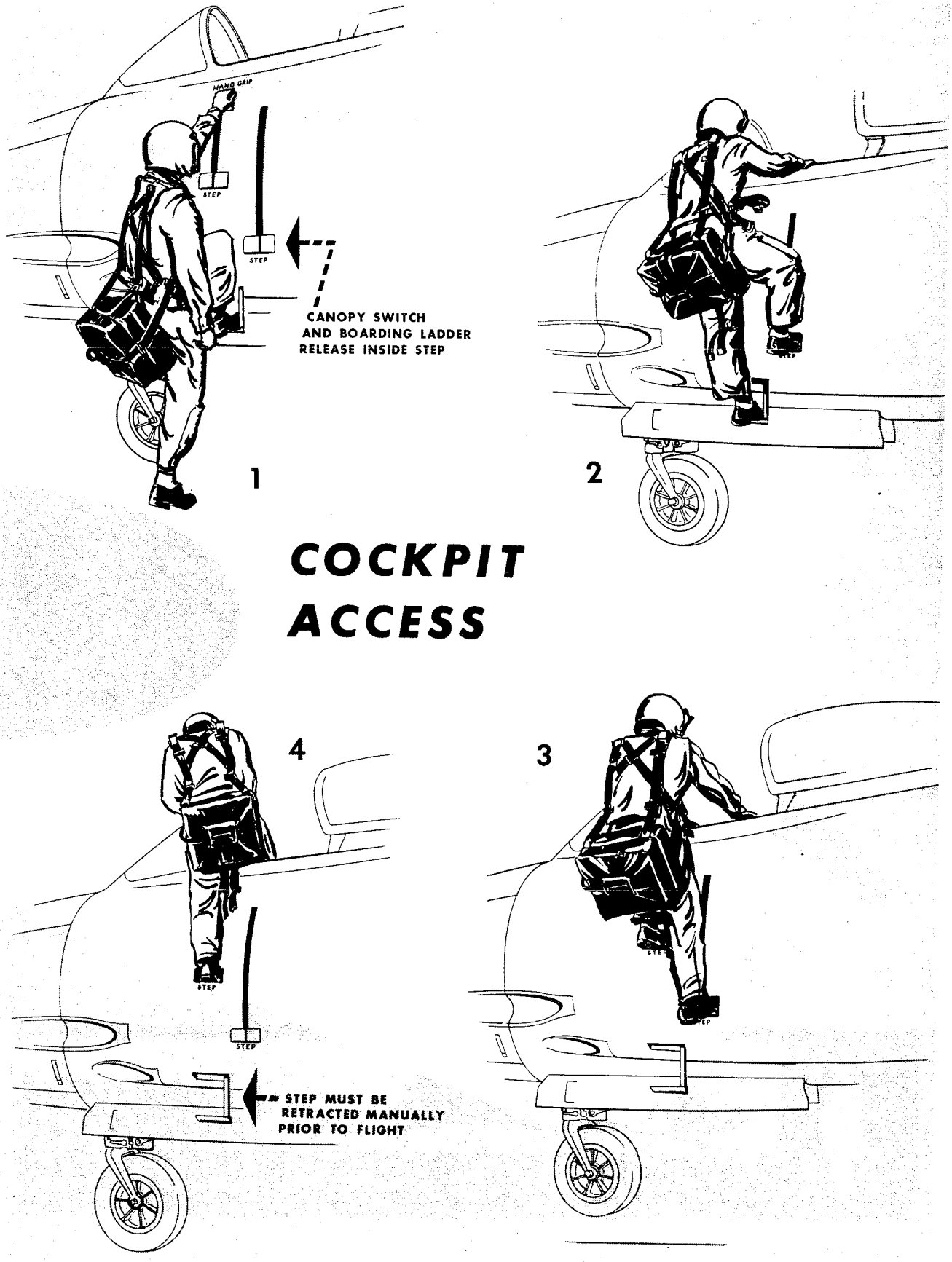

HAND GRIP
STEP
STEP
CANOPY SWITCH
AND BOARDING LADDER
RELEASE INSIDE STEP
1
2
COCKPIT
ACCESS
4
3
STEP
STEP
STEP MUST BE
RETRACTED MANUALLY
PRIOR TO FLIGHT

Figure 2-3.

rating of 1000 amperes plus 100 amperes minus zero using a 53A3A211-A30 cable and connector.

2. In an emergency, four to six (depending on existing air temperature) fully charged 24 volt, 34 ampere hour aircraft batteries connected in parallel using #0 cable and the connector described above.

Note

An external power supply is necessary for ground starting.

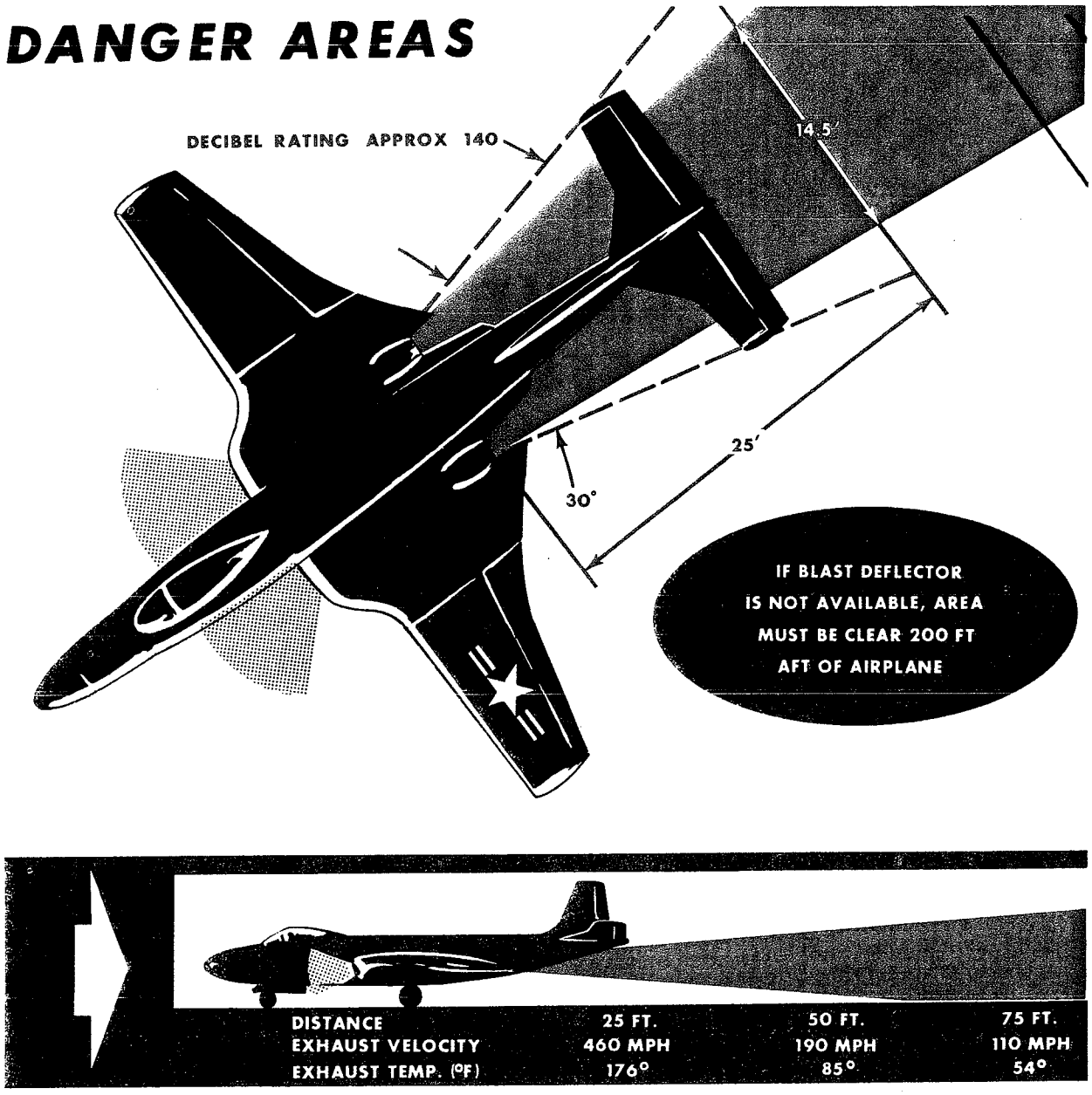


Figure 2-4.

STARTING PROCEDURE

Perform the following operations to obtain optimum engine starting:

1. Plug external power source to starting receptacle.
2. Electrical power switch to BATT-GEN position.
3. Throttles to OFF.
4. Fuel valve control ON, engine being started.

Note

If fuel shut-off valve sticks, move throttle rapidly from OFF to IDLE to OFF prior to initiating starting.

5. Engine master switch ON, engine being started (open air duct valve).
6. Move the toggle starter switch to energize starter of engine being started.
7. Permit engine to reach cranking speed of 10 to 12% rpm.
8. Press IGNITE switch and advance throttle to the IDLE position.
9. Hold IGNITE switch until engine lights off, adjusting throttle as required to prevent excessive turbine outlet temperature while accelerating.

CAUTION

Constantly watch turbine outlet temperature gage during acceleration.

Note

Starting is accompanied by a characteristic whine, increasing in pitch with combustion. Watch for the turbine outlet temperature rise to positively identify light-off.

10. Start the second engine after the started engine reaches IDLE speed, approximately 32% rpm, using the procedure outlined above.
11. Disconnect external power source after starting the second engine.

GROUND IDLING CHARACTERISTICS

The engine idling characteristics may vary from day to day, but should be kept between 32 - 40% rpm. However, since the generator reverse current relays close only when the generator output reaches 25 volts (approximately 38.5% rpm), prolonged engine idling should be conducted at this speed, or above, to prevent excessive battery drain.

CAUTION

Avoid prolonged operation at speeds between 68 and 76% rpm in order to prevent encountering critical vibratory stresses in the third stage compressor blades in this rpm range. Brief periods of operation in this range are not considered detrimental.

ENGINE RUN-UP AND GROUND TESTS

An extended warm-up period is not required for jet engines since proper combustion and operation are not dependent on engine temperature. In addition, low viscosity engine oil provides lubrication at low temperatures. The only purpose of the run-up is to assure satisfactory engine operation prior to take-off. An adequate run-up period is allowed if the first engine started is ground tested as soon as the second engine reaches stable operating conditions.

CAUTION

Avoid prolonged engine run-up since high fuel consumption seriously reduces actual flight duration.

The second engine may be run up and tested as soon as ground testing of the first engine has been completed. In this manner, the complete starting and ground tests of both engines can be accomplished within two minutes. During engine run-up, check the following:

1. Check ammeter readings for generator output.
2. Advance throttles to 65% rpm and check fuel pressure warning light, oil pressure and oil temperature indicators and a-c generator cut in.
3. Increase power to 100% rpm or turbine outlet limit temperature.

Note

If oil pressure is below the limit or oil temperature above the limit, the appropriate indicator on the instrument panel will show red and yellow diagonal stripes. Barber pole will usually show at IDLE rpm.

4. Check pneumatic pressure gage.
5. Check hydraulic pressure gage for proper pressure.
6. Spread and lock wings and check both wing lock indicators.

ENGINE TEMPERATURE LIMITS

Refer to Section V in CO 01-245FBC-1A for all operating limits.

FAILURE OF ENGINE TO START

An unusual delay in lighting-off may flood the combustion chamber and tail pipe with raw fuel, resulting in a flaming start. Such starts result in hot spots within the engine and sometimes cause a jet flame to issue from the engine exhaust nozzle. If the engine fails to light-off within thirty seconds after initiating a start, take the following action:

1. Return throttle to the OFF position.
2. Move starter switch to stop cranking.
3. Drain residual fuel from engine.

CAUTION

The starter must be allowed to cool for 30 minutes after two false starts or a total of 60 seconds cranking. Drain engine dump tank after three successive false starts.

4. After three false starts, investigate cause of failure to start.

TURBINE OUTLET TEMPERATURE CHECK

Refer to Section V in CO 01-245FBC-1A for operating limits.

OPERATIONS, LAND BASED

TAXIING

Note

Avoid taxiing over soft surfaces.

1. Allow the airplane to roll straight ahead a few feet before making a turn.
2. Turns are accomplished by use of the desired brake and opposite throttle.
3. When making sharp turns, anticipate the engine acceleration.
4. Usé brakes to steer the airplane.
5. When taxiing in cross winds, brake usage can be reduced by applying more power on one engine.

Taxiing With One Engine:

1. Braking is required on the side of the operating engine. Watch for excessive brake heating on the brake being used.
2. Taxiing with one engine is easier at speeds slightly above normal speeds, however, use caution and taxi in areas free of obstacles.

TAKE-OFF

Perform the following checks prior to take-off:

1. Shoulder harness locked, seat belt fastened.
2. Controls free.
3. Aileron and power control switches ON.
4. Check wing fold warning indicators.
5. Canopy closed (recommended).
6. Set elevator trim tabs to zero with the elevator override switch.
7. Return elevator override switch to AUTO.

TAKE-OFF TECHNIQUE

After turning into take-off position, roll straight ahead to align the nose wheel. Hold position with brakes. Pilot should pump brakes to insure positive pressures. Advance throttles to MILITARY power, check for allowable engine indications, (total percentage versus configuration). Check instruments and release brakes evenly. At low speeds before rudder becomes effective use slight brake pressure to maintain directional control. Rudder becomes effective at approximately 55 knots IAS. Hold nose on runway until approximately 120 knots IAS. A slight aft stick force will effect take-off. Maintain a set rate of climb (usually 500 feet per minute) allowing airspeed to build up. Retract gear and flaps at 155 knots IAS. When climb speed is reached vary rate of climb to maintain IAS. (See Figure 2-5.)

Note

- Raising the nose gear at above 50 knots on take-off roll may extend rather than decrease take-off distance. Unless proper technique is used rotation of aircraft can be exaggerated by raising the nose, thus extending required distance for take-off.

- It is imperative that pilots avoid exceeding the speed limitations referred to in Section V, page 13, of CO 01-245FBC-1A when landing flaps are extended. Although equipped with automatic flap retracting mechanism to prevent inadvertent overloading of the flap, repeated use of this feature will cause fatigue of the flap hinge fitting.

CAUTION

- Do not take off with one tip tank full and the other partially full.

- Nose gear extension with full flaps should not be used for take-off, since only slight rotation places the aircraft in a stalled attitude.

CLIMB

See Flight Operational Data Charts in Appendix I of CO 01-245FBC-1A for climb performance in the

various configurations and gross weights. The climb performance permits a high rate of climb and sustained climbing speed to the service ceiling.

Note

Occasionally, in some airplanes, when passing through 10,000 feet during a climb or descent, the forward fuel tank cover will "oil can". This results in a muffled sound that, in the past has been mistakenly identified as an explosion.

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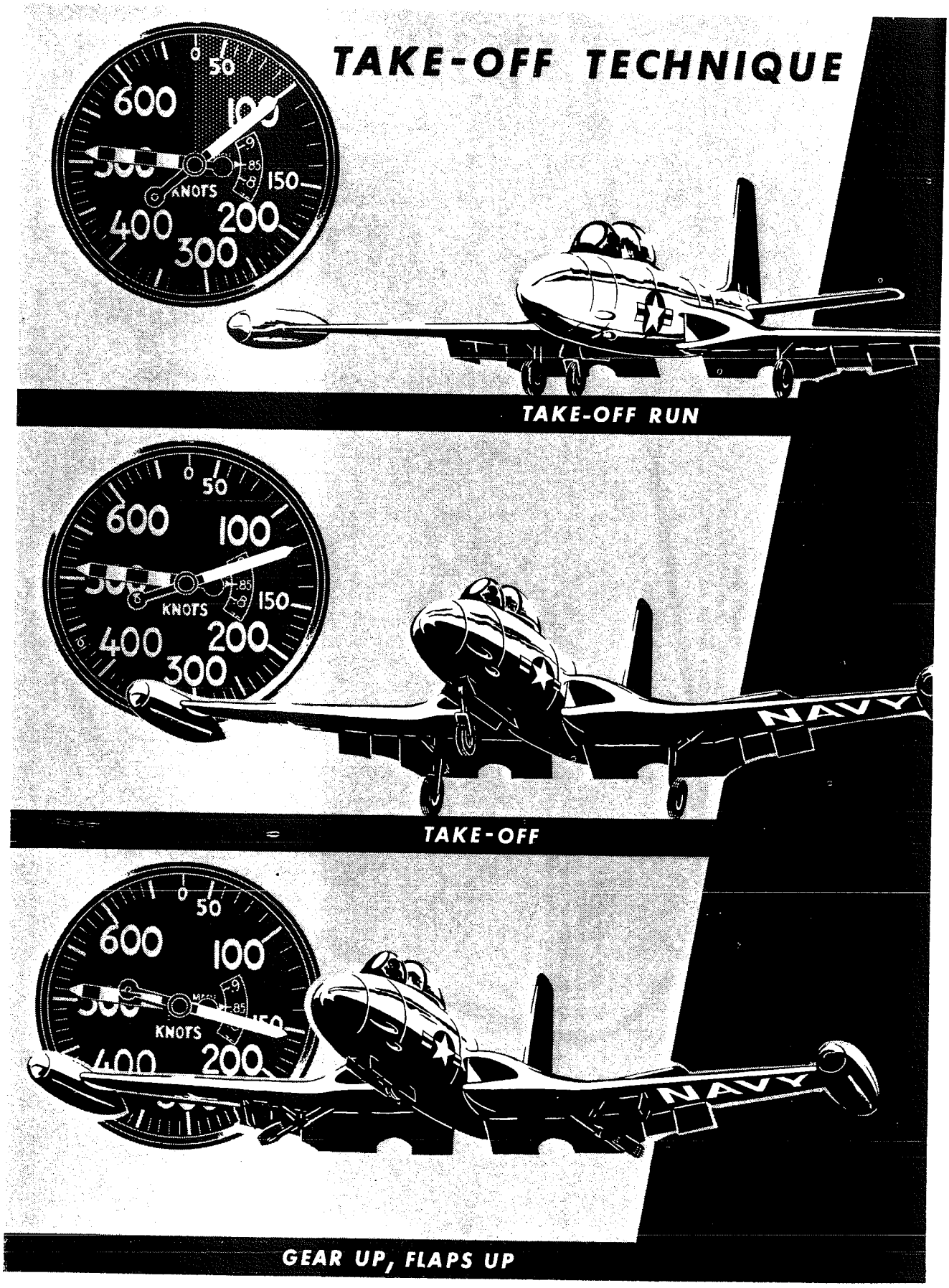
TAKE-OFF TECHNIQUE
KNOTS
TAKE-OFF RUN
KNOTS
NAVY
TAKE-OFF
KNOTS
NAVY
GEAR UP, FLAPS UP

Figure 2-5.

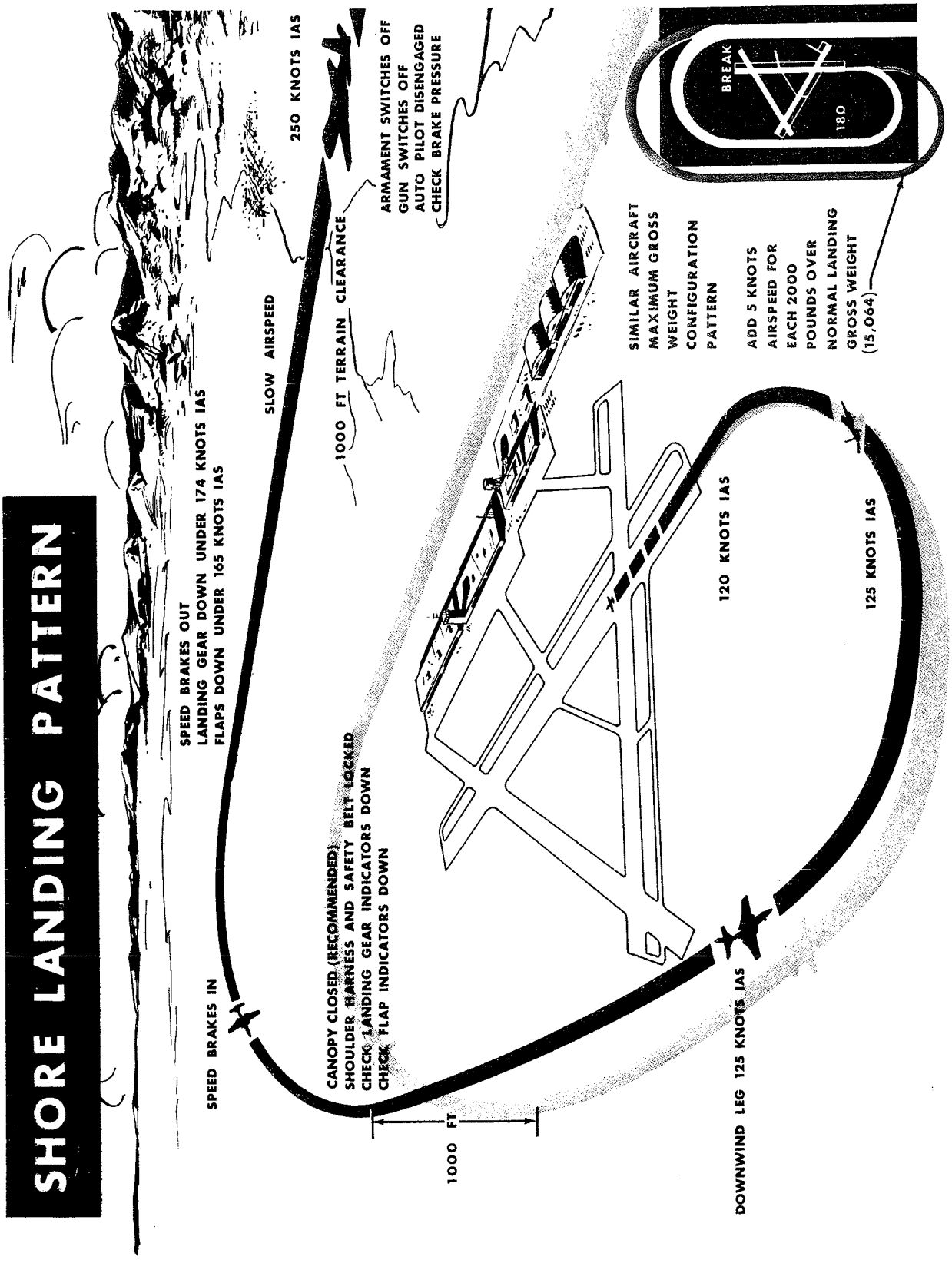
SHORE LANDING PATTERN
SPEED BRAKES IN
CANOPY CLOSED (RECOMMENDED)
SHOULDER HARNESS AND SAFETY BELT LOCKED
CHECK LANDING GEAR INDICATORS DOWN
CHECK FLAP INDICATORS DOWN
1000 FT
SPEED BRAKES OUT
LANDING GEAR DOWN UNDER 174 KNOTS IAS
FLAPS DOWN UNDER 165 KNOTS IAS
SLOW AIRSPEED
250 KNOTS IAS
1000 FT TERRAIN CLEARANCE
ARMAMENT SWITCHES OFF
GUN SWITCHES OFF
AUTO PILOT DISENGAGED
CHECK BRAKE PRESSURE
DOWNWIND LEG 125 KNOTS IAS
120 KNOTS IAS
125 KNOTS IAS
SIMILAR AIRCRAFT
MAXIMUM GROSS
WEIGHT
CONFIGURATION
PATTERN
ADD 5 KNOTS
AIRSPEED FOR
EACH 2000
POUNDS OVER
NORMAL LANDING
GROSS WEIGHT
(15,064)
BREAK
180

Figure 2-6.

FLIGHT CHARACTERISTICS

Refer to Section VI in CO 01-245FBC-1A for detailed information on the airplane flight characteristics.

AUTO PILOT OPERATION

Refer to Section IV for detailed information on the auto pilot and yaw damping systems.

LONGITUDINAL TRIMMING DURING FLIGHT

(See Figure 1-11.)

LATERAL TRIMMING DURING FLIGHT

The control stick trim switch is used for lateral trimming at all times.

ENGINE SHUTDOWN IN FLIGHT (VOLUNTARY)

1. Throttle OFF.
2. Fuel OFF.
3. Allow engine to windmill until turbine outlet temperature is less than 233° C.

CAUTION

Allow engine rpm to decrease before closing inlet door. Do not allow the engine to windmill over extended periods. The engine cools in a relatively short time with the air inlet duct doors open. Fuel for lubricating and cooling is always available at the fuel control inlet during windmilling operation with the throttle in the OFF position, however during windmilling this fuel recirculates in the fuel pumps and can generate dangerously high temperatures.

4. Engine master switch OFF (closes air inlet duct valve).

AIR START

Refer to Air Start Procedure, Section III.

DESCENT

See Descent Chart, Appendix I in CO 01-245FBC-1A for various descent speeds and configurations. Refer to Section IV for defrosting procedures.

APPROACH

Perform the following checks prior to approach:

1. Armament switches OFF.
2. Gun switches OFF.
3. Auto pilot DISENGAGED.
4. Arresting gear UP.
5. Landing gear DOWN.
6. Wing flaps DOWN.
7. Trim as desired.
8. Canopy closed (recommended).
9. Shoulder harness locked, seat belt fastened.
10. Check brakes.

WARNING

Begin approach with at least 360 pounds of fuel in the event that a wave-off is necessary.

See Descent Chart, Appendix I in CO 01-245FBC-1A for various descent speeds and configurations.

LANDING PATTERN

The power requirements of jet aircraft at low speed require constant attention. The pilot must anticipate any increased power requirement. (See Figure 2-6.)

CAUTION

At low speeds and low percentage of power ON, the addition of power will not give immediate response in indicated air speed.

LANDING TECHNIQUE

A glance at accident reports will show you that the majority of aircraft accidents occur in the traffic pattern. Anywhere in the pattern, a mistake can be costly; these mistakes are commonly referred to as "Pilot Error". In an effort to improve the presentation of facts given pilots in their flight handbook, the following paragraphs correlate the more important facts with which you'll be concerned and may help you to understand the fundamentals of the landing pattern.

Let's assume that you are flying at a high altitude and have arrived at the intended landing area. Having established the altimeter setting, noted field elevation, and traffic direction, you begin the descent. Anticipation is the key to consistent and accurate flying and the aircraft that you control requires anticipation in all details. You should plan your descent to enter the traffic pattern without circling at a low altitude. Your descent should bring you into the proper entry to the traffic pattern. Complete all prelanding checks as prescribed. Lose excess speed before crossing the field boundary by power reduction and speed brake extension, then retract speed brakes and hold speed with power.

It is assumed that the traffic pattern will be as illustrated (see Figure 2-6); your particular adaptation must be made. The essential downwind, base, and final legs appear almost circular in the illustrated approach. Break in the direction of traffic, that is, left-hand traffic - left-hand break, reduce power, and if necessary, extend speed brakes. A tight turn with g loading will bring the speed down rapidly. The effect of g's and high angle of bank is discussed

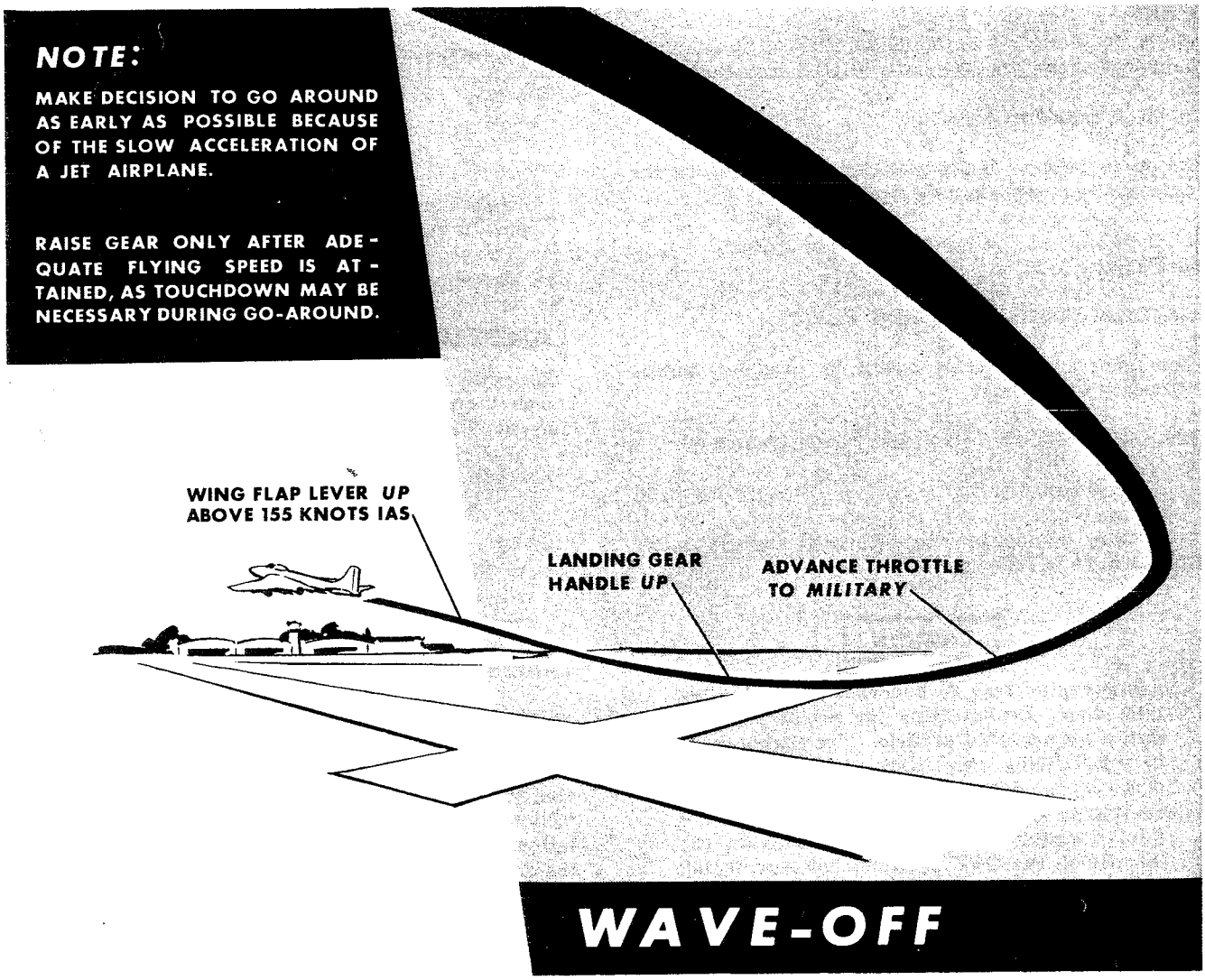

Figure 2-7.

in Section VI in CO 01-245FBC-1A. Roll into the downwind leg with the gear extended and make the proper checks - with the extension of the gear, the power should be increased enough to maintain air speed and altitude. At your selection, the flaps are extended and the turn through the base leg started. Check the stall table (Figure 6-2) and it is evident that air speed must increase as angle of bank does. G's create an accelerated stall and again the speed must increase. Your squadron has established speeds for the traffic pattern so no mention of figures will be made. Note that all the variables, such as c.g. locations, external configurations, fuel load, and temperatures affect these figures. The final approach taxes the skill of the pilot to the utmost, for here he must exercise all the judgement available to preclude this approach becoming another statistic. The final or landing approach in jet aircraft is a combination of power, air speed, rate of descent and attitude. In order to properly establish these and land at the intended point requires practice and planning; this skill is not developed in a short period. The pilot must establish an attitude that will allow a flare-out, a rate of descent which is not extreme, and power sufficient to maintain this attitude and yet enough rpm to allow acceleration in event of wave-off. Actually, the pilot will pull off the power when, as the saying goes, "He's got it made".

Power can save almost all errors if you haven't forsaken it to some rpm where it cannot rapidly respond. Altitude could help you, but at traffic altitude, you are without the room needed to recover. It is therefore imperative to establish the correct power, air speed, and rate of descent; this creates your attitude. It should be readily seen that if the power is too much - you'll be landing long, too little - short. The air speed too high, you'll float, too little - you'll stall. The rate of descent too great, and you'll drive the gear up into the wing, too little, and you'll never make the field. Excessive air speed should be lost by a combination power reduction and nose up, followed

by a power INCREASE to maintain this new attitude. IT IS THE LATTER POWER INCREASE THAT PILOTS TEND TO FORGET.

WARNING

Under heavy gross weight configurations the landing pattern must be extended and speeds increased. The pilot should limit the angle of bank to 30 degrees or less to avoid stall tendencies. See Figure 2-6 landing pattern and Figure 6-2 stall table.

Note

For night landings, turn the elevator feel position trim light OFF.

LANDING ROLL

For normal landings, keep the tail well down, holding the nose off as long as possible. Maintain directional control with rudders. The nose wheel will rock to the three-point attitude at approximately 60 knots IAS; directional control is then maintained by brake pressure.

SINGLE ENGINE APPROACH

Refer to Section III, EMERGENCY OPERATING PROCEDURES, for single engine approach procedures.

WAVE-OFF

WARNING

The speed brakes should be retracted prior to attempted wave-off due to slow acceleration characteristics of jet aircraft.

Perform the following in event of wave-off:

1. Advance throttles to MILITARY POWER and start climb when safe airspeed is reached.
2. Landing gear UP.
3. Flaps UP when safe altitude and speed is attained. (See Figure 2-7.)
4. With clean configuration and safe airspeed power can be reduced.

WARNING

About 240 pounds of fuel are required to go around.

CAUTION

After landing, do not fold the wings with fuel in the tip tanks.

CROSSWIND LANDING

Normal cross-wind landing technique can be used in cross-wind landings. The landing gear will assure a straight roll after landing. Use brake or rudder as required.

STOPPING THE ENGINES

Engine stopping procedure:

1. Throttles OFF.
2. Fuel shutoff valve control OFF.
3. Electrical power switches OFF.
4. Engine master switches OFF.
5. Disconnect external power if connected.

BEFORE LEAVING THE AIRPLANE

1. Lock control surfaces.
2. If hangar facilities are not available, secure the airplane with mooring lines.
3. Place chocks fore and aft of the main landing gear and nose wheel.
4. Attach engine inlet air duct valve guards, canopy cover, pitot and radar cooling inlet covers.
5. Install jury struts if wings are folded.
6. Complete all flight forms.

OPERATIONS, CARRIER

Except for a minor amount of repetition the following paragraphs contain only those procedures that differ from, or are in addition to, the operating procedures already covered in this section.

TAXIING

Taxiing aboard ship offers no unusual problems to the pilot; however, it is well to keep in mind that due to high tire pressures for shipboard operations, which result in less tire surface on the deck, braking action is decreased. Operations on wet decks require utmost attention to your taxi signalman, and much lower speeds. When moving fast, such as coming out of the gear, it is better to make several applications of the brakes rather than hold a steady pressure. A steady pressure often develops into a locked wheel, and loss of braking action in the ensuing skid.

1. Allow the airplane to roll straight ahead a few feet before making a turn.
2. Turns are accomplished by use of the desired brake and opposite throttle.
3. When making sharp turns, anticipate the engine acceleration.
4. Use brakes to steer the airplane.

TAKE-OFF

Perform the following checks prior to catapult shot:

1. Shoulder harness locked, seat belt fastened.
2. Controls free.
3. Aileron and power control switches ON.
4. Check wing fold warning indicators.
5. Canopy closed (recommended).
6. Set elevator trim tabs to zero with the elevator override switch.
7. Return elevator override switch to AUTO.

TAKE-OFF TECHNIQUE

Having completed all checks and given ready signal, the pilot awaits his shot. Use your throttle catapult and the stick positioned correctly, there should be no noticeable elevator forces as the plane leaves the deck. During the catapult run the neutral position of the stick will move aft as speed is increased and ram air enters the bellows, by maintaining the neutral position the airplane does not have to be rotated. As the deck is cleared, retract the gear and start a clearing turn. For maximum gross weight take-offs, the clearing turn should be delayed or gently made. Raise flaps and establish climb. The proposed mission will dictate the pilot's choice of airspeeds and climb technique.

CAUTION

Do not take off with one tip tank full and the other partially full.

Note

Fatigue failure of the flap hinge fitting can occur if the speed limitations set forth in Section V of the CO 01-245FBC-1A are exceeded repeatedly.

CLIMB

See Flight Operational Data Charts in Appendix I of CO 01-245FBC-1A for climb performance in the various configurations and gross weights. The climb performance permits a high rate of climb and sustained climbing speed to the service ceiling.

Note

Occasionally, in some airplanes, when passing through 10,000 feet during a climb or descent, the forward fuel tank cover will "oil can". This results in a muffled sound that, in the past, has been mistakenly identified as an explosion.

FLIGHT CHARACTERISTICS

Refer to Section VI of CO 01-245FBC-1A for detailed information on the airplane flight characteristics.

AUTO PILOT OPERATION

Refer to Section IV for detailed information on the auto pilot and yaw damping systems.

LONGITUDINAL TRIMMING DURING FLIGHT. (See Figure 1-11.)

LATERAL TRIMMING DURING FLIGHT

The control stick trim switch is used for lateral trimming at all times.

ENGINE SHUTDOWN IN FLIGHT (VOLUNTARY)

1. Throttle OFF.
2. Fuel OFF.
3. Allow engine to windmill until turbine outlet temperature is less than 233° C.

CAUTION

Allow engine rpm to decrease before closing

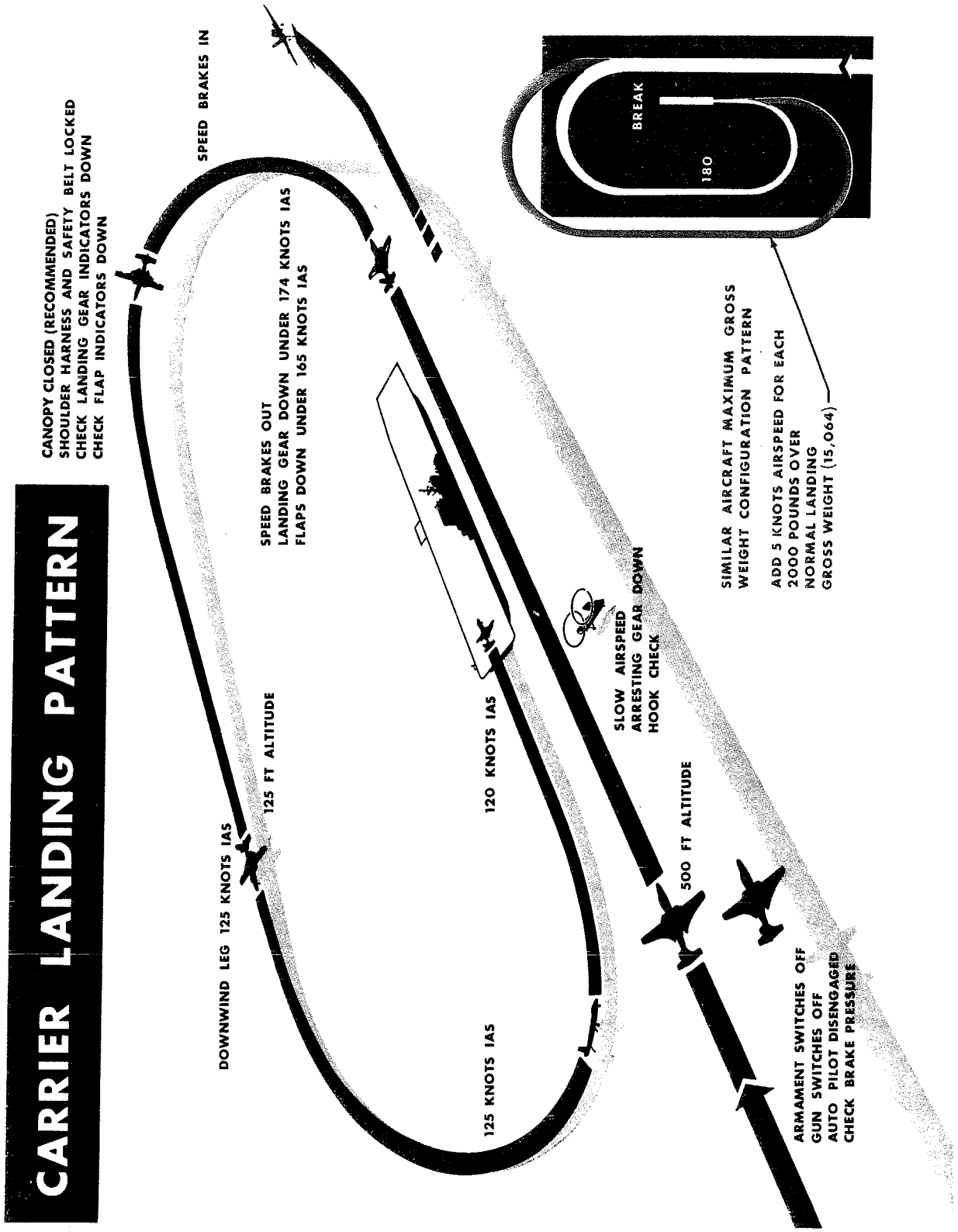
CARRIER LANDING PATTERN
CANOPY CLOSED (RECOMMENDED)
SHOULDER HARNESS AND SAFETY BELT LOCKED
CHECK LANDING GEAR INDICATORS DOWN
CHECK FLAP INDICATORS DOWN
SPEED BRAKES IN
SPEED BRAKES OUT
LANDING GEAR DOWN UNDER 174 KNOTS IAS
FLAPS DOWN UNDER 165 KNOTS IAS
DOWNWIND LEG 125 KNOTS IAS
125 FT ALTITUDE
120 KNOTS IAS
125 KNOTS IAS
SLOW AIRSPEED
ARRESTING GEAR DOWN
HOOK CHECK
500 FT ALTITUDE
ARMAMENT SWITCHES OFF
GUN SWITCHES OFF
AUTO PILOT DISENGAGED
CHECK BRAKE PRESSURE
BREAK
180
SIMILAR AIRCRAFT MAXIMUM GROSS
WEIGHT CONFIGURATION PATTERN
ADD 5 KNOTS AIRSPEED FOR EACH
2000 POUNDS OVER
NORMAL LANDING
GROSS WEIGHT (15,064)

Figure 2-8.

inlet door. Do not allow the engine to windmill over extended periods. The engine cools in a relatively short time with the air inlet duct doors open. Fuel for lubricating and cooling is always available at the fuel control inlet during windmilling operation with the throttle in the OFF position, however, during windmilling this fuel recirculates in the fuel pumps and can generate dangerously high temperatures.

4. Engine master switch OFF (closes air inlet duct valve).

AIR START

Refer to Air Start Procedure, Section III.

DESCENT

See Descent Chart, Appendix I in CO 01-245FBC-1A for various descent speeds and configurations. Refer to Section IV for defrosting procedures.

APPROACH

Perform the following checks prior to approach:

1. Armament switches OFF.
2. Gun switches OFF.
3. Auto pilot DISENGAGED.
4. Arresting gear DOWN.
5. Landing gear DOWN.
6. Wing flaps DOWN.
7. Trim as desired.
8. Canopy closed (recommended).
9. Shoulder harness locked, seat belt fastened.
10. Check brakes.

WARNING

Begin approach with at least 360 pounds of fuel in the event that a wave-off is necessary.

See Descent Chart, Appendix I in CO 01-245FBC-1A for various descent speeds and configurations.

LANDING PATTERN

The power requirements of jet aircraft at low speed require constant attention. The pilot must anticipate any increased power requirement. (See Figure 2-8.)

CAUTION

At low speeds and low percentage of power ON, the addition of power will not give immediate response in indicated air speed.

CARRIER LANDING TECHNIQUE

PATTERN

The normal carrier pattern (see Figure 2-8) may vary by operational direction; however, this pattern gives the pilot the basic information. The position you occupy in the traffic pattern, interval, airspeeds, and altitudes must be strictly adhered to. Your ability and accuracy of control affect all planes in the pattern.

As you initially approach the carrier, on a parallel heading (initial), lose speed to correspond to illustrated pattern. Drop arresting hook on initial and complete proper checks. Make your break in direction of traffic (left) and establish your landing interval. Normally the break is the combination of turn and airspeed reduction. On the break, pull off the power to IDLE and extend speed brakes; as the speed decreases to the gear down limits, extend the gear. Airspeed drops rapidly now and as speed decreases to flap extension limit, lower flaps, retract speed brakes, and add power. The turn completed, allow the airspeed to decrease to pattern speed. Lose altitude on the downwind leg in order to be at the correct altitude and airspeed at the 180° point. A pilot should not endeavor to memorize power settings but should use power to maintain the desired airspeeds and altitudes regardless of gross weight and configuration conditions.

Note

In jet check-outs, pilots are impressed with the power available particularly when holding brakes at 100 percent ready for take-off. Pilots should use any and if necessary all power available to prevent stalls when at critical attitudes of flight. To anticipate power requirements, and have your engines at proper percentages at the proper time, requires a technique and understanding of jet aircraft capabilities.

From the 180° point start a level turn with power and altitude established. At the completion of the turn, the wings are level and the airspeed can safely be lowered to final approach speed. The L.S.O. will direct your landing but YOU MUST CONTROL IT. When the cut signal is given, maintain your attitude and with power reduced, you'll descend, and the hook will engage. With your altitude and speed correct, the plane will make a good landing if the stick is held absolutely still after the "cut". The pilot must not force the nose down or he will dive for the deck creating excessive rate of sink with potential damage to aircraft structure. The pilot must not apply excessive back pressure or hold the nose off at the cut, or the aircraft attitude becomes exaggerated, usually resulting in a bounce off the main gear, and since the airplane is in this exaggerated flight condition, float into the barriers nose high.

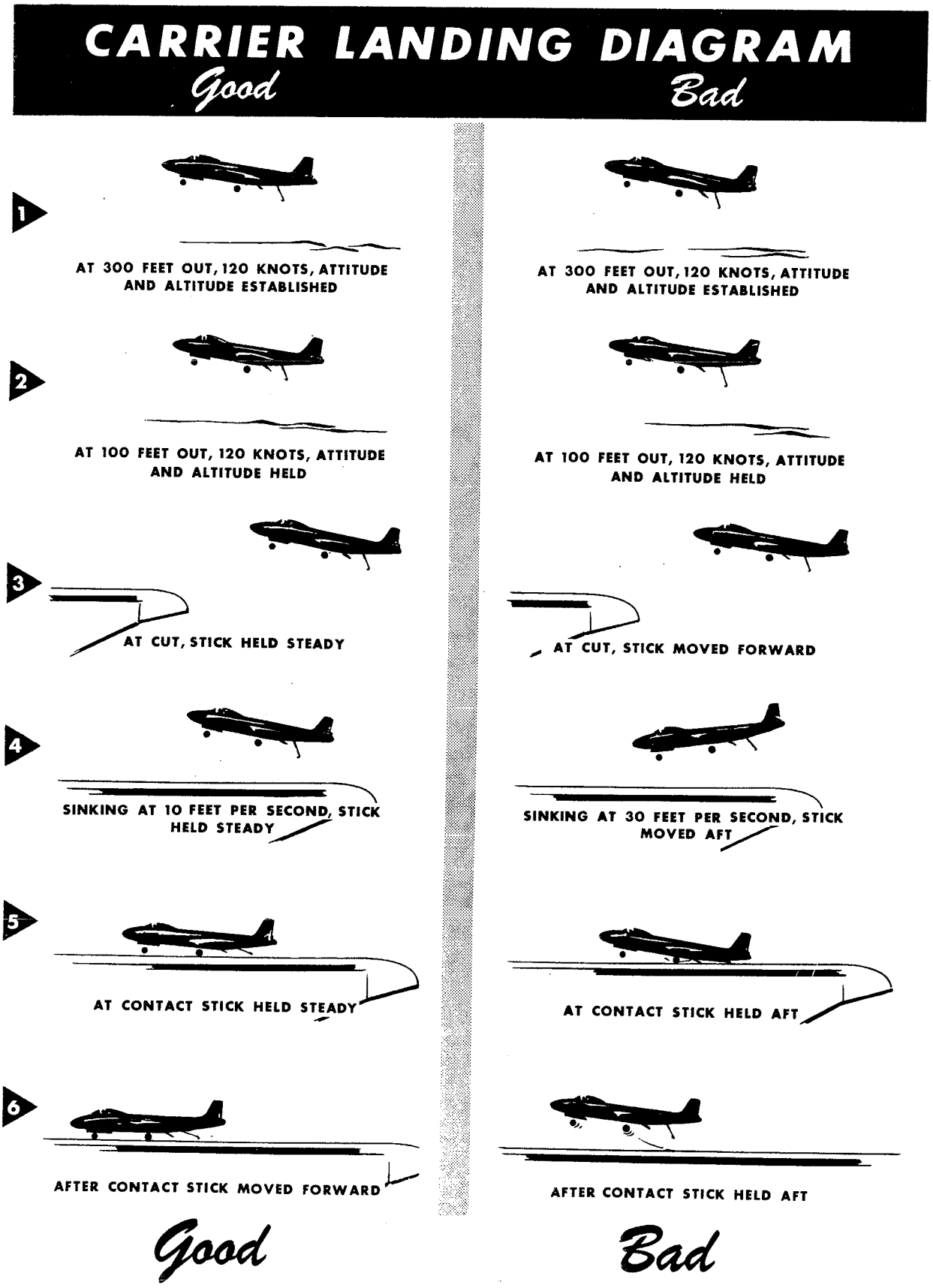
CARRIER LANDING DIAGRAM
Good
Bad
1
AT 300 FEET OUT, 120 KNOTS, ATTITUDE AND ALTITUDE ESTABLISHED
AT 300 FEET OUT, 120 KNOTS, ATTITUDE AND ALTITUDE ESTABLISHED
2
AT 100 FEET OUT, 120 KNOTS, ATTITUDE AND ALTITUDE HELD
AT 100 FEET OUT, 120 KNOTS, ATTITUDE AND ALTITUDE HELD
3
AT CUT, STICK HELD STEADY
AT CUT, STICK MOVED FORWARD
4
SINKING AT 10 FEET PER SECOND, STICK HELD STEADY
SINKING AT 30 FEET PER SECOND, STICK MOVED AFT
5
AT CONTACT STICK HELD STEADY
AT CONTACT STICK HELD AFT
6
AFTER CONTACT STICK MOVED FORWARD
AFTER CONTACT STICK HELD AFT
Good
Bad

Figure 2-9.

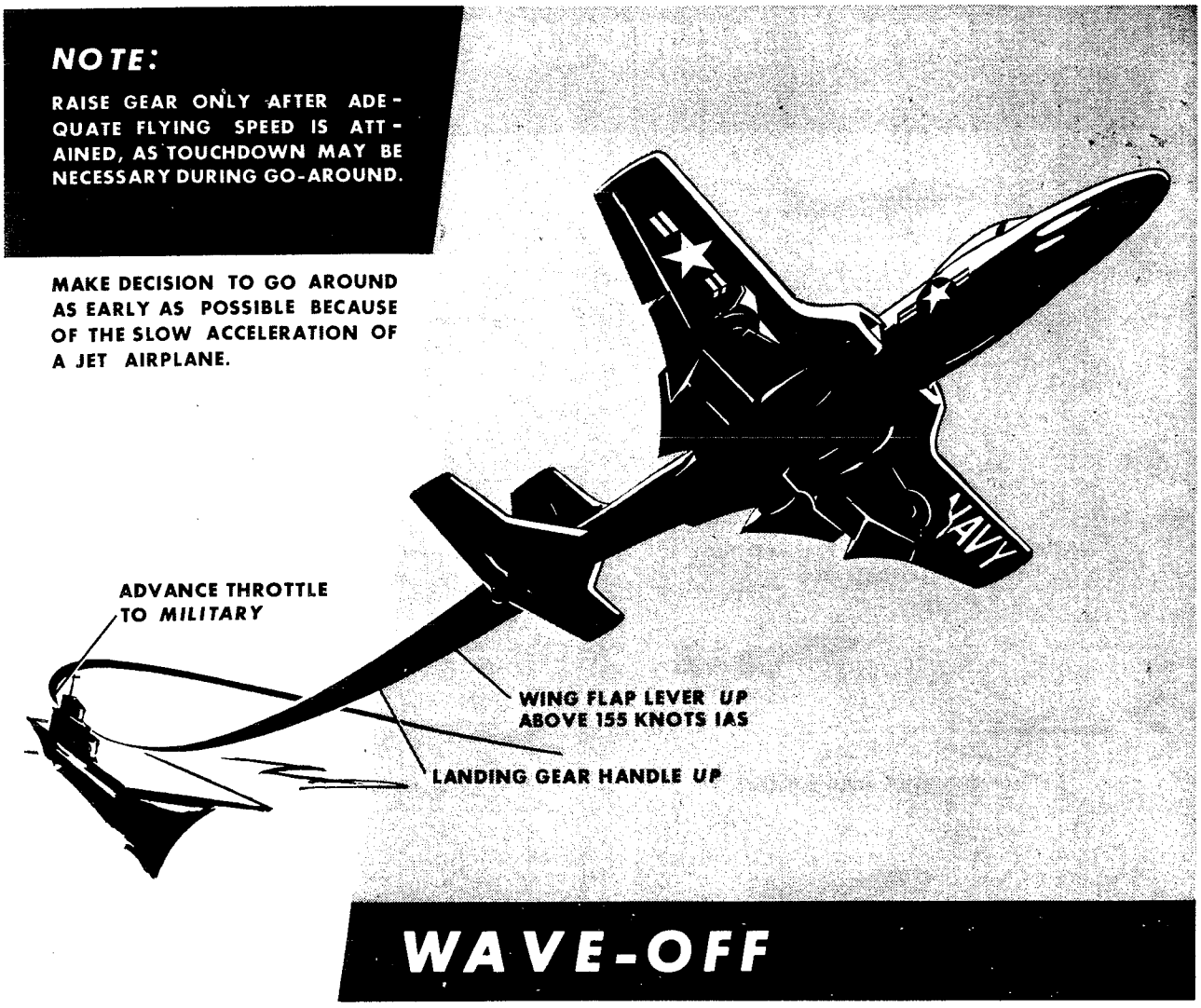

Figure 2-10.

Most troubles in the approach occur from about 300 feet out to the cut. It is here that the pilot must overcome the tendency to lower the nose. A level approach gives a false impression that altitude is gained as the distance to the carrier decreases. By maintaining a constant altitude and airspeed in the groove you establish an attitude. After the initial transition period each pilot will establish a control feeling after the cut. This is usually in the form of easing back pressure or almost imperceptible control movement to make a smoother landing.

After initial touchdown pilots should apply positive forward stick. This assures several beneficial results. When a normal landing has been made it holds the nose wheel firmly on the deck; should the plane fail to grab a wire and bounce into the air again, it will return the aircraft to the deck quickly; should barrier engagement be imminent it will assure engagement at the best possible attitude.

CAUTION

Under unusual wing retardation barricade engagement conditions such as free flight or severely yawed aircraft attitudes, it is possible for the upper loading strap to enter the open cockpit. It is therefore mandatory that the pilot keep his head down and forward in the cockpit when barricade engagement is imminent.

WARNING

At heavy gross weight configurations the land-

ing pattern must be extended and speeds increased. The pilot should limit the angle of bank to 30 degrees or less to avoid stall tendencies. See Figure 2-8 landing pattern and Figure 6-2 stall table.

SINGLE ENGINE APPROACH

Refer to Section III, EMERGENCY OPERATING PROCEDURES, for single engine approach procedures.

WAVE-OFF

WARNING

The speed brakes should be retracted prior to attempted wave-off due to slow acceleration characteristics of jet aircraft.

Perform the following in event of wave-off:

1. Advance throttles to MILITARY POWER and start climb when safe airspeed is reached.
2. Landing gear UP.
3. Arresting hook UP.
4. Flaps UP when safe altitude and speed is attained. (See Figure 2-10.)

WARNING

About 240 pounds of fuel are required to go around.

Note

When making a carrier landing, and the arresting hook has engaged and the cable has run out, allow the airplane to run aft several feet before applying brakes to insure disengagement of the cable from the hook.

CAUTION

After landing, do not fold the wings with fuel in the tip tanks.

STOPPING THE ENGINES

Engine stopping procedure:

1. Throttles OFF.
2. Fuel shutoff valve control OFF.
3. Electrical power switches OFF.
4. Engine master switches OFF.
5. Disconnect external power if connected.

BEFORE LEAVING THE AIRPLANE

1. Lock control surfaces.
2. Place chocks fore and aft of the main landing gear and nose wheel.
3. Attach engine inlet air duct valve guards, canopy cover, pitot and radar cooling inlet covers.
4. Install jury struts if wings are folded.
5. Complete all flight forms.

"Figure 2-11. Deleted."

SECTION III
EMERGENCY PROCEDURES

ENGINE FAILURE DURING TAKE-OFF RUN

the event of failure of one or both engines during ke-off and before becoming airborne, perform the llowing as rapidly as possible:

1. Retard throttles to OFF.
2. Place fuel valves in the OFF position.
3. Apply brakes as required to stop.

Note

Full flap and speed brake extension is helpful in stopping.

ENGINE FAILURE AFTER TAKE-OFF (FORCED LANDING)

In the event of power failure (both engines) after becoming airborne, perform the following operations as rapidly as possible:

1. Landing gear UP.
2. Flaps DOWN.
3. Fuel OFF.
4. Jettison tip tanks and external stores.
5. Canopy open, shoulder harness locked, seat belt fastened.
6. Electrical power switches OFF before contact.
7. Land straight ahead, maneuvering only to avoid obstacles.

WARNING

Perform all forced landings with landing gear UP unless certain that landing surface and available space is suitable for gear down landing.

FAILURE OF ONE ENGINE AFTER TAKE-OFF (FLIGHT CONTINUED)

In the event of failure of one engine after becoming airborne and continued flight is elected, perform the following operations to assure optimum single-engine flight:

1. Jettison tip tanks if carried with fuel aboard.
2. Retract landing gear.
3. Jettison bombs, rockets or other external store aboard.
4. Raise flaps to 1/2 or less.
5. Throttle and master switch OFF on dead engine.
6. Fuel valve control OFF on dead engine.
7. Trim the airplane for flight.
8. Climb at 190 knots IAS.

SINGLE ENGINE FLIGHT CHARACTERISTICS

In general, the handling qualities, aside from reduced performance and directional retrim due to asymmetrical thrust, are essentially the same as those prevailing with both engines operating. In the event of one engine failing, refer to Section II, ENGINE SHUTDOWN IN FLIGHT and AIR START PROCEDURES for detailed information.

SINGLE ENGINE APPROACH AND LANDING

Check List

1. Jettison tip tanks if fuel is aboard. Jettison all external stores.
2. Armament switches OFF.
3. Gun switches OFF.
4. Arresting hook UP for field landing; arresting hook DOWN for carrier landing.
5. Landing gear DOWN.
6. Flaps DOWN to desired setting.

Note

Use 1/4 flap setting for field landing if landing space permits. Use 1/2 flap setting for carrier landing.

7. Trim as desired.
8. Shoulder harness locked, seat belt fastened.
9. Canopy closed (recommended).

Note

Partial flap settings result in slightly higher approach and landing speeds, but permit improved acceleration and flight characteristics in the event of overshooting or wave-off.

SINGLE ENGINE WAVE-OFF

WARNING

The speed brakes MUST be retracted to assure best acceleration characteristics.

1. Advance throttle on operating engine to MILITARY power and pick up airspeed.
2. Landing gear UP.
3. Arresting hook UP.
4. Increase air speed and retract flaps slowly at a safe altitude.
5. Maintain 190 knots IAS in go-around pattern.
6. Perform single engine CHECK LIST on second approach and landing.

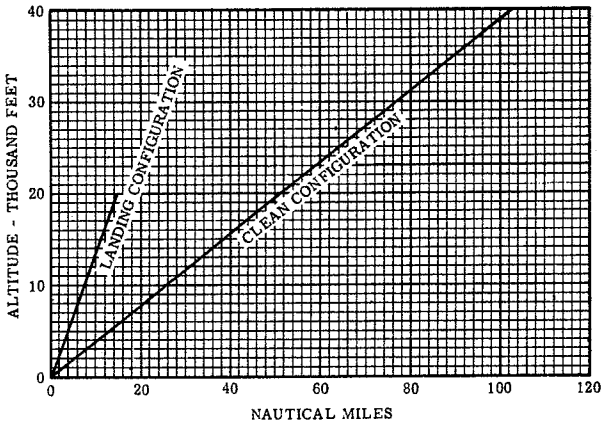

Figure 3-1. Flame and Glide Range

ENGINE-OFF GLIDES

During engine-off glides, the cabin pressurization, radio and all electrical systems not operating from the essential bus are inoperative when the electrical power switch is in the BATT-GEN position. For prolonged glides from altitude, the electrical power switch should be placed in the OFF position to conserve the battery for restarting the engines or for other uses at lower altitudes. Placing the landing gear control handle in the DOWN position when the electrical power switch is in the BATT-GEN position, or placing the electrical power switch in the BATT ONLY position will energize the secondary bus, permitting radio operation. However, before performing either operation, circuit breakers for all non-essential circuits should be 'pulled' to prevent excessive battery drain.

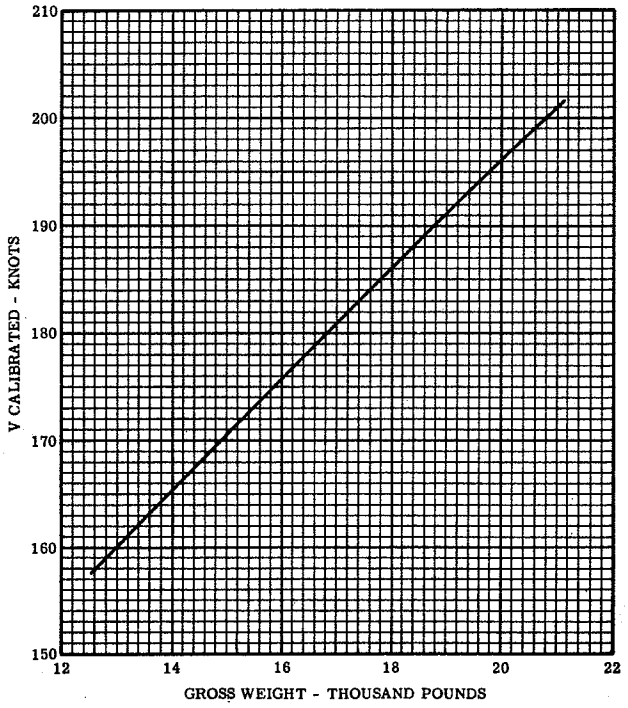

Figure 3-2. Air Speed for Best Glide

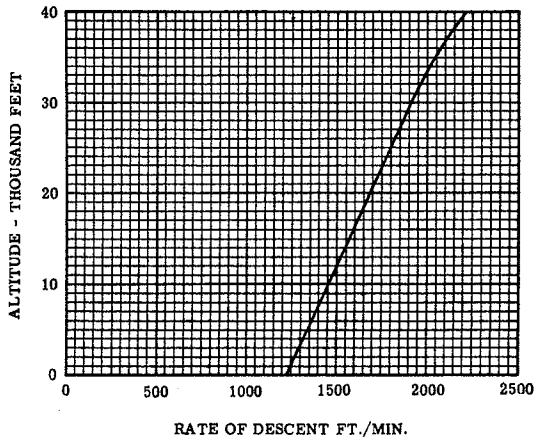

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Figure 3-3. Rate of Descent of Best Glide

Note

If a 'flame-out' landing is to be accomplished the landing gear should be lowered by the emergency extension system to conserve the battery.

AIR START PROCEDURE

1. Obtain an air speed of approximately 175 knots IAS.

Note

Best air starts can be made below 25,000 feet although it is possible to obtain an air start between 25,000 feet and 35,000 feet if windmilling rpm does not exceed 16% rpm prior to light-off.

2. Engine master switch ON (opens air inlet duct valves).
3. Fuel ON both engines.

Note

Should either fuel shutoff valve "stick" in the CLOSED position, momentarily move the corresponding throttle to IDLE and back to OFF. This action should permit the fuel shutoff valve to be opened without undue strain.

4. Press IGNITE switch and advance throttle to IDLE position.
5. After light-off and acceleration begins, use the throttle to keep within turbine outlet temperatures.

AIR START (HIGH RPM)

In many cases, particularly at very high altitudes (39,000 feet to 42,000 feet) successful air starts may be accomplished using the following procedure:

1. As soon as flame-out is positively identified, retard throttle to CUT-OFF.
2. Press ignition switch and advance throttle to IDLE.

Note

In order to obtain successful high RPM starts above 39,000 feet, the start attempt must be initiated before the RPM drops below approximately 38%. The time for the engine RPM to drop from 95% to 38% when the engine is flamed out at 40,000 feet is approximately 4 1/2 seconds. Successful air starts can be achieved at and below the normal air start ceiling of 39,000 feet at any RPM from windmill RPM up.

Should the high RPM start fail, place throttle in the CUT-OFF position and allow sufficient time for the engine to clear excessive fuel before proceeding with normal air start as outlined.

The hydraulically operated elevator and rudder power control systems will also be inoperative in prolonged glides. However, if the airplane is trimmed for best glide speed (approximately 170 knots), the air duct doors are left open, and stick movements are kept to a minimum, it is possible to have some hydraulic pressure available for control all of the way down. The controllability of the airplane remains good even with no hydraulic pressure. The glide range is not affected with duct doors in either open or closed position. To determine 'Air Speed for Best Glide', 'Rate of Descent at Best Glide', or 'Flame-Out Glide Range' see Figures 3-2, 3-3, and 3-1.

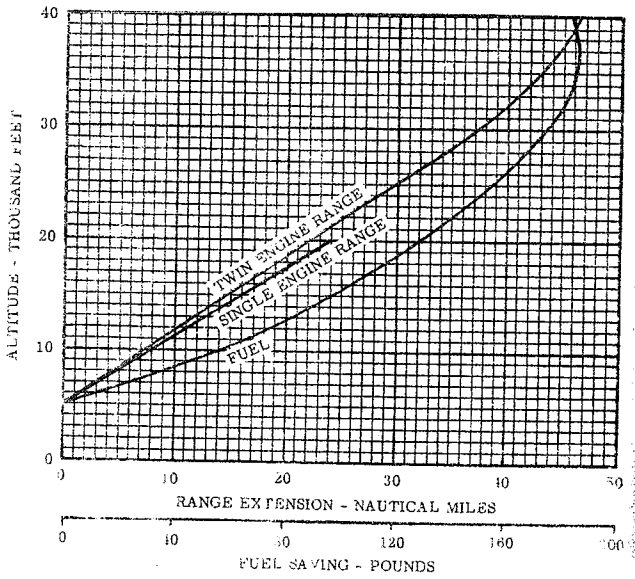


Figure 3-4. Fuel Saving or Range Extension

FUEL SAVING OR RANGE EXTENSION

CAUTION

The following procedure is for emergency use only.

Saving of fuel for extension of range or for landing is possible by making an engines-off descent. The procedure is to shut down the engines at a certain distance from the landing point, glide to 5,000 feet over the base, execute an air start and land with power. Figure 3-4 shows the fuel saving or range extension possible with this procedure. The fuel saving curve represents the additional fuel which may be used for landing. Figure 3-4 represents the possible range extension made possible by an engine-off descent. The fuel saving is converted into extra range at the optimum altitude and air speed. The distance [illegible] use to commence the descent may be obtained from Figure 3-4.

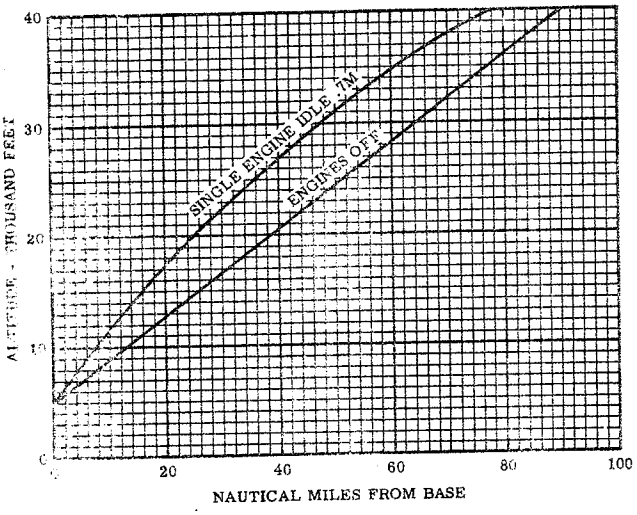


Figure 3-5. Letdown Points

LANDING WITH COMPLETE POWER FAILURE ON BOTH ENGINES

1. If a complete power failure is experienced, and an air start cannot be accomplished, a flame-out landing may be executed providing sufficient altitude and suitable runways are available. See Figure 3-6 for recommended flame-out landing procedure.

2. If runways of adequate length are not available, select the best available field within gliding distance and perform a wheels-up landing as follows:

Note

Refer to ENGINE-OFF GLIDES.

a. Landing gear UP.
b. Fuel OFF.
c. Jettison external stores.
d. Glide at 170 knots IAS to landing approach.
e. Speed brakes IN.
f. Canopy OPEN.
g. Shoulder harness locked, seat belt fastened.
h. Full flaps DOWN and 150 knots IAS for the approach prior to flaring out for landing.
i. Electrical power switch OFF before contact.

CAUTION

Make landing approach at a higher altitude. The glide path with both engines dead in the clean configuration is approximately the same as the glide path with both engines idling and gear down.

FIRE WARNING LIGHT

CAUTION

Do not ignore fire warning light at any time. Be sure the warning light bulb and test circuit are operating properly before take-off.

ENGINE FIRE WHILE STARTING

If the fire warning light illuminates, or if there is other evidence of fire while starting, perform the following actions:

1. Throttle to the OFF position.
2. Fuel OFF.
3. Take necessary action to extinguish fire.

CAUTION

No fire extinguishing equipment is installed in the airplane.

4. Investigate the cause of fire and take corrective action to prevent recurrence.

ENGINE FIRE DURING FLIGHT

If the fire warning light illuminates, or if there is other evidence of fire during flight, perform the following actions:

1. Fuel OFF on the affected engine.
2. If the fire warning light goes out as a result of the above action, continue flight and land as soon as possible.

Note

Increased speed by diving will aid in extinguishing flames.

3. If the fire warning light does not go out and there are other evidences of continued fire, or if the fire warning light goes out then relights, abandon the airplane.

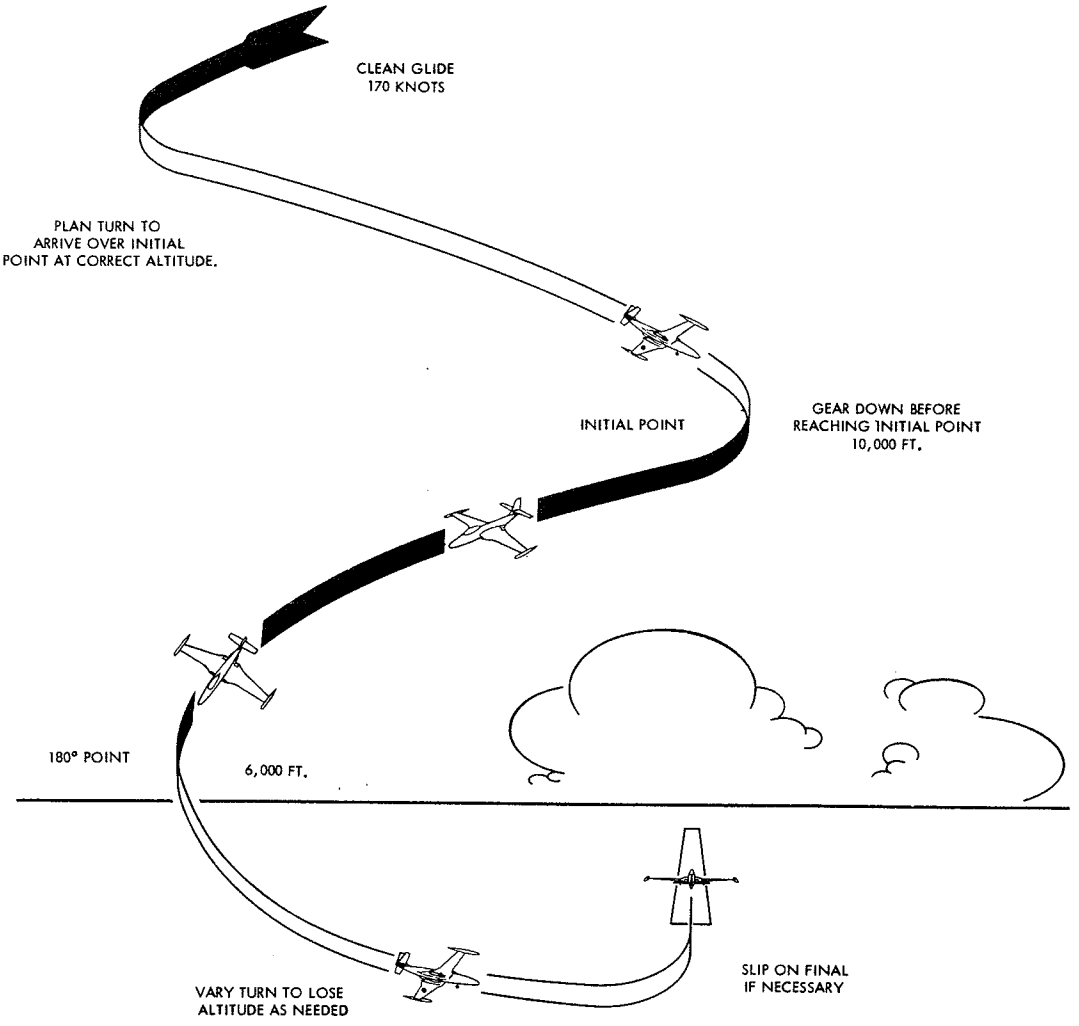
CAUTION

Do not restart the affected engine unless it has been definitely established that it is safe to do so.

ELECTRICAL FIRE DURING FLIGHT

Perform the following actions for electrical fires:

1. Electrical power switch (BATT-GEN., BAT ONLY) - OFF.
2. A-C power selector switch STANDBY.
3. Wall standby inverter circuit breaker



ACTUAL AND SIMULATED FLAME OUT LANDING PROCEDURE	F2H-3, -4
BEST GLIDE SPEED, CLEAN AIRPLANE V_{CAL}, KNOTS	170K
RECOMMENDED APPROACH SPEED, LANDING CONDITION, V_{CAL}, KNOTS	150K
OPTIMUM ALTITUDE ON INITIAL GEAR AND FLAPS DOWN	10,000 FT.
OPTIMUM ALTITUDE 180° POSITION GEAR AND FLAPS DOWN	6,000 FT.
OPTIMUM ALTITUDE ON INITIAL GEAR DOWN	6,000 FT.
MINIMUM ALTITUDE ON INITIAL GEAR DOWN	5,000 FT.
MINIMUM ALTITUDE ON 180° POSITION - GEAR DOWN	2,500 FT.

RPM FOR FLAME OUT SIMULATION SPEED BRAKES EXTENDED, CONTROL BOOST OFF	F2H-3, -4
ALTITUDE	
30,000 - 20,000	81%
20,000 - 10,000	78%
10,000 (GEAR AND FLAPS DOWN)	66%

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Figure 3-6. Flame-Out Landing Pattern

4. Reset 'popped' circuit breakers (except standby inverter circuit breaker).

WARNING

Do not manually hold 'popped' circuit breakers in at any time.

5. Land as soon as possible.

SMOKE ELIMINATION

To eliminate smoke or toxic fumes from the cockpit:

1. Actuate the EMERGENCY VENTILATION handle.

Note

The EMERGENCY VENTILATION handle must be up and locked to eliminate smoke or toxic fumes.

2. Place the VENTILATION AIR handle to the DEFROST position.

EMERGENCY ESCAPE

1. Reduce airspeed if possible.
2. Disconnect oxygen tube and radio leads.
3. Place feet hard aft in foot stirrups.
4. Pull either or both seat leg braces.

WARNING

- Clearance between canopy and pilot's head is critical. Make sure head is below normal operating path of canopy before actuating canopy jettison.

- Ejection through the canopy is recommended only in those cases in which the aircraft is in uncontrolled flight or when the quickest possible escape is necessary; at all other times, the canopy should be jettisoned prior to ejection. Under no circumstances should the pilot attempt to eject with the canopy in the open position. It is recommended that take-offs and landings be made with the canopy in the closed position.

5. Activate emergency oxygen supply.
   This action is necessary only at altitudes above 20,000 feet.
6. Pull face curtain.
   While continuing to control aircraft as much as possible, reach up with one hand and locate face curtain; then, sitting erect, with head back against headrest and muscles tensed to absorb ejection forces, reach up with other hand and pull face curtain until fully extended. The last three inches of travel actuates the catapult firing mechanism.

Note

Face curtain ground lock must be removed prior to flight to unlock face curtain handle and permit ejection when desired.

7. Separate from seat.
   Immediately following ejection release face curtain (lap belt will open automatically in 3/4 sec.) and roll forward out of seat if necessary.
8. Pull parachute rip cord (if the automatic opening parachute is not worn).
   If above 3000 feet at time of separation from seat, delay at least five seconds before pulling rip cord. This delay will preclude any possibility of collision between the seat and parachute and will also result in a lower parachute opening shock. When the escape is accomplished at high altitude, it is recommended that the pilot free fall to an altitude of approximately 18,000 feet before opening this parachute in order to avoid the effects of anoxia and cold.

WARNING

Do not pull rip cord while in seat.

EMERGENCY LANDING GEAR OPERATION

If time and flying conditions permit:

1. Pull the power circuit breakers on the landing gear or gears that indicate DOWN.
2. Cycle the landing gear UP and DOWN. After cycling the landing gear handle to the DOWN position, allow sufficient time for normal gear extension.

CAUTION

Avoid repeated cycling of the gear electrically, trying to obtain a DOWN indication. Raise the gear and then drop by the emergency procedure if the first extension fails to indicate DOWN and LOCKED.

3. Rocking the wings, side slips and pull-ups will sometimes aid landing gear extension.
4. Check the main and nose gear indicators for the DOWN position.
5. After landing, taxi carefully and avoid sharp turns on rough surfaces.

ESCAPE PROCEDURE

1 PLACE FEET IN STIRRUPS.

2 PULL LEG BRACES (JETTISONING CANOPY).

SHOULD CANOPY FAIL TO JETTISON AND REMAIN FULLY CLOSED, PILOT MAY ELECT TO EJECT THROUGH CANOPY BY PULLING FACE CURTAIN.

3 SIT ERECT, HEAD HARD BACK, CHIN TUCKED IN. REACH OVERHEAD, KEEPING ELBOWS TOGETHER. GRASP FACE CURTAIN. PULL HANDLE.

4 PULL FACE COVER DOWN (EJECT).

WARNING

DO NOT EJECT THROUGH A PARTIALLY OR FULLY OPENED CANOPY AS CANOPY FRAME WILL CAUSE SEVERE PERSONAL INJURY.

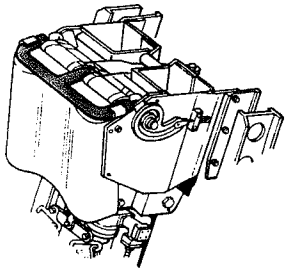

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Figure 3-7.

EMERGENCY EXTENSION OF THE LANDING GEAR

If unsafe condition still exists after attempting emergency operations, as stated above, proceed as follows:

1. Push circuit breakers in and raise all gear.
2. Slow aircraft to 150 knots IAS.
3. Pull out all landing gear circuit breakers.
4. Place handle in DOWN position and pull smartly aft (about 3 inches). LEAVE HANDLE OUT.
5. Check main and nose gear indicators for DOWN position.

LANDING WITH FLAT TIRE

For Field Landing:

1. With one main wheel tire flat, make normal landing on the side of the runway from the flat tire.
2. With both main wheel tires flat, make normal landing in center of runway. Use brakes sparingly.
3. With the nose wheel flat, make a normal landing, nolding the nose wheel off as long as possible.

For Carrier Landing:

1. Make normal landing with any one tire flat or combination of tires flat.

EMERGENCY CANOPY OPERATION

(See Figure 3-8.)

Emergency Entrance:

1. Push button on external emergency handle.
2. Pull external emergency handle.
3. If the emergency motor fails to release the canopy, pull the external emergency handle and manually push the canopy aft.

Emergency Exit:

1. Pull the internal emergency canopy handle.
2. If the emergency canopy handle fails to release the canopy, operate the normal canopy switch.
3. If internal emergency canopy handle and the normal canopy switch fail to release the canopy, pull the internal emergency canopy handle, grasp the forward roller arms on the canopy and manually pull the canopy aft.

DITCHING

If ditching the airplane is unavoidable proceed as follows:

1. Follow radio distress procedure.
2. Canopy OPEN.
3. Jettison external stores.
4. Landing gear UP.
5. Speed brakes IN.
6. Flaps DOWN.
7. Shoulder harness locked, seat belt fastened.
8. Pull oxygen lines and radio plugs.
9. Make normal approach, land fully stalled, nose high attitude.

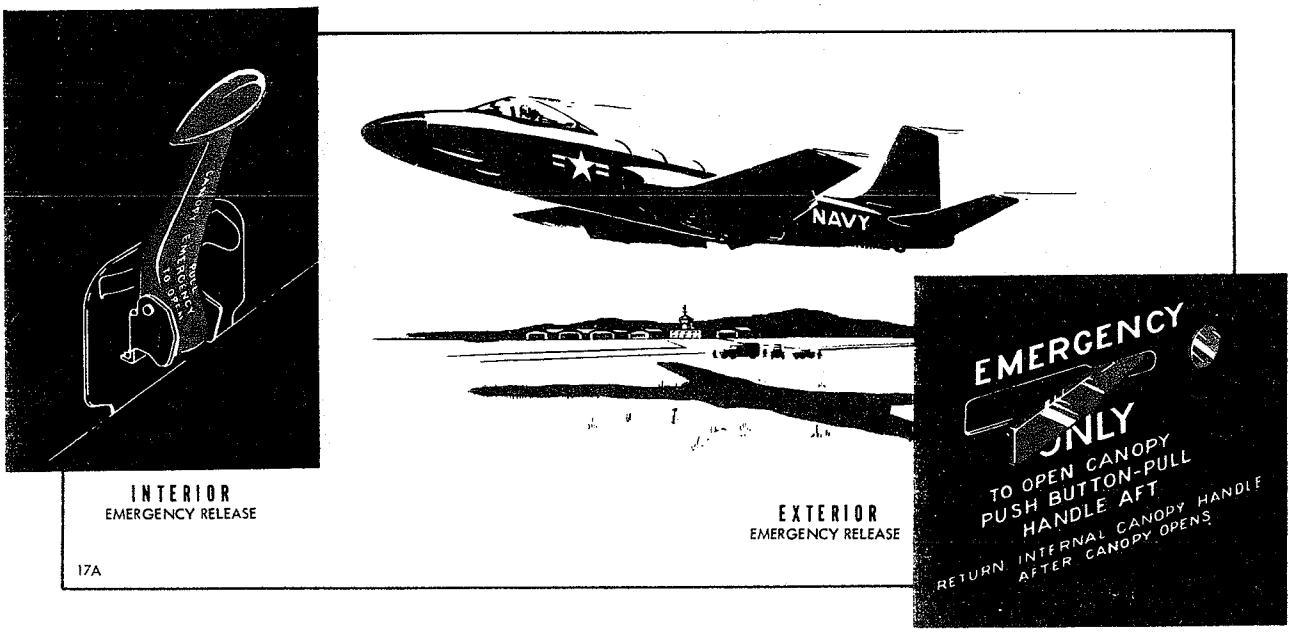


Figure 3-8. Emergency Opening of Canopy - Interior and Exterior

FUEL SYSTEM FAILURE

Tip tank transfer failure can be detected by:

1. With tip tank transfer switches ON, the fuel transfer indicator will show NO or OFF.
2. A gradual increase in lateral trim.
3. A decrease in the amount of fuel in the main fuselage tanks.

When tip tank transfer fails to work perform the following:

1. Push tip tank control circuit breaker.
2. Push WARN. LTS. circuit breaker.
3. If the circuit breakers have no effect, turn the tip tank transfer switches OFF.
4. Hold fuel quantity gage switch to FUSELAGE to check usable fuel.

ENGINE OPERATION WITHOUT FUEL BOOST PRESSURE

Loss of fuel boost pressure will be indicated to the pilot by illumination of the fuel pressure warning light on the left console.

Engine operation without fuel boost pressure will be near normal in that 98-100% rpm will be obtainable. However, acceleration will be seriously affected in the low rpm range. It is therefore recommended that engine rpm be maintained above 50% at all times when operating without fuel boost pump pressure especially during landing approach.

LATERAL CONTROL DURING TIP TANK ASYMMETRY (ONE TIP TANK FULL, ONE EMPTY)

1. The aileron effectiveness is greatly reduced at high and low speeds.
2. Maximum speed with one tip tank full and one empty is 400 knots IAS. The minimum speed is 130 knots IAS with power controls ON.
3. Restrict the airplane to normal flying at all speeds. Do not pull g's.

CAUTION

Except in emergencies, the tip tanks should be released in straight and level flight. Safe release can be accomplished at both high and low speeds from this attitude.

EMERGENCY OPERATION OF THE ELECTRICAL SYSTEM

FAILURE OF ONE GENERATOR

Normal flight can be sustained with one generator.

An inoperative generator is indicated by a red warning light on the generator control panel.

The right fuel boost pump becomes de-energized upon failure of either d-c generator.

A-C GENERATOR FAILURE

In the event of failure of the a-c generator, turn the A.C. POWER switch OFF. The following a-c circuits will be de-energized:

External Stores
Autopilot
ACS Radar (AN/APQ-41 or E-10)
IFF Radar (AN/APX-6)
Gun Heaters

FAILURE OF BOTH GENERATORS

1. Pull all circuit breakers not needed to sustain flight.
2. If operation of any equipment on the SECONDARY BUS is needed, place electrical power switch to BATT ONLY position and push the circuit breaker only on the equipment to be used. Pull the circuit breaker immediately after the equipment is no longer needed.
3. Land as quickly as possible.

CAUTION

Failure of both generators places a heavy load on the battery, therefore battery power is limited to a few minutes operation.

COMPLETE D-C POWER FAILURE

In the event of a complete d-c power failure (both d-c generators and the battery), there will be a resultant loss of ALL a-c power. With a complete loss of d-c power, there is no power available to operate relays necessary in energizing the a-c power system.

Note

If conditions permit, decrease altitude to below 10,000 feet.

1. Turn all electrical power OFF.
2. Avoid abrupt throttle movement to assure engine operation.
3. Land as quickly as possible.

STAND-BY INVERTER FAILURE

In the event of failure of the stand-by inverter, pull the STAND-BY INVERTER circuit breaker located on the right circuit breaker panel to the OFF position. Move the INSTR PWR switch from INVERT to GEN OR EXT position. This will restore power to the following a-c instrument circuits:

Direction Finder (AN/ARA-25)
Hydraulic Pressure Indicator
Fuel Flowmeter
Fuel Quantity Indicator
Remote Indicating Compass
Gyro Horizon
Radio Compass (AN/ARN-6)

POWER CONTROL SYSTEMS FAILURE

An elevator or aileron power control system failure will result in high maneuvering stick forces. At high Mach number, a small longitudinal trim change may occur and either a gentle or abrupt roll may result. An aileron power control failure will decrease total aileron throw. Take the following action:

1. Return to level flight attitude immediately.
2. Turn the affected power control system OFF.

Note

With power OFF, maneuverability will be restricted to that obtainable by pilot effort only.

3. Retrim if required.

ELEVATOR FEEL SYSTEM FAILURES

PARTIAL BELLOWS FAILURE

This condition is recognized by a mild nose down stick force proportional to airspeed, unless the failure occurs during maneuvering flight, at which time it may not be noticeable. Reduced stick centering and longitudinal static stability will occur. Take the following action:

1. Retrim as required.
2. Avoid abrupt fore and aft stick movements.

Note

If a partial bellows failure is noticed or even suspected, it should be reported so corrective action may be taken to prevent a complete bellows failure.

COMPLETE BELLOWS FAILURE

A complete bellows failure will produce a severe NOSE DOWN stick force proportional to airspeed up to a maximum of 35 pounds. The airplane will remain under control, without damage, only if the pilot has a firm grip on the stick at the time of failure. Take the following action:

1. Place control stick trim switch to NOSE UP position until zero stick force is obtained.

CAUTION

If the elevator power system is left on, there will be no 'feel' to the elevator system and the stick will remain in any position it is placed. Extreme caution must be observed when making fore or aft stick movements especially at high speeds as the viscous damper will be ineffective and the structure may be easily overloaded.

AUTOMATIC ELEVATOR TRIM FAILURE

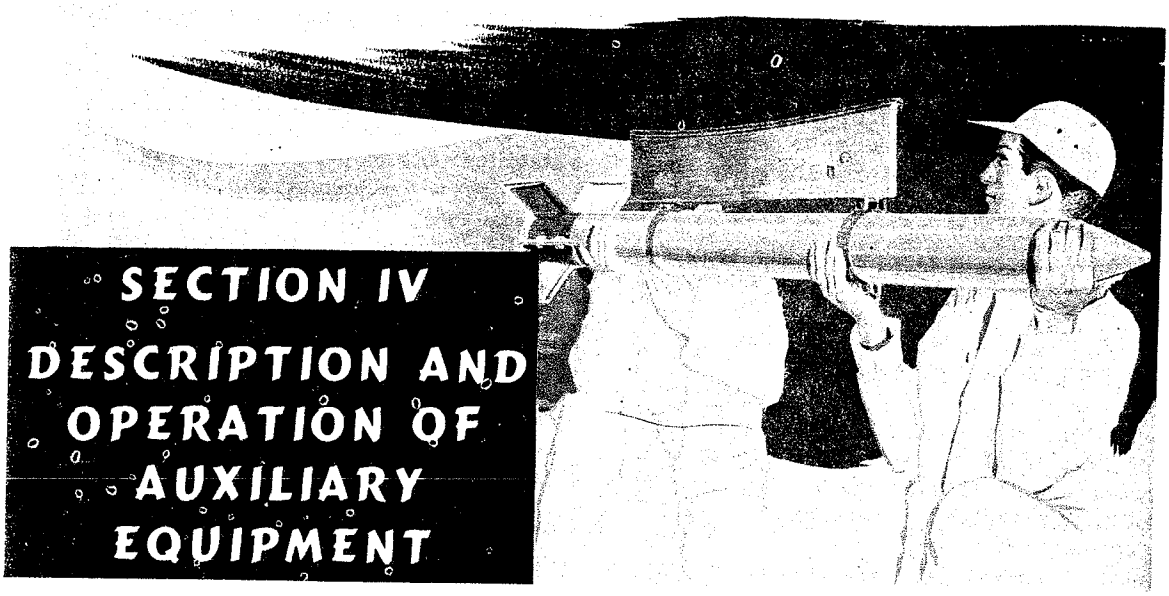
Failure of the automatic elevator trim tab mechanism during POWER ON operation will be noted by a constant tab position registered on the position indicator during maneuvering. Should the tab system fail in extreme NOSE UP or NOSE DOWN position, a severe change in trim will be encountered in event the elevator power control system is turned OFF or the hydraulic pressure system fails. Therefore, as soon as an automatic trim failure is noticed, take the following action:

1. Place ELEV TRIM OVERRIDE switch in NOSE UP or NOSE DOWN as required to return tab to approximately zero position.
2. Do not fly at Mach numbers above .78.
3. Leave switch in OFF position.

TRIM SWITCH FAILURE

CAUTION

The pilot should avoid rapid and excessive trim switch operation. The desired trim condition should be made by a steady pressure, not intermittent ("nibbling") switch selection. Failure of trim switches has been attributed to improper switch actuation.



SECTION IV
DESCRIPTION AND OPERATION OF AUXILIARY EQUIPMENT

CABIN PRESSURIZATION AND AIR CONDITIONING — GENERAL

The cabin is pressurized and air-conditioned by air bled from the engine compressors. The same air both pressurizes and heats the cabin. It is taken from the last stage of each engine compressor and routed to the cabin through a duct system containing flow control and temperature control devices. The air enters the cabin through the windshield defrosting tubes and the cabin air inlet valve located beneath the pilot's seat. (See Figure 4-2.) All the controls for the cabin pressurization and air-conditioning equipment are located on the R.H. console utility panel.

Note

In addition to pressurizing and heating the cabin, the air supplied by the engine compressors is also used as follows: To inflate the canopy rubber seal, to supply air pressure for the pilot's anti-G suit, to run the gyro in the turn-and-bank indicator, to provide ground level air supply to the pneumatic compressor at altitude, to transfer fuel from the wing tip tanks and to add air pressure into the hydraulic reservoir which helps push the hydraulic fluid from the reservoir.

CABIN PRESSURE

The pressure in the cabin is maintained by the cabin pressure regulator which controls the outflow of pressurized air from the cabin to the atmosphere. The operation of this unit is entirely automatic except the pilot may select a NORMAL pressurization schedule or a COMBAT pressurization schedule. An altimeter which indicates the pressure altitude of the cabin is located on the R.H. console generator panel. The cabin pressure regulator allows a maximum of 3.3 psi differential pressure between the cabin and the atmosphere. However, in the event that the regulator fails, a safety valve (dump valve) will automatically relieve the cabin air when the differential pressure reaches 3.5 psi. This same safety valve will also allow atmospheric air to enter the cabin when cabin pressure becomes lower than atmospheric pressure. A rapid descent from altitude can cause this condition to exist thus causing the cabin to become unpressurized at an altitude above 5,000 feet.

CABIN PRESSURE CONTROL SWITCH

This switch has two positions, NORMAL and COMBAT. With the switch in NORMAL position, the desired amount of cabin pressure is maintained at all altitudes. If the airplane is above 35,000 feet and the switch in COMBAT position, the pressure regulator will maintain a lower cabin pressure than normally desired. This reduces the chances of personal injury to the pilot due to a pressure loss if the cabin is ruptured during combat. Technically speaking, it will allow a safe gas expansion ratio in the event of explosive decompression. The NORMAL and COMBAT pressurization schedule are the same schedule below 35,000 feet airplane altitude.

NORMAL VENTILATING CONTROL HANDLE

This handle opens and closes the cabin air inlet valve. With the handle in DEFROST position, the cabin air inlet valve is closed and all the pressurized air will enter the cabin through the windshield defrosting tubes. This position provides a maximum defrosting condition for the windshield. With the handle in CABIN HEAT position, the pressurized air enters the cabin from both the cabin air inlet valve and the windshield defrosting tubes. The pilot may place the handle in intermediate positions as necessary.

CABIN TEMPERATURE

As noted in the previous paragraphs, the same air both pressurizes and heats the cabin. The air is at a very high temperature when it leaves the engine compressors. The temperature control valve diverts a certain amount of this air through the refrigeration unit to be cooled before entering the cabin. The thermostats of the automatic temperature control system determine the position of this temperature control valve.

TEMPERATURE CONTROL SWITCH

The three-position switch is the master control for cabin temperature. With the switch in AUTO position, the temperature of the air entering the cabin will be held constant at any point between approximately 50° F and 80° F depending on the position of the pilot's temperature control rheostat. The two momentary positions of this switch, HOT and COLD, are provided for manual adjustment of the cabin temperature in case the automatic system fails.

TEMPERATURE CONTROL SWITCH (Effective upon incorporation of ASC 334.)

A two-position switch on the master control panel allows pilot selection of temperature. The two momentary positions of this switch, HOT and COLD, are provided for adjustment of cabin temperature.

TEMPERATURE CONTROL RHEOSTAT (Removed upon incorporation of ASC 334.)

The cabin temperature may be held constant at any degree by positioning this rheostat. The rheostat is effective only when the temperature control switch is set at AUTO position.

CABIN PRESSURIZATION PROCEDURE

With the canopy closed and an engine or engines in operation, the cabin will automatically be pressurized when the airplane is over 5,000 feet.

1. Keep the cabin pressure control switch at NORMAL position when flying in non-combat areas.
2. Before entering a probable combat area, preset the cabin pressure control switch at COMBAT position.
3. For rapid depressurization, pull the emergency ventilating control handle. (To retain cabin heat and depressurization at the same time, pull the emergency ventilating control handle to the first or second notch only.)

CABIN HEATING PROCEDURE

With an engine or engines in operation, air will automatically enter the cabin from the engine compressors at all altitudes. To control the temperature of this air, proceed as follows:

1. Place the temperature control switch at AUTO position.
2. Adjust the temperature control rheostat for the desired cabin temperature condition. (Allow one minute for the automatic temperature control system to stabilize at each new setting of this rheostat.)
3. Place the normal cabin ventilating control handle at desired position. (The pilot should position this handle for personal comfort and yet with effective windshield defrosting.)
4. If the automatic temperature control system fails a temporary temperature adjustment may be obtained by bumping the temperature control switch to HOT or COLD position. (The temperature of the air entering the cabin can be made warmer or colder by momentarily depressing this switch to HOT or COLD position.)
5. Holding the temperature control switch at HOT or COLD position for 10 seconds obtains the maximum temperature condition.

CABIN HEATING PROCEDURE (Effective upon incorporation of ASC 334.)

With an engine or engines in operation, air will automatically enter cabin from the engine compressor at all attitudes. To control the temperature of this air proceed as follows:

1. Place the normal cabin ventilating control handle at desired position. The pilot should position this handle for personal comfort and yet with effective windshield defrosting.
2. Temperature adjustment is made by turning the temperature control switch to HOT or COLD position as desired.
3. Holding the temperature control switch at HOT or COLD position for 10 seconds obtains the maximum tomperature condition.

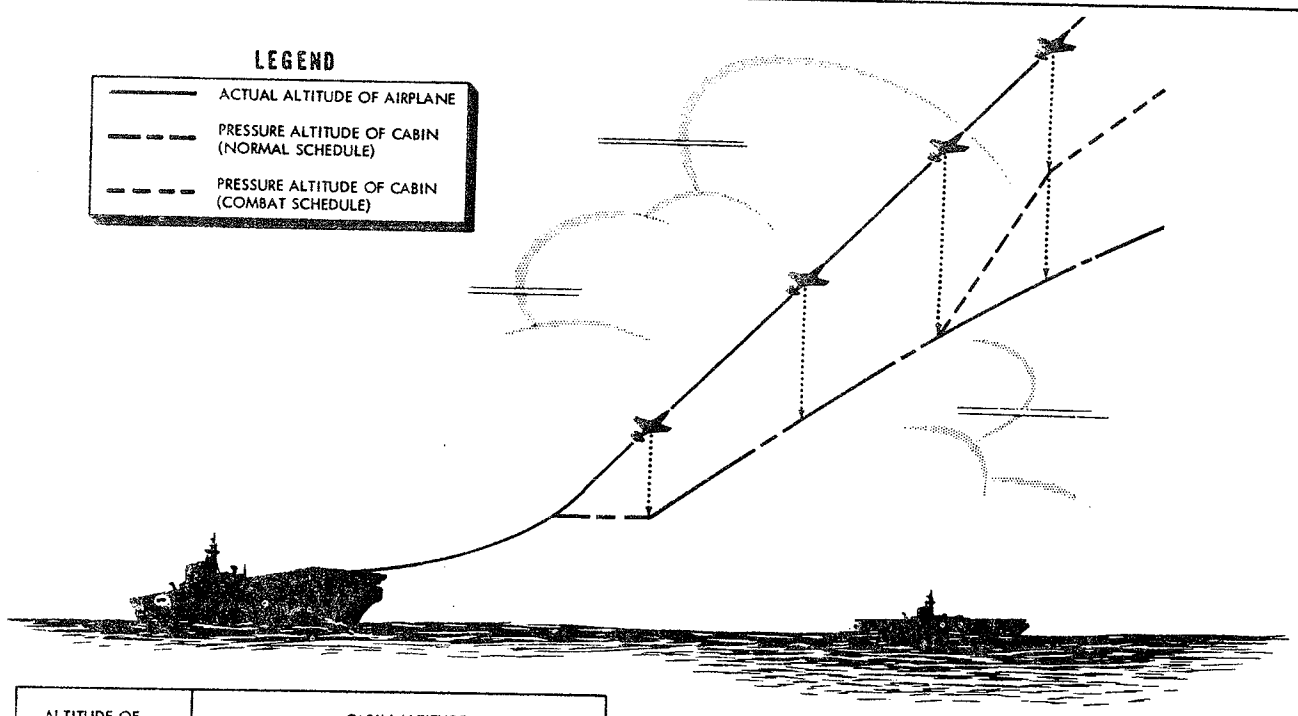
CAUTION

Do not select full LOW or COLD cabin temperature when the outside air temperature at ground level is near freezing. This may result in failure of the refrigeration unit.

Pull the emergency ventilating control handle at least half way up or more to shut off the cabin from the engines. (This operation also depressurizes the cabin.)

WINDSHIELD DEFROSTING

Fog or frost may form on the windshield and canopy when flying in rain or clouds or on days when the relative humidity is high. Sometimes it will begin at the aft end of the canopy and move forward. To obtain maximum windshield and canopy defrosting, perfrom the following steps:



ALTITUDE OF AIRPLANE (FEET)	CABIN ALTITUDE	
	NORMAL SCHEDULE	COMBAT SCHEDULE
SEA LEVEL TO 5000	*UNPRESSURIZED	*UNPRESSURIZED
5000 TO 13000	5000 ISOBARIC	5000 ISOBARIC
13000 TO 35000	3.3 PSI DIFF	3.3 PSI DIFF
35000 TO 50000	3.3 PSI DIFF	RGE 2.3
50000 AND ABOVE	3.3 PSI DIFF	1.3 PSI DIFF

*BLEED AIR IS ENTERING THE CABIN IN THIS ALTITUDE RANGE BUT THE CABIN PRESSURE REGULATOR RELIEVES THE AIR AT A RATE TO RETAIN CABIN PRESSURE JUST SLIGHTLY HIGHER THAN ATMOSPHERIC PRESSURE.

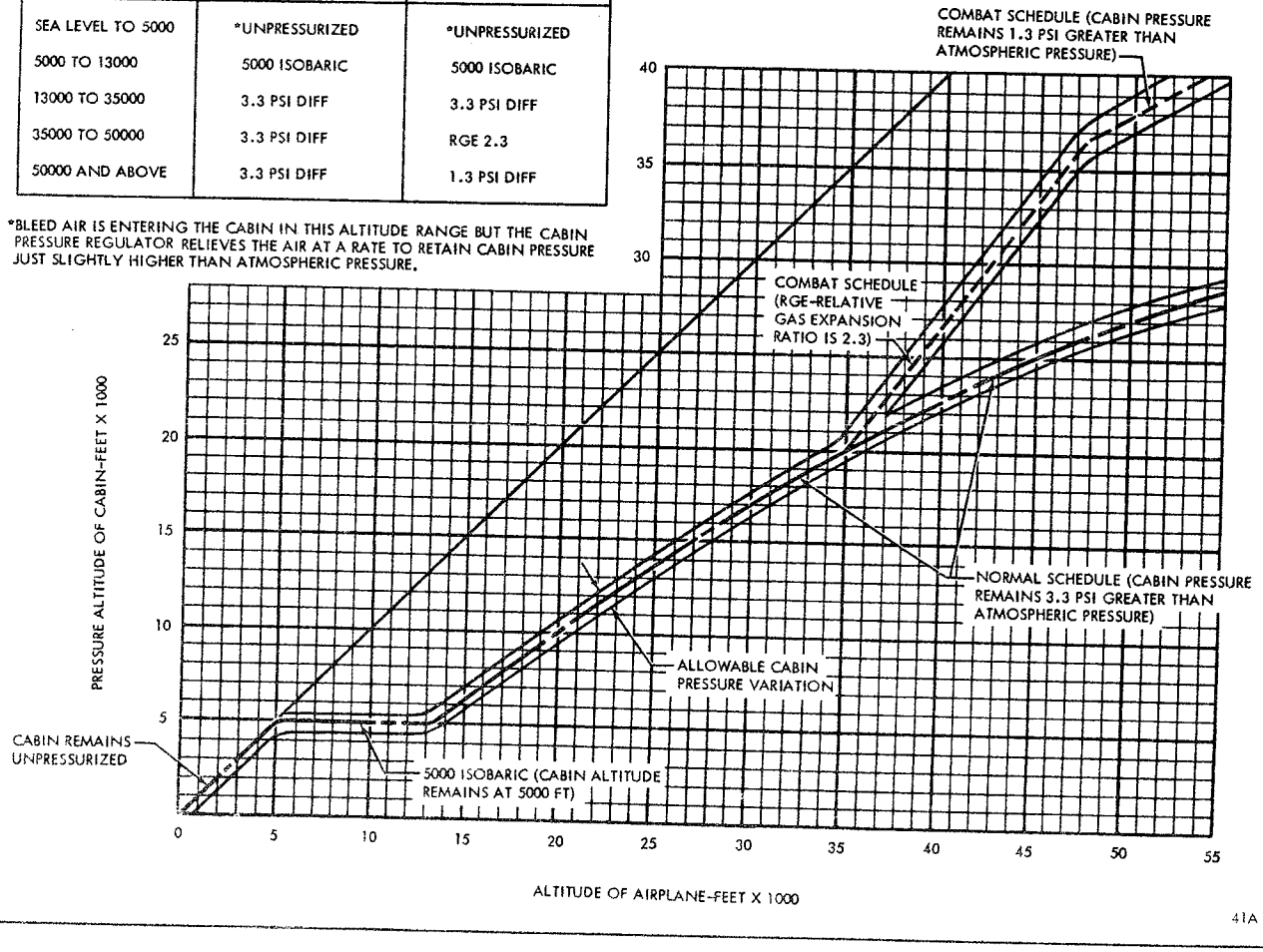


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Figure 4-1. Cabin Pressurization Schedule

1. Place the normal ventilating handle in full DEFROST position.
2. Adjust the cabin temperature to a hotter condition.
3. Increasing the engine speed may also help.

Rapid descents from altitude can cause the windshield to frost or fog over because the cold windshield moves into a warmer atmosphere containing more moisture. Perform the following steps before making a rapid descent:

1. Place the normal ventilating handle in full DEFROST position.
2. Adjust the cabin temperature to a hotter condition.
3. If frosting or fogging occurs excessively, decrease the rate of descent if possible.

CAUTION

When flying at low altitudes on warm humid days, the pilot often has the cabin temperature adjusted to a cold condition. The humid atmospheric air passing through the refrigeration unit may be chilled to a degree to cause the mositure to condense into fog or 'snow'. Therefore, if this fog or 'snow' enters the cabin through the windshield defrosting tubes, PLACE THE NORMAL VENTILATING HANDLE IN FULL CABIN HEAT POSITION. Do not place the handle in DEFROST position as this would obscure vision. A higher cabin temperature will help dissipate this condensed moisture. If the fogging condition persists, pull the emergency ventilation control handle to the full up position until the fog clears.

EMERGENCY VENTILATING CONTROL HANDLE

This handle, located on the R.H. console utility panel, locks in full down and full up position and has four intermediate locked positions. One quarter turn in either direction unlocks or locks the handle. When pulled to the full up position, simultaneously the three following actions occur:

1. All heating and pressurizing air from the engine compressors is completely shut off.
2. The pressure safety valve opens and the cabin is completely depressurized.
3. The emergency ventilating shutoff valve opens which allows atmospheric air to enter directly into the cabin through the windshield defrosting tubes.

EMERGENCY VENTILATING PROCEDURE

The cabin may be cleared of undesired smoke or fumes by pulling the emergency ventilating control handle. Pulling the handle to the first or second notch only depressurizes the cabin and allows atmospheric air to enter. To also shut off the heating and pressurizing air from the engines, pull the handle at least half way up or more. The pilot may position the handle at an intermediate position to obtain the desired amount of emergency ventilation.

Note

More effective emergency ventilation may be had by placing the normal ventilating control handle in full DEFROST position before or after pulling the emergency handle. This lets all the new air escape from the windshield defrosting tubes and pass through the entire cabin area before making an exit at the safety valve.

LIGHTING EQUIPMENT

EXTERIOR LIGHTING

POSITION LIGHTS

The position lights consist of a green light on the right wing tip, a red light on the left wing tip and one white and one yellow light on the aft end of the fuselage. In event tip tanks are carried, red and green position lights are installed on the tip tanks to automatically operate in place of the wing tip lights. The lights are controlled by the OFF - CODE - FLASH - STEADY master switch located on the exterior lights control panel, on the aft end of the right console. When the master switch is placed in the CODE or STEADY position, all position lights burn continuously. When the master switch is placed in the FLASH position, the wing tip lights and white tail light flash alternately with the yellow tail light. The brilliance of the tail lights and wing tip light are controlled by two BRIGHT - OFF - DIM switches located on the exterior lights control panel.

FUSELAGE LIGHTS

A fuselage light unit, containing two lights, is installed on the top and on the bottom of the fuselage. The fuselage lights are controlled by the OFF - CODE - FLASH STEADY master switch, the AUTO - MANUAL code switch, and the BRIGHT - OFF - DIM fuselage lights switch, all located on the exterior lights control panel. When the fuselage light switch is in DIM or BRIGHT position, the code switch in the AUTO position, and the master switch in the FLASH or STEADY position, the fuselage lights will burn continuously. When the code switch is placed in the MANUAL position, with the master switch in the STEADY or FLASH position and the fuselage lights switch in the DIM or BRIGHT position, a code may be flashed manually by use of the code key located on the exterior lights control panel. An indicator light on the exterior lights control panel provides indication that the fuselage lights are functioning when the key is depressed. When the code switch is in the AUTO position, the master switch in the CODE position and the fuselage lights switch in the BRIGHT or DIM position, a code letter may be

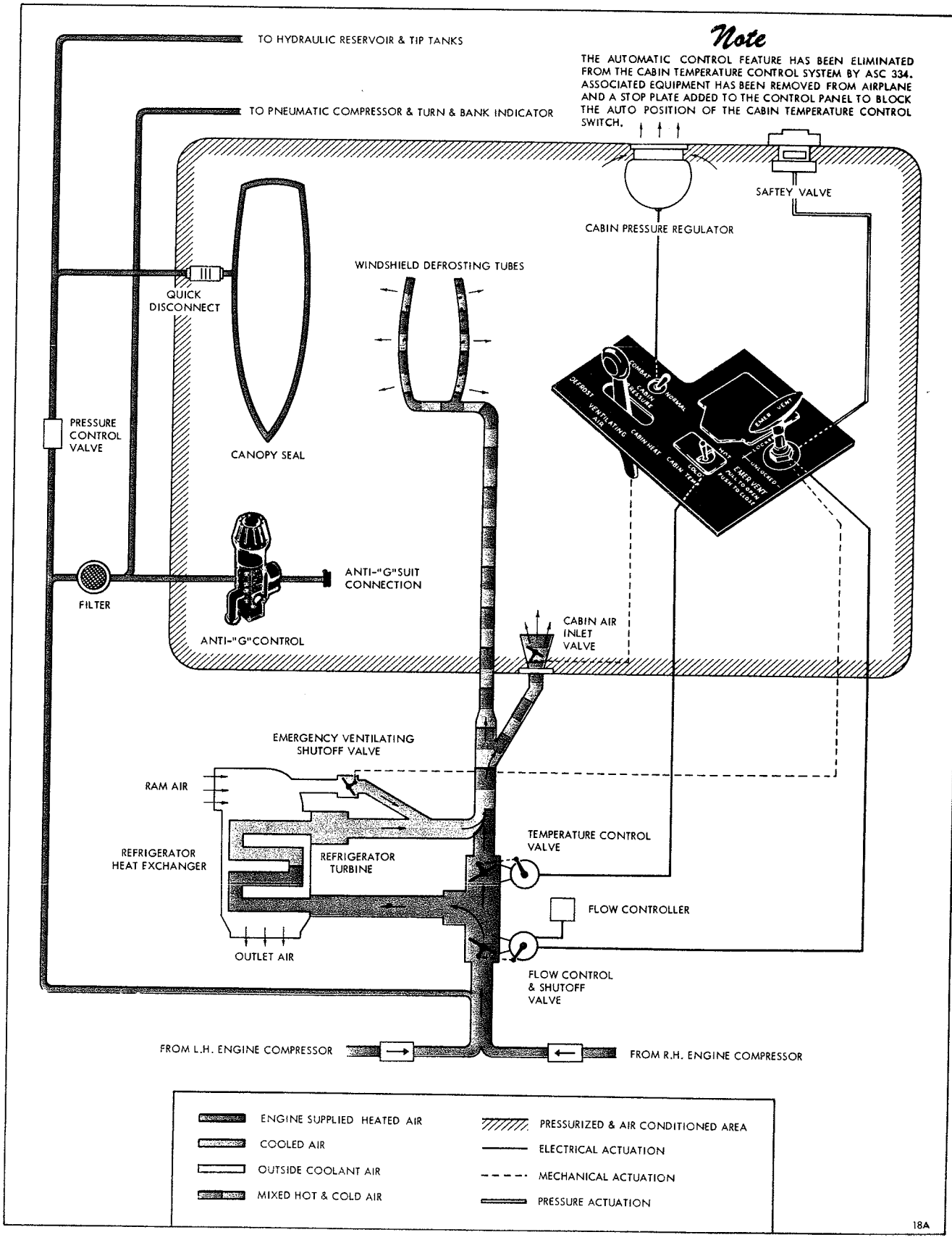

Figure 4-2. Heating, Ventilating and Pressurization Systems Schematic Diagram

selected on the code selector switch also located on the exterior lights control. The fuselage lights will then flash the letter in Morse code. A flasher-coder mechanism operates the lights.

FORMATION LIGHTS

A formation light is located on the lower surface of each outer wing panel, near the trailing edge. The formation lights will operate continuously when the OFF - CODE - FLASH - STEADY master switch, located on the exterior lights control panel, is in the CODE , FLASH or STEADY position and the formation lights BRIGHT - OFF - DIM switch is placed in the BRIGHT or DIM position.

INTERIOR LIGHTING

INSTRUMENT LIGHTS

The instrument lights include the shielded lights for the indicators located on the main instrument panel, the unshielded lights for the oil pressure and oil temperature indicators also located on the main instrument panel, the angle-of-attack indicator light, the stand-by compass light, the shielded lights for the exhaust temperature indicator located on the cockpit pedestal and the shielded lights for the oxygen regulator panel located on the forward end of the left console. The instrument lights are controlled by the instrument lighting OFF-BRIGHT control knob located on the interior lights control panel on the right console. The stand-by compass light is also controlled by an OFF - ON toggle switch located on the auto pilot switch panel above the right console.

TABLE OF COMMUNICATION AND ASSOCIATED ELECTRONIC EQUIPMENT

TYPE	DESIGNATION	FUNCTION	RANGE	LOCATION OF CONTROLS
Radio Altimeter	AN/APN-1	Indicated distance in feet from airplane to ground.	Low Range 0 to 400 feet. High Range 400 to 4000 ft.	Indicator on instrument panel. Limit switch on right console. Warning light on instrument panel.
UHF Radio	AN/ARC-27	AM radio telephone communication between aircraft and ship, aircraft and shore, or between aircrafts.	Up to line of sight depending upon frequency and antenna coverage.	Control panel on right console.
Direction Finder	AN/ARA-25	Adjunct to AN/ARC-27.	Frequency range of 225.0 to 399.9 megacycles. 30-200 miles.	AN/ARC-27 control panel on right console.
VHF Radio	AN/ARC-1	Radio telephone communication between aircraft, or between aircraft and ground station.	Atmospheric condition limits the line of sight. 30-200 miles.	Control panels on right console.
Navigation Receiver	AN/ARR-2A	Receives either navigation signals (telegraph) or voice signals.	Frequency range of 234.0 to 258.0 megacycles. 30-200 miles.	Control panels on right console.
Radio Compass	AN/ARN-6	Receive modulated and CW signals for direction homing and bearing.	Range depends on operating frequency and the time of day (e.g., range station 150-200 miles).	Indicator on instrument panel. Control panel on right console prior to incorporation of ASC 310. Control panel on left console upon incorporation of ASC 310.
IFF Set	AN/APX-6	Identifies aircraft as friendly.	0-200 miles or line of sight.	Control panel on right console.
Navigation Radio Set *	AN/ARN-21	Indicates bearing and distance to selected ground station. Supplies fly left or right instructions for approaching or leaving ground station.	Line of sight up to 195 miles.	Control panel on right console. Range indicator ID-310 and course indicators ID-250 and ID-387 all on instrument panel.

* Effective upon incorporation of ASC 378 (-4 airplanes) and 379 (-3 airplanes)

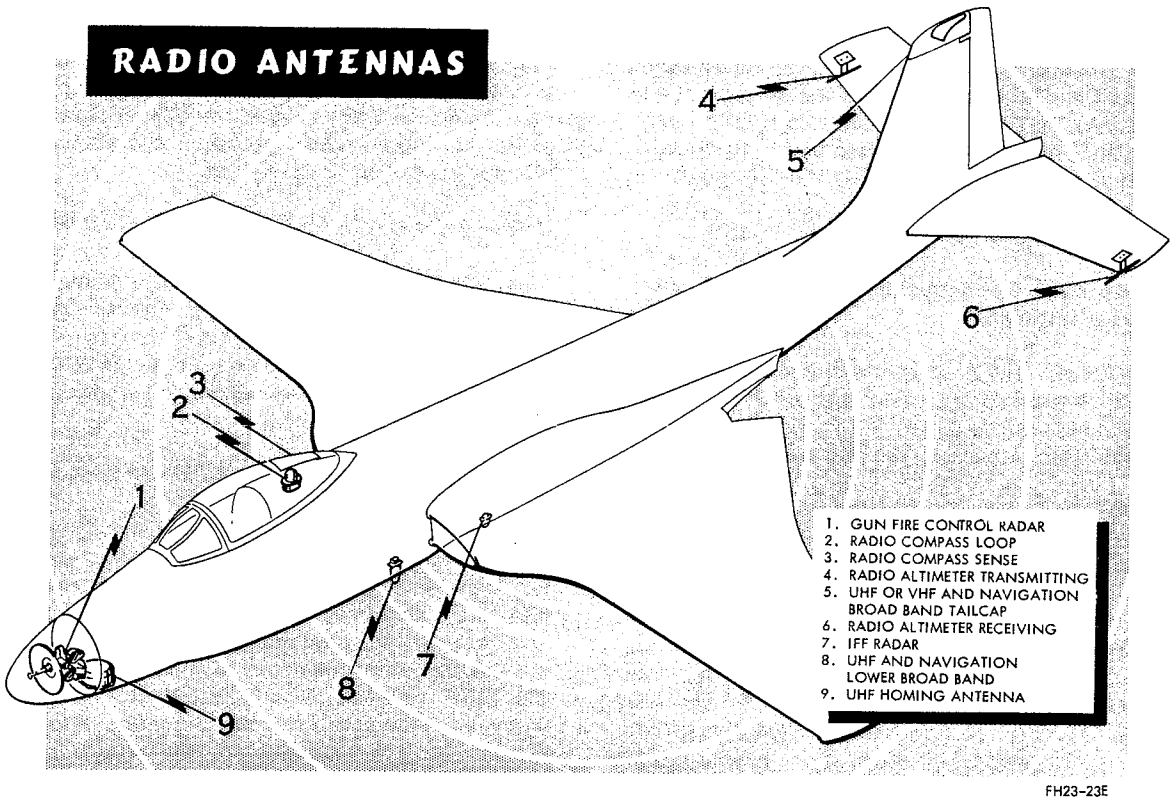

Figure 4-3.

COCKPIT LIGHTS

The cockpit lights include the edge lights on panels located on the left and right consoles, the check list lights on the main instrument panel, the G-2 compass control light, auxiliary fuel flow indicator lights, emergency floodlights, rudder pedal adjustment light, pneumatic switch light, rocket station selector lights, accelerometer indicator lights, pneumatic indicator lights, hydraulic indicator lights, radar indicator lights and the six cockpit floodlights. The emergency floodlights are controlled by an OFF - ON toggle switch located above the right console on the autopilot switch panel. All other cockpit lights are controlled by a cockpit lighting OFF - BRIGHT control knob located on the interior lights control panel on the right console. The cockpit floodlights are also controlled by a BRIGHT-DIM-MEDIUM switch located on the interior light control panel.

LANDING/TAXI LIGHT

Effective upon incorporation of ASC 382, the aircraft will be equipped with a landing/taxi light mounted on the nose gear strut. The two position control switch is located on the left console outboard of the throttles. When placed in the ON position, the landing/taxi light will be turned on regardless of the position of the nose wheel. An amber light located just forward of the switch glows when the switch is turned ON while the landing gear handle is in the UP position.

RADIO ALTIMETER SYSTEM AN/APN-1

The radio altimeter system provides a direct measurement of ABSOLUTE ALTITUDE (terrain clearance) during flight, by measuring electrically the time interval required for a transmitted radio signal to travel to earth and return to the airplane.

The altitude is indicated directly by a meter (radio altimeter altitude indicator) which is operated from the radio altimeter transmitter-receiver. Two altitude ranges are provided.

Low range - 0 to 400 feet
High range - 400 to 4000 feet

The radio altimeter system also indicates the altitude of flight with reference to PRESET ALTITUDES (setting of the radio altimeter altitude limit switch) as follows:

Low range - from 50 to 300 feet inclusive, in steps of 25 feet.

High range - from 500 to 3000 feet inclusive, in steps of 250 feet.

The radio altimeter low altitude warning light will glow (red) when the flight is below the PRESET ALTITUDE. Power is obtained from the airplane's 24-28 volt d-c electrical system, when the circuit breaker is closed and the electrical power control switch is placed in either the BATT-GEN position or the BATT ONLY position, through the rotation of the radio altimeter altitude indicator switch to the ON position.

FUNCTIONS AND LOCATIONS OF CONTROLS

The controls used for operating the radio altimeter system are as follows:

POWER SWITCH. The power switch controls the battery input to the radio altimeter system. It is operated by the knob marked ON, with clockwise arrow, at the lower left corner of the altimeter indicator.

RANGE SWITCH. The range switch is used to select the desired altitude range of the radio altimeter. It is operated by the knob marked RANGE, located at the upper right corner of the altitude indicator. This knob is set in the counterclockwise position for the low range (0 to 400 feet) and in the clockwise position for high range (400 to 4000 feet). The scale numerals are changed by operation of the switch so that the scale reads directly in hundreds of feet for either range.

ALTITUDE LIMIT SWITCH. The control setting of the altitude limit switch determines the preset altitude with reference to which the altitude limit indicator operates. The scale of the altitude limit switch is calibrated directly in feet for the low range; the same scale reads in tens of feet for the high range.

OPERATING PROCEDURE

STARTING THE RADIO ALTIMETER SYSTEM

To place the radio altimeter system in operation, proceed as follows:

Set the range switch for the required range.

WARNING

The high range of the AN/APN-1 altimeter cannot be relied upon below 500 feet over water and 600 feet over land. Below these altitudes, when on the high range, the indicator will usually read high and may fail to read below 400 feet no matter how close to the terrain the airplane may actually be flying. Therefore, when flying under conditions of poor visibility, the AN /APN-1 indicator should always be on the low range.

Set the altitude limit switch for the desired preset altitude.

Turn the power switch to the ON position, clockwise. The altitude limit indicator warning light should glow (red) and will be sustained during the warm-up period. After allowing an interval of approximately one minute for the tubes to heat, the pointer of the altitude indicator will have moved from its subzero position to some other position, indicating the radio altimeter system is operating.

OPERATION OF COMMUNICATION EQUIPMENT

Insert the microphone plug and the headset plug into the disconnect assembly, located on the left console. The airplane's electrical power control switch must be in the BATT-GEN position or the BATT ONLY position or an external power supply connected to the airplane for radio operation.

UHF RADIO COMMUNICATION SYSTEM AN/ARC-27

The UHF radio communication system provides AM telephone communication, in the frequency range of 225.0 to 399.9 megacycles, between aircraft and ship, aircraft and shore, or between aircrafts. The transmitter may be tone-modulated at 1020 cycles per second for emergency or direction finder purposes. The UHF radio communication system provides 1750 frequency channels in the aforementioned range. Provisions have been made for the pilot's remote selection of any one of 18 preset frequencies or operation on a guard channel frequency. Transmission and reception are on the same frequency and by the same antenna. Provision is made for ADF operation in conjunction with the Direction Finder Group.

Power is obtained from the airplane's 24-28 volt d-c electrical system, and is controlled through two radio control panels and a circuit breaker which is mounted in the right circuit breaker panel. A radio control is mounted in the right wing center section. The remote control panel is located on the right console.

FUNCTIONS AND LOCATIONS OF CONTROLS

The controls for operating the UHF radio communication system are as follows:

RADIO SET CONTROL C-626/ARC-27

Three decade frequency selectors are incorporated in this control. Each of these positions a selector switch associated with a corresponding autopositioner in the receiver-transmitter. The autopositioners tune the receiver-transmitter to the selected frequency. Preset channel frequencies may be selected by the LOCAL CHANNEL SELECTOR on this control or by the remote CHANNEL selector on the remote control panel.

The radio set control is located in the right wing center section. Power ON - OFF, TONE-VOICE and LOCAL-REMOTE switches are provided to control the functions of the receiver-transmitter.

REMOTE CONTROL PANEL C-628/ARC-27. (Effective airplanes 126291 thru 126300.)

This remote control panel is installed on the right console. The CHANNEL selector switch on this control permits the pilot to select any one of 18 frequencies preset on the radio control in the right wing center section. A four-position switch provides the following functions:

OFF	Transmitter-receiver and ADF off.
T/R	Transmitter on in stand-by, main receiver on, ADF in stand-by.
T/R and G REC	Transmitter on in stand-by, main receiver on, guard receiver on, ADF in stand-by.
ADF	Transmitter in stand-by, guard receivers in stand-by, ADF and main receivers on.

An audio volume control is also provided.

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REMOTE CONTROL PANEL C-905/ARC-27. (Effective airplanes 126301 and up.)

This remote control panel is installed on the right console and contains the same controls as the C-628 /ARC-27 control panel described in the preceding paragraph, plus the MANUAL PRESET switch and the three knurled disks that comprise the manual channel selector. With the MANUAL PRESET switch in PRESET position, the control unit functions the same as the C-628/ARC-27 control unit. With the MANUAL PRESET switch in MANUAL position, the operating frequency will be any one of the 1750 available frequencies selected by means of the three knurled disks.

DISCONNECT ASSEMBLY

The microphone and pilot's headset connections are provided as a part of the pilot's gear disconnect assembly, located on the left console. An adapter to the disconnect assembly brings the leads to the pilot.

ANTENNA SWITCH

The antenna switch is installed in the right throttle. It performs two functions, actuating the pilot's microphone and selecting the antenna through which radio communication takes place. Placing the switch in the upper position directs radio transmission and reception through the broadband tailcap. Placing the switch in the lower position directs it through the lower broadband antenna. See Figure 4-3. Depressing the switch while it is in either position activates the pilot's microphone and permits him to transmit.

FOOT OPERATED MICROPHONE SWITCH

Effective upon incorporation of ASC 368, a foot switch is installed which facilitates transmitting during maneuvers. Depressing the switch, located on the floor inboard and aft of the right rudder pedal, activates the pilot's microphone. The transmission will be broadcast from whichever antenna has been selected with the antenna switch.

OPERATING PROCEDURE

STARTING THE UHF RADIO COMMUNICATION SYSTEM

To place the UHF radio communication in operation, proceed as follows:

1. Push in the circuit breaker to close the UHF radio communication system circuit.
2. Place the function switch on the remote control panel in the T/R position. Allow an interval of one minute for the tubes to heat.
3. Set the CHANNEL switch for the desired preset channel.
4. Adjust the audio volume control.
5. Select reception or transmission on the upper or lower broadband antennas by operating the antenna switch in the upward or downward position.

AN/ARA-25 ADF-UHF RADIO

DIRECTION FINDER

The direction finder is used in conjunction with the UHF radio communication system on a frequency band of 225-399.9 mcs. The direction-finding feature of the UHF receiver provides the pilot with a continuous indication of the relative bearing to the transmitting station. Operation of the direction finder is controlled by the function switch on the UHF radio control panel. Placing the function switch in the ADF position directs electrical input from the antenna, through the UHF receiver and direction-finder amplifier, to the single needle pointer of the radio magnetic indicator.

ID-250 RADIO MAGNETIC INDICATOR

The RMI consists of a rotating compass card, a single needle and a double needle. The magnetic heading of the aircraft is shown under the index arrow at the top of the instrument. Relative bearing to the station tuned in by the automatic direction finding system (AN/ARA-25) is indicated by the single needle. Relative bearing to the station selected by the radio range (AN/ARN-6) or TACAN (AN/ARN-21) is indicated by the double needle.

FUNCTIONS AND LOCATIONS OF CONTROLS

The automatic direction finder is controlled from the UHF radio remote control panel. When the UHF radio is operating, the automatic direction finder system is in stand-by. Placing the control in the ADF position causes the automatic direction finder to go into operation. Placing the control in the OFF position turns off both the UHF and ADF systems. The reception frequency is selected by the channel selector on the UHF remote control panel.

VHF RADIO COMMUNICATION SYSTEM AN/ARC-1

The VHF radio communication system is used as an alternate radio communication system. All necessary provisions for its installation are provided for in the airplane. When the VHF radio communication system is installed in the airplane the following procedures are to be followed.

The VHF radio communication system provides two-way voice communication between aircraft or between aircraft and ground station on any of nine prearranged main channel communication frequencies or a guard-channel frequency. Incoming signals are received with the VHF radio communication system except for those intervals when transmission is desired. The change from the receiving to the transmitting condition is accomplished simply by operating the antenna switch. Power is obtained from the airplane's 24-28 volt d-c electrical system, when the circuit breaker is closed and the radio master control OFF-ON switch is placed in the ON position.

Complete remote control of the VHF radio communication system is obtained by means of the radio master switch and the VHF control panel. The disconnect assembly forms a part of the VHF radio communication system and includes jacks for the pilot's headset and microphone plugs.

FUNCTIONS AND LOCATIONS OF CONTROLS

The controls used for operating the VHF radio communication system are as follows:

RADIO MASTER CONTROL C-739/ARC

The radio master control panel is located on the right console and functions as a master power switch for the radio communication and navigation transmitter and receivers, but does not include IFF and radar equipment. The radio master control panel also functions as a master volume control for the VHF radio communication system COMM. VOLUME knob which allows the adjustment of the headset signal for comfortable operation.

The front panel of the radio master control panel contains the master radio switch (bat handle type toggle switch) and a guard to prevent accidentally turning off the equipment.

CONTROL PANEL C-865A/ARC-1

This control provides a CHAN SEL switch for selecting one of the nine main channels, and a guard-main switch GUARD - BOTH - MAIN T/R. The guard-main switch provides a choice of operation on the selected main channel or the guard channel, or operation on the selected main channel and monitoring on the guard channel. Windows are provided to show the guard and main-channel operating conditions. The guard-channel window shows OFF, R, or T/R, indicating that the guard channel is turned off, is set for reception only, or is set for transmission and reception. The main-channel window shows the number (1 to 9) of the selected main channel when the main channel is in an operating condition, or OFF when the VHF radio communication system is set for operation on the guard channel only.

OPERATING PROCEDURE

STARTING THE VHF RADIO COMMUNICATION SYSTEM

To place the VHF radio communication system in operation, proceed as follows:

Note

Each time the VHF radio communication system is turned on, allow at least 20 seconds for the vacuum tubes to reach operating temperature before operating the antenna switch.

RECEPTION

Close the circuit breaker and place the radio master control OFF-ON switch in the ON position. Place the control panel guard-main switch in the BOTH position, then rotate the CHANNEL SELECTOR switch as required for operation on the desired main channel. The VHF radio communication system will be ready for the reception of incoming signals on the guard channel and the selected main channel after the vacuum tubes reach operating temperature. Headset noises sometimes heard with other receivers will be absent; the VHF radio communication system suppresses such noise during the intervals between incoming messages.

While operating on the main channel and monitoring on the guard channel (guard-main switch in the BOTH position), reception on either channel may be prevented by interfering signals or noise passed by the other channel. This interference may be suppressed by operating the guard-main switch to the MAIN T/R or GUARD position as required. If the desired signal is recognized to be on the main channel, operate the switch to the MAIN T/R position. If the desired signal is recognized to be on the guard channel, operate the switch to the GUARD position. The use of the VHF radio communication system is blocked for approximately five seconds, when the switch is moved to the GUARD position. This delay is required by the channel selector motor in order to change the main channel r-f circuits for operation on the guard-channel frequency.

TRANSMISSION

When the pilot wishes to talk, it is necessary only to move the antenna switch (located in the right throttle handle grip assembly) in the upward or downward position. When talking into the microphone the lips should just touch the front of the microphone. Talk in a loud, clear voice but do not shout, finish each word completely before starting the next one. The antenna switch must be released after each transmission in order for the VHF radio communication system to operate for the reception of signals.

NAVIGATION RADIO SYSTEM AN/ARR-2A

The navigation radio system is a special purpose type of radio equipment which is used to receive a parti-

cular type of ultra-high-frequency signal in the range of 234 to 258 mc. The signal must have a modulation at a lower radio frequency, which usually is keyed telegraphically but may be amplitude modulated in turn by a voice signal. The modulation may be set at any one of six frequencies in the range of 540 to 830 kc. The navigation radio system is for remote control operation only. The navigation radio system will receive either navigation signals (telegraph) or voice signals. In either case the original signal (at the transmitter) is impressed on another signal in the band between 540 and 830 kilocycles (called the modulation frequency). This, in turn, modulates a carrier frequency between 234 and 258 megacycles to produce the radiated signal. The receiver demodulates the signal in reverse order. Six modulation-frequency channels are available and may be selected by remote control. When the receiver is used for navigation, a beat oscillator produces an audible beat note. When used for reception of voice modulation, the beat note oscillator is cut out. The desired operating condition (NAV or VOICE) is selected by the switch on the navigation radio system remote control panel.

Power is obtained from the airplane's 24-28 volt d-c electrical system, when the circuit breaker is in the closed position.

FUNCTIONS AND LOCATIONS OF CONTROLS

The controls for operating the navigation radio system are as follows:

Note

No harm to the navigation radio system or to the pilot can result from any combination of settings of the controls.

CONTROL PANEL C-738/ARR-2

This control is located on the right console. All necessary controls for complete operation on any one of the six channels are located on this control panel. The navigation radio control panel has a combination switch with NAV-VOICE positions; an output (sensitivity) control SENS; a channel selector control CHAN-SEL.

NAV-VOICE CONTROL

Power is applied to the navigation radio receiver when the control knob NAV-VOICE is placed in either the NAV or VOICE position. When the control is set to NAV position, the beat note oscillator functions and a navigation signal is heard. The VOICE setting should never be used for navigating service. If VOICE is to be used, instructions will ordinarily be given prior to take-off. Always be sure the NAV-VOICE control is set for the kind of reception desired.

OUTPUT CONTROL (SENSITIVITY CONTROL)

The output control (SENS) varies the gain (sensitivity) of the receiver and is used as a volume control to limit the audio output to a comfortable level. The output control will vary the sensitivity over a considerable range.

BEAT NOTE CONTROL

Movement of the NAV-VOICE control pointer will vary the PITCH or the tone of the observed navigation signal.

CHANNEL CONTROL

The channel selector control CHAN-SEL consists of a rotary six-position switch which causes the motor of the electric tuning control adapter (located on the front panel of the receiver) to rotate when a channel position has been selected. The electric tuning control motor rotates until the proper position has been reached.

OPERATING PROCEDURE

STARTING THE NAVIGATION RADIO SYSTEM

To place the navigation radio system in operation, proceed as follows:

Set the channel control CHAN-SEL in accordance with the instructions received prior to take-off. This amounts to selecting the proper transmitting station.

Place the NAV-VOICE control in the NAV position. Adjust the output control SENS by beginning with the output control set in the extreme counter-clockwise position. Advance the output control slowly clockwise until either noise or signals of moderate strength are heard. If it is possible to receive signals, they will be heard without advancing the SENS control any further.

Readjust the output control (SENS) by turning in a counter-clockwise direction until the desired signal is obtained. The output control (SENS) will require frequent readjusting, especially when near a transmitter. As the transmitter is approached the output control (SENS) should be set further and further counter-clockwise. This procedure is necessary to obtain sharp sector indications and to prevent receiver overloading. Failure to observe this procedure may result in incorrect sector identification.

RADIO COMPASS SYSTEM AN/ARN-6

The radio compass system will guide the airplane to a transmitting station at its destination or to take bearings on transmitting stations as an aid to navigation. The radio compass indicator continuously indicates the direction of the transmitting station with respect to the aircraft heading. While the radio compass system is being used as a radio compass, the

pilot can also hear station signals and thus obtain weather reports or other flight information. The radio compass can also be used as a communication receiver. Power is obtained from the airplane's 24 - 28 volt d-c electrical system, when the circuit breaker is in the closed position.

FUNCTIONS AND LOCATIONS OF CONTROLS

The controls for operating the radio compass system are as follows:

RADIO COMPASS CONTROL PANEL

This control panel, located on the right console prior to incorporation of ASC 310 and on the left console upon incorporation of ASC 310, contains an OFF - COMP - ANT. LOOP function switch, tuning meter, LOOP L-R switch, dial band switch, TUNING crank, AUDIO control, CW-VOICE switch, and spare bulb. The controls provide the pilot with facilities for remote operation of the radio compass receiver, and also provides a means of selecting frequency, selecting VOICE or CW reception, controlling the function of the radio compass system, controlling the audio gain and providing a meter for visual tuning purposes.

INDICATOR ID-90A/ARN-6

Note

Indicator ID-90A/ARN-6 is replaced by indicator ID-250/ARN when the ADF (AN/ARA-25) system is installed as a functional system.

This indicator is located on the main instrument panel. It is an autosyn driven device. It indicates the angular position of the autosyn transmitter located in the loop and gives the bearing of a radio transmitter when the loop is at a true null. Its scale is graduated every two degrees with every 30 degree graduation indicated by the proper numeral. The azimuth scale of the indicator may be manually rotated by means of the VAR knob located on the front of the indicator.

OPERATING PROCEDURE

STARTING THE RADIO COMPASS SYSTEM

To place the radio compass system in operation, proceed as follows:

Place the control panel function switch in COMP., ANT. or LOOP position. To stop the radio compass system turn the function switch to OFF.

OPERATION

The radio compass system will perform the following three major functions:

Homing compass operation.
Position finding using automatic and aural-null methods.
Receiver operation using ANT. or LOOP.

HOMING COMPASS OPERATION

To use as a homing compass perform the following operations:

1. Turn the function switch to COMP position. Rotate the band switch to the frequency band in which operation is desired.
2. Turn the TUNING crank to the desired station frequency and tune for maximum swing of the tuning meter. Greater accuracy in tuning may be obtained by placing the CW-VOICE switch in the CW position. A 900-cycle tone will be heard along with the station modulation. This will aid in accurate tuning. After tuning, return the CW-VOICE switch to VOICE to eliminate the 900-cycle tone.
3. Adjust the AUDIO control for the desired headset level.
4. Listen for station identification to be sure that the correct station is being received.
5. Turn the VAR knob on the radio compass indicator until the azimuth zero is at the index.
6. The radio compass indicator pointer will now show the bearing of the station relative to aircraft heading.

POSITION FINDING

AUTOMATIC METHOD

For operation as an automatic indicating position finder, perform the following operations:

1. Adjust the VAR knob on the radio compass indicator until its bearing scale at the index is the same as the true magnetic heading of the airplane.
2. Set the function switch knob on the control panel to COMP.
3. Tune in the desired station and record the bearing as indicated by the tail of the indicator pointer.

AURAL-NULL METHOD

For operation as an aural-null position finder perform the following operations:

1. Adjust the VAR knob on the radio compass indicator until its bearing scale at the index is the same as the true magnetic heading of the airplane.
2. Set the function switch knob on the control panel to tune in the desired station. To obtain good signal strength for station identification it may be necessary to rotate the loop by means of the LOOP L-R switch knob for maximum signal.
3. Use the LOOP L-R switch to rotate the loop for minimum headset volume. Better definition of the null may be obtained by turning the AUDIO control fully clockwise and locating the null by either listening for minimum audio signal or noting a counterclockwise dip of the tuning meter pointer. The use of CW operation also improves the definition of the null. To

obtain CW operation place the CW-VOICE switch in the CW position.

Position finding in LOOP operation is subject to a 180 degree error since there are two null points in a 360 degree rotation of the loop. This ambiguity is overcome by keeping aware of your general geographical location and selecting stations located well to the left and right of your course.

RECEIVER OPERATION

CANOPY ANTENNA OPERATION

1. Turn the radio compass control panel function switch to the ANT. position.
2. Turn the band switch to the desired frequency band.
3. Place the CW-VOICE switch in the CW position for aural reception of unmodulated signals.
4. Use the tuning crank and tune in the desired station.
5. Adjust the AUDIO control for desired headset volume.

Note

For best definition of radio range stations adjust the AUDIO control for the lowest usable headset volume and continue to reduce the volume as the A-N signals increase in strength.

LOOP RECEPTION

If reception on ANT. is noisy due to precipitation static, commonly known as rain or snow static, better results may be obtained by operating in LOOP position as follows:

1. Turn the function switch on the radio compass control panel to LOOP position.
2. Turn the band switch to the desired frequency band.
3. If the station is unmodulated, place the CW-VOICE switch in the CW position.
4. Tune in the desired station.
5. Rotate the loop with the LOOP L-R switch until maximum signal is obtained. If the flight course is not straight, readjustments may be necessary.
6. Adjust the AUDIO control for desired headset volume.

For the best definition of radio range A-N signals on LOOP, it is necessary to maintain the loop near the 90 to 270 degree position and adjust the AUDIO control for the lowest usable headset volume.

IFF EQUIPMENT AN/APX-6

The IFF system is a radar identification airborne transpondor and is one of several equipments which may be operated together to provide a system of electronic identification and recognition. The primary purpose of the IFF system is to identify the airplane in which it is installed as friendly when correctly challenged by friendly radars that are shore to ship based or airborne.

Power for operation of the IFF equipment is obtained from two sources. The airplane's main inverter supplies 380 - 420 cycle, 109 - 119 volt a-c current. 28 volt d-c power is supplied by the airplane's primary bus. A five-ampere circuit breaker protects the d-c power circuit to the IFF control panel. A ten-ampere circuit breaker protects the d-c power circuit to the transmitter-receiver destructors.

FUNCTIONS AND LOCATIONS OF CONTROLS

CONTROL PANEL C-629/APX-6

This control panel is located on the right console and permits the pilot's selection of all functions of the IFF system. The control panel contains a five-position rotary switch and two toggle switches for the selection of the type of operation. A third toggle switch, located under a guard, permits energizing the destructor circuit.

MASTER SWITCH

This switch permits the selection of operational characteristics as follows:

OFF. In this position the IFF system is in the secured condition and no primary power is applied.

STDBY. All primary power is turned on and tubes are heated and ready for immediate operation, but the receiver is desensitized to prevent operation.

LOW. In this position, the receiver is partially sensitive and operation will occur when in the presence of strong near-by interrogations.

NORM. The receiver is operated at full sensitivity to provide maximum performance.

Note

The selection of receiver sensitivity, i.e., LOW or NORM, affects performance in the same identical manner regardless of the characteristic of interrogation used.

EMERGENCY. In this position the receiver is operated at full sensitivity and emergency replies are transmitted when any characteristic interrogation is received. The emergency reply is transmitted to all modes of interrogation, regardless of the settings of the MODE switches. In order to prevent accidental switching of the IFF system into emergency operation, a push button guard or dial stop is located immediately under and to the left of the MASTER switch.

OPERATING PROCEDURE

1. Rotate the MASTER switch to NORM position unless instructed otherwise.
2. Set the MODE switches in the OUT position unless instructed otherwise.

EMERGENCY

For EMERGENCY operation, press the dial stop and rotate the MASTER switch to the EMERGENCY position. Following is a suggested technique for right-hand, rapid operation of the MASTER switch to obtain EMERGENCY operation. Grasp the knob between the knuckles of the first and second fingers. At the same time press the dial stop with the thumb and rotate the switch to the EMERGENCY position.

To secure the IFF system, rotate the MASTER switch to the OFF position.

VHF NAVIGATION RADIO AN/ARN-21 (TACAN)

Effective upon incorporation of ASCs 378 and 379a the AN/ARN-6. The ARN-21, called "TACAN", is a short-range VHF navigational aid which converts radio signals received from a selected ground station into visual displays of azimuth and range. TACAN operates on 126 manually-selected channels at altitudes below 50,000 feet. At altitudes above 50,000 feet an altitude limit switch cuts off power to the set. Power is supplied by the 28 volt d-c bus and the 115 volt single phase a-c bus.

Azimuth information is broadcast continuously by the ground station. A beacon, which rotates at a constant rate, transmits a special pulse signal when it passes through the 090° radial. By measuring the length of time necessary for the beacon to rotate from this radial to the one on which the aircraft is located, azimuth can be determined. This information is displayed in terms of relative bearing, accurate to 1/4 degree, on the double-needle pointer of the ID-250 radio magnetic indicator, and in terms of course displacement on the vertical cross-pointer of the ID -387 course indicator. Unlike azimuth signals, distance signals are not broadcast continually. The airborne TACAN transmitter initiates a request for distance information. A pulse signal from the TACAN transmitter triggers a responding pulse signal from the ground station. The time lapse is translated into distance. Range information is displayed in nautical miles on the ID-310 range indicator.

The maximum operating range of the TACAN distance function is 195 nautical miles, but bearing information is accurate beyond this range under most conditions. Ground equipment can respond to distance inquiries of more than 100 aircraft simultaneously without interference. A station identification signal, in morse code, is broadcast once every 75 seconds.

FUNCTIONS AND LOCATIONS OF CONTROLS AND INDICATORS

All of the ARN-21 indicators are located on the instrument panel. The TACAN control panel is located forward on the right console and contains all of the controls.

CHANNEL SELECTOR KNOBS

The desired operating channel is selected by two knobs. The left knob selects the first two digits of the desired channel, and the right knob the last digit. Any selection from 00 to 129 is possible, but only channels 01 to 126 are operative.

CAUTION

Do not select channels above 126 or below 01 as damage to the equipment will result.

POWER SWITCH

The power switch has three positions: OFF, REC and T/R. In the OFF position, power to the set is shut off. In the REC position, the airborne transmitter which initiates requests for range information is inoperative, no pulse signals are transmitted and no range information is received. Bearing data only is obtained. The REC position is used when it is undesirable to emit signals from the aircraft, e.g., over enemy territory. Both range and bearing signals are received when the switch is in the T/R position.

VOLUME KNOB

This control adjusts the volume of the station identification signal in the pilot's headset.

ID-387 COURSE INDICATOR

The course indicator has a bearing selector knob, a bearing window, a TO-FROM window, a bearing deviation (vertical) cross-pointer, a glide slope (horizontal) cross-pointer, and a heading needle. The horizontal cross-pointer is used only for ILS approaches and is inoperative in F2H-3 and -4 airplanes. The magnetic course which the pilot desires to fly is set in the bearing window by turning the bearing selector knob. The display in the TO-FROM window then indicates whether this course will carry the aircraft towards or away from the station. If flying the selected course will carry the aircraft towards the station, the word TO appears in the window. The deviation (vertical) cross-pointer shows the position of the aircraft (represented by the center dot) in relation to the desired course (represented by the vertical cross-pointer). If the cross-pointer is deflected to the right, the plane must be turned to the right in order to intercept the selected course. Each 1-dot deflection of the cross-pointer from the center indicates that the aircraft is 5° off course. When unreliable signals are received, a red

OFF flag appears at the bottom of the vertical cross-pointer. The heading needle indicates the heading of the aircraft in relation to the selected course. When this needle is displaced at the same time the vertical cross-pointer is centered, the aircraft is crabbing to hold the selected course.

ID-250 RADIO MAGNETIC INDICATOR

The operation of this instrument is described in this section under the discussion of the ARN-6. TACAN information is supplied to the number 2 needle.

ID-310 RANGE INDICATOR

The slant range distance from the aircraft to the transmitting station is displayed in the window of the range indicator. When the signal is unreliable, a horizontal red OFF flag drops down and partially covers the display. The error introduced by measuring slant rather than horizontal range is negligible, being only about 0.1 of a mile at the set's operating limits (50,000 feet altitude, 195 nautical miles from the station).

NORMAL OPERATION OF THE AN/ARN-21

Note

If reliable signals cannot be received, all of the indicators will "search" constantly.

1. Power switch - REC or T/R as desired.
   Allow approximately 90 seconds for warm-up.
2. Select the desired channel.
3. VOLUME - as desired.
4. Observe the double needle indication on the ID-250 radio magnetic indicator.
5. Observe vertical cross-pointer deflection on the ID-387 course indicator.

Note

Check to see that the warning flag disappears completely.

6. Observe the range indication on the ID-310 range indicator.

Note

The power switch must be in the T/R position to make range information available.

7. Set the desired course in the bearing window of the ID-387. Fly heading to or from the station.

EMERGENCY OPERATION OF THE AN/ARN-21

There is no emergency procedure as such for TACAN. If difficulty is experienced the following checks are recommended. First determine that there is no obstruction between the ground station and the aircraft, for TACAN, like all VHF equipment, is subject to line-of-sight restrictions. If there are no obstructions, select a second station known to be within range. If operation is satisfactory on the second channel, switch back to the first station to determine whether the faulty operation was caused by a temporary pause in beacon transmission or an unknown obstruction between the beacon and the aircraft.

OXYGEN SYSTEM

The airplane is equipped with a high pressure diluter-demand oxygen system which consists of two oxygen cylinders, with provisions for installation of a third cylinder, an oxygen regulator, and the necessary lines, fittings, and check valves. The automatic positive pressure diluter-demand regulator, located on the left console, mixes a varying ratio of cabin air and oxygen depending upon altitude, and delivers the quantity demanded upon inhalation. The regulator incorporates an oxygen cylinder pressure gage, a flow indicator, an air valve and a safety pressure valve.

Note

Only a pressure type breathing mask may be used with this regulator.

The operational limit of cabin altitude with this regulator is 43,000 feet. In emergencies this limit may be exceeded by 2000 feet for short periods of time. Sufficient pressure is automatically delivered for an emergency descent from 50,000 feet in the event pressurization is lost and cabin pressure is reduced to that of the surrounding air.

AIR VALVE CONTROL

The air valve located on the face of the regulator has two positions, NORMAL OXYGEN and 100% OXYGEN. Under all normal operating conditions the air valve is in the NORMAL OXYGEN position. Whenever carbon monoxide or other noxious gases are present, place the air valve in the 100% OXYGEN position regardless of altitude.

Note

To preclude adverse effects due to possible contamination, it is recommended that 100% OXYGEN be used on all flights of the subject aircraft as practicable considering the amount of oxygen available and duration of the flight.

SAFETY PRESSURE

When turned on oxygen is supplied upon demand but at a positive pressure of 1 3/4 ± 1/4 inch of water. The required positive pressures of oxygen are automatically supplied at 35,000 feet and above and the use of the manually operated safety pressure is unnecessary and may be uncomfortable. Routine use of safety pressure at lower altitudes is not recommended since

the use of safety pressure reduces the effectiveness of the air diluter and causes increased oxygen consumption. If symptoms occur suggestive of the onset of anoxia, immediately turn the safety pressure to the ON position.

PREFLIGHT CHECK

1. Turn on oxygen supply valve at forward edge of regulator and check oxygen pressure gage. Pressure should be 1800 to 1850 psi when cylinders are fully charged.
2. Turn supply pressure off. After a few minutes observe the pressure gage and simultaneously turn on supply pressure. If the gage pointer jumps, leakage is indicated and the system must be subjected to a ground crew check before use.
3. Test the breathing tube couplings regulator diaphragm, and diluter check valve for leakage by inserting a spare mask tube quick-disconnect fitting, AN 6043, into the open end of the disconnect. Blow into the open end of the disconnect until the flow indicator face opens. Seal the end of the disconnect with the tongue. If the flow indicator does not close within five seconds, the leakage is within acceptable limits. If leakage exists, check the couplings outlet elbow, and breathing tube clamps for tightness.
4. Put on mask. To check mask fit, place thumb over disconnect at end of mask tube and inhale lightly. If there is no leakage, the mask adheres tightly to the face and a definite resistance to inhalation is encountered. If leakage is present, adjust mask.

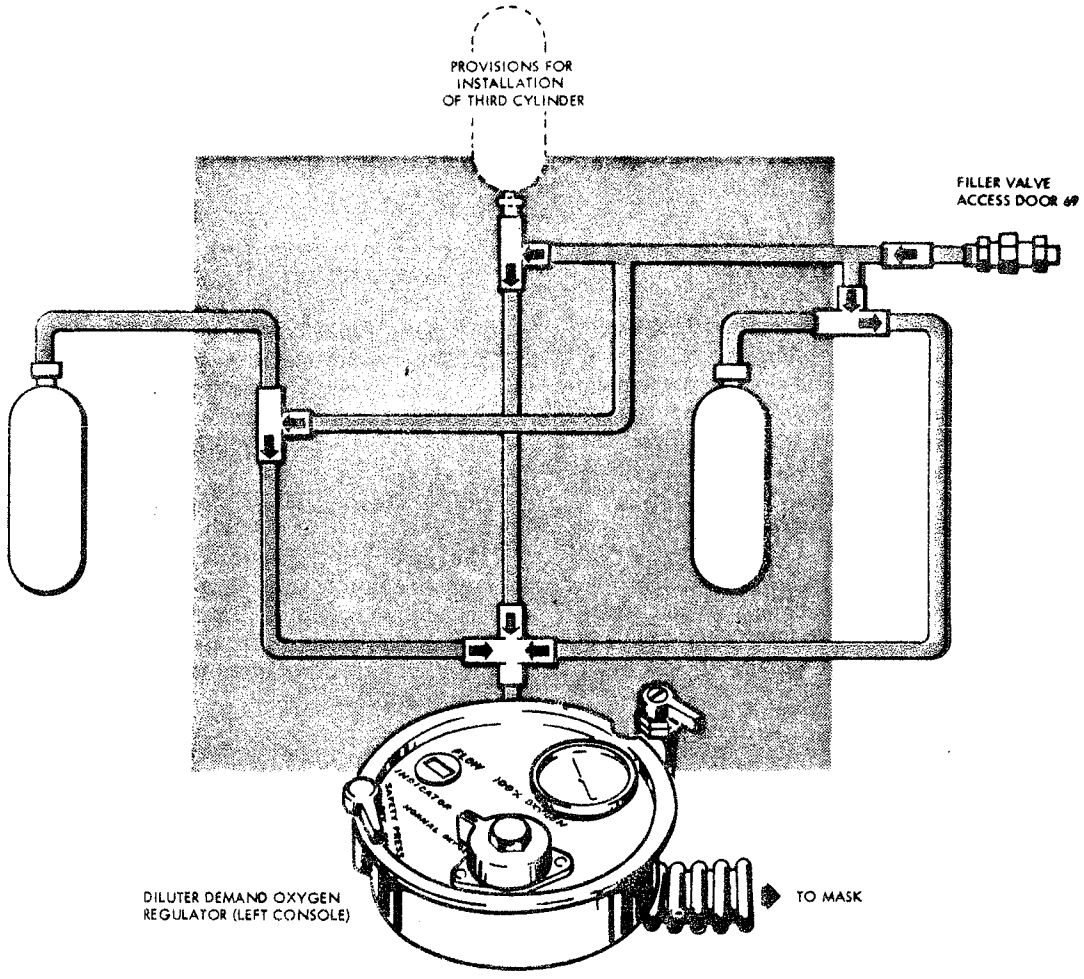
WARNING

Do not use a mask that leaks.

5. Engage mating portions of disconnect couplings so mask is connected to oxygen system breathing tube. The force to disconnect should not be less than 10 pounds. Turn on supply valve and check regulator operation by breathing several times at NORMAL OXYGEN and 100% OXYGEN. Observe flow indicator for blink verifying positive flow of oxygen.

NORMAL OPERATION PROCEDURE

1. Use oxygen for all day flights over 10,000 feet and all night flights over 5,000 feet.
2. Set air valve to NORMAL OXYGEN.
3. Put the mask on. Fully engage the mating portions of the disconnect couplings to connect the mask to the oxygen system. Attach the breathing tube connector clamp to proximate strap of shoulder harness sufficiently high on the chest to permit free movement of the head without stretching the mask tube. The web tab of the Erie 191A24 mask hose connector must be attached to the parachute chest buckle or other secure position on the pilot's person.



OXYGEN DURATION CHART

UPPER FIGURES = HOURS AT 100 %
LOWER FIGURES = HOURS AT NORMAL OXYGEN

TWO 514 CUBIC INCH CYLINDERS

CABIN ALTITUDE, in feet	CYLINDER PRESSURE - in P. S. I. 1800	1500	1200	900	600	300
40,000	13.8 13.8	11.0 11.0	8.2 8.2	5.6 5.6	2.8 2.8	DESCEND BELOW 10,000 FEET
35,000	8.2 8.2	6.8 6.8	5.0 5.0	3.4 3.4	1.6 1.6	
30,000	6.2 6.2	5.0 5.0	3.8 3.8	2.4 2.4	1.2 1.2	
25,000	4.6 8.2	3.6 6.6	2.7 4.8	1.8 3.2	.9 1.6	
20,000	3.7 13.8	2.9 11.0	2.2 8.2	1.4 5.8	.7 2.8	
15,000	2.9 17.0	2.3 13.6	1.7 10.2	1.1 6.8	.5 3.4	
10,000	2.3 18.0	1.8 14.4	1.4 10.8	.9 7.2	.4 3.6	
5,000	1.9 15.0	1.5 12.0	1.1 9.0	.7 6.0	.3 3.0	

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Figure 4-4. Oxygen System Schematic Diagram and Oxygen Duration Chart

Note

To check mask fit during flight, depress the manual safety pressure button. Take a deep breath and hold breath. Note the position of the flow indicator. If the flow indicator opens, (i.e., all black) a leak is indicated. Tighten mask straps until flow indicator closes (i.e., all white). Resume breathing and release manual safety pressure. DO NOT USE A MASK THAT LEAKS.

4. When using oxygen frequently check:

a. Oxygen pressure gage. Do not exhaust supply below 300 psi except in emergency.
b. Flow indicator to verify flow of oxygen through regulator. The flow indicator will remain open at approximately 41,000 feet. However, oxygen flow will be evident at the mask.
c. Mask fit for leak tightness.
d. Mask tube disconnect coupling for full engagement.

5. Upon completion of flight turn off oxygen supply valve, and turn air valve to 100% OXYGEN position.

EMERGENCY PROCEDURE

1. If symptoms occur which are suggestive of anoxia turn SAFETY PRESSURE lever to ON position and descend below 10,000 feet. If for any reason the regulator should become inoperative and a constant flow of oxygen is not obtained by use of safety pressure, disconnect the quick-disconnect coupling, activate the emergency oxygen equipment, and descend below 10,000 feet.
2. Turn air valve to 100% OXYGEN if carbon monoxide or other noxious gases are present.

P-3 AUTOMATIC PILOT

DESCRIPTION

The P-3 automatic pilot is a system of automatic controls which will hold the aircraft on any selected heading and accurately stabilize flight about the pitch, roll and yaw axis of the aircraft. This system is designed for steadfast control and yet allow full tactical advantages of high performance. Incorporated in the system is a synchronizing device allowing normal engagement and operation at any pitch attitude. The P-3 automatic pilot system is so designed that the aircraft flies precisely to a reference in maintaining altitude and direction. Headings are held more accurately by means of co-ordinated turns throughout the range of air speeds, surface trimming of rudder and elevator position is automatic, manual control of yaw is eliminated, and pressure altitude maintained by use of a barometric control. With the auto pilot engaged, all F2H-3 aircraft are capable of a climb or dive of approximately 38° and a right or left roll of about 60°. Under the same conditions, all F2H-4 aircraft have the same roll ability, but the maximum dive or climb angle has been increased. This has been accomplished by the use of a modified stick controller and different wiring on the F2H-4 aircraft.

The control switches for the auto pilot system are located on the auto pilot switch panel above the right console. The manual controls and the disengage switch are located below the switch panel on the console. The following controls operate the auto pilot:

Note

Automatic pitch trim has been provided in all F2H-3 and F2H-4 aircraft except F2H-3 aircraft 126291 through 126320. Instructions for incorporating this feature in these aircraft have been provided in ASC 245.

AUTO PILOT CONTROLS

AUTO PILOT CIRCUIT BREAKER

The auto pilot circuit breaker is located on the circuit breaker panel immediately aft and outboard of the right console. This 10 ampere circuit breaker closes the 28 d-c circuit through contacts on the auto pilot transfer relay to the compass adapter and control amplifier.

ENGAGING CONTROL

The engaging control is located outboard of the stick controller on the right console. The auto pilot servo units are engaged by pushing forward on the two engaging levers. The rudder channel may be engaged separately to act as a yaw damper. The rudder lever is held in the engaged position by a holding solenoid, the elevator-aileron lever locks mechanically to the rudder lever. Switching off the auto pilot or a system power failure will cause the solenoid to be disengaged releasing both the rudder lever and the aileron elevator lever.

CAUTION

Do not engage levers until the auto pilot has had a warm-up period of approximately 5 minutes.

STICK CONTROLLER

The stick controller is located on the right console. The function of the stick controller is to give accurate control of the aircraft through the automatic pilot. The controller locks in center detent for straight and level flight; to release the stick for maneuvering press the detent button located on the top of the stick knob. Moving the controller fore and aft changes pitch attitude. Moving the controller laterally provides coordinated turns with the bank angle proportional to controller movement.

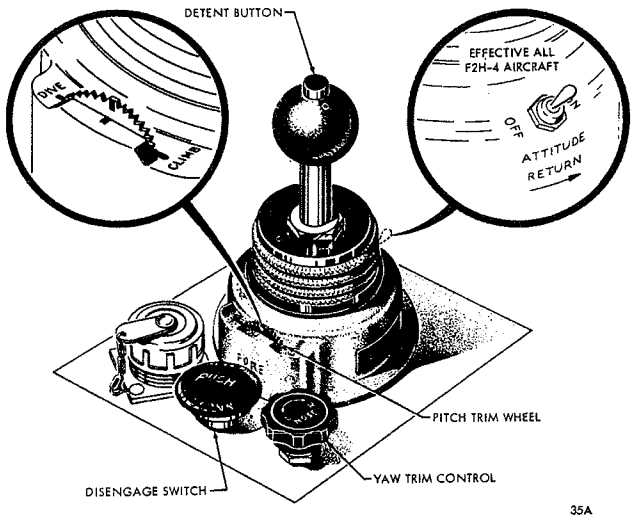


Figure 4-5. Stick Controller

Stick controller movement is limited to 30° from detent in each direction, pitch and roll. This 30° stick controller movement on the F2H-3 aircraft will produce a dive or climb of approximately 38° or a roll of about 60°. On the F2H-4 aircraft, however, maximum forward or aft stick controller motion will produce a climb or dive of only 7°. Pushing the stick controller against the forward or aft stops, however, activates limit switches which increase the pitch angle until the maximum climb or dive is attained. This continued change in pitch is at a constant rate, slower in a dive than in a climb. The roll characteristics remain the same as on the F2H-3.

ATTITUDE RETURN SWITCH

The attitude return switch is utilized on the F2H-4 aircraft only and provides the only visual difference between the F2H-3 and F2H-4 stick controller units. This toggle switch is an integral part of the stick controller and is located on the right side, directly across from the pitch trim wheel. This switch is used to return the aircraft to its former attitude only after engaging in a climb or dive of more than 7°. When in such a dive or climb, movement of the switch from the OFF to the ON position will return the aircraft to the attitude it was in at the time of auto pilot engagement, provided the stick controller is in detent. If however, the aircraft has been trimmed while under auto pilot, the attitude return switch will return the aircraft to the trimmed attitude. After resuming the engagement or trimmed attitude, the switch should be returned to the OFF position.

CAUTION

The attitude return switch will not return the aircraft to any predetermined or selected altitude. Nor will it necessarily return the aircraft to level flight. If the aircraft is in a climb at the time of auto pilot engagement, the attitude switch will return the aircraft to the same degree of climb and not to level flight unless it has been trimmed to level flight after engagement.

PITCH TRIM WHEEL

The pitch trim wheel is built integral with the stick controller. The purpose of the pitch trim is to trim the airplane for level flight and provide a climbing attitude up to 15° and dives to 5° while operating on automatic pilot.

DISENGAGE SWITCH

This switch is a push button type switch mounted adjacent to the stick controller. Under all normal conditions the disengage switch will be used to disconnect the auto pilot from the airplane control system. The disengage switch cuts off the d-c power to the holding solenoid on the rudder lever of the engaging control.

Note

Automatic disengagement of the compass accompanies roll displacement.

YAW TRIM CONTROL

The purpose of the yaw trimmer is to eliminate aircraft yawing upon engagement of the auto pilot. Turn the trimmer control to center the ball in the inclinometer of the turn-and-bank indicator.

RATIO CHANGE SWITCH

The ratio change switch is located on the auto pilot switch panel. The function of this switch is to change the sensitivity of motion. When flying at a low speed the amount of control surface deflection needed to maintain a desired attitude increases. Placing the ratio change switch in the LO position will increase the surface movement per unit deviation from desired attitude.

Note

The ratio change switch will always be in the HI position under normal cruise conditions.

ALTITUDE CONTROL SWITCH

The altitude control switch is located on the auto pilot switch panel. This switch when placed in the ON position, with the stick controller in center detent and the aircraft flying level, will provide a barometric altitude reference relative to the altitude at the time of

engagement. The auto pilot will maintain the aircraft at this pressure altitude as long as the stick controller is in detent.

Note

Moving the stick controller in pitch automatically disengages the barometric reference control. The control will, however, re-engage at a new altitude and maintain the aircraft at the barometric pressure relative to this altitude when the stick controller is returned to straight and level position.

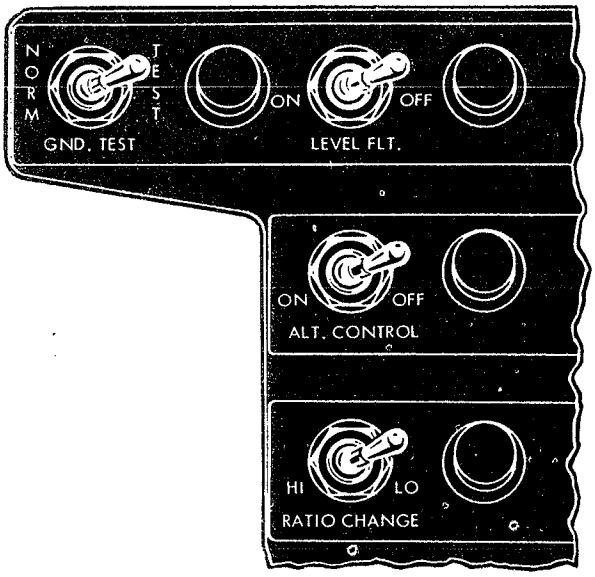


Figure 4-6. Auto Pilot Switch Panel

LEVEL FLIGHT SWITCH

This switch, located on the auto pilot switch panel, has been deactivated to prevent the possibility of excessively abrupt attitude changes when used under certain conditions.

GROUND TEST SWITCH

The ground test switch is located on the auto pilot switch panel. This switch enables ground checking of the auto pilot by closing the rudder lever holding solenoid circuit with the main gear extended.

CAUTION

Immediately after ground check return test switch to NORMAL position.

AUTO PILOT OPERATION

Operation of the P-3 auto pilot is accomplished by manipulating the system control as follows:

Note

Auto pilot power requirements are such that if the normal a-c generator fails and the standby inverter takes over the electrical load, the auto pilot is automatically disconnected from both the a-c and d-c electrical circuits.

PRE-ENGAGEMENT

1. Trim aircraft manually to maintain the flight attitude desired.
2. Place stick controller in center detent, pitch trim wheel at zero.
3. Place auto pilot control switch as follows:

Altitude control switch OFF
Ratio switch in HI
Ground test switch NORMAL
Auto pilot circuit breaker IN
Attitude return switch OFF (F2H-4 only)

ENGAGING PROCEDURE

1. Engage the rudder channel by pushing up and forward on the rudder (inboard) lever until it locks in the engaged position.

Note

The auto pilot requires approximately 5 minutes to warm up after power is turned on before the rudder engage lever will lock in the engaged position.

2. Engage the elevator-aileron channel by pushing up and forward on the outboard engaging lever until it locks to the rudder lever.

CAUTION

The rudder lever must always be engaged first when the levers are engaged individually.

3. To engage the entire auto pilot at once push up and forward on both levers until they lock in the engaged position.

CLIMBING ON ENGAGEMENT

1. To continue a climb as the auto pilot is engaged, manually trim the aircraft to the angle of climb desired before engaging. Stick controller in center detent.

Note

The reference attitude is always the attitude of the aircraft at the time the auto pilot is engaged.

2. To return to level flight from a climb attitude of 5° or less, trim with the pitch trim wheel.

3. To return to level flight from a climb attitude in excess of 5°, disengage the auto pilot, manually trim to level flight, reengage the autopilot.

STRAIGHT FLIGHT

1. During auto pilot engagement the P-3 system maintains the aircraft in accurately stabilized flight by correcting for displacements in yaw, pitch and roll.

2. Through interconnection with the G-2 compass the auto pilot will maintain the heading at time of engagement provided the stick controller is not moved from center detent.

HOLDING CONSTANT ALTITUDE

1. Place stick controller in center detent. Trim aircraft for level flight with the pitch trim wheel.

2. Move the altitude control switch to ON. The auto pilot will now maintain the aircraft at the selected barometric altitude.

Note

Sufficient engine thrust must be available to maintain level flight.

3. The barometric altitude control will maintain the aircraft in approximately constant altitude during turns, depending on the steepness of the turn, if during a turn, the stick controller is moved out of pitch detent, the barometric altitude control disengages and will engage again at the altitude at which the controller is replaced in pitch detent.

Note

Climb or descent may be accomplished by moving the stick controller in pitch without switching the barometric altitude control.

MANEUVERING

1. Moving the stick controller laterally will cause the aircraft to make co-ordinated turns, the bank angle being dependent on the distance the stick controller is moved from center detent. A full 30° of stick controller movement produces 60° of aircraft bank or roll.

2. To recover from a turn neutralize the stick controller in center detent.

Note

When the stick controller is centered laterally the auto pilot locks to the compass heading.

3. Stick controller movement fore and aft controls pitch attitude. On the F2H-3 the change of attitude is proportional to the amount of stick controller movement. On the F2H-4, only ± 7° of attitude change is proportional to stick controller movement and the ratio of attitude change to stick motion is much smaller. When the F2H-4 stick controller hits its stops, stick motion ceases but the attitude change continues until the maximum pitch angle is reached or until the stick controller is pulled off the stop. On both aircraft the pitch trim wheel provides an additional 5° dive angle or 15° climb angle.

4. To recover from any pitch attitude change in the F2H-3 or from a climb or dive of less than 7° in the F2H-4, neutralize the stick controller. To recover from greater climbs or dives in the F2H-4, either move the stick controller against its stop in the opposite direction and then return it to detent when level flight is reached or return the stick controller to detent and move the attitude return switch to the ON position. If, however, the aircraft's reference attitude is other than level flight, the attitude return switch will return the aircraft to that attitude and not to level flight. After resuming the reference attitude, move the switch to the OFF position.

Note

Centering stick controller in pitch makes possible engagement of the barometric altitude control.

5. For better performance at low aircraft speed, move the ratio change switch to the LO position. This provides more surface control for a given attitude deviation.

YAW DAMPING

1. To improve yaw stability while flying manually engage the rudder channel of the auto pilot only. The rudder pedal force links act as a booster for rudder control and permits easy overpowering of the rudder servo.

Note

The rudder pedals will feel 'alive' moving to compensate for aircraft yaw. This is a normal condition.

DISENGAGING AUTO PILOT

1. To normally release all auto pilot controls press down the disengage switch located adjacent to the stick controller on the right console.

2. When desiring to leave the auto pilot rudder channel engaged for yaw damping, disengage the elevator-aileron engage lever by releasing the mechanical clip holding this lever to the rudder lever. The elevator-aileron engage lever will then drop out.

3. To manually release the auto pilot pull the engage levers out of the engage position by overpowering the holding solenoid.

Note

Press down the mechanical clip on the elevator-aileron lever when overpowering the engage control holding solenoid.

4. In an 'emergency' actuating the trim tab button on the main control stick fore and aft will disconnect the auto pilot, PROVIDING BOTH ENGAGING LEVERS ARE IN THE ENGAGE POSITION. If only the rudder channel is engaged the normal disengage switch must be used or the lever released manually.

GROUND CHECK

PROCEDURE	REACTION
1. Set auto pilot ground test switch to TEST.	
2. Altitude control switch OFF.	
3. Ratio change switch HI.	
4. Stick controller center detent.	
5. Pitch trim wheel at ZERO.	
6. Attitude return switch OFF (F2H-4 only).	
7. Check manual aircraft controls hard-over to hard-over.	
8. Place the aircraft control surfaces in the streamlined position.	
	Note Allow approximately 5 minutes for auto pilot warm up after starting engines.
9. Engage the rudder channel by pushing up and forward on the rudder engage lever.	9. There should be no movement of the rudder control surface provided the aircraft is level.
10. Displace rudder approximately 5 degrees either side of streamline - release rudder pedals.	10. Rudder will creep to streamline position.
11. Engage the elevator-aileron channel by pushing up and forward on the engaging lever.	
Note Control stick should be in neutral and feel forces at zero.	
12. Move stick controller maximum fore and aft.	12. Elevator on F2H-3 should follow stick controller in all movements. Elevator on F2H-4 should move to maximum up and down limits. Upon return of stick controller to detent, however, elevator should move only partially toward neutral position.
13. With stick controller in detent, move attitude return switch to ON position (F2H-4 only).	13. Elevator should return to neutral position.
14. Move attitude return to OFF position (F2H-4 only).	
15. Move stick controller to right and left limits.	15. Ailerons should follow stick controller.
16. Move pitch trim wheel in climb and dive.	16. Elevator motion up for climb, down for dive.
17. Move ratio change switch to LO. Move stick controller in climb, dive and bank.	17. The aileron and elevator will follow stick controller. The angle of control surface deflection is greater than with the ratio change switch in HI.
18. Replace ratio change switch in HI.	
19. Automatic pitch trim can be checked by dropping out aileron-elevator engage lever. Run elevator feel trim to full nose down condition. Pull control stick full aft against spring force. Engage aileron-elevator lever.	19. Spring force on control stick will gradually decrease.
20. Disengage auto pilot by pushing disengaging switch on the left console.	20. Both engaging levers will release and return to the disengage position.
CAUTION The trim button release is to be used in emergency only during flight.	**Note** The trim tab button will not release the auto pilot unless both engaging levers are in the engaged position.
21. Replace the ground test switch in the NORMAL position.	
22. Altitude control switch OFF.	
23. Ratio change switch HI.	
24. Stick controller center detent.	
25. Pitch trim wheel at zero.	

FLIGHT CHECK

The following is an in-flight operational check and should be performed in the sequence outlined.

CHECK	PROCEDURE	REACTION
PRE-ENGAGE	Stick controller in detent. HI-LO switch in HI.	
	Ground test switch in FLY position. Attitude return switch OFF (F2H-4 only).	
	Altitude control switch OFF.	
	Maintain straight and level flight.	
	Trim ship for hands off at normal cruising.	
YAW DAMPING	Engage rudder.	
	Center inclinometer ball in turn and bank indicator.	
	Depress rudder pedal.	Rudder response to rudder pedals producing skid.
PITCH	Return to straight and level flight with ship trimmed at cruise speed.	
	Engage complete auto pilot by pushing home aileron elevator engage lever.	
	Move F2H-4 stick controller against forward stop.	Plane will go into comparatively gentle dive until stick hits stop. Angle of dive then will increase sharply and will continue increasing until maximum pitch angle is attained.
	Move F2H-4 stick controller against aft stop.	Plane will pull out of dive and enter climb. Angle of climb will increase until maximum is reached.
	Move F2H-4 stick controller into detent.	Angle of climb will decrease about 7°.
	Move attitude return switch to ON position.	Plane will resume level flight.
	Move attitude return switch to OFF position.	
	Move F2H-3 stick controller fore and aft.	Plane diving and climbing.
	Rotate elevator trim fore and aft.	Plane diving and climbing.
	Disengage while in straight and level flight and then climb at approximately 15 degrees.	Nose up.
	Engage auto pilot.	Plane maintaining climb under auto pilot control.
	Repeat for dive.	Plane maintaining dive under auto pilot control

CO-ORDINATED TURN	Disengage and return to straight and level flight.	
	Re-engage auto pilot.	
	Move stick controller right and then left.	Co-ordinated turns.
STRAIGHT FLIGHT	Put the stick controller in detent.	Plane holding heading of master direction indicator at time of detent.
CONSTANT ALTITUDE	Throw altitude control switch ON.	Plane maintaining straight and level flight locking to the barometric altitude.
	Make a right bank with the pitch detent in climb.	Climbing turn.
	Return stick controller to pitch and bank detent.	Straight and level flight maintaining altitude and heading.
HI-LO SPEED CONTROL	With auto pilot disengage throttle back to normal approach speed, fly straight and retrim airplane.	
	Throw HI-LO switch to LO, then engage auto pilot.	Plane holds altitude and direction.
	Move stick controller for right bank.	Normal response to controller in all altitude changes.
DISENGAGE AUTO PILOT	Disengage with disengage switch.	Surfaces in any position with no control through auto pilot.

ARMAMENT EQUIPMENT

This airplane is equipped to carry guns, bombs, and rockets. The guns are carried internally in the forward fuselage section and the bombs and rockets are installed as external stores. The sight unit is provided to be used in firing the guns and rockets and releasing the bombs at the proper instant to be effective on the target. The pilot is protected by armor located in the forward fuselage section and aft of the canopy. A gun camera is located in the right wing to record the results of the gun firing.

Note

The ballast carried in lieu of ammunition weighs 94 lbs. excepting, on aircraft 126291 thru 126300 and any aircraft that have not incorporated ASC 236. These aircraft have provisions for an alternate battery mounting in the aft fuselage. If this alternate battery location is used, ballast should be 180 lbs, otherwise, it remains 94 lbs.

GUNNERY EQUIPMENT

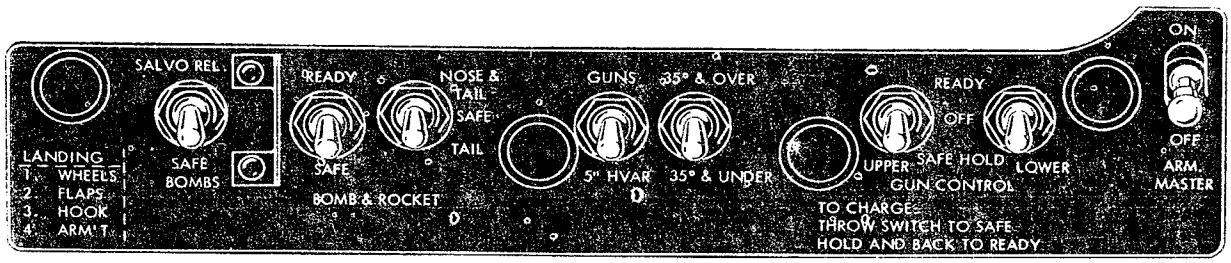
This airplane is equipped with four fixed, forward firing 20 mm cannon. The guns are located on the outboard sides of the forward fuselage; there are two on each side. Each gun is supplied with 20 mm ammunition which is carried to the guns through flexible chutes from the ammunition boxes located above the guns. The guns are equipped with pneumatic feeders and chargers and electric triggers. Expended links and cases are forced into a compartment inboard of the guns and are removed after flight. Armament controls are incorporated on the lower left side of the main instrument panel. The controls consist of the armament MASTER switch and two GUN CONTROL switches. The gun trigger switch is integral with the control stick. A gun camera is incorporated in the firing circuit and operates when the guns are fired to take pictures of the target.

ARMAMENT MASTER SWITCH

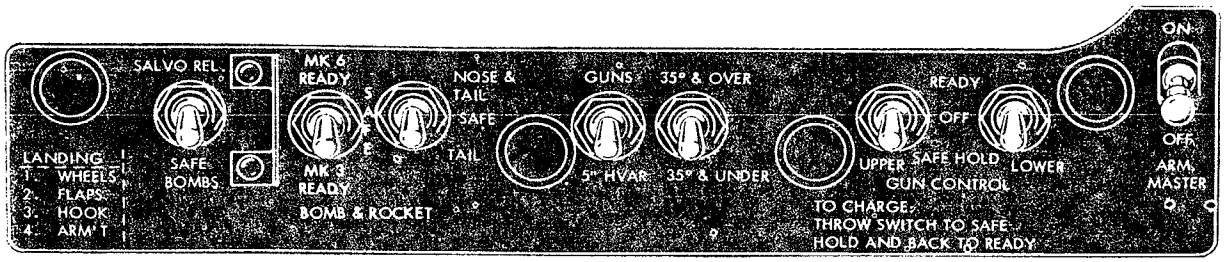
This switch is an ON and OFF position circuit breaker type toggle switch and must be ON before the guns can be charged or fired.

GUN CONTROL SWITCHES

These switches are three-position toggle type switches with READY, OFF and SAFE HOLD positions. The left switch controls the upper guns and the right switch controls the lower guns. This allows the guns to be fired in pairs or all at once. Placing the gun control switch in the SAFE HOLD position charges the guns. Then placing the switch to READY allows the guns to be fired when the trigger is squeezed.



EFFECTIVE AIRPLANES 126291 THRU 126300



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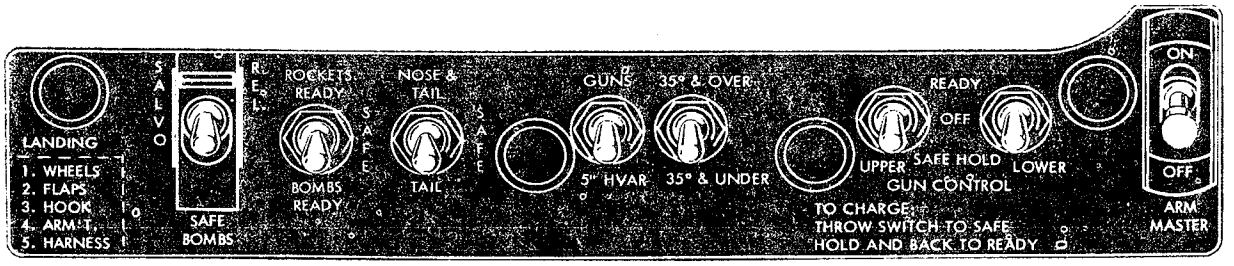

EFFECTIVE AIRPLANES 127587 & UP.

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Figure 4-7. Armament Control Panel

GUN TRIGGER SWITCH

The gun trigger switch is located in the control stick grip. This switch is squeezed to fire the guns. See the gun firing paragraph for firing the guns. The gun camera is automatically put into operation when the guns are fired.

GUN CAMERA

The gun camera is mounted in the leading edge of the center section of the right-hand wing panel. The camera operates automatically when the ARMAMENT MASTER switch is ON and the trigger switch is depressed. The camera incorporates a built-in overrun device which allows it to operate for from two to five seconds after the trigger switch is released. A heater and a receptacle for a lens heater is built into the camera and is operated by the camera controls. The camera may be operated without firing the guns by placing the ARMAMENT MASTER switch in the ON position, placing the gun control switches in the OFF or SAFE HOLD position and squeezing the trigger on the control stick.

BOMB AND ROCKET EQUIPMENT

This airplane is equipped with 8 Aero 14A rocket launchers and bomb racks. These are located on the lower sides of the wings. The racks are designed to carry rockets and/or up to and including 500 lbs. of bombs. The racks are operated electrically and controlled by the pilot in the cockpit.

BOMB AND ROCKET CONTROLS

The controls for both the bombs and rockets are located on the armament panel on the lower left side of the main instrument panel. The station selector is located on the instrument panel. The electrical controls (effective Airplanes 126291 thru 126300) consist of ARMAMENT MASTER switch, with ON and OFF positions; bomb and rocket control switch with SAFE and READY positions, bomb and rocket arming switch with NOSE & TAIL, SAFE and TAIL positions, the fin control selector switch with GUNS and 5" HVAR positions, dive angle switch with 35° & OVER and 35° & UNDER positions, and the MK 2 Mod 0 station selector. Effective Airplanes 126301 thru 127586, the

bomb switches are marked MK 6 READY, SAFE and MK 3 READY. Effective Airplanes 127587 and up, bomb switch is marked ROCKETS READY and BOMBS READY. See Figure 4-7 for illustration.

FIRING ORDER

The station selector is an eight-position switch, which controls the firing order and release of bombs. Stations are 1-2-3-4 for singles, and 5-6-7-8 for pairs. The station selector is set to either SINGLES or PAIRS and as the bomb and rocket release button is pressed, it advances automatically to the next station until all the bombs and rockets are fired. The pointer can be rotated counter-clockwise and the bombs are dropped and the rockets fired in the following order:

FIRING ORDER - SINGLES

STATION SELECTOR POSITION	LAUNCHER STATION
1	1
2	7
3	3
4	5
5	8
6	2
7	6
8	4

FIRING ORDER - PAIRS

STATION SELECTOR POSITION	LAUNCHER STATION
5	1 & 8
6	2 & 7
7	3 & 6
8	4 & 5

ROCKET FIRING PROCEDURE

1. Landing gear handle UP.
2. Place the ARMAMENT MASTER switch ON.
3. Place the BOMB & ROCKET CONTROL switch from SAFE to READY.
4. Place the BOMB & ROCKET ARMING switch from SAFE to NOSE & TAIL or TAIL.
5. Turn station selector to PAIRS or SINGLES.
6. Turn the sight selector switch to GYRO or FIXED & GYRO position.
7. Adjust the DIMMER control to provide reticle image contrast for the particular light condition.
8. Set the fire control selector switch to the 5" HVAR position.
9. Set the DIVE ANGLE switch to 35° & OVER if a steep dive approach to the target is desired, or to 35° & UNDER if a dive angle of 35° or less is best suited for the operation.
10. Cage the gyro in the sight unit by rotating the ranging throttle grip to the extreme maximum range position.

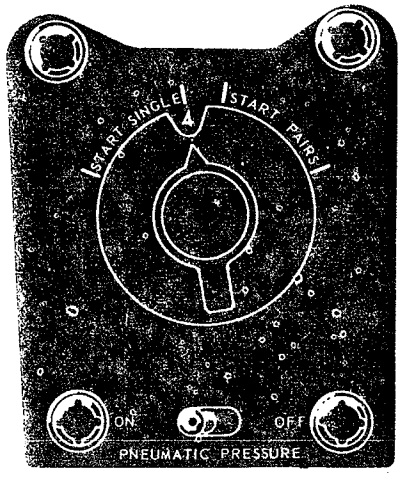


Figure 4-8. Bomb and Rocket Selector Switch

11. When the target is approached, place the aircraft in an attitude so that the center pip of the gyro image is directly on the target.

Note

The system will compensate for windage and target motion as long as the pilot maneuvers the aircraft so as to keep the pip on the target. For accurately aiming rockets, it is essential that the pip be held smoothly on the target from the time the approach is initiated, until the rockets are released. It is not necessary to range the target by framing it when using the equipment as a lead-computing sight for rocket-firing operations.

12. Uncage the gyro by rotating the ranging throttle grip slightly from the extreme maximum range position.
13. After uncaging the gyro, hold the pip smoothly on the target for at least four seconds before firing the rockets.
14. To release the rockets, press the bomb and rocket release button on the control stick.

The optimum conditions for use of the BETA OFFSETS when firing the 2.25" SCAR are:

Under 35°		Over 35°	
Dive Angle	25°	Dive Angle	25°
IAS	360 Kts.	IAS	380 Kts.
Release Altitude	2,030 Ft.	Release Altitude	4,165 Ft.
Slant Range	1,500 Yds.	Slant Range	1,500 Yds.
Propellant Temp	70° F	Propellant Temp	70° F

Gross Weight 15 500 Pounds

BOMB RELEASE PROCEDURE

1. Landing gear handle UP.
2. Set the sight selector switch to FIXED position.
3. Adjust the dimmer control to provide the proper reticle image contrast for the particular light condition.
4. Set the BOMB & ROCKET arming switch to NOSE & TAIL or TAIL depending on type of bomb being carried.
5. Place station selector to SINGLES or PAIRS.
6. Place bomb and rocket control switch to READY.
7. Track the target with fixed sight.
8. Release bomb (s) by pressing bomb and rocket release button on control stick handle.

SALVO RELEASE OF BOMBS (EMERGENCY)

(Effective F2H-3 Airplanes 126471 and up, F2H-4 Airplanes 127587 and up, and F2H-3 Airplanes 126291 thru 126470, F2H-4 Airplanes 126351 thru 126353, and F2H-4 Airplanes 127547 thru 127586 after incorporation of ASC 262.)

1. Landing gear handle UP.

Note

Landing gear handle must be pulled UP regardless of gear position before salvoing bombs. To prevent cycling of gear, pull landing gear circuit breakers.

2. Salvo switch to SALVO.

CAUTION

If ARMAMENT MASTER switch is ON, bombs will release SAFE or ARMED according to position of bomb arming switches.

Note

On F2H-3 Airplanes 126291 thru 126470, F2H-4 Airplanes 126351 thru 126353, and F2H-4 Airplanes 127547 thru 127586 prior to incorporation of ASC 262, the SALVO switch is inoperative.

INDIVIDUAL RELEASE OF BOMBS FROM STATIONS 4 & 5 WITH MARK 51 BOMB RACKS INSTALLED

Mark 51 bomb racks may be installed on this airplane at Stations 4 & 5 instead of Aero 14A launchers. These racks allow heavier stores to be carried at these stations. It may be required that these stores be released individually or out of sequence with the other stores. To do this, the sight unit and bomb and rocket armament switches are turned ON, as in the preceding paragraph. The station selector is turned to Station 4; this will release rack 5 when the bomb and rocket release switch is pressed. After bomb has released from rack 5, remove hand from bomb and rocket RELEASE switch and turn station selector to Station 8.

WARNING

BE SURE to remove hand from the bomb and rocket RELEASE switch when changing station selector from 4 to 8 while the ARMAMENT MASTER switch is ON. Failure to do this will release stores from all the racks. Press the bomb and rocket RELEASE switch and rack 4 will release.

Note

To release racks 4 and 5 together, merely turn station selector to Station 8 and press bomb and rocket RELEASE switch; this will release both racks at once.

TOW TARGET EQUIPMENT

The target carrier is installed on the bomb rack at station 4. A banner target and 900 feet of nylon towline are loaded in the target carrier with the end of the line extending under left center section wing and fuselage to the tow target release hook aft of the fuselage bumper.

LAUNCHING PROCEDURE

The banner target is launched in the following manner:

1. Landing gear control handle UP.
2. Armament master switch ON.
3. Bomb and rocket master switch in READY.
4. Turn station selector to 8.
5. Fly the airplane at 160 - 170 knots IAS in a level turn to the left.
6. Press bomb and rocket switch on control stick.
7. Maintain rate of turn and air speed until target has streamed and is being towed.

TARGET RELEASE

The banner target and towline are jettisoned by pushing the arresting gear control handle to the DOWN position. When the arresting hook is lowered, the target release mechanism is opened through a cable linkage. The arresting gear control handle is raised to the UP position after the target has been released.

Note

The target carrier cannot be jettisoned before or after release of the target.

IN-FLIGHT REFUELING SYSTEM

The in-flight refueling system is installed to provide

a greater range and to enable take-offs with a maximum of stores and a minimum of fuel.

The probe which extends forty-four inches beyond the nose of the aircraft, passes through the upper left gun blast tube (guns are removed on this kit installation) and is routed to the fuel cells.

The probe nozzle incorporates a spring valve and connector fitting which, when flown into the refueling drogue extending from the tanker, will make a fuel tight connection with the assembly in the refueling drogue.

After contact is made, fuel is pumped under pressure from the tanker through the hose, refueling drogue, probe and tubing to the check valve at the in-flight refueling adapter and through the pressure fueling and defueling units of the forward and aft fuel cells.

AUXILIARY EQUIPMENT

ANTI-G SUIT PROVISIONS

An anti-G suit control valve is located on the aft section of the left console. The valve receives air from the low pressure air system and meters it to the pilot's anti-G suit when a force of approximately 1.75 G's is applied to the aircraft. A HI and LO control allows for adjustment of rate of inflation of the anti-G suit. In the LO range, the valve opens at 1.75G and allows 1 psi of air pressure to pass to the suit for every increase of 1G force thereafter. In the HI range, the valve also opens at 1.75G but delivers 1.5 psi per G force thereafter. A button is provided on top of the anti-G valve for manually inflating the anti-blackout suit on the ground with engine running, or in straight and level flight. Prior to each flight, with engine running and anti-blackout suit connected, depress this button manually several times to check the operation of the anti-blackout system. If the valve has any tendency to stick or fails to return to the closed position it should be replaced. On long flights, this feature makes it possible for the pilot to occasionally inflate the suit for body massage to lessen fatigue.

The suit is connected to the valve through a quick-disconnect assembly located on the left console adjacent to the valve.

DATA CASE

The data case is installed in the aft end of the right console adjacent to the seat. The cover, which is flush with the surface of the console, is secured with a quick latch at the forward edge.

CHECK LISTS

The landing and take-off check lists are located on the main instrument panel.

RELIEF TUBE

The relief tube consists of a plastic horn and a tubing assembly. The horn, which rests in a support on the pedestal, contains a control valve with a small handle to prevent loss of cabin pressure.

MOORING FITTINGS

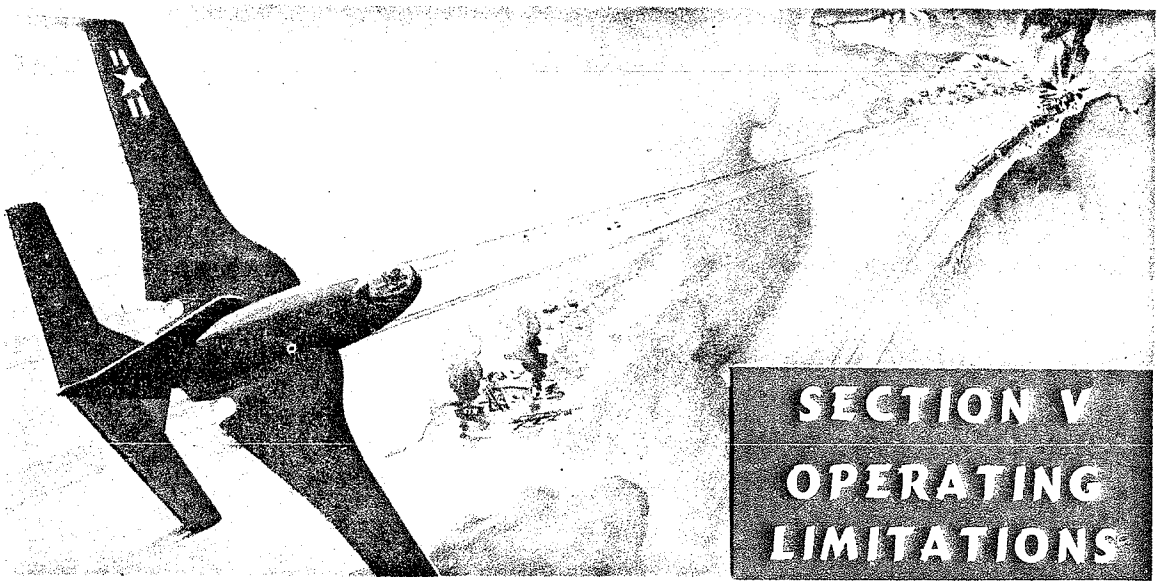
The mooring fittings are located on the nose and main landing gear and the aft fuselage bumper.

COVERS

The following covers are provided for the airplane: canopy cover, engine inlet duct plug, engine cooling compartment duct plug, engine exhaust cover, refrigeration cover, air turbine exhaust cover, pitot static head cover, and the air stream direction detector cover.

BLIND FLYING HOOD

The blind flying hood, which consists of an amber colored celluloid windshield and canopy hood, is attached by Airloc fasteners to the windshield arch and canopy frame. Goggles for instrument flying are used with the blind flying hood.



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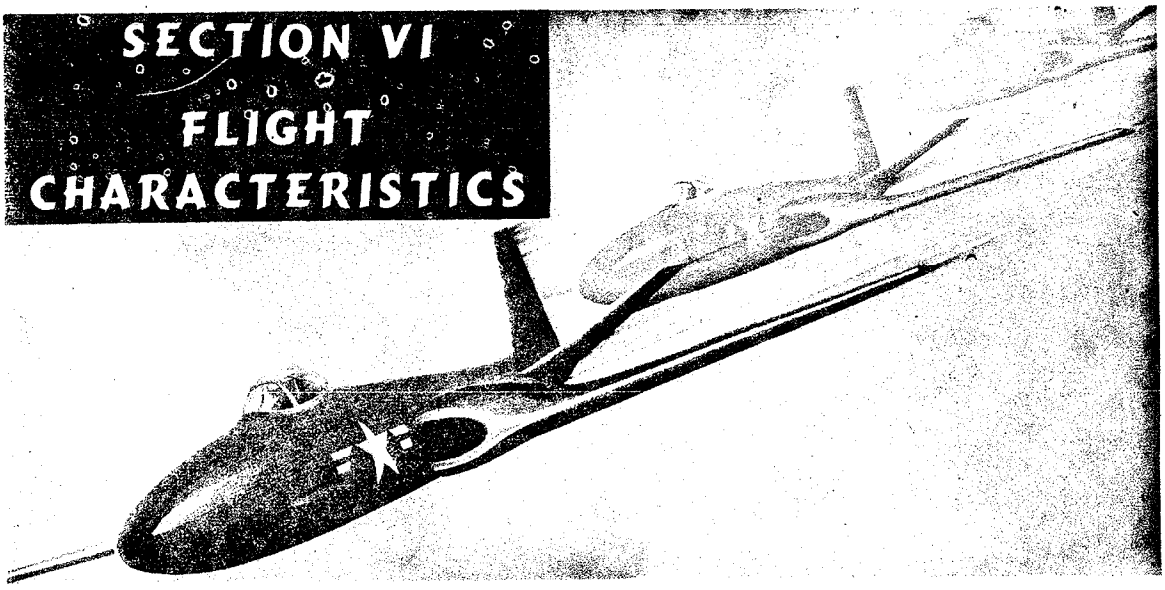
OPERATING DATA
FOR
NAVY MODEL
F2H-3, F2H-4
AIRPLANES



SEE CO 01-245FBC-1A
OPERATING DATA
FOR
NAVY MODEL
F2H-3, F2H-4
AIRPLANES

SECTION VII
SYSTEMS OPERATION

FUEL SYSTEM MANAGEMENT

FUSELAGE FUEL SYSTEM

The operation of the fuselage fuel system which is composed of the three large fuel cells is completely automatic. After the fuel system control levers are moved to the ON position and the engines are operating, the pilot has no manual control over the fuel flow routing, fuselage cell transfer, pump operation, etc. (with the exception of auxiliary fuel transfer which is dependent upon whether tip tank kits have been installed). With the fuselage cells full and either left or right engine master switch placed in the ON position in preparation for engine operation, the left boost pump (negative G pump) in the center fuel cell is energized and supplies fuel to the fuel system manifold assembly. (See Figure 1-8.) The shutoff valve for the engine to be started is then moved to the ON position which allows fuel to be supplied to the engine fuel pump. After both engines are in operation and both d-c generators are on the line, the right boost pump is energized automatically, and also supplies fuel to the fuel system manifold.

Note

The negative G booster pump is encased by a cover which acts as a fuel reservoir during inverted flight and negative G conditions. If the lower booster pump impellers are uncovered as the fuel in the center cell is forced to the upper portion of the tank, a flapper valve in the top of the reservoir closes, retaining the fuel and allowing the upper element of the negative G booster pump to supply fuel to the fuel system manifold. The reservoir contains sufficient fuel to operate the engines for a period of 30 to 90 seconds, depending on altitude and engine speed. See Section V in CO 01-245FBC -1A, PROHIBITED MANEUVERS, for overall airplane limitations during inverted flight and negative G conditions. Failure of either d-c generator will de-energize the right fuel boost pump.

The forward and aft fuel cells are connected to the center cell by transfer lines. Fuel is transferred from the two cells to the center cell by gravity during this period. With this arrangement, the fuel level in the three cells lowers simultaneously until the quantity of fuel contained in the center cell reaches the 504 lb. level. At this point, the fuel float switches mounted in the center cell energize the forward and aft transfer pumps and fuel is then transferred from the forward and aft cells under pump pressure until the fuel quantity contained in the center cell reaches the 924 lb. level. At this point, the fuel float switches de-energize the transfer pumps. Check valves in the transfer lines which connect the three cells retain the higher fuel level in the center cell and do not allow fuel to flow back to the forward and aft cell by gravity. When the fuel contained in the center cell again lowers to the 504 lb. level, the transfer pumping operation is repeated.

AUXILIARY FUEL SYSTEM

If tip tanks are installed, the fuselage fuel system operates in the same sequence as described in the preceding paragraph. However, immediately after take-off and cruise altitude has been reached, auxiliary fuel transfer should be initiated by the pilot. This may be done by placing both the left and right auxiliary fuel transfer switches in the ON position. The solenoid valves which are normally in the closed position are then energized and compressed air is allowed to flow into the tip tanks which forces fuel up through the transfer lines by displacement. The air pressure is regulated before entering the tip tanks by regulating valves which are adjusted to bleed pressure in excess of 13 ± 1 psi. The regulating valve also

incorporates a flapper type check valve assembly which will vent the tip tank should atmospheric pressure exceed internal tip tank pressure during rapid descents from altitude. During fuel transfer, the fuel is transferred inboard through the leading portion of the wings and join in the fuselage where they tee and flow into the top of the center fuel cell through the fuel transfer control valve. This valve allows fuel transfer to continue until the center cell is full and then only at the rate of engine consumption. This insures that fuel will not overflow and be dumped overboard through the fuel vent system.

Because the fuel quantity gage control switch is spring loaded to the TOTAL position, the pilot must exercise care in managing fuel when tip tanks are installed. With the switch in the TOTAL position, tip tank fuel is included in the gage reading even though this fuel is not being transferred. It is therefore possible to experience a flameout due to internal fuel exhaustion while 2000 lbs. of fuel are available in the tips. It is an easy matter for the pilot to determine whether he has transferred his tip tank fuel. If, because of elapsed flight time, the tip tanks ought to be exhausted, the pilot can hold the fuel quantity gage control switch in the FUSELAGE ONLY position momentarily. The gage indication will not change if all tip tank fuel has been transferred. If the gage reading decreases, there is still fuel available in the tip tanks and the pilot should re-check the transfer switches ON.

FUSELAGE FUEL VENT SYSTEM

The fuselage fuel vent system consists of a combination of vent tube passages which interconnect the three fuselage cells. The vent tubes join at the aft valve junction box at which point an overboard drain line is routed aft through the fuselage and terminates at the mast assembly mounted on the right fuselage just forward and below the empennage. The mast outlet is made in such a manner as to allow air to be rammed through the mast when the airplane is in flight. The inlet of the mast is larger than the outlet and as a result, a slight positive pressure is maintained in the fuel cells during flight. This fuel cell pressurization insures that fuel cell collapse will not occur during rapid descents due to pressure differentials between atmospheric and the internal pressure in the fuel cells. Because the three cells are interconnected by the vent system, each cell contains the same internal pressure. A positive pressure vent check valve is located on the forward cell which incorporates a weighted flapper type valve assembly. The valve is normally in the open position which allows pressure, in excess of that created by the mast, to be bled out of the system. Should negative G conditions cause fuel to go to the top of the cell, the weighted flapper covers the major portion of the vent outlet. In this manner, the major portion of the fuel is retained in the cell, but the small opening still allows excess pressure to bleed off. A second negative pressure type check valve located on the aft cell allows pressurized air to enter the cells should the internal pressure in the fuel cells drop below the pressure created by the vent mast assembly.

JETTISONING TIP TANKS

During carrier operations restrictions are applied against arrested landings with auxiliary fuel aboard. Fuel remaining in each tip tank is not to exceed 35 gallons (210 lbs.). Should a malfunction occur during auxiliary fuel transfer or should the pilot suspect that complete transfer has not been obtained, the approximate amount of auxiliary fuel still remaining in the tip tanks may be determined by the quantity gage system. However, the quantity gage system will indicate total auxiliary fuel and cannot differentiate between left and right tip tank quantities. Due to this condition, should the fuel gage system indicate that 210 to 420 lbs. of fuel (35 to 70 gallons) remain in the tip tanks, it cannot be assumed that each tank contains an equal amount of fuel. Although each tip tank is permitted to contain 35 gallons, it is probable that the major portion of the remaining tip tank fuel is contained in only one of the tip tanks. Therefore, should the gaging system indicate more than 210 lbs. (35 gallons) total auxiliary fuel aboard, the tip tanks should be dropped before landing aboard. During land base operations 60 gallons (360 lbs.) may remain in each tip tank. Therefore, using the gaging system to determine auxiliary fuel aboard, tip tanks should be dropped if more than 360 lbs. remain. Auxiliary fuel aboard may be determined by placing the gaging switch first in the FUSELAGE ONLY position and then in the TOTAL position. Using the first reading as a reference point, a needle movement of one division on the scale (6 degrees rotation) indicates 200 lbs. of auxiliary fuel is still aboard and is the maximum for carrier landings. During land base operations, the needle movement may not exceed 1.80 divisions (about 11 degrees rotation) which indicates 360 lbs. of auxiliary fuel aboard.

IN-FLIGHT REFUELING PROCEDURE

1. The tanker aircraft is approached from the rear and slightly below the refueling drogue to avoid the wake of the tanker aircraft.
2. Before engaging refueling drogue, turn off the following items:

a. Radar System
b. APX-6 (IFF System)
c. ARN-6 or ARN-21 (Radio Compass System)
d. APN-1 (Radio Altimeter System)
e. Exterior Lights
f. ARA-25 (Direction Finder Group)

3. Place the refueling switch in REFUEL position.
4. Maintaining a moderate rate of closure, fly probe nozzle into drogue cone.

Note

Rapid rate of closure will move drogue for-

ward too fast for proper reel-in thus causing slack in the hose resulting in a violent whipping action which may damage the probe or drogue.

5. The pilot reduces speed to that of the tanker and flies in formation during the refueling operation.

Note

When drogue has extended the proper distance for refueling an amber light on the tanker will be on. After contact is made the drogue must be moved forward approximately ten feet automatically turning on the fuel transfer pumps. This is indicated by a green light on the tanker while the amber light goes out. The sequence of these indicator lights is reversed when dropping back to break contact.

6. The pilot notes the progesss being made during the refueling process by momentarily holding the fuel quantity check switch in the FUSELAGE ONLY position while observing the aircraft's fuel quantity gage. The refueling rate is approximately 190 - 200 gallons per minute.

Note

Automatic shutoff of the valves in the tank of the fighter can be detected by an oscillation of the hose, caused by the increase in pressure at the instant shutoff occurs and also by no further increase on the fuel quantity gage.

7. When tanks are full, pilot reduces speed slightly to disengage probe from reception coupling.

Note

High rate of separation when breaking contact should be avoided to preclude sudden loads on the tanker hose braking system.

WING FOLDING AND SPREADING (See Figure 1-6.)

Folding and spreading of the outer wing panels is controlled from the pinlock control handle and the wing fold switch on the right console. Pulling the pinlock control handle to the UP position pulls the pinlock from the forward wing pins by means of a cable linkage. Placing the wing fold switch in the FOLD position causes the electric actuators to pull the wing pins from the wing hinge fittings. After withdrawal of the wing pins, the solenoid valves direct hydraulic fluid to the inboard ends of each wing fold actuating cylinder. When each piston is fully extended, locking lugs are cammed outward into a recess in the cylinder locking the wing in the UP position. Placing the wing fold switch in SPREAD directs hydraulic pressure to the outboard end of the actuating cylinder unlocking the piston and pushing it inward. When the wings are spread, the electric actuators insert the wing pins. Pinlocks are then inserted in the wing pins by pushing the pinlock control handle DOWN.

CAUTION

Before folding or spreading wings, observe the following:

1. External clamps removed from control surfaces.
2. Jury struts removed.
3. Speed brakes retracted.
4. Tip tanks empty.
5. Wings are not spread or folded while taxiing on rough ground.
6. Wings are not spread or folded broadside to the blast of another airplane's engines or in a wind over 60 knots.

To Fold Wings:

1. Pull pinlock control handle to the UP position.
2. Place wing fold switch in FOLD position.

To Spread Wings:

1. Place wing fold switch in SPREAD position.
2. Wait five seconds after wings are fully spread and push pinlock control handle to DOWN position.

Note

Red warning posts which are attached to the pinlocks will be flush with wing skin if pinlocks are fully inserted. The posts will extend above the wing surface inboard of the wing fold line when pinlocks are not inserted.

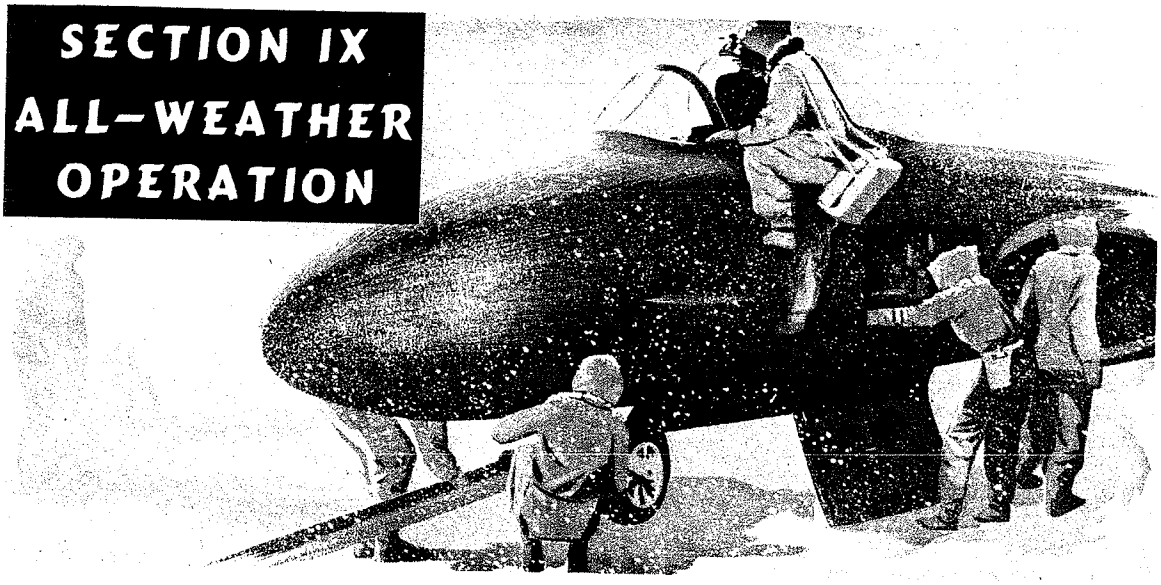
CAUTION

- Ashore. Whenever aircraft are parked or towed with wings folded, jury struts will be installed. Taxiing with wings folded and jury struts not installed will be held to a minimum.
- Afloat. Jury struts will be installed at all times wings are folded except immediately prior to spreading wings before launching.

SECTION VIII
CREW DUTIES (NOT APPLICABLE)

THIS SECTION NOT APPLICABLE

SECTION IX ALL-WEATHER OPERATION



FLIGHT IN TURBULENCE AND THUNDERSTORMS

Avoid flight through a thunderstorm whenever possible by using available weather information and radar. If flight through a thunderstorm cannot be avoided, in general, stay as low as possible to avoid severest turbulence; however, maintain safe altitude to clear all terrain and obstacles.

To Prepare the Airplane for Penetration:

1. Check airplane completely to assure proper operation of all flight instruments, pitot heat, panel light, oxygen and safety belts.
2. Slow down penetration speed.
3. Pitot heat ON.
4. Check gyro for proper settings.
5. Auto pilot DISENGAGED.

Note

Auto pilot rudder may be engaged to act as a yaw damper.

6. Shoulder harness locked, seat belt fastened.
7. Turn off any radio equipment rendered useless by static.
8. At night, turn cockpit lights full bright or put on dark glasses to minimize the effect of lightning.

While in the Storm:

1. Maintain flight attitude with the gyro-horizon.
2. Use as little elevator control as possible to prevent overcontrolling the air speed.
3. Maintain original heading.
4. Avoid large or abrupt aileron deflections.

OPERATING IN ICING CONDITIONS

No de-icing equipment is installed on the airplane.

Wing or fuselage icing can be recognized visually or by reduced efficiency of the flight controls and loss of thrust. Icing of the inlet duct valves is generally apparent by the increase in turbine outlet temperatures and loss of thrust. Icing of the inlet duct valves can occur with no other visual icing in evidence.

The recommended operating procedures when icing conditions are encountered:

1. Avoid atmospheric icing whenever operational requirements permit.
2. Operate with caution during take-off in fog or into very low clouds when temperature is at or slightly above freezing.
3. If icing is encountered, take the following immediate corrective actions:

   a. Maintain close watch on turbine outlet temperatures.
   b. Reduce rpm as practical.
   c. Reduce air speed. Do not reduce air speed by flaps or other drag means at the expense of maintaining high engine rpm.
   d. Change altitude rapidly by climb or descent in layer clouds. Vary course as appropriate for cumulus cloud formations.

COLD WEATHER PROCEDURES

Before Entering the Cockpit:

1. Blow air into the air inlet duct valves with a portable heater. This prevents damage to the starter mechanism.
2. Open canopy far enough to place the heater hose into the cockpit enclosure and then heat the cockpit.
3. Remove all covers and guards on the airplane.
4. Make a complete visual external inspection of the airplane.

a. Check for fuel, oil and hydraulic leaks. Leakages are more likely to occur at low temperatures.
b. Inspect fuselage surface, wing and tail surfaces, pitot tubes and all fuel, oil and hydraulic caps. Remove snow and ice if present. Do not remove ice or snow by chipping or chiseling.
c. Inspect the flight controls, trim tabs, flaps, speed brakes and wing fold pins and pinlocks. Make a careful inspection of all hinge linkages. Remove snow and ice if present.
d. Inspect tires and landing gear struts for proper inflation. Remove all snow and ice from the exposed part of the landing gear struts.

WARNING

Dangerous stalling speeds and flying characteristics are present with snow, ice or frost on the wings and fuselage surfaces. Do not take off unless wings and fuselage are completely clean.

AFTER STARTING THE ENGINES

1. Check the flight controls for freedom of movement.
2. Cycle trim controls, flaps, speed brakes, and arresting hook several times to assure proper operation.
3. Operate the canopy to assure proper forward and aft movement. See that the canopy closes snugly to the windscreen arch.
4. When the windshield is extremely cold, the ventilating air control should be left in the full CABIN HEAT position until the cockpit temperature has reached a reasonable level, and the control should then be moved to the DEFROST position only as far as necessary to clear the windshield. If the control is placed in the full DEFROST position, all of the hot air entering the cabin is discharged through the holes in the defroster tubes and failure of the windshield side panels may result.
5. Inspect all instruments for proper operation.
6. Exercise caution while running up engines on snow or ice as the chocks will frequently slip.
7. Use only the electrical equipment needed while engines are at low rpm and generators are not charging.

CAUTION

Battery performance and life is greatly reduced in cold weather operations. Increased electrical power is required to operate all electrical equipment.

TAKE-OFF

1. Avoid taxiing in loose snow.
2. Pack or remove snow on the take-off surface.
3. Pitot heat ON.
4. Cockpit heating and defrosting equipment ON.
5. A full power take-off check cannot be safely accomplished on snow or ice. Make the power check in conjunction with the take-off.

AFTER TAKE-OFF

1. Cycle landing gear to prevent freezing in the UP position.

Note

Landing gear retraction will be slower in the lower temperatures.

LANDING

1. Pump brakes several times during approach.
2. Turn off all electrical power switches not needed.
3. Landing gear extension is slower in the low temperatures and should be extended eariler in the approach.

CAUTION

The emergency landing gear extension is considerably slower in the lower temperatures. In the event an emergency landing gear extension is necessary, allow sufficient time for extension.

4. Use brakes sparingly after making contact.

BEFORE LEAVING THE AIRPLANE

CAUTION

Exercise extreme care when folding or spreading the wings in cold temperatures.

1. Install all protective covers and guards.
2. If airplane remains outside chock the wheels and moor firmly.
3. Remove the battery if:

a. A layover of several days is anticipated or,
b. A four hour layover is anticipated in temperatures at -20° or lower.

HOT WEATHER OPERATION

BEFORE ENTERING THE AIRPLANE

1. Complete all ground checks, giving particular attention to tire inflation and condition, system leakages, and surface corrosion.

STARTING THE ENGINES AND GROUND OPERATION

1. Use the normal starting procedures.
2. Engine temperatures will likely be on the high side of normal operating ranges.
3. Complete the power check; however, keep ground operation to a minimum.
4. Adjust cockpit heat.

TAKE-OFF

1. Use brakes sparingly while taxiing.
2. Hot weather will result in slower acceleration.

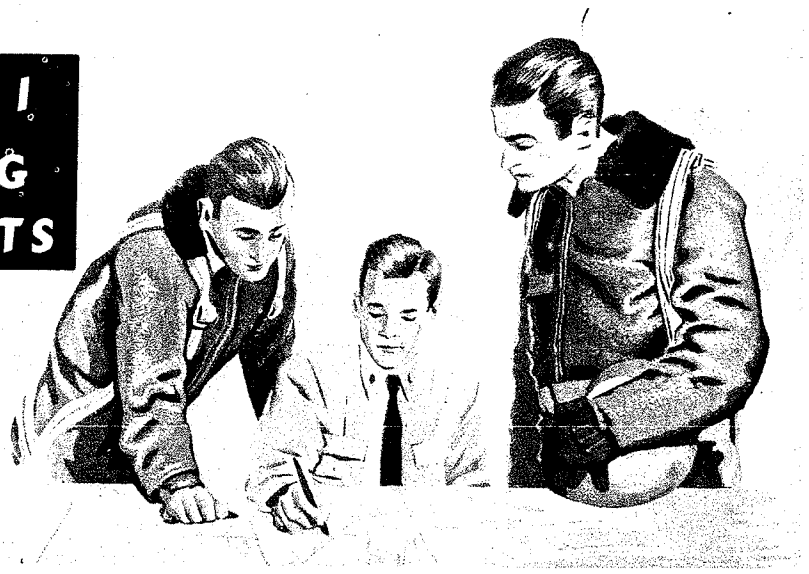
LANDING

1. Hot weather will increase stalling speeds.
2. Expect gusts and wind shifts.

BEFORE LEAVING AIRPLANE

1. Install all covers and guards.

APPENDIX I
OPERATING DATA CHARTS



SEE CO 01-245FBC-1A
OPERATING DATA
FOR
NAVY MODEL
F2H-3, F2H-4
AIRPLANES

ALPHABETICAL INDEX

A

B

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