RESTRICTED
SECURITY INFORMATION

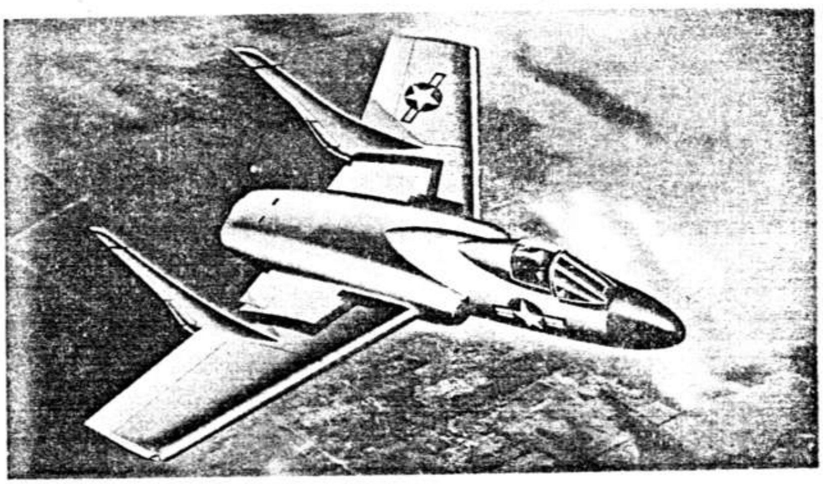
AN 01-45HFC-1

Flight Handbook

NAVY MODEL

F7U-3
AIRCRAFT

(Bu No. 128451 – 128466)



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RESTRICTED

1 December 1952

LIST OF REVISED PAGES ISSUED

INSERT LATEST REVISED PAGES. DESTROY SUPERSEDED PAGES.

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TABLE OF CONTENTS

IMPORTANT

To gain the maximum benefits from this handbook, be sure to read this page carefully.

FOREWORD

Handbooks covering special versions of the F7U-3 airplanes have been issued to accompany these airplanes.

The airplane, its systems, and its equipment are described in sections I and IV. Operating procedures are covered in sections II, III, and IV. Systems requiring discussion in addition to the information given in section I or IV are further discussed in section VII. The table below shows the breakdown of the airplane equipment and indicates the sections in which this equipment is discussed.

Information concerning flight limitations, flight characteristics, and night and all weather flight operation can be found in the following sections:

Section V. Important limitations that must be observed during normal operation.

Section VI. Flight characteristics of the airplane.

Section VII. Explained in footnote to table.

Section VIII. Not required; pertains to airplanes having crew positions in addition to pilot and co-pilot.

Section IX. Night and all weather flight operation procedures.

Appendix I. Operating data charts necessary for preflight and inflight mission planning. (Refer to CO 01-45HFC-1A, Operating Data for Navy Model F7U-3 Airplane.)

The handbook will be revised frequently, but because of the time necessary to incorporate revisions it is important that the pilot keep abreast of all technical directives affecting this airplane.

Equipment		*Description*	*Normal Operating Procedures*	*Emergency Operating Procedures*
Engine Fuel* Electrical Hydraulic Flight Controls Slats Speed Brakes	Landing Gear Brakes Arresting Gear Catapult Provisions Instruments Fire Detector Canopy Ejection Seat	Section I	Section II	Section III
Cabin Air Conditioning, Defogging, and Pressurization Anti-Icing Radio and Radar	Lighting Oxygen Navigation Armament Miscellaneous	Section IV	Section IV	Section IV

*Additional discussion of operation is given in section VII.

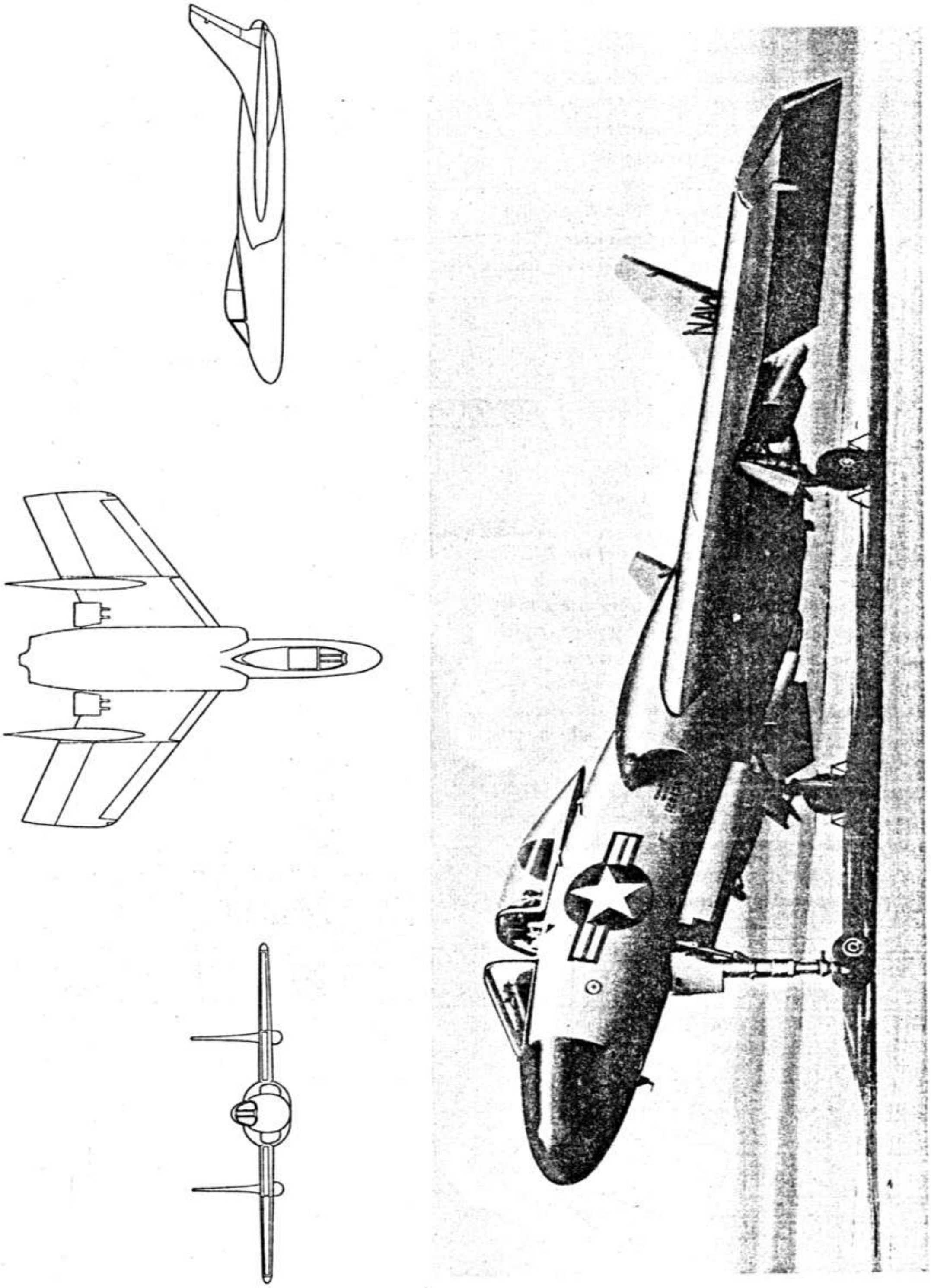
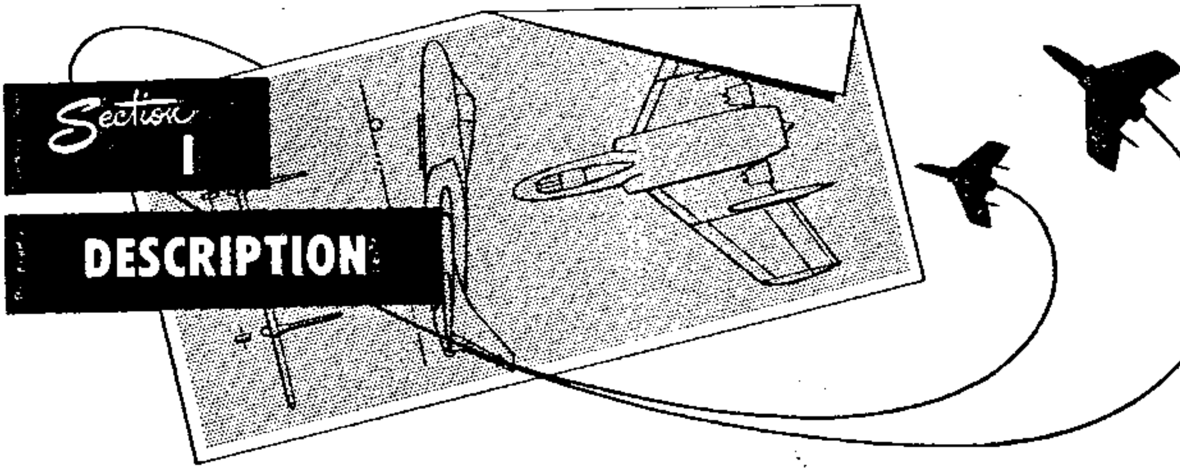


Figure 1-1. F7U-3 Airplane



Section I
DESCRIPTION

THE AIRPLANE.

The F7U-3 airplane is a single-place jet-propelled swept-wing carrier-based fighter: It is a larger and improved version of the F7U-1 airplane. The F7U-type airplanes are characterized by the absence of a horizontal tail surface and the location of the vertical tail surfaces on the wings. The F7U-3 airplane is further distinguished by its silver color, instead of the usual sea blue.

The twin vertical surfaces mounted at the wing trailing edges provide directional control of the airplane. Longitudinal and lateral control is obtained through ailavators. The ailavators perform the functions of both ailerons and elevators and are opened by irreversible hydraulic systems which are, in turn, controlled by the conventional control stick movements. When an irreversible hydraulic system is used, no aerodynamic force is felt at the control stick so an artificial feel system is used to simulate this force. Controllable full-span slats on the leading edges of the wings are provided to increase the maximum lift coefficient and thereby improve the low-speed characteristics of the airplane. A flight stabilization system dampens yawing and pitching motions to improve the high-speed characteristics of the airplane.

The general dimensions of the airplane are:

Span	39 ft 8.6 in.
Length (over-all — level flight)	43 ft 9.5 in.
Length (over-all — static ground position)	45 ft 1 in.
Height (over-all — static ground position)	14 ft 1 in.
Wings folded:	
Width	22 ft 3.8 in.
Height (over-all — static ground position)	14 ft 10 in.
Design gross weight	29,397.7 lb

ENGINE.

GENERAL. The airplane is powered by two J35-A-29 Allison turbojet engines. Each engine consists essentially of a single-entry eleven-stage axial-flow compressor, a set of eight cylindrical through-flow combustion chambers, and a single-stage turbine.

THROTTLES. The throttle control levers (figure 1–4) are mounted in a quadrant on the left-hand console. The levers are manual controls for the engine fuel system and the starting and ignition switches. The ranging throttle grip is incorporated in the left-hand throttle; the slat control switch and the microphone button, in the right-hand throttle. Six throttle positions are labeled on the quadrant:

"OFF" — Normal fully retarded position

"CRANK" — Momentary position for starting

"EMERG IGNITE" — Momentary position for ignition

"IDLE" — Approximate position for idle engine speed

Note

Idle engine speed is between 38 and 40 percent of rated engine rpm.

"NORMAL" — Approximate range for the throttle during normal operations

"MILITARY POWER" — Maximum throttle position

THROTTLE FRICTION CONTROL. The throttle FRICTION control (figure 1–4) is located on the left-hand console, adjacent to the throttles. Rotating the control forward to "INCR" increases throttle friction and rotating it aft to "DECR" decreases throttle friction.

LH AND RH MASTER ENGINE SWITCHES. The MASTER ENGINE SWITCHES, LH and RH (figure 1–4), are located on the throttle quadrant on the left-hand console. When the ENGINE MASTER SWITCHES are "ON," electrical power is fed to the

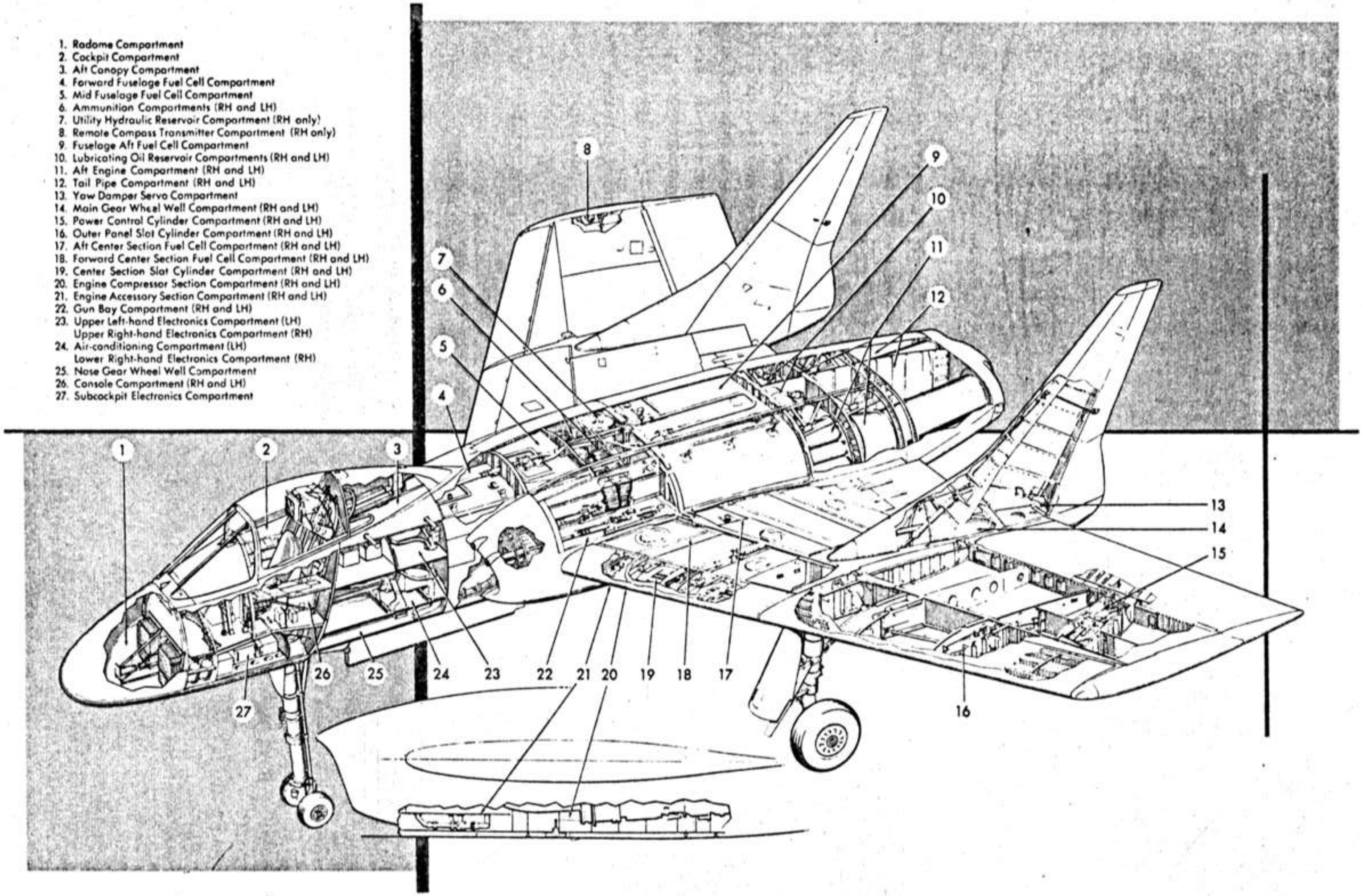


Figure 1–2. General Arrangement and Compartment Diagram

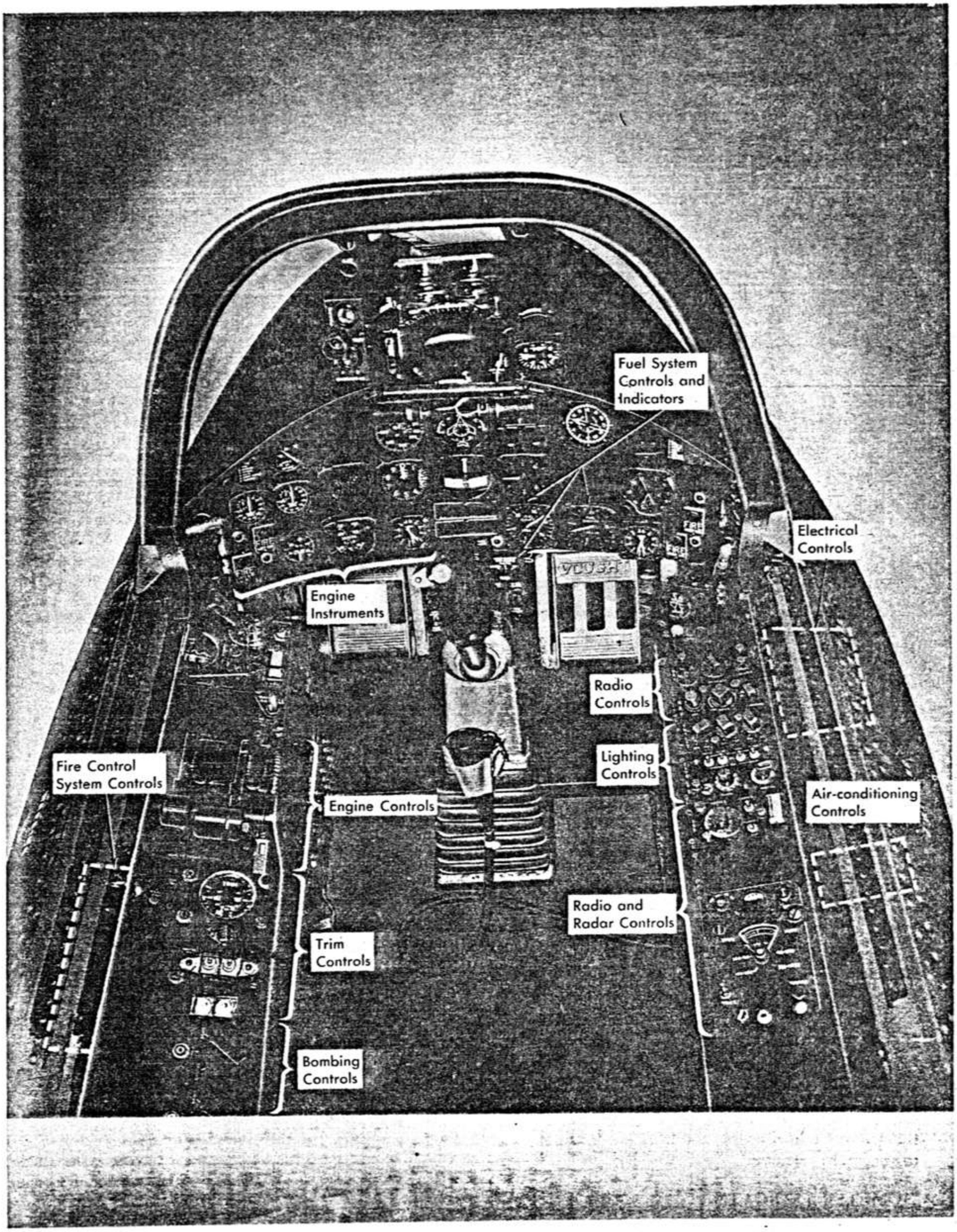


Figure 1–3. Pilot's Compartment

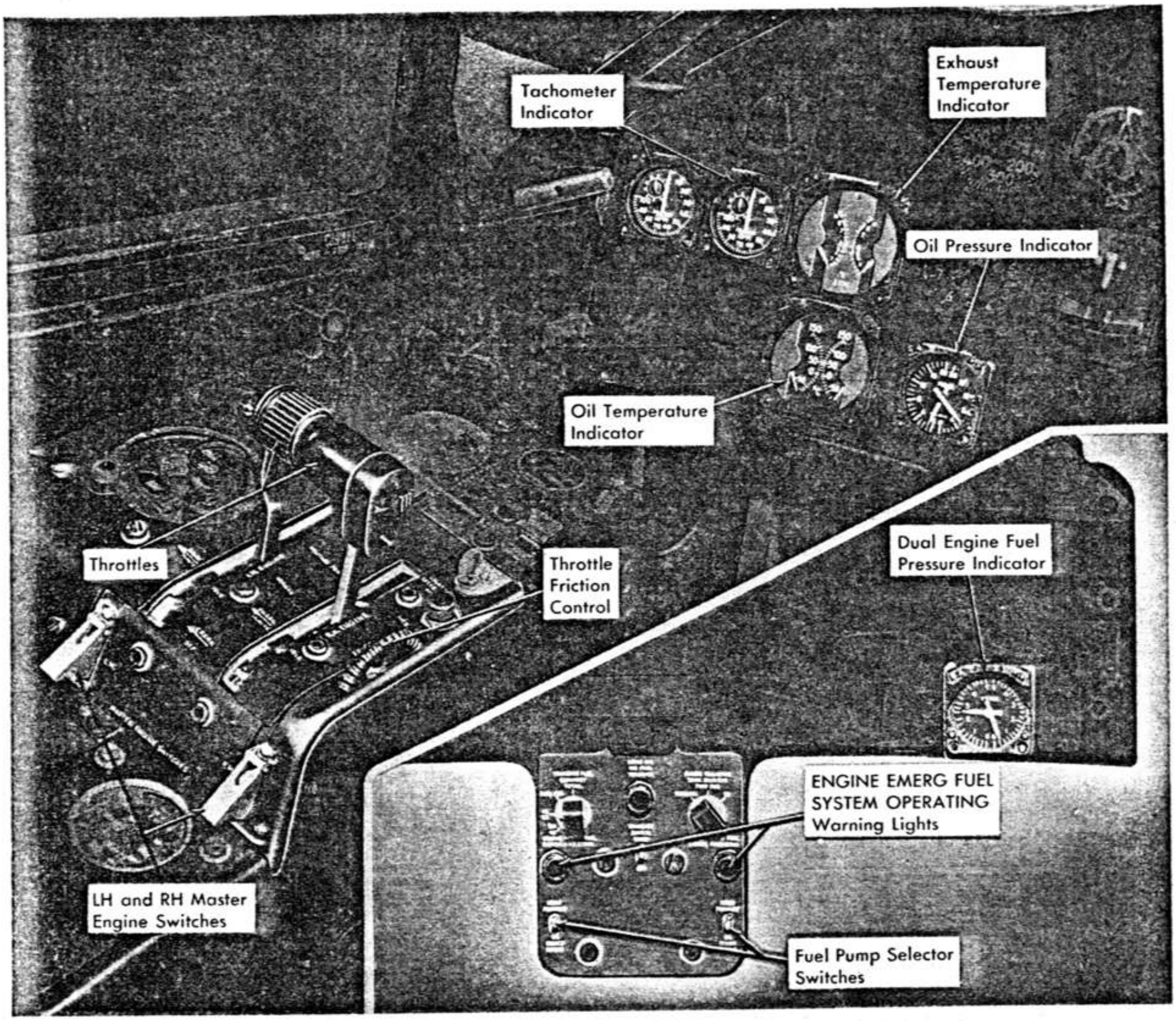


Figure 1–4. Engine Controls and Instruments

following circuits: starting and ignition, fuel boost and transfer, and engine fuel.

CAUTION

Always cut the throttles and wait until the engines stop turning before moving MASTER ENGINE SWITCHES to "OFF." This prevents closing the fuel system shutoff valve before the engine fuel control is closed. If this procedure is not followed, the engine fuel pumps will run dry, resulting in damage to the pump elements.

TACHOMETER INDICATORS. Two electrical tachometer indicators (figure 1–4), one for each engine, are mounted on the instrument panel. The indicators show the speed of the engines in percent of rated engine rpm.

EXHAUST TEMPERATURE INDICATOR. The dual exhaust temperature indicator (figure 1–4), calibrated from 0°C to 1,000°C, indicates exhaust gas temperature for both engines.

ENGINE FUEL SYSTEM.

GENERAL. The engine fuel system (figure 1–5) performs the following functions:

a. Affords the pilot manual selection of power anywhere within the safe operating range of the engine.

b. Maintains a constant engine speed at any throttle setting, regardless of air density, altitude, or airspeed.

c. Regulates the rate of fuel increase during acceleration to prevent excessive exhaust gas temperature. *(This does not relieve the pilot of the responsibility*

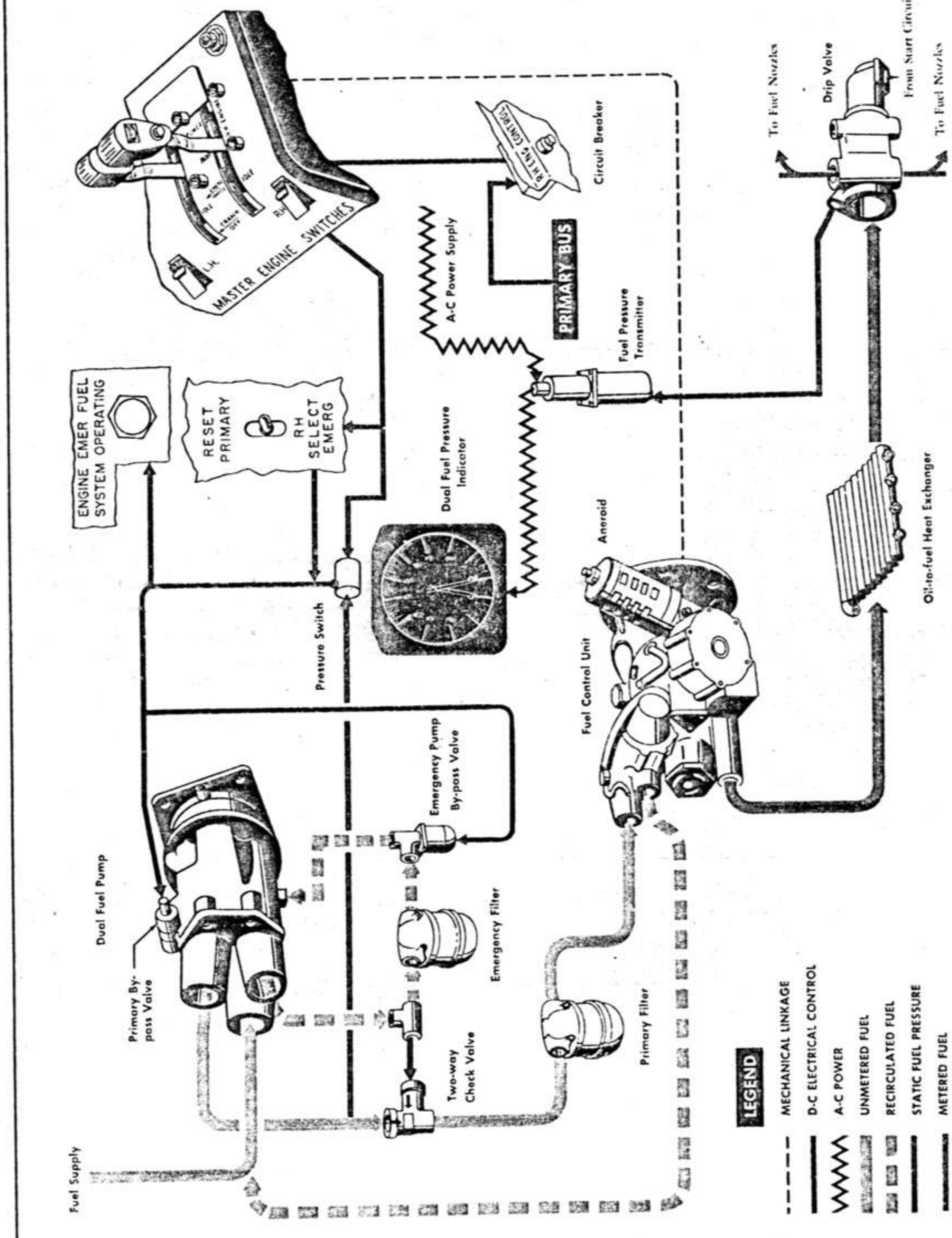


Figure 1–5. Engine Fuel System Schematic

of watching the exhaust temperature indicator since the engine fuel control does not automatically regulate exhaust gas temperatures.)

d. Controls the rate of decrease in fuel metering during deceleration to prevent flame-out.

e. Prevents the engine from overspeeding beyond preset limits.

f. Automatically switches from the primary fuel pump element to the emergency fuel pump element when the engine fuel pressure drops below 90 psi. (Manual selection of emergency operation is accomplished by means of the fuel pump selector switch in the cockpit.)

Note

The engine starts with the engine fuel system in emergency operation because of the lack of engine fuel pressure (below 90 psi) in the primary system during starting. At any time after the engine has started, primary fuel should be selected by moving the fuel pump selector switch to "RESET PRIMARY."

FUEL PUMP SELECTOR SWITCHES. The two (LH and RH) fuel pump selector switches (figures 1–4 and 1–5) on the instrument panel are three-position switches with momentary positions of "SELECT EMERG" and "RESET PRIMARY." The center position is neutral. The main function of these switches is to provide a manual means of selecting the engine emergency fuel pump if the automatic emergency select circuit fails. The switches also provide a means of returning to primary fuel operation from emergency operation and checking the operation of the emergency fuel pump.

DUAL ENGINE FUEL PRESSURE INDICATOR. The dual engine fuel pressure indicator (figures 1–4 and 1–5) is installed on the instrument panel and provides an indication of the fuel system pressure of each engine.

ENGINE EMERGENCY FUEL SYSTEM OPERATING WARNING LIGHTS. The two (LH and RH) ENGINE EMERG FUEL SYSTEM OPERATING warning lights (figures 1–4 and 1–5) on the instrument panel are illuminated whenever their respective engine emergency fuel pumps are in operation.

STARTING AND IGNITION SYSTEM.

GENERAL. The engines are brought up to starting speeds and ignited by the starting and ignition system. This system is used for both normal starting and emergency air starting. Igniter plugs are located in combustion chambers 1 and 5 of each engine. Power for the igniter plugs is furnished by ign tion transformers which operate on a-c power. Combustion, once initiated, is self-supporting so the starting and ignition circuit is de-energized after the engines pick up speed. If the engine fails to start, an igniter timer will de-energize the circuit after 30 seconds.

If an engine flames out during flight, it may be ignited by momentarily placing the throttle in "EMERG IGNITE." (For air starting procedure, refer to section III.) No cranking power is required since the engine will be windmilling sufficiently. If both engines flame out, the inverter transfer switch must be placed in the "STDBY" position before either engine can be re-ignited.

STARTING AND IGNITION CONTROLS. The starting and ignition controls (figure 1–4) consist of momentary switches located in the throttle quadrant and actuated by an outboard movement of the throttle levers. The two momentary switches for each engine are "CRANK" and "EMERG IGNITE" switches. Placing the throttle lever in "CRANK" operates the starter-generator as a cranking motor. Placing the throttle lever in "EMERG IGNITE" energizes two ignition transformers and igniter plugs which are used to initiate combustion. "EMERG IGNITE" is used for normal engine starting as well as for emergency air starts.

OIL SYSTEM.

GENERAL. *(See figure 1–6.)* Each engine incorporates a dry-sump full-scavenge oil system. (See figure 1–3 for information on the oil used in the system.) The oil tanks (usable capacity, 4.5 gallons; expansion space, 4.8 gallons; total volume, 9.3 gallons) incorporate a pendulum for inverted flight. A two-element gear-type pump provides both lubricating and scavenging and is mounted on the accessories drive casing of each engine. An additional scavenge pump is mounted in the midframe of the engine and returns oil from the three aft main bearings to the tank by the way of the oil-to-fuel heat exchanger.

OIL PRESSURE INDICATOR. A dual oil pressure indicator (figures 1–4 and 1–6), calibrated to read from 0 to 200 psi, is provided to give an indication of the pressure of the oil being fed into the three aft main bearings of each engine. A-c power is used for the oil pressure indicator circuit.

OIL TEMPERATURE INDICATOR. A temperature bulb is located in the oil inlet line to each engine. The temperature bulbs are connected to a dual temperature indicator (figures 1–4 and 1–6) with a range of –70°C to +150°C. Electrical power for the indicator is taken from the d-c instrument bus.

FUEL SYSTEM.

GENERAL. *(See figure 1–7.)* Fuel for the airplane is stored in seven internal self-sealing cells. (Refer to figure 1–40 for the fuel grade and specification and to the table below for fuel quantity data.) The cells are serviced at two pressure fueling adapters on the underside of the fuselage. If pressure fueling facilities are not available, the cells can be filled individually at filler necks.

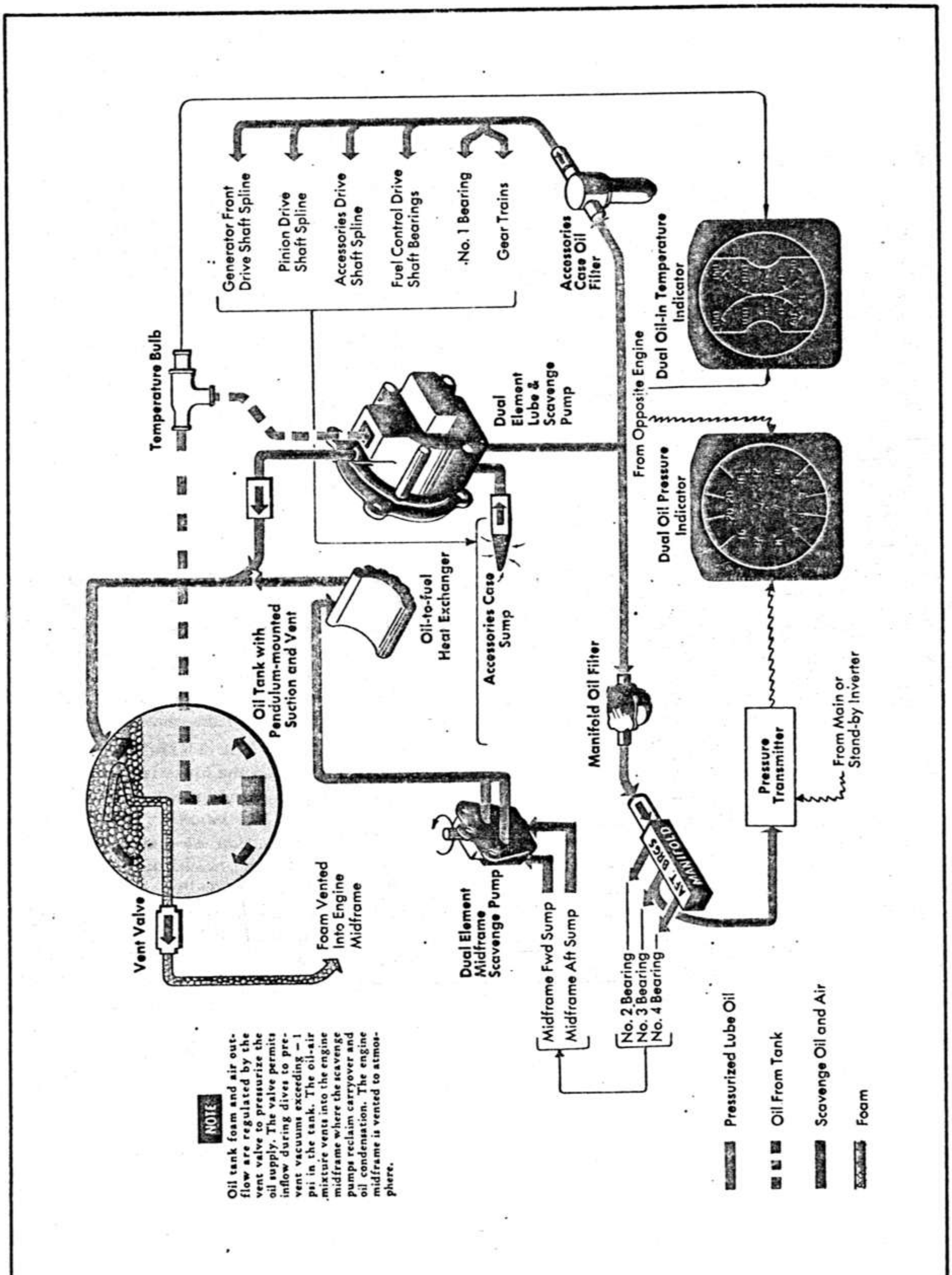


Figure 1–6. Oil System Schematic

CAUTION

The engines are adjusted to JP-3 (MIL-F-5624) fuel. The engine fuel control has to be readjusted before a different grade of fuel can be used.

Fuel quantity indications are shown on two indicators; one for main fuel, the other for transfer fuel.

To prevent excessive loss of fuel due to boiling at altitudes above 18,000 feet, the fuel cells are pressurized through a pressure-regulating vent valve. Vacuum relief valves are installed in all but two of the fuel cells (forward center section cells) to prevent damage to the cells during rapid dives. Additional vacuum protection is afforded by the vent valve which opens in response to a partial vacuum in the lines.

Note

Refer to section VII for fuel management information.

Fuel Quantity Data

Fuel Cell	*No.*	*System*	*Capacity (Gal)* Pressure Fueling	Filler Neck Fueling
Mid fuselage	1	Main	206	211
Forward center section*	2	Main	92 (each)	92 (each)
Aft fuselage	1	Main	337	343
"FWD FUS" (forward fuselage)	1	Transfer	252	257
"CS" (aft center section)	2	Transfer	148 (each)	148 (each)
	4	Main	727	738
Totals	3	Transfer	548	553
	7	......	1275	1291

*Forward center section cells are filled through standpipes in the mid fuselage cell.

MAIN FUEL SYSTEM. *(See figures 1–7 and 1–8.)* The mid fuselage cell is the engine feed cell; fuel flows by gravity from the other three main system cells (aft fuselage, LH forward center section, and RH forward center section) to this cell. The fuel is pumped from the mid fuselage cell into a manifold at a pressure between 10 and 30 psi. From the manifold, fuel flow is directed into two lines: one for each engine. (This arrangement permits either engine to be supplied by any or all of the fuel boost pumps.) An electrically operated shutoff valve is located in each fuel line. The shutoff valves are opened when the MASTER ENGINE SWITCHES are "ON."

There are four fuel boost pumps in the mid fuselage cell:

D-c level flight pump (2)......Normal main system pumps

A-c level flight pump..........Normal main system pump

D-c inverted flight pump..............Operated by an attitude switch during inverted flight

Note

A fifth fuel boost pump is installed in a sump chamber beneath the aft end of the aft fuselage cell. This pump ensures fuel flow to the engines during steep, prolonged periods of high nose-up operation without transfer fuel.

TRANSFER SYSTEM. *(See figures 1–7 and 1–8.)* The three transfer cells are the forward fuselage cell, the left-hand aft center section cell, and the right-hand aft center section cell. An automatic pumping cycle pumps fuel from the transfer cells through a fuel transfer manifold into the main system. The automatic pumping cycle operates as follows:

a. Fuel is pumped from the forward fuselage cell until only 49 gallons remain in that cell. A float switch is actuated at the 49-gallon level and the two transfer pumps in the cell stop operating.

b. The float switch in the forward fuselage cell starts a pump in each aft center section cell. Fuel is pumped from these cells until they are empty. As soon as one of these cells is empty, the two forward fuselage pumps are energized by the float switch in the empty cell. The aft center section cell pumps continue to operate after their cells are empty.

c. The remaining 49 gallons of fuel are pumped from the forward fuselage cell.

d. When all the fuel is transferred, a warning light in the cockpit will be illuminated. The TRANSFER SWITCH should be placed momentarily in "OFF" to stop the pumps at the end of the transfer system cycle.

TRANSFER SWITCH. The TRANSFER SWITCH (figure 1–9) is located on the lower instrument panel. It has three positions: neutral, momentary "OFF," and momentary "RESET." The switch is placed momentarily in "OFF" either to stop the fuel transfer pumps at the end of the transfer cycle or for any other reason. The NO FUEL TRANSFER warning light is also turned off. The transfer pumps will start operating when the airplane's electrical power is first turned on, but, if after that the TRANSFER SWITCH is turned to "OFF," the pumps can only be started again by placing the switch momentarily in "RESET." *The TRANSFER SWITCH can turn the transfer system off when the EMERG TRANSFER TANK SELECTOR switch is in "NORMAL."*

EMERGENCY TRANSFER TANK SELECTOR SWITCH. The EMERG TRANSFER TANK SELECTOR switch (figure 1–9) has three positions: "NORMAL," "FWD FUS," and "CS." This switch should be left in "NORMAL" unless the automatic transfer cycle is inoperative or malfunctioning. Moving the switch from "NORMAL" overrides the TRANSFER SWITCH. Placing the switch in "CS" starts both aft center section cell pumps; "FWD FUS" position starts

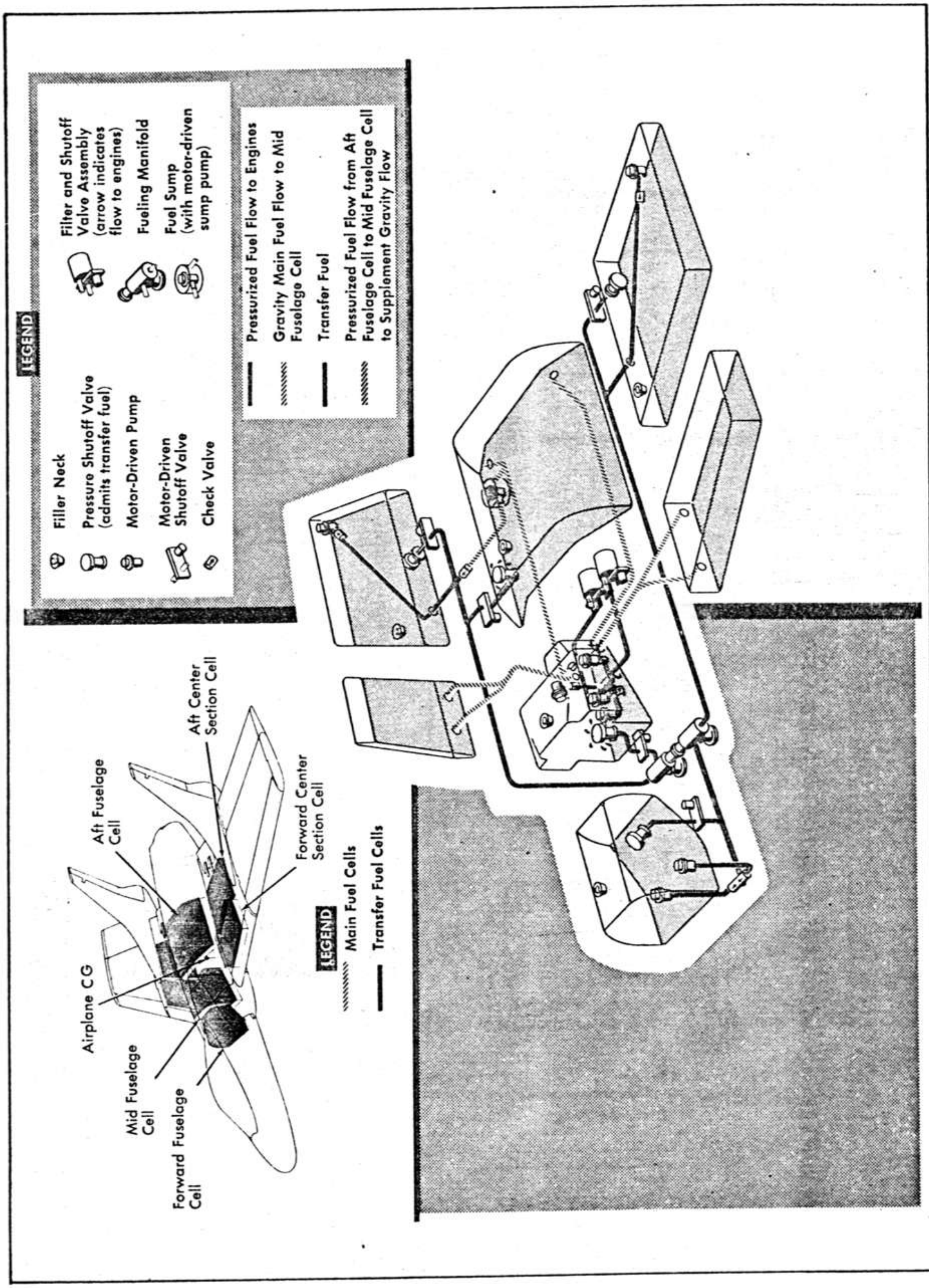


Figure 1–7. Fuel System Flow Schematic

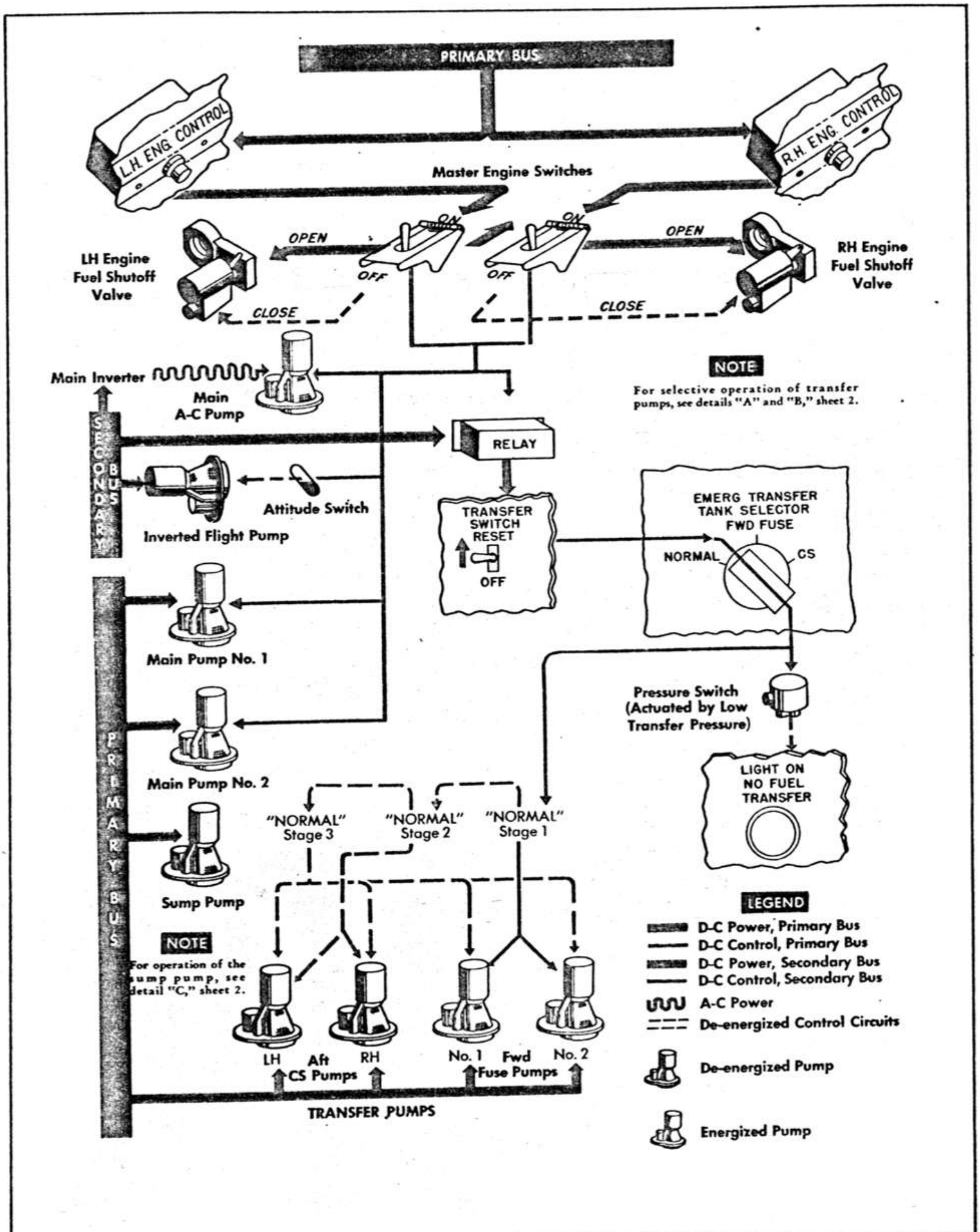


Figure 1–8. Fuel System Control Schematic (Sheet 1 of 2)

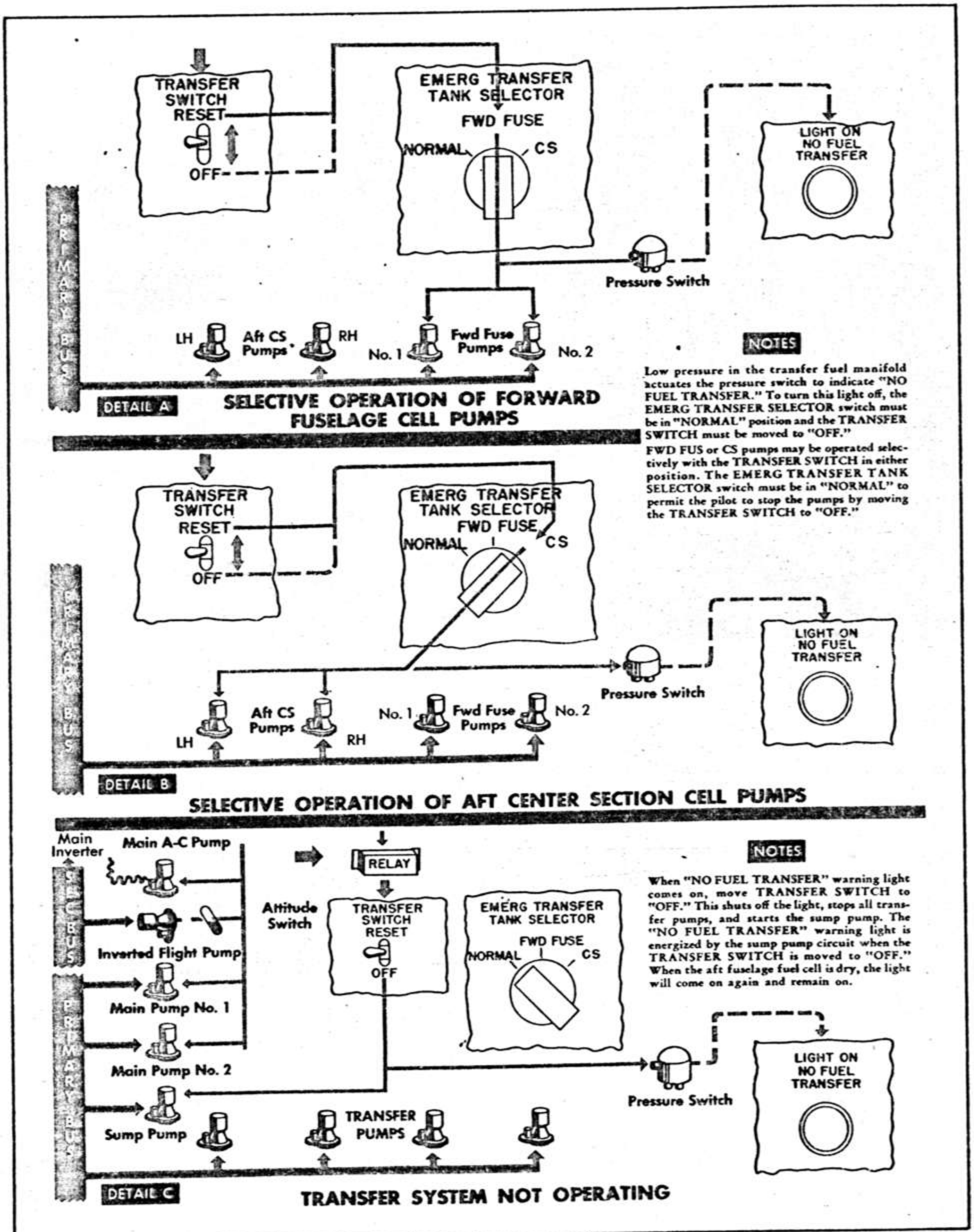


Figure 1–8. Fuel System Control Schematic (Sheet 2 of 2)

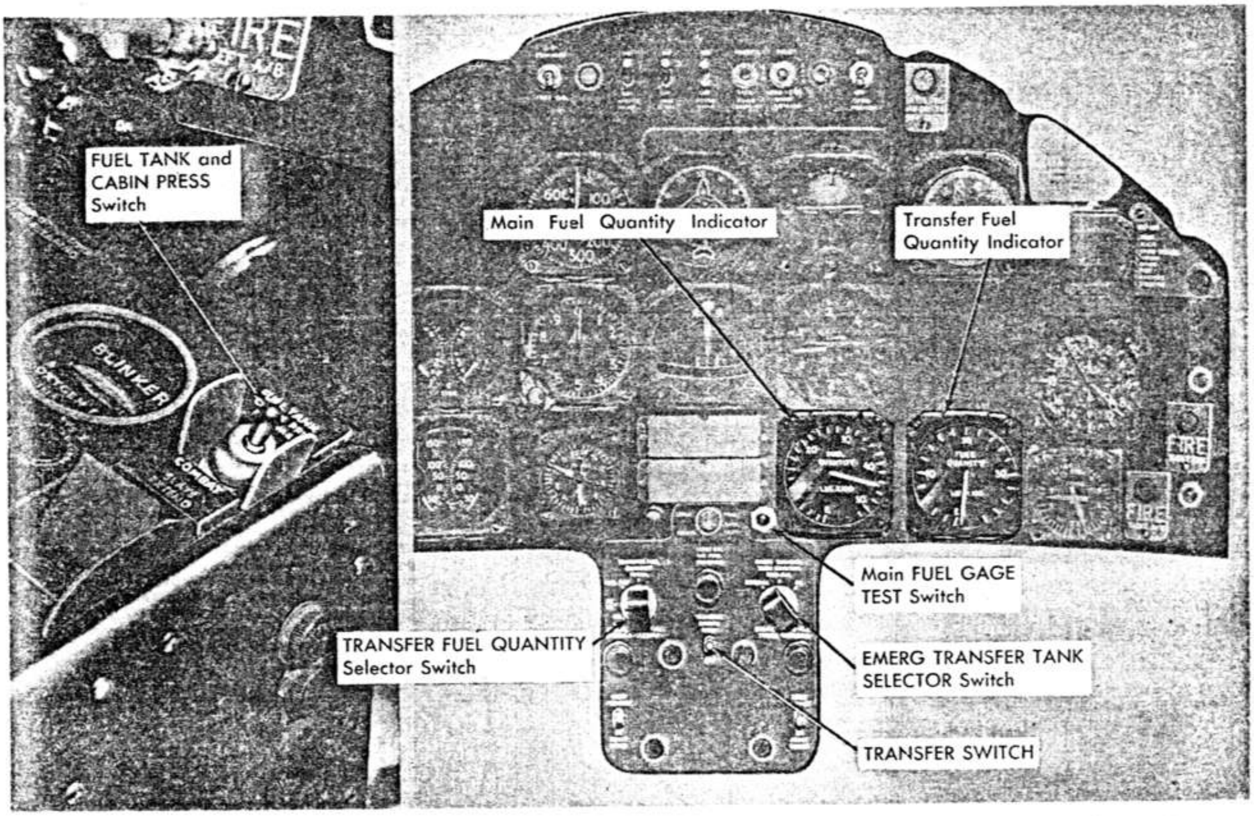


Figure 1–9. Fuel System Controls and Instruments

both forward fuselage cell pumps. When selective pumping is complete, always turn the switch back to "NORMAL." This will cut in the "TRANSFER SWITCH" and then the pumps can be turned off if desired by placing the TRANSFER SWITCH momentarily in "OFF."

TRANSFER FUEL QUANTITY SELECTOR SWITCH. The TRANSFER FUEL QUANTITY selector switch (figure 1–9) is located on the lower instrument panel. It has four positions: "FWD FUS," "LHCS," "RHCS," and "TOTAL" and provides a means of selecting readings of individual transfer cell quantities. It also serves as a means of checking the freedom of rotation of the transfer fuel quantity indicator mechanism.

MAIN FUEL GAGE TEST SWITCH. The main FUEL GAGE TEST switch (figure 1–9) is located on the instrument panel. It is provided to position the main system quantity indicator pointer to zero momentarily as a check on the electrical continuity of the gage and the freedom of rotation of the indicator mechanism.

FUEL TANK AND CABIN PRESSURIZATION SWITCH. The FUEL TANK AND CABIN PRESS switch (figure 1–9) is located on the left-hand console. During routine flight conditions, it is placed in "NORMAL." Placing the switch in "COMBAT" reduces the tank vent system pressure and the cabin pressure. (Pressure in the cells seriously limits the capacity of self-sealing cells to close off punctures and slits.)

MAIN FUEL QUANTITY INDICATOR. The main fuel quantity indicator (figure 1–9) is located on the instrument panel. It is calibrated in pounds and indicates the total quantity in the four main cells.

TRANSFER FUEL QUANTITY INDICATOR. The transfer fuel quantity indicator (figure 1–9) is located on the instrument panel. It is calibrated in pounds and indicates the quantity of fuel in the transfer cells selected by the TRANSFER FUEL QUANTITY selector switch.

NO FUEL TRANSFER WARNING LIGHT. The NO FUEL TRANSFER warning light (figure 1–9) is located on the lower instrument panel. When fuel pressure in the transfer manifold drops, for any reason, a pressure differential switch energizes this light.

D-C ELECTRICAL SYSTEM.

GENERAL. The d-c electrical system is based on a one-wire distribution with the circuit grounded through the airplane structure. The operation of the d-c electrical system is shown in figure 1–11.

ELECTRICAL POWER CONTROL SWITCH. The electrical power control switch (figure 1–10) is located

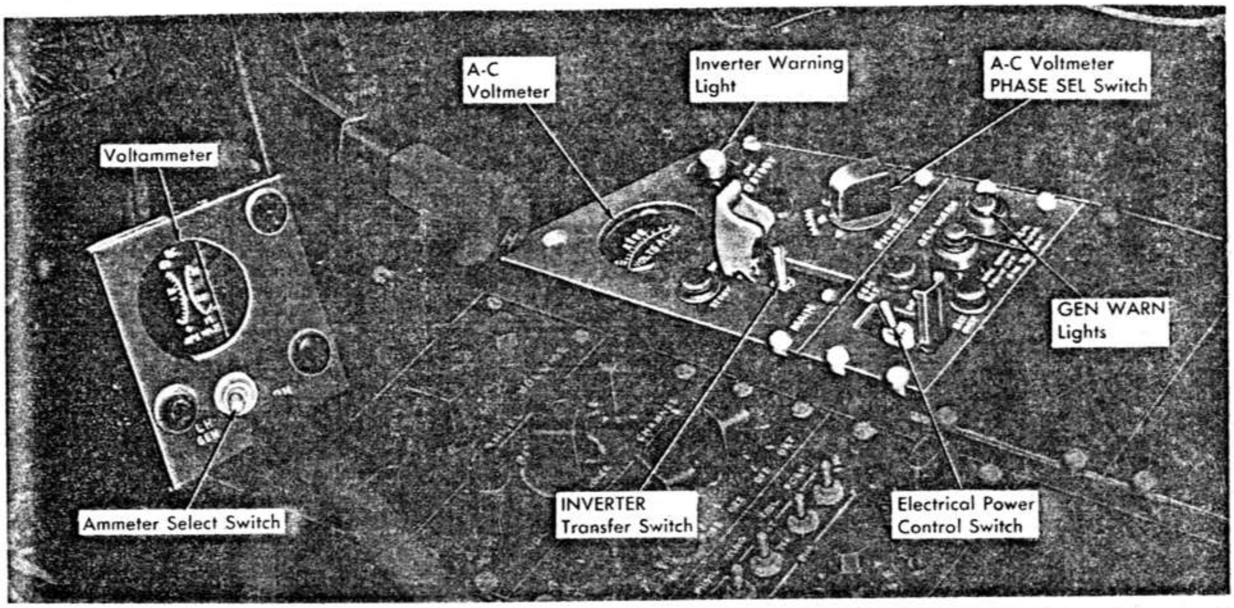


Figure 1–10. D-C and A-C Electrical System Controls and Instruments

on the right-hand console. The switch positions are labeled "GEN & BAT," "OFF," and "BAT ONLY." Placing the switch in "GEN & BAT" connects d-c generator power to all four buses (primary, secondary, monitored, and battery) or battery power (engines not running) to only the battery and primary buses. Lifting a guard and placing the switch in "BAT ONLY" connects the battery power to all but the monitored bus.

AMMETER SELECT SWITCH. The ammeter select switch (figure 1–10) is located just below the voltammeter on the right-hand console. The switch positions are labeled "LH GEN" and "RH GEN." Placing the switch in either position connects the ammeter side of the voltammeter to the generator selected.

VOLTAMMETER. The voltammeter (figure 1–10) on the right-hand console indicates right-hand console primary bus voltage and generator output current. The ammeter side of the voltammeter gives the output current for the generator selected by the ammeter select switch.

GENERATOR WARNING LIGHTS. The two red GEN WARN lights (figure 1–10) are located on the right-hand console. Each light illuminates when the corresponding generator output voltage drops below the primary bus voltage.

A-C ELECTRICAL SYSTEM.

GENERAL. The operation of the a-c electrical system is shown in figure 1–13.

INVERTER TRANSFER SWITCH. The INVERTER transfer switch (figure 1–10) is located on the right-hand console. When the switch is in "MAIN," the main inverter supplies 115-volt 400-cycle three-phase a-c power for the operation of the airplane's a-c circuits, and the stand-by inverter supplies 115-volt 400-cycle three-phase a-c power for the AN/APX-6 system. When the switch is in "STDBY" position, the main inverter is inoperative and the stand-by inverter stops supplying a-c power for the AN/APX-6 system and supplies it instead to the following circuits:

Ignition	G-2 Compass
Engine Instruments	Oil Pressure
Fuel Quantity	Fuel Pressure
Gyro Horizon	AN/ARA-25

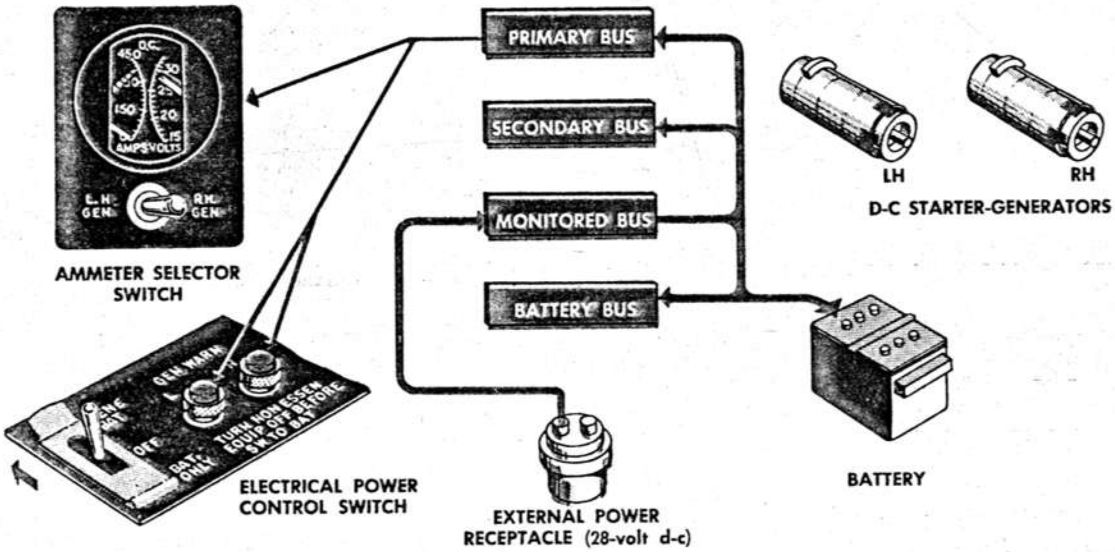
A-C VOLTMETER PHASE SELECTOR SWITCH. The a-c voltmeter PHASE SEL switch (figure 1–10) is located on the right-hand console. It is a five-position rotary switch and is used for selecting the main or stand-by inverter phase to be indicated by the a-c voltmeter. The five positions are "MAIN A," "MAIN B," "MAIN C," "STDBY A," and "STDBY C."

A-C VOLTMETER. The a-c voltmeter (figure 1–10) indicates main or stand-by inverter phase voltage according to the position of the PHASE SEL switch. Phase voltages should be approximately 115 volts when each inverter is running.

INVERTER WARNING LIGHT. When the red inverter warning light (figure 1–10) comes on, it indicates that the main inverter has failed to produce enough voltage to keep the inverter warning relay energized. The light will go off when the INVERTER transfer switch is placed in "STDBY."

PRESTART

External power connected. Electrical power control switch in "GEN & BAT." GEN WARN lights remain on until engines are running. *Note:* If power control switch is in "OFF," same conditions exist except that battery is not charged.



NORMAL FLIGHT

Use ammeter selector switch to obtain generator load readings on voltammeter. Typical readings are as follows: start, 150 amp; take-off, 200 amp; and cruise, 180 amp. Primary bus voltage is always indicated on voltammeter whether from generators or battery. Fixed index pointers indicate electrical system voltage and maximum generator current available. Generators supply electrical power and charge battery if electrical power control switch is in "GEN & BAT" and BATTERY CONTROL cicuit breaker (right-hand console) is pushed in.

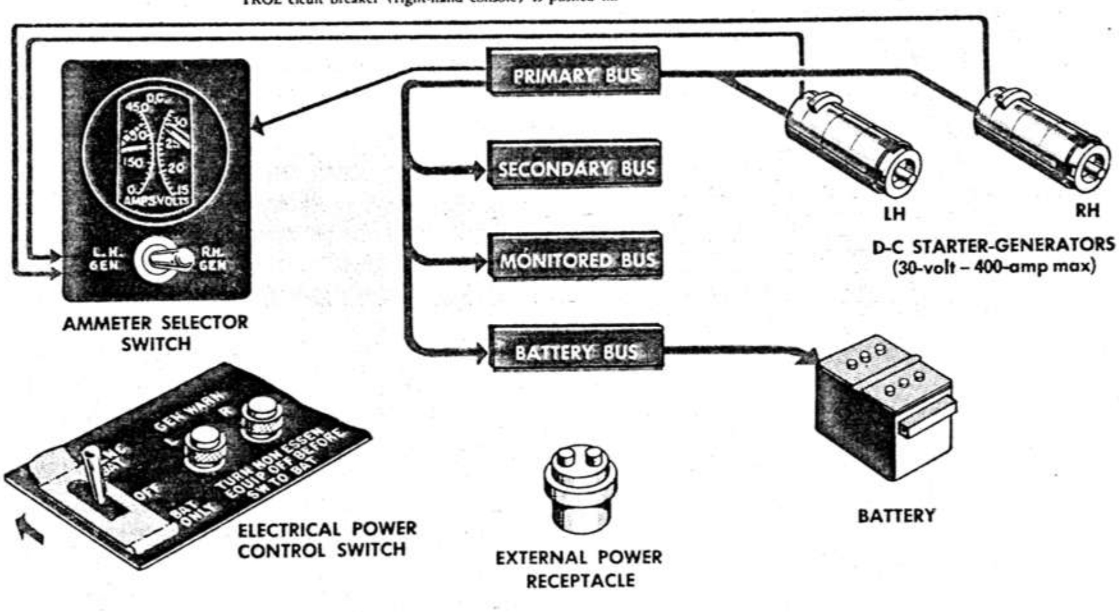
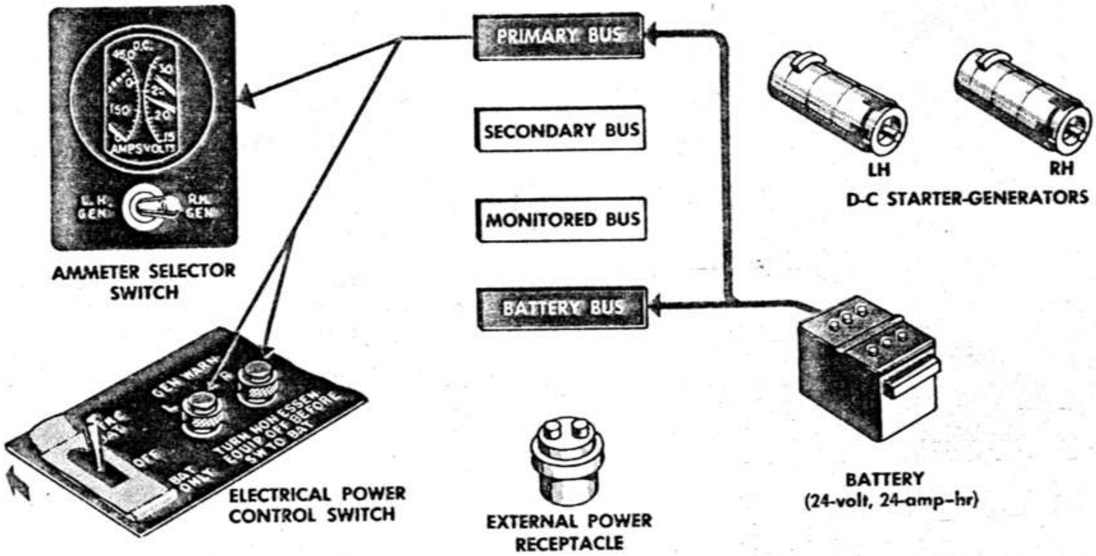


Figure 1–11. D-C Electrical System Schematic (Sheet 1 of 3)

GENERATOR FAILURE

Conditions indicated will prevail when generator voltage drops below battery voltage as a result of generator failure or engine failure; landing gear up and electrical power control switch in "GEN & BAT." BATTERY CONTROL circuit breaker (right-hand console) pushed in.



BATTERY OPERATION

Turn off nonessential equipment and place electrical power control switch in "BAT ONLY." (BATTERY CONTROL circuit breaker on right-hand console should be pushed in.) If power control switch is left in "GEN & BAT," secondary bus is automatically connected to primary bus when landing gear is extended.

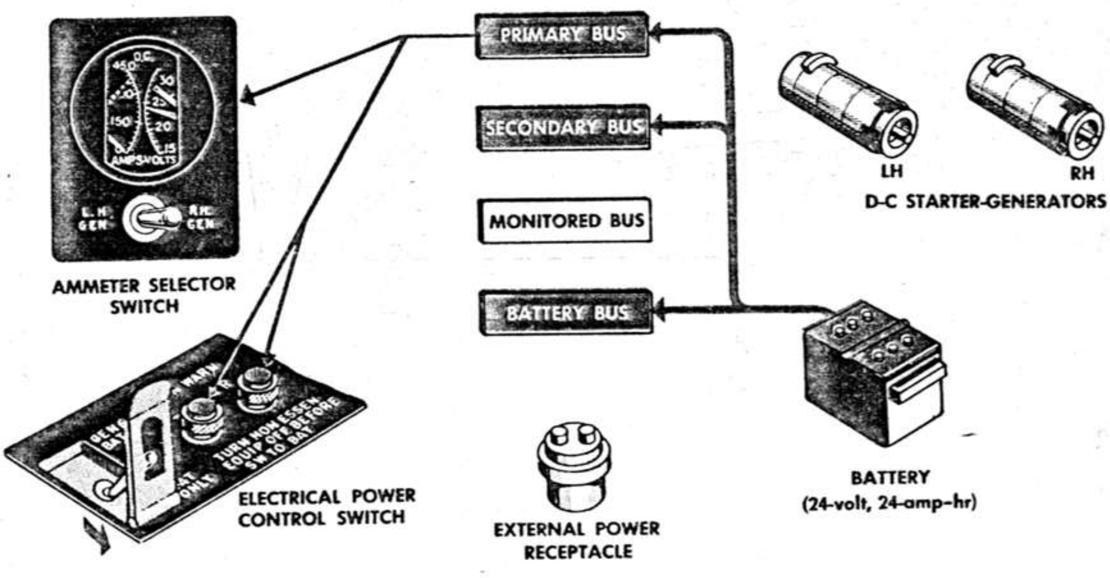
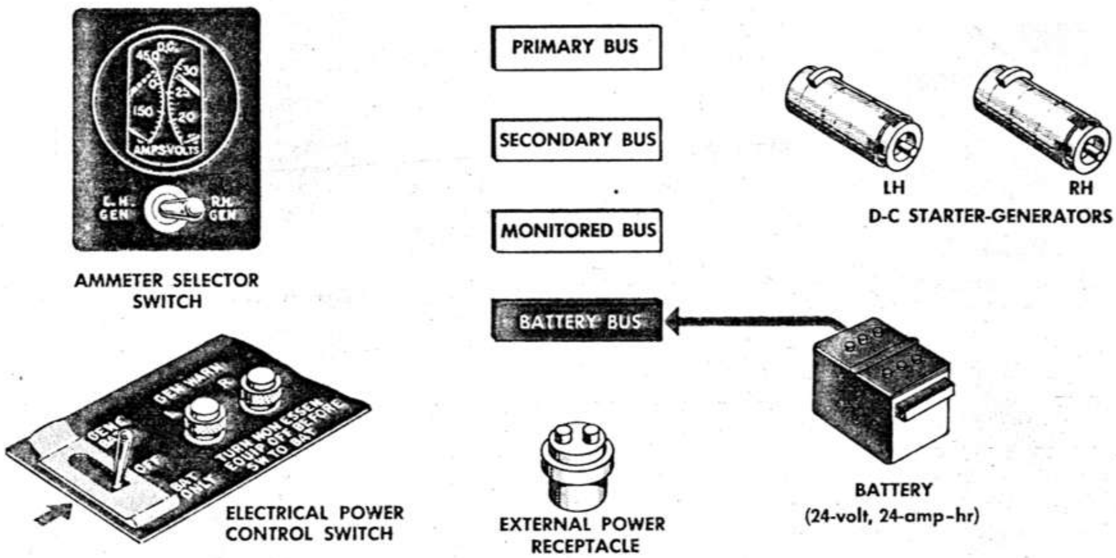


Figure 1–11. D-C Electrical System Schematic (Sheet 2 of 3)

PARKED

Airplane at rest with all switches off. Battery bus is energized at all times.



PRIMARY BUS

- Angle of Attack
- Arresting Gear Control
- Bomb and Rocket System
- Cockpit Air Control
- Fire Control — MK 6
- Fire Detector
- Fuel Control, Engine
- Fuel Control, Main System
- Fuel Pumps (all d-c pumps except inverted flight pump)
- Fuel Tank and Cabin Pressure
- Fuel Transfer Quantity Selector Circuit
- G-2 Compass (d-c power)
- Gunnery System
- Hydraulic Shutoff
- Landing Gear and Slot Position Indicator
- Landing Gear Handle Lock
- Lights, Emergency Spot and Flood
- Lights, Warning (landing gear warning light receives power from secondary bus)
- Oil Temperature Indicator
- Rudder Pedal Adjust
- Stand-by Inverter
- Starting and Ignition Control
- Speed Brake Control
- Trim Control

MONITORED BUS

- Auxiliary Battery Charging
- Auxiliary Hydraulic Pump Control
- Flight Stabilization (d-c power)
- Main Inverter Control (inverter power is received from secondary bus)

SECONDARY BUS

- Anti-icing
- Canopy Control
- Fuel Pump, Inverted Flight
- Fuel Control, Transfer System
- Gun Bay Heat
- Lights, Exterior and Approach
- Main Inverter Power (control circuit receives power from monitored bus)
- Nose Wheel Prerotation
- Radar Identification (IFF) AN/APX-6
- Radar Range AN/APG-30
- Radio Compass AN/ARN-6
- Radio Direction Finder (ADF) Group AN/ARA-25
- Radio Receiver AN/ARR-2A
- Radio Set (UHF) AN/ARC-27
- Seat Adjust
- Slat Control
- Windshield Defogging

BATTERY BUS

- Auxiliary Hydraulic Pump
- Battery Control
- Canopy Control, Ground Operated
- IFF (AN/APX-6) Destruct Circuit
- Underside Fueling and Defueling

NOTE

Each electrical circuit is connected to a bus on a priority and functional basis as follows:

PRIMARY BUS —— safety-of-flight circuits
SECONDARY BUS — essential circuits
MONITORED BUS — auxiliary circuits
BATTERY BUS —— circuits which may require power under any condition of flight or ground operation.

Figure 1-11. D-C Electrical System Schematic (Sheet 3 of 3)

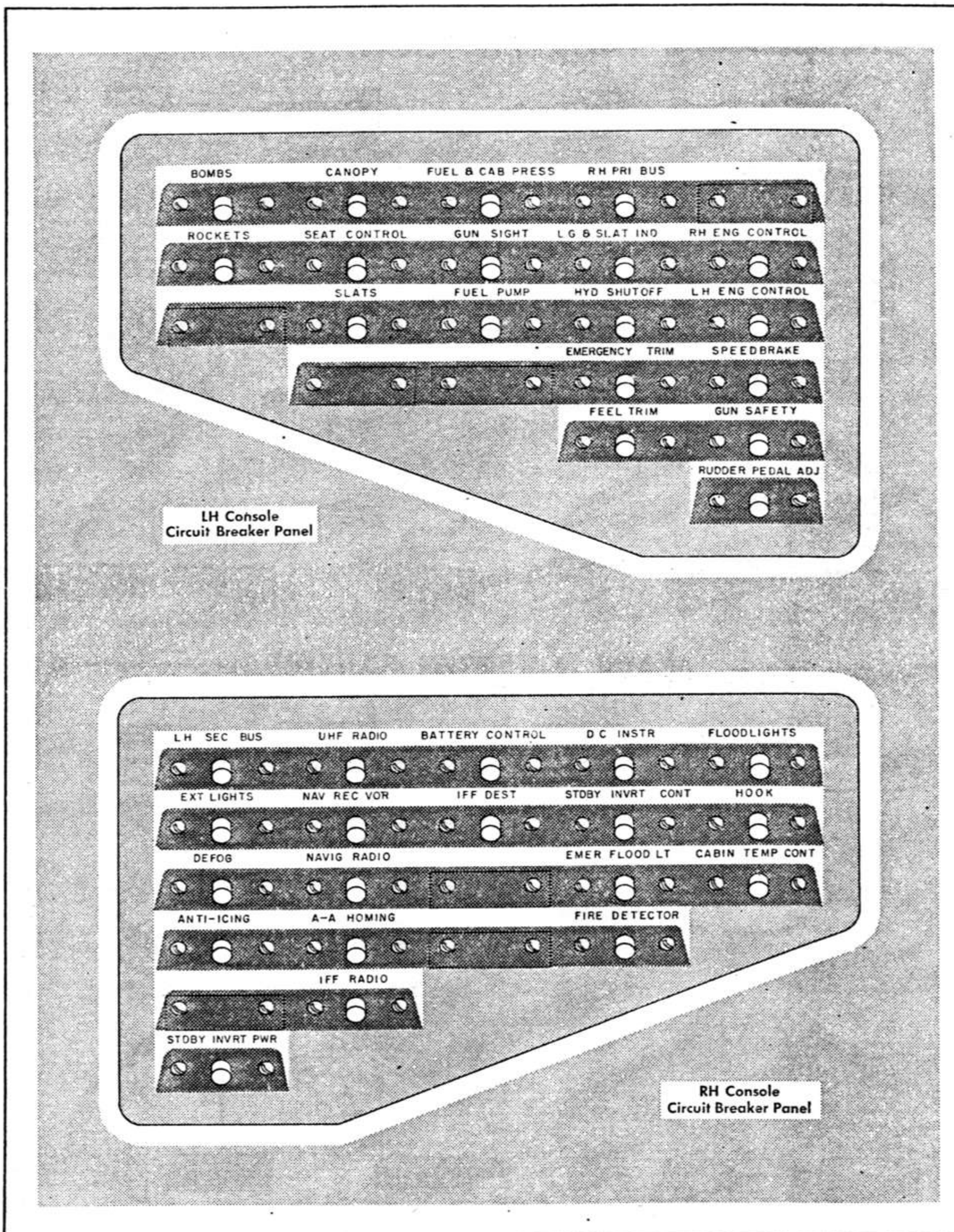


Figure 1–12. Circuit Breaker Panels

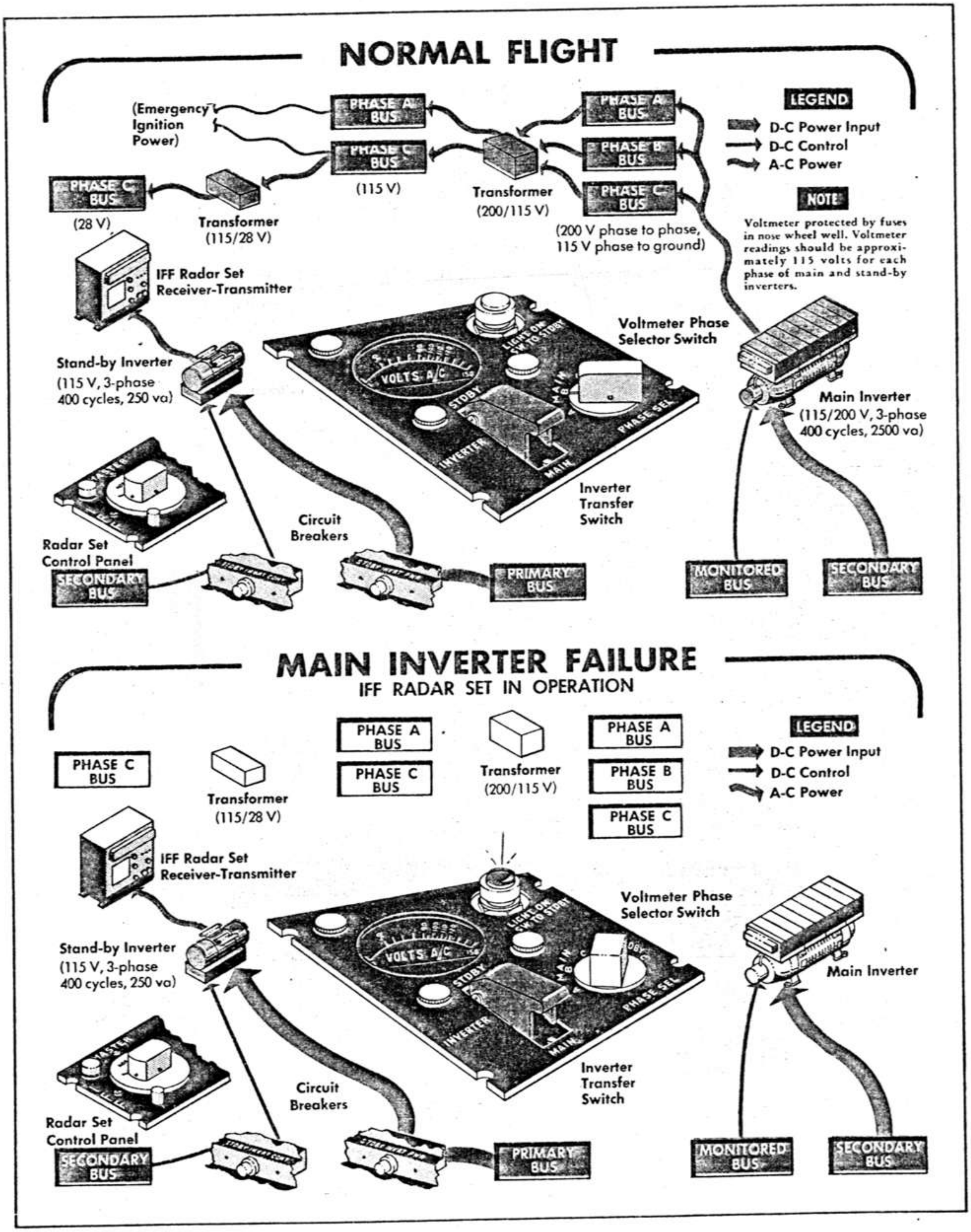


Figure 1–13. A-C Electrical System Schematic (Sheet 1 of 2)

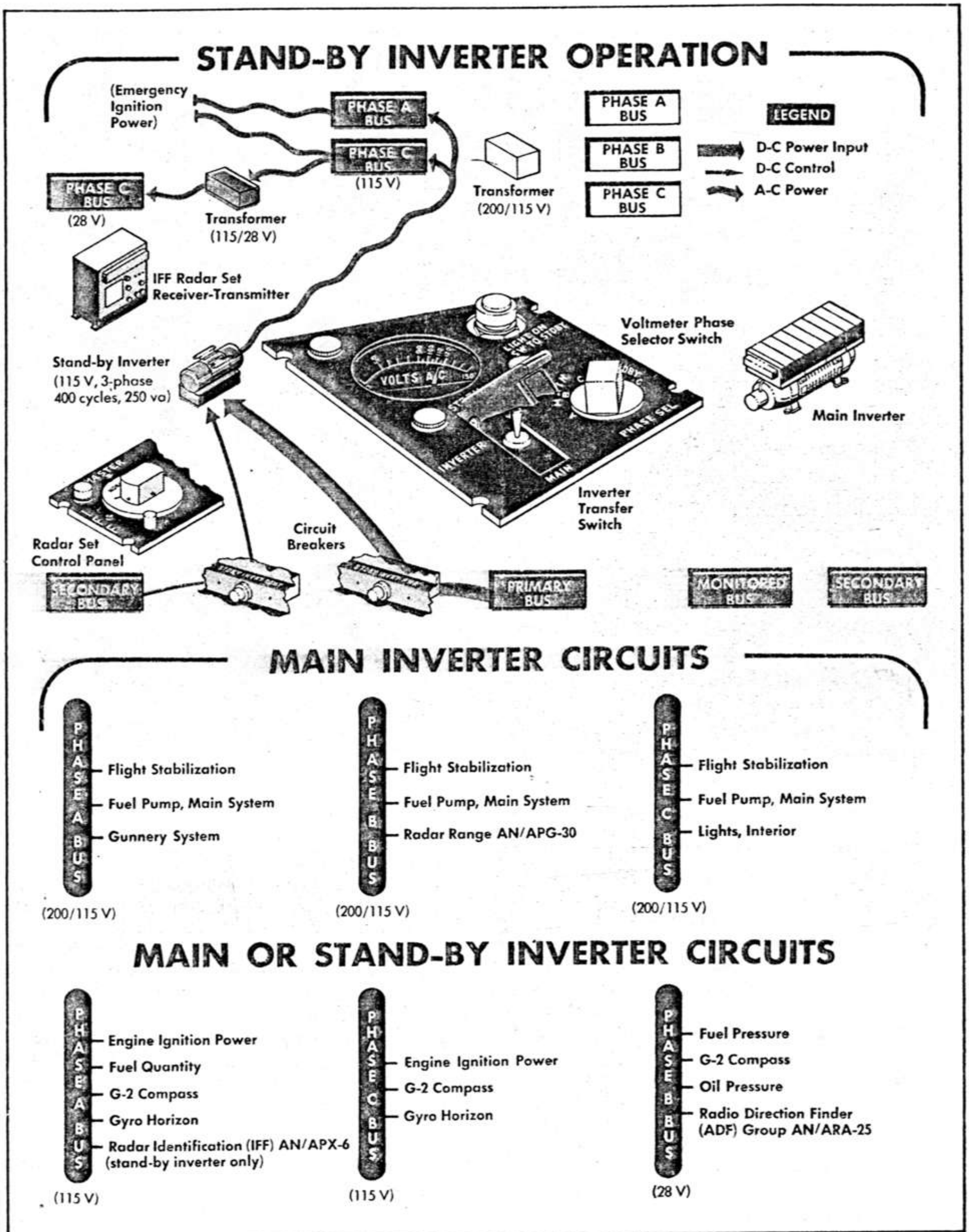
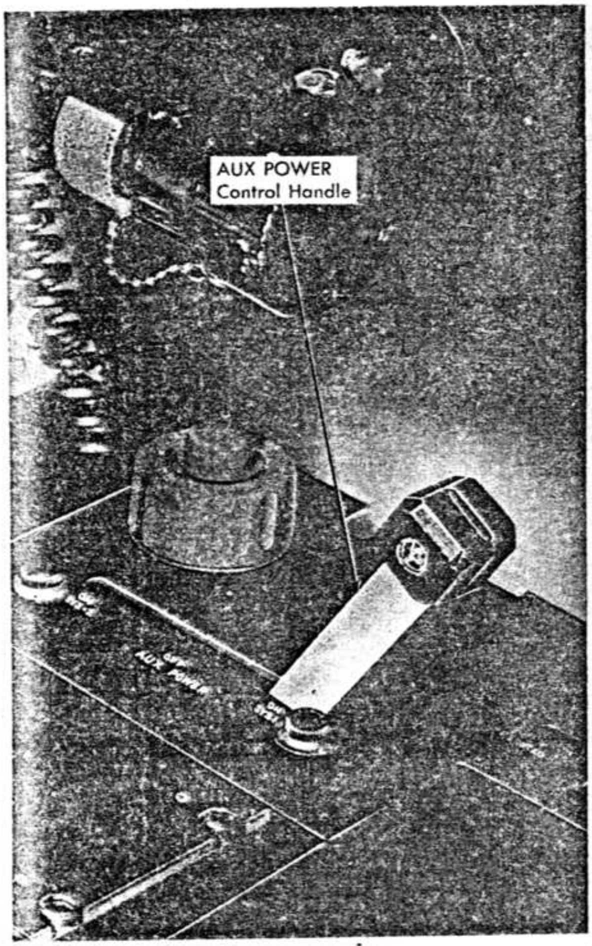


Figure 1–13. A-C Electrical System Schematic (Sheet 2 of 2)



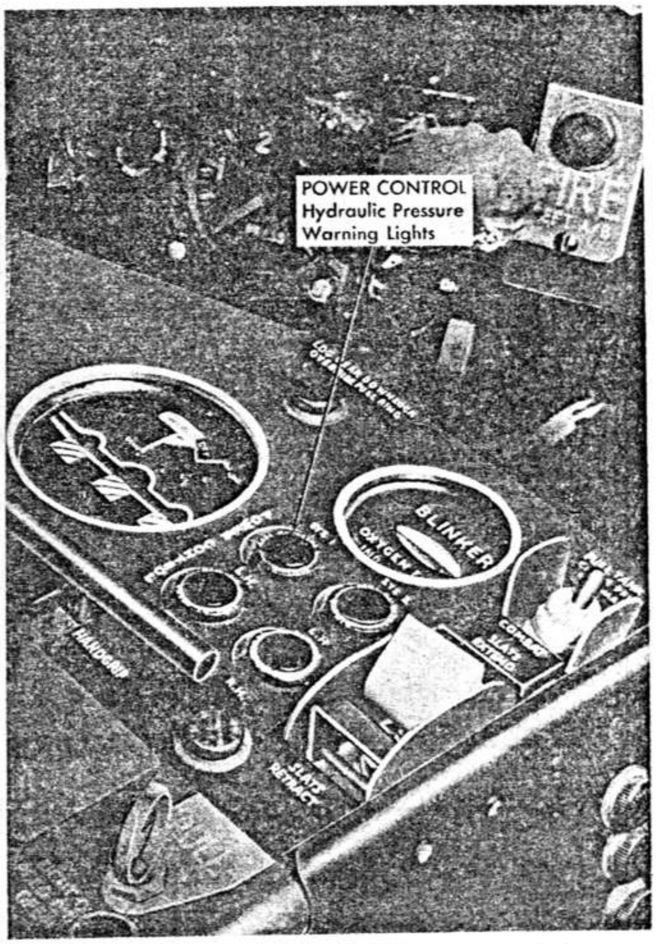


Figure 1–14. Power Control Hydraulic System Controls

POWER CONTROL HYDRAULIC SUPPLY SYSTEM.

GENERAL. *(See figure 1–15.)* Hydraulic pressure (3,000 psi) for ailavator control is supplied by two independent hydraulic systems (Power Control Systems No. 1 and No. 2). The two systems function simultaneously under normal conditions. Dual-engine, dual-pump, and dual-cylinder safety is obtained by each system having two pumps, one on each engine, and each ailavator control cylinder having two tandem chambers with each chamber connected to one of the two power control systems. If one engine fails, the other engine will keep both power control systems pressurized. If both engines fail, the windmilling of the engines, at airspeeds above 200 knots, will continue to drive the main hydraulic pumps. The ailavator power control systems are equipped with an emergency pump which receives power from a special battery. The battery is kept charged during normal flight and it will operate the emergency pump for 3 minutes. The emergency pump should be used for an emergency landing approach at airspeeds below 200 knots with both engines out.

AUXILIARY POWER CONTROL HANDLE. The AUX POWER control handle (figure 1–14) is located on the left-hand console. Placing the handle in either "ON SYS 1" or "ON SYS 2" closes a switch which starts the emergency pump and connects the pressure and return lines of the selected power control system to the emergency pump.

POWER CONTROL HYDRAULIC PRESSURE WARNING LIGHTS. The four POWER CONTROL hydraulic pressure warning lights (figure 1–14) are located on the left-hand console. Each light (SYS 1 LH, SYS 1 RH, SYS 2 LH, and SYS 2 RH) is illuminated when the pressure in its particular system is reduced (800 to 1,000 psi) because of pump failure, engine failure, or a break in a hydraulic line. The warning lights will not turn off when the emergency pump is operated because a check valve is installed between the pressure switch for each light and the emergency pump.

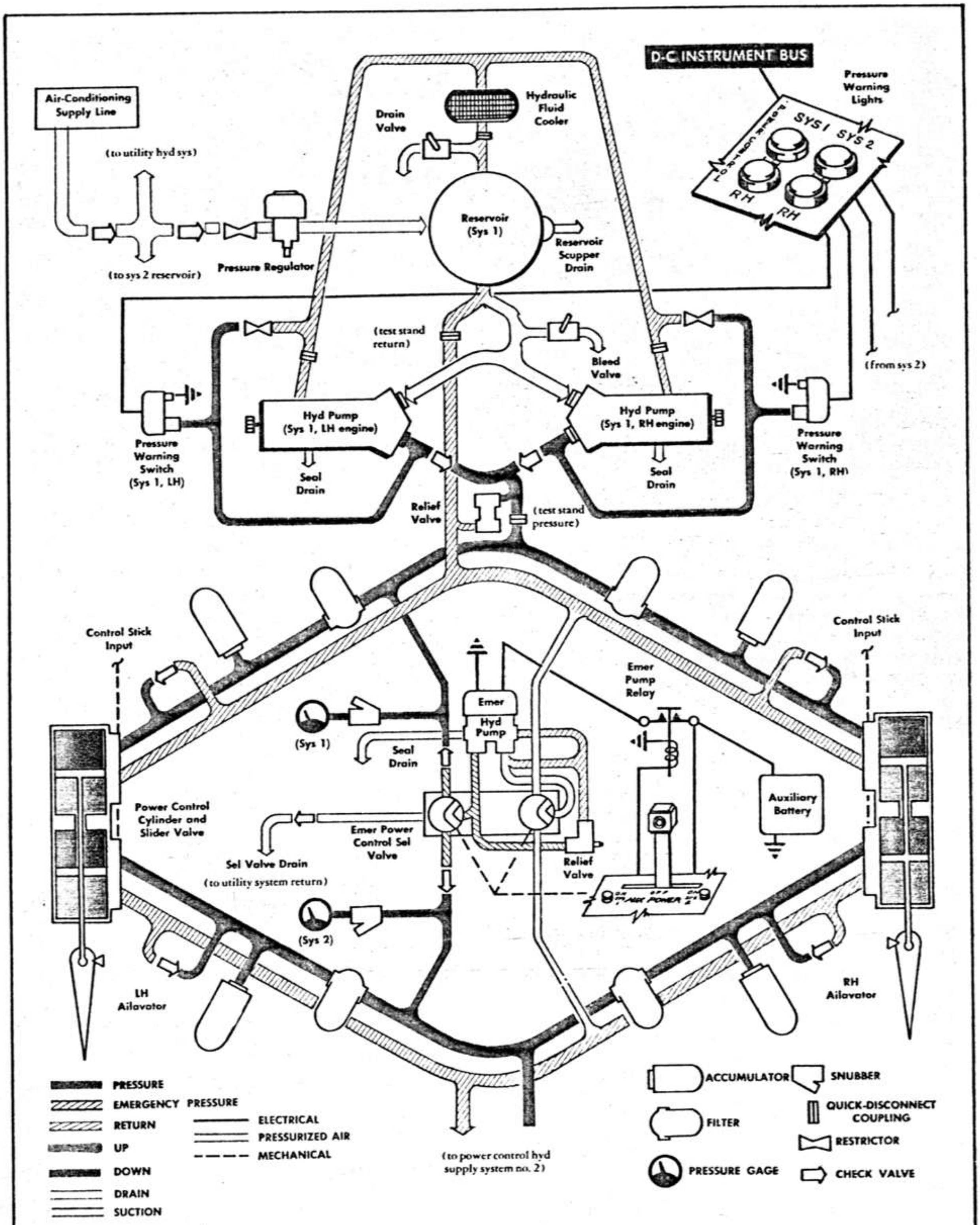


Figure 1–15. Power Control Hydraulic System Schematic

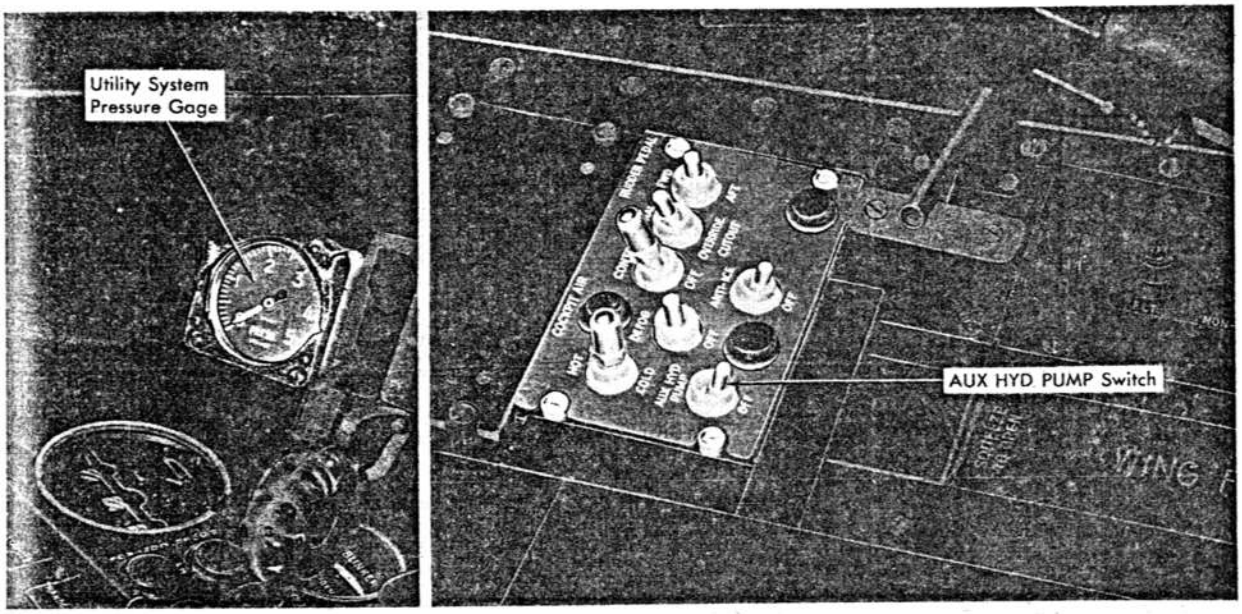


Figure 1–16. Utility Hydraulic System Control and Indicator

UTILITY HYDRAULIC POWER SUPPLY SYSTEM.

GENERAL. *(See figure 1–17.)* The utility hydraulic power supply system supplies the power for the operation of all the hydraulic circuits except the ailavator control circuit. A pump on each engine supplies 3,000-psi pressure for the system. The utility hydraulic system pressure line is divided into a pressurized-in-flight line and a depressurized-in-flight line which service the following circuits:

Pressurized-in-Flight Circuits	*Depressurized-in-Flight Circuits*
Speed brakes	Landing gear
Auxiliary rudder	Arresting gear
Gun charger compressor drive	Slat
Rocket pack door	Canopy
	Wheel brake
	Wing-fold

The pressure in the depressurized-in-flight line is controlled by an electrically operated shutoff valve. When all the flight circuits serviced by the depressurized-in-flight line are in their in-flight position, a time delay mechanism starts its timing sequence. After 20 seconds, the time delay energizes the shutoff valve to shut off hydraulic pressure in the line. The line is pressurized as soon as a control of any one of the first four depressurized-in-flight circuits is placed in an operating position.

An electrically operated auxiliary hydraulic pump is incorporated in the utility hydraulic system to provide hydraulic pressure for operating the system on the ground when the engines are not running. The pump is controlled by the external canopy switch in the left-hand gun bay door and an AUX HYD PUMP switch on the right-hand console. The pump should not run longer than necessary and never more than 1 minute at a time.

PRESSURE GAGE. A pressure gage (figure 1–16) for the utility hydraulic system is located on the left-hand console and indicates the pressure in the main pressure line. Under normal conditions, the gage reading should be 3,000 psi. The gage reading should be 3,400 psi when the system is pressurized from the auxiliary hydraulic pump and no utility circuit is operating.

AUXILIARY HYDRAULIC PUMP SWITCH. The AUX HYD PUMP switch (figure 1–16) is located on the cockpit air panel on the right-hand console. Holding the switch in "AUX HYD PUMP" operates the auxiliary hydraulic pump.

Note

The switch is connected to the monitored bus so external power must be connected before the switch will become operative.

FLIGHT CONTROL SYSTEM.

The primary flight controls of the airplane are the ailavator control, feel, and trim system; the flight stabilization system; and the rudder control system.

AILAVATOR CONTROL, FEEL, AND TRIM SYSTEM.

AILAVATOR CONTROL. *(See figure 1–19.)* The ailavators perform the functions of conventional ailerons and elevators. The control stick is conventional; combining of lateral stick motion (aileron) and longitudinal stick motion (elevator) is accomplished by a mixing linkage. Movement of the control stick actuates a system of control rods which terminate at hydraulic actuating cylinder slider valves in each wing outer panel. A hydraulic actuating cylinder controls

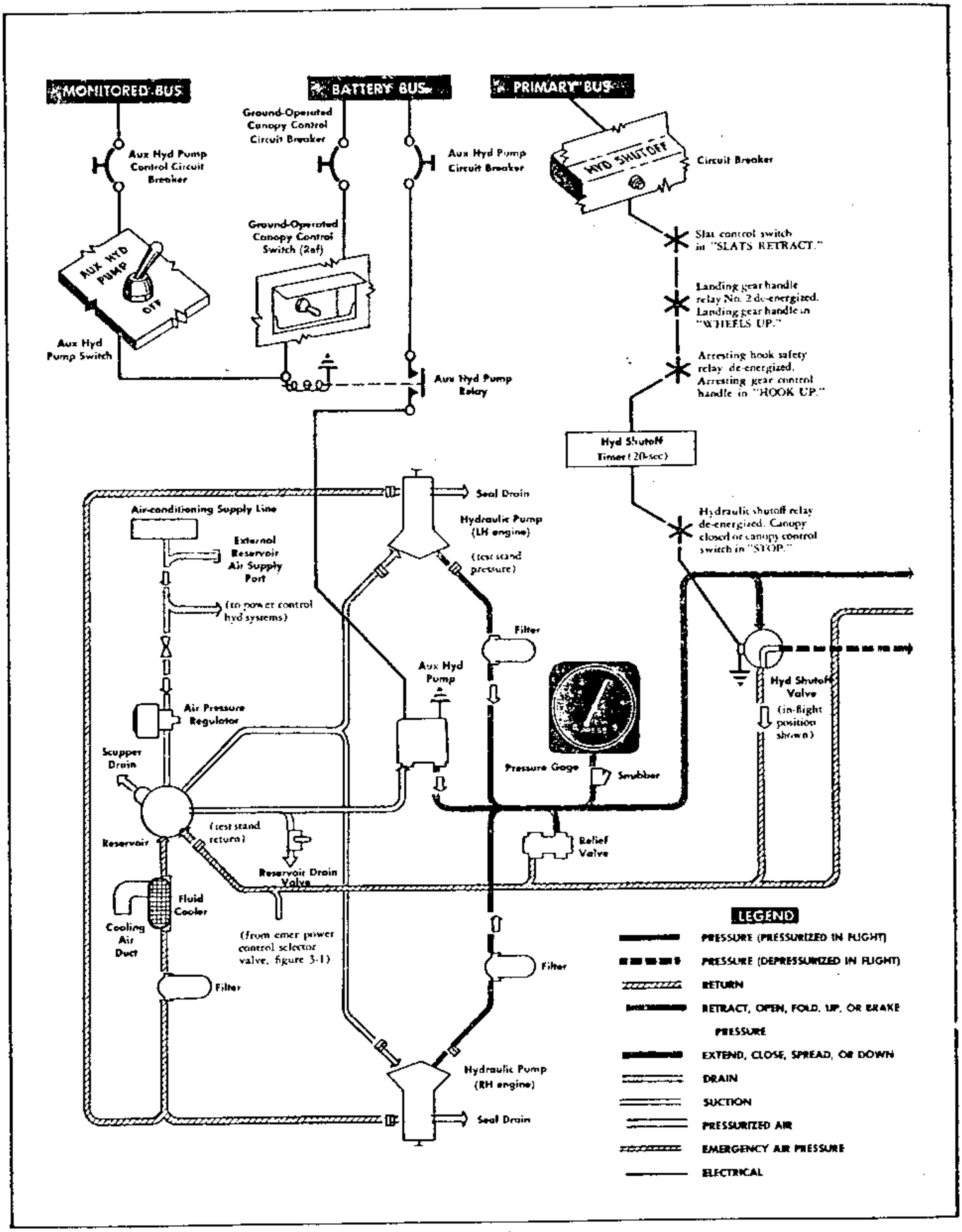


Figure 1-17. Utility Hydraulic System Schematic (Sheet 1 of 3)

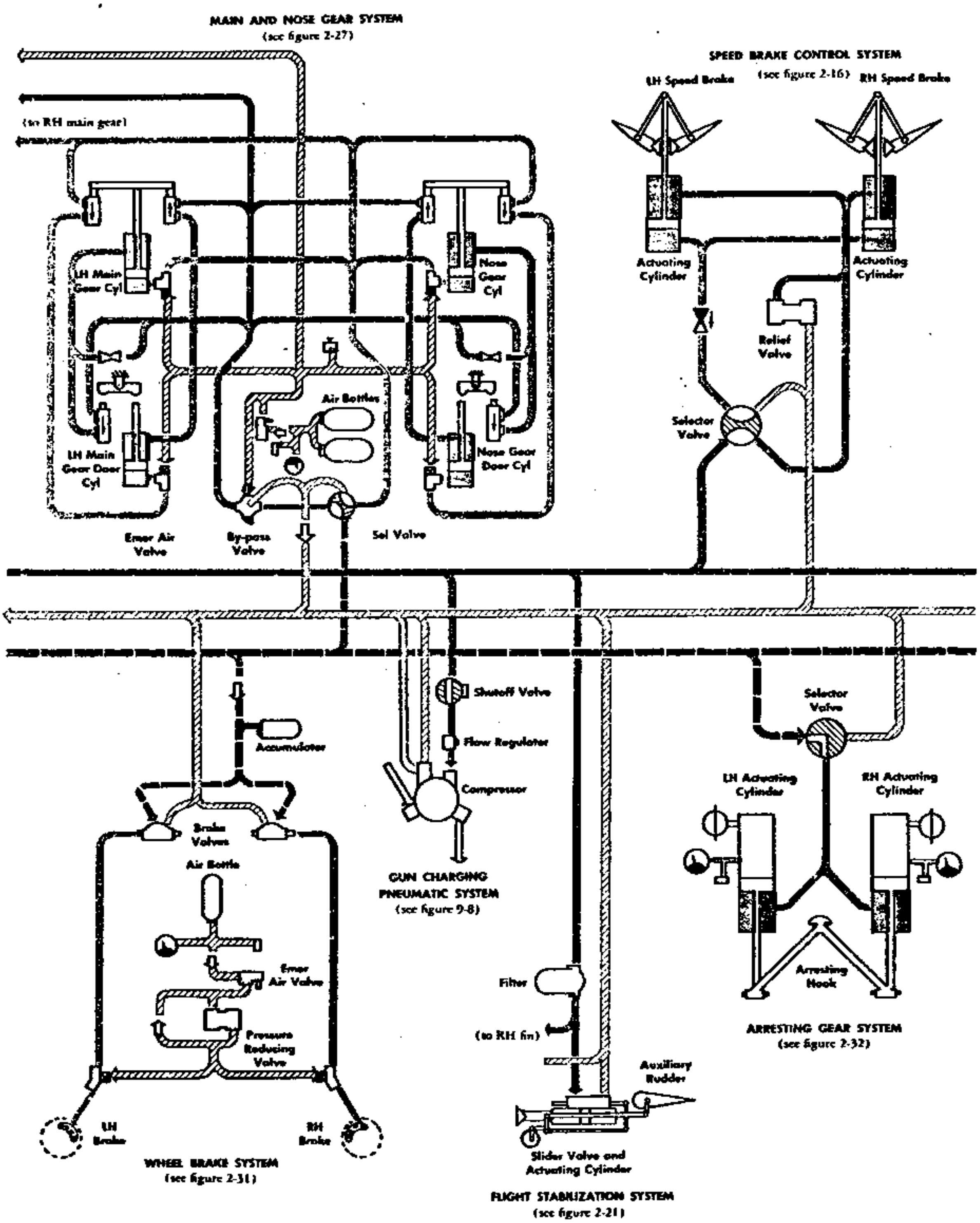


Figure 1-17. Utility Hydraulic System Schematic (Sheet 2 of 3)

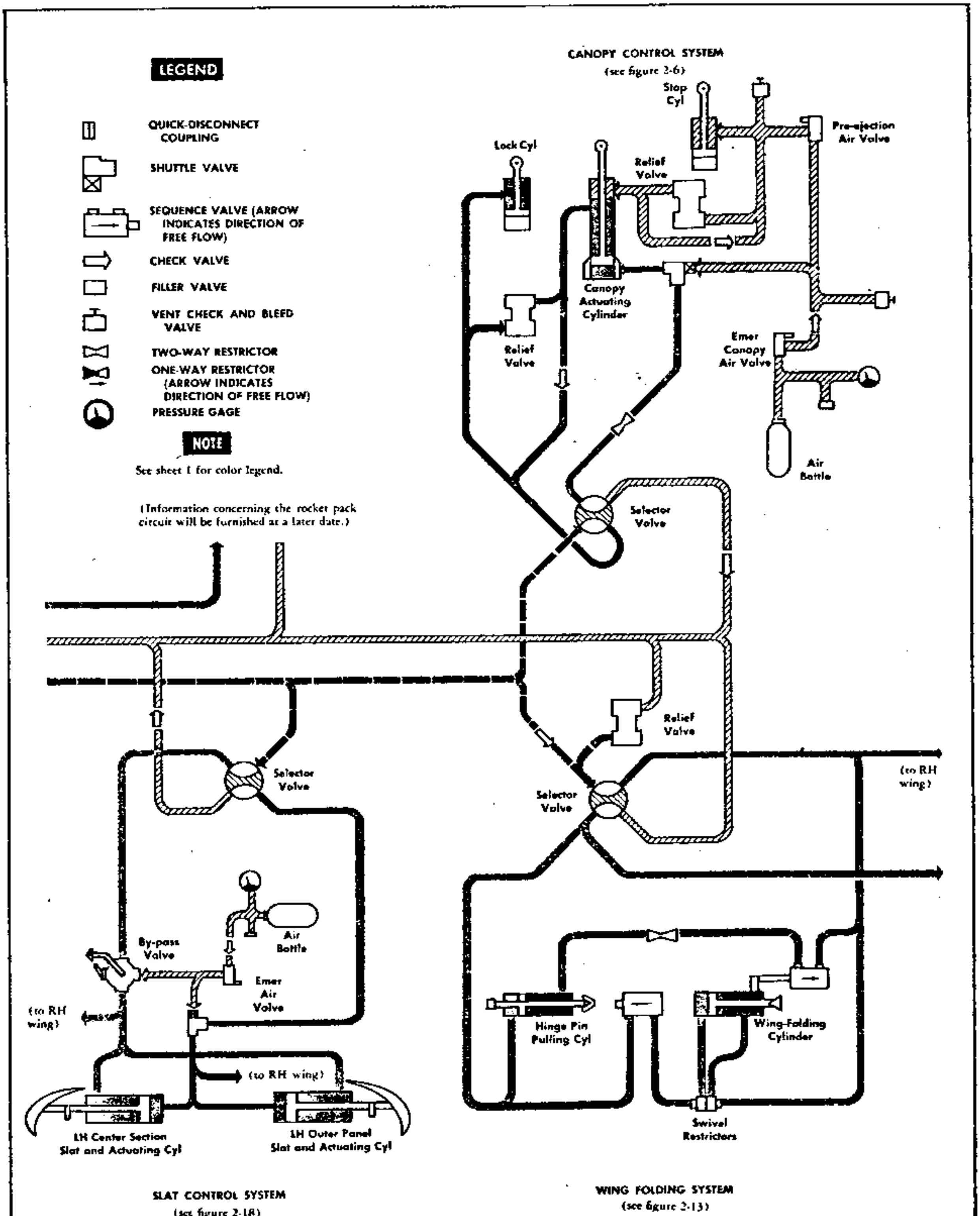


Figure 1–17. Utility Hydraulic System Schematic (Sheet 3 of 3)

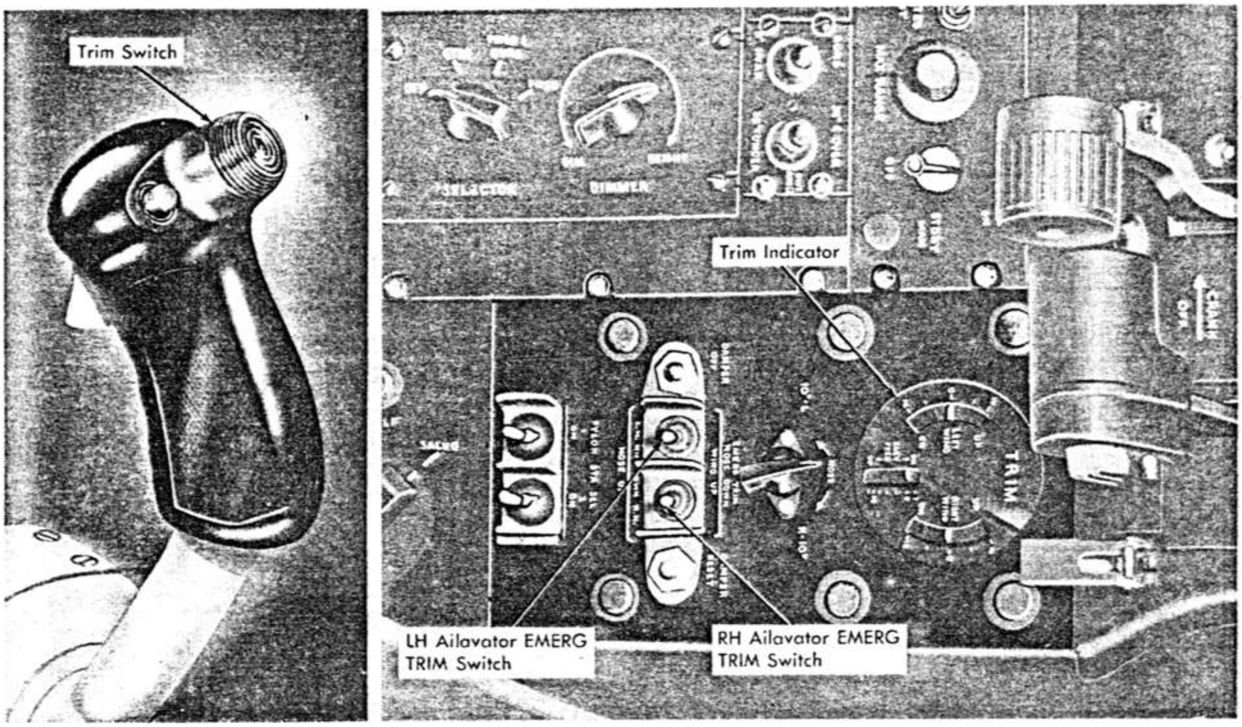


Figure 1–18. Ailavator Control and Trim System Controls

each ailavator. Each of the two cylinders has two tandem chambers and pistons using a common actuating rod. This provides, in effect, two actuating cylinders for each ailavator.

Two independent power control hydraulic systems are incorporated in the airplane for the sole purpose of providing hydraulic power to move the ailavators. (These two systems are discussed under POWER CONTROL HYDRAULIC SUPPLY SYSTEMS.) There are two slider valves at each hydraulic actuating cylinder. One slider valve regulates the flow from power control hydraulic system No. 1 to one of the tandem cylinder chambers; the other regulates the hydraulic flow from power control system No. 2 to the other cylinder chamber. This is a safety feature which provides ailavator control even when one of the hydraulic systems fails.

Mechanical stops in the ailavator control system limit the ailavator throws as follows:

Full Up Ailavator	47 degrees 43 minutes
Full Down Ailavator	32 degrees 22 minutes
Full Up "Aileron"	21 degrees 45 minutes*
Full Down "Aileron"	21 degrees 45 minutes*
Full Up "Elevator"	32 degrees 22 minutes
Full Down "Elevator"	11 degrees

A device is incorporated in the ailavator control linkage to center the ailavators while the wing is being folded and at least one power control hydraulic system is pressurized.

CONTROL STICK. The conventional control stick (figure 1–18) is used to control the aileron and elevator functions of the ailavator. It operates the same as that used in airplanes with conventional ailerons and elevators. Three switches are mounted in the control stick handgrip: ailavator trim, bombs and rockets, and gun trigger. The pilot's relief tube is also attached to the control stick.

AILAVATOR FEEL. *(See figure 1–19.)* Ailavator feel is developed by combining the action of a bobweight, two mechanical spring struts, and a viscous damper. (Viscous damper opposes direction of motion with a force proportional to rate of motion.) The bobweight and the viscous damper are directly connected to the control stick. A mechanical spring strut is connected to the control linkage in each outer panel. The viscous damper is a self-contained assembly with its own fluid reservoir and does not depend upon the airplane's hydraulic system. The function of each unit in developing ailavator feel forces at the control stick is given in the following breakdown:

Bobweight — Supplies significant portion of feel in relation to g's; action least significant at slow speeds. A balancing spring neutralizes bobweight action for 1-g conditions.

Viscous Damper — Functions only for longitudinal motions of control stick. Adds a desirable qualitative

*Angle will decrease as airspeed increases because of action of a variable stop installation.

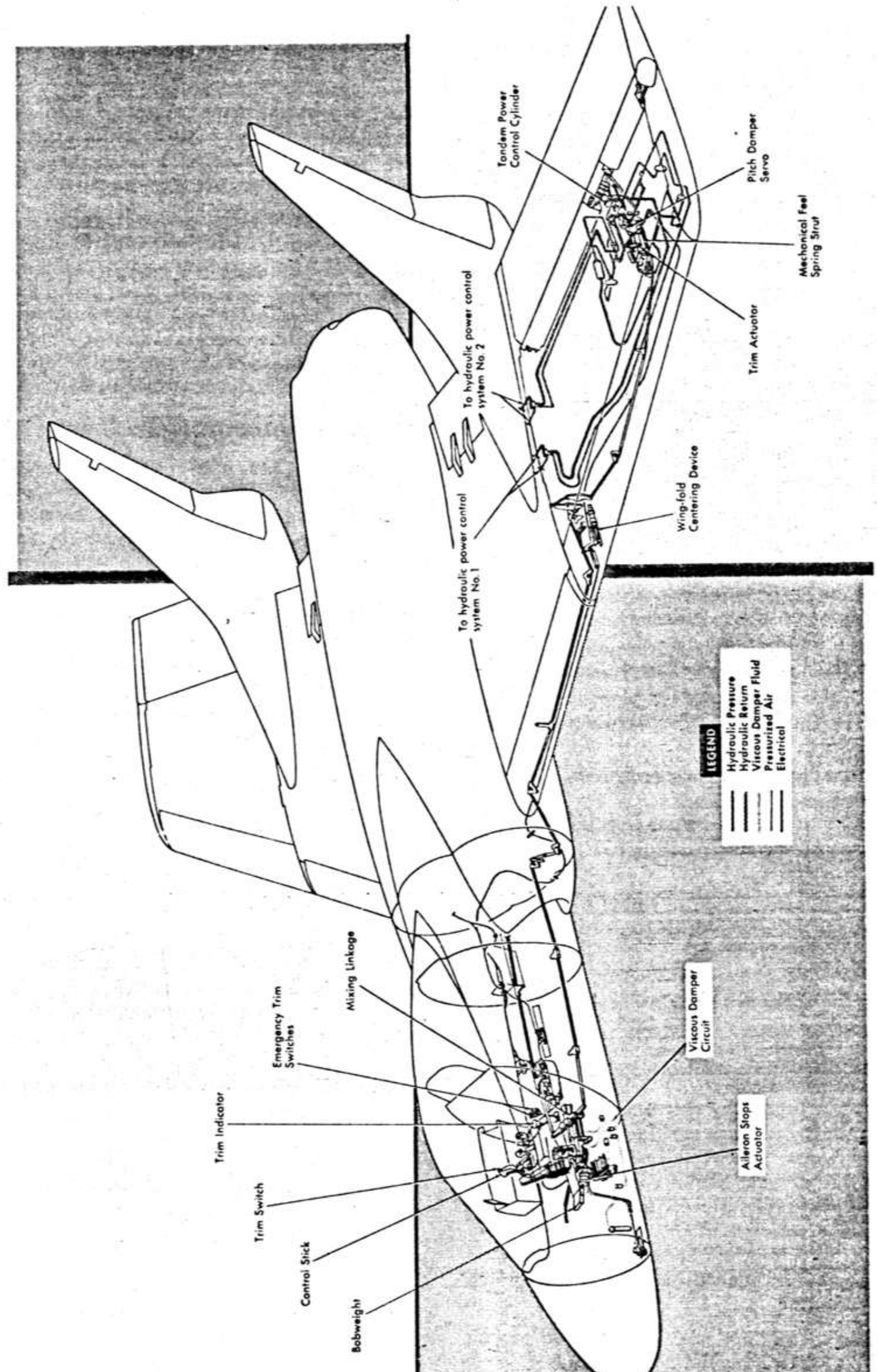


Figure 1–19. Ailavator Control, Feel, and Trim System

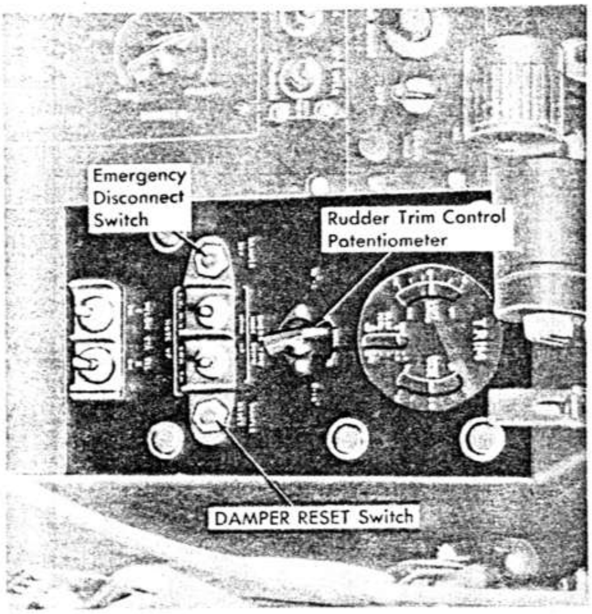


Figure 1–20. Flight Stabilization System Controls

feel to stick and prevents excessive oscillations of bob-weight in rough air or abrupt maneuvers.

Spring Strut — Supplies feel in proportion to ailavator deflection from trim. It is effective for both lateral and longitudinal motion. Spring strut is attached to control rods at input linkage to actuating cylinder slider valves.

AILAVATOR TRIM. *(See figure 1–19.)* The airplane is trimmed as follows:

a. Longitudinal (nose up — nose down) trim is achieved by adjusting the zero position of both ailavators in the same direction.

b. Lateral (left wing down — right wing down) trim is achieved by adjusting the zero position of both ailavators in opposite directions.

c. Directional (nose left — nose right) trim is achieved by means of the auxiliary rudders in the flight stabilization system.

d. Emergency longitudinal and lateral trim is achieved through individual control of each ailavator.

The ailavators are trimmed by electrical trim actuators. During normal trim operations, the left- and right-hand ailavator trim actuators automatically move in the same direction or in opposite directions by means of eight relays. The relays are controlled by the trim switch on the control stick. During emergency trim operations, the left- and right-hand ailavator trim actuators are each controlled by an individual switch on the left-hand console.

TRIM SWITCH. The four-way button trim switch (figure 1–19) is located on the control stick grip. It controls longitudinal and lateral trimming of the ailavators. The four positions of the switch are momentary. The switch is moved forward for nose down, aft for nose up, left for left wing down, and right for right wing down.

EMERGENCY TRIM SWITCHES. The EMERG TRIM switches (figure 1–19) are located on the left-hand console. The left-hand switch controls the position of the left-hand ailavator and the right-hand switch controls the position of the right-hand ailavator. To achieve nose up or nose down trim, the two switches have to be actuated together.

TRIM INDICATOR. The trim indicator (figure 1–19) is located on the left-hand console. The indicator has two dials. The larger dial indicates the effective lateral trim; this value is the difference in degrees between the positions of the left- and right-hand pointers. These pointers are interconnected so that when one moves up the other moves down. The smaller dial in the center of the indicator shows the effective longitudinal trim.

FLIGHT STABILIZATION SYSTEM.

GENERAL. The flight stabilization system (figure 1–21) improves the stability of the airplane as a gun-platform and contributes to the safety of flight and the comfort of the pilot. When the system is in operation, oscillations in pitch and yaw are sensed by the pitch and yaw gyros housed in the rate gyro control and corresponding electrical signals are sent out. These signals are adjusted by the gain control unit to compensate for the decrease in effectiveness of the airplane's control surfaces at higher altitudes, lower airspeeds, or both. The adjusted yaw or pitch signal is then passed to the control amplifier for signal amplification.

The adjusted pitch signal sent to the control amplifier is amplified and the resulting high-power signals operate the two pitch servos in the wing outer panels. The pitch servos actuate the ailavator control linkage, which positions the ailavators to cancel the oscillation sensed by the pitch gyro.

The adjusted yaw signal sent to the control amplifier is amplified by the two yaw servo amplifiers and the resultant signal is transmitted to the two yaw servos. The yaw servos actuate slider valves on the yaw cylinders. The slider valves regulate the hydraulic flow from the utility hydraulic system to actuate the yaw cylinder pistons, which, in turn, move the auxiliary rudders to cancel the oscillation sensed by the yaw gyro.

When the wing slats are extended, the operation of the flight stabilization system changes. The pitch damper function of the system is interrupted and the pitch servos are locked in neutral. The air stream direction detector senses slip or skid of the airplane and sends a corresponding electrical signal to the control amplifier where it is mixed with the normal yaw damper signal to provide a combined signal to the yaw servos and automatically coordinate the airplane in turns. The air stream direction detector probe is heated by the ANTI-ICE switch on the right-hand console.

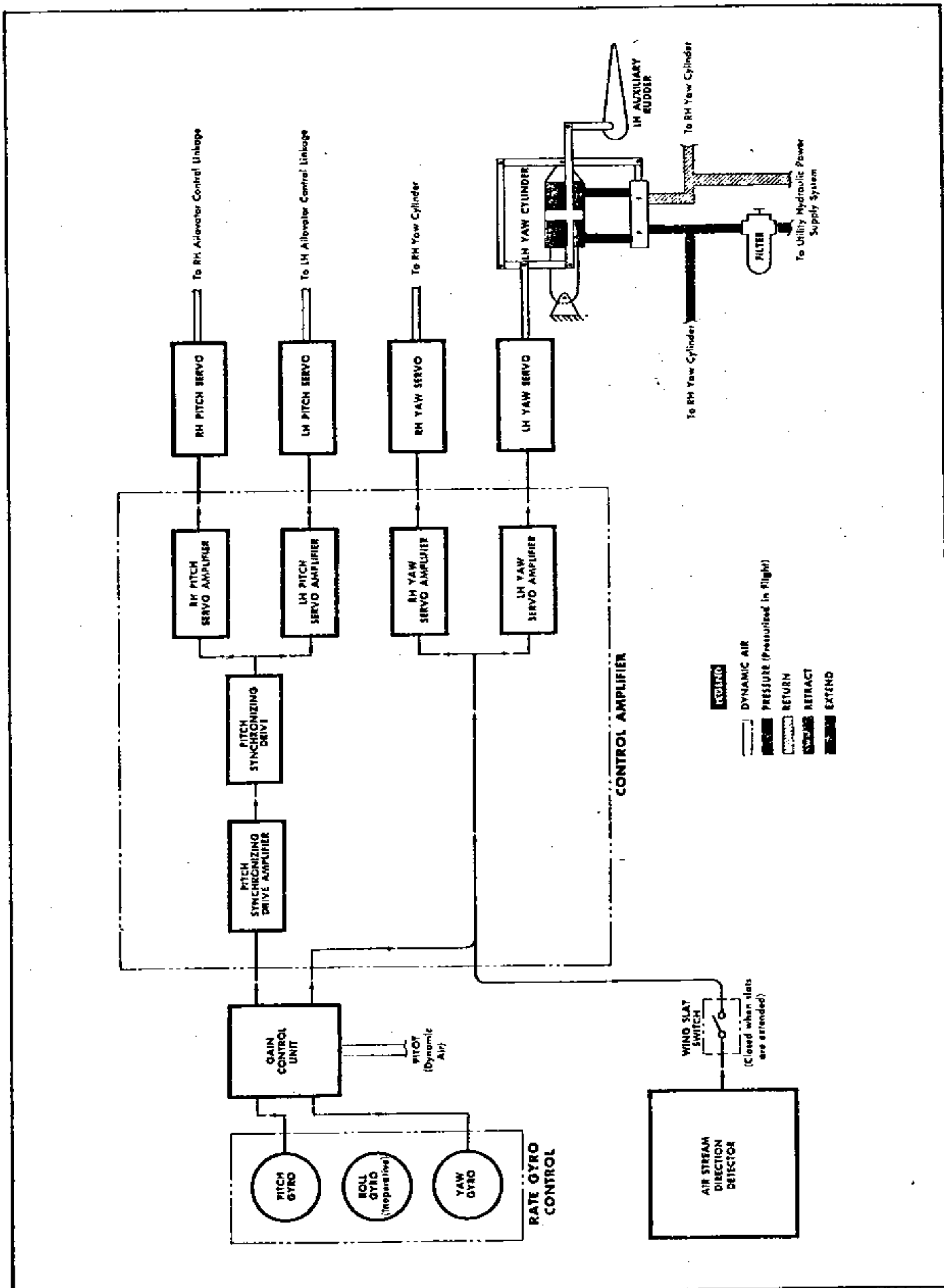


Figure 1-21. Flight Stabilization System Schematic

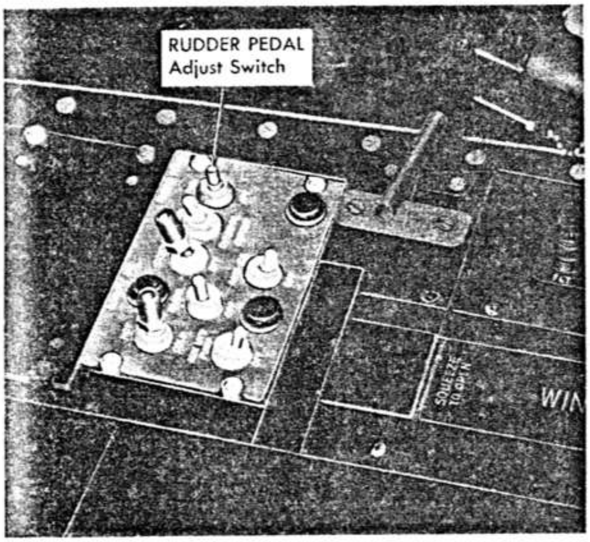


Figure 1–22. Rudder Pedal Adjust Switch

Rudder trim is accomplished through the flight stabilization system. The damper function of the flight stabilization system can move the auxiliary rudders 22 degrees 48 minutes (left and right) and the rudder trim function of the system can move the auxiliary rudders 11 degrees (left and right).

EMERGENCY DISCONNECT SWITCH. The emergency disconnect push-button switch (figure 1–20) is labeled DAMPER OFF and is located on the left-hand console. It is pushed to disengage the flight stabilization system in an emergency. It is not the normal "off" switch for the system; the system is turned off when the main electrical power is turned off.

Note

When the emergency disconnect switch is actuated, the flight stabilization system can be re-engaged by pressing the reset switch.

RESET SWITCH. The reset push-button switch (figure 1–20) is labeled DAMPER RESET and is located on the left-hand console. Pushing the reset switch engages the flight stabilization system after the emergency disconnect switch has disengaged it.

RUDDER TRIM CONTROL POTENTIOMETER. The rudder trim control potentiometer (figure 1–20) is located on the left-hand console. It is used for directional trim control and can be positioned anywhere within the range of "NOSE 10°-L" and "NOSE R-10°."

RUDDER CONTROL SYSTEM.

GENERAL. The twin rudders are controlled by conventional foot pedals using a system of control rods. Rudder trim is accomplished through the operation of auxiliary rudders, located below each rudder. The auxiliary rudders are operated entirely by the flight stabilization system.

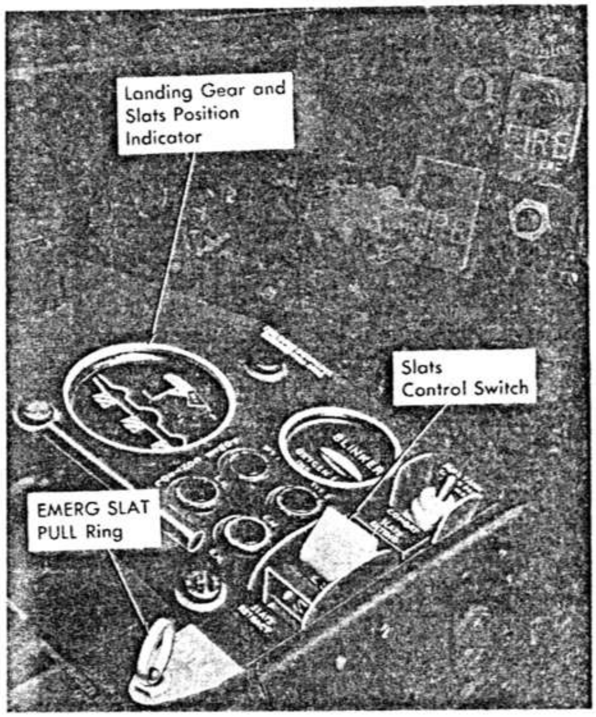


Figure 1–23. Slat System Indicator and Controls

RUDDER PEDALS. The hanging-type rudder pedals (figure 1–22) are easily and quickly adjusted to suit individual pilot preference. The position of the pedals is adjusted by an electrical rotary actuator which actuates two screw jacks. The position of the rotary actuator is controlled by a RUDDER PEDAL adjust switch on the right-hand console.

RUDDER PEDAL ADJUST SWITCH. The RUDDER PEDAL adjust switch (figure 1–22) is located on the cockpit air control panel on the right-hand console. The "FWD" and "AFT" positions of the switch are momentary and the center position is off or stop. Holding the switch in "FWD" moves the rudder pedals forward; holding the switch in "AFT" moves the pedals aft.

SLAT CONTROL SYSTEM.

GENERAL. *(See figure 1–24.)* Full-span controllable slats are provided on the wing leading edges to improve lift at low speeds during landing and take-off. The slats are normally extended and retracted hydraulically by a control switch on the left-hand console. The slat control switch is moved automatically to "SLATS EXTEND" when the landing gear handle is moved to "WHEELS DN." If the slats cannot be extended normally, emergency operation is available by an air pressure system actuated by a pull ring adjacent to the slat control switch. A manually reset bypass valve is also actuated by emergency air pressure, eliminating the possibility of hydraulic pressure being trapped in the retract lines and acting against the air

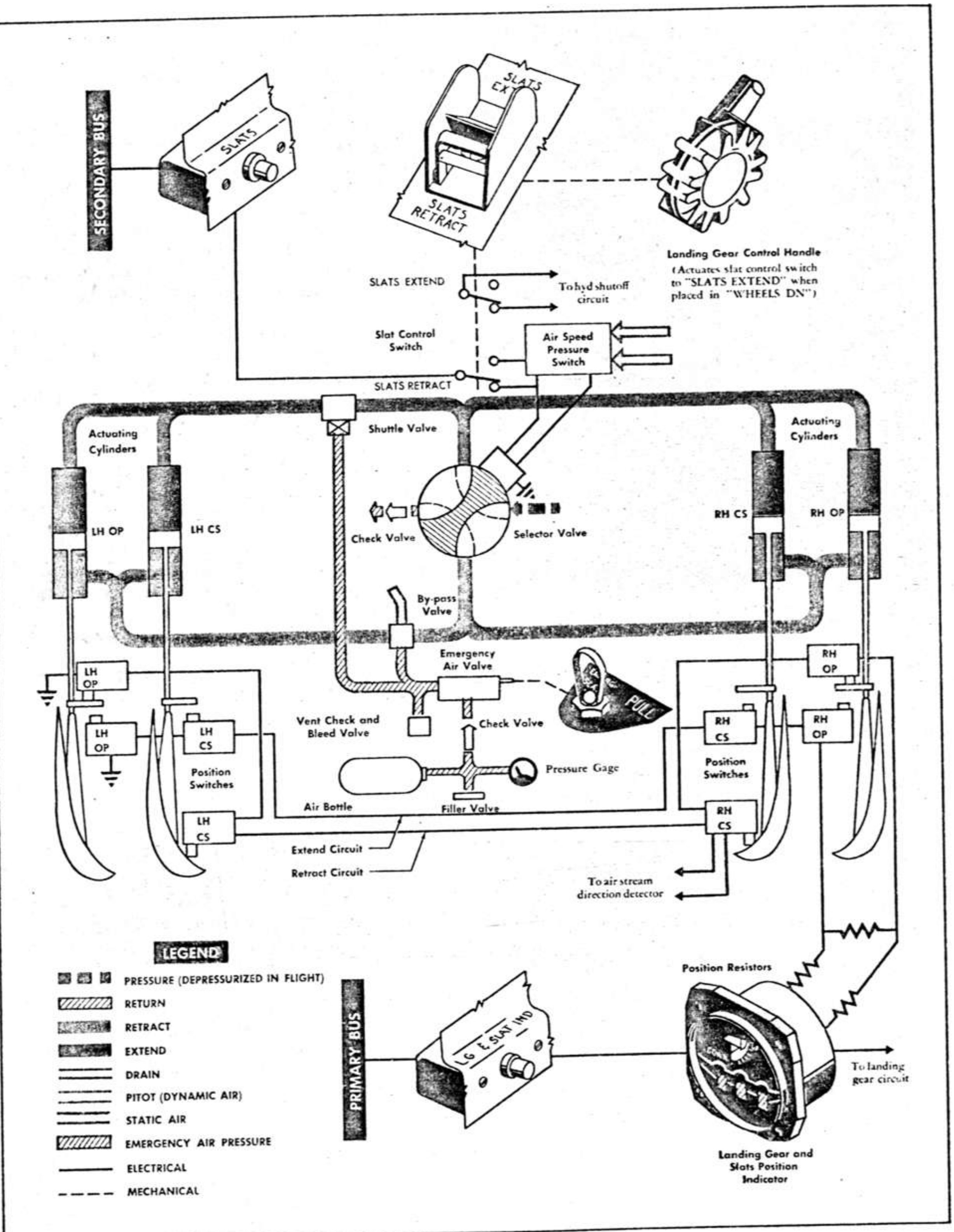


Figure 1–24. Slat Control System Schematic

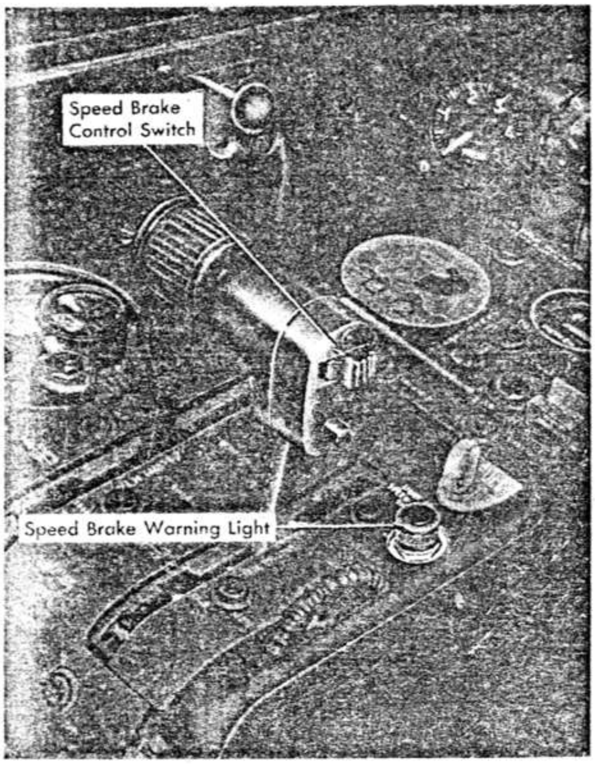


Figure 1–25. Speed Brake Controls

pressure. The by-pass valve has to be reset after the air pressure system is used or the hydraulic system will not function properly.

SLAT CONTROL SWITCH. The slat-shaped control switch (figure 1–23) is located on the left-hand console. Moving the slat control switch to either "SLATS EXTEND" or "SLATS RETRACT" energizes the electrical solenoids of a hydraulic selector valve to direct hydraulic pressure from the utility hydraulic system to the extend or retract side of the four slat actuating cylinders. The cylinders are locked in the retract position by internal locks.

EMERGENCY SLAT PULL RING. The emergency slat pull ring (figure 1–23) is located on the left-hand console. When pulled, it mechanically operates an air pressure valve which delivers compressed air (3,000 psi) to the slat actuating cylinders to extend the slats. A spring-loaded latch beneath the console holds the control ring in the open position after it is pulled.

LANDING GEAR AND SLAT POSITION INDICATOR. This indicator (figure 1–23) is located on the left-hand console and is a modified landing gear and flap position indicator with the flap portion being used for the slat indication. The flap readings are related to slat readings as follows:

"DOWN" indicates slats *extended*

"UP" indicates slats *retracted*

When electrical power is off or when the slats are neither fully retracted nor extended, an "OFF" flag appears on the slat indicator.

SPEED BRAKE CONTROL SYSTEM.

GENERAL. *(See figure 1–26.)* In the closed position, the split-flap speed brakes form the trailing edge of the wing between the fuselage and the vertical fin. In the open position, they restrict excessive diving speeds and slow down the airplane. The speed brakes are controlled by a thumb switch on the right-hand throttle. The switch actuates the solenoids on a hydraulic selector valve, which, in turn, regulates hydraulic power from the utility hydraulic system to actuating cylinders at each speed brake. An equalizer linkage in each brake provides equal and opposite movement of the upper and lower surfaces.

The speed brakes are not locked in any open position. A hydraulic pressure relief valve allows the brakes to be closed by excessive aerodynamic loads. The speed brakes also close when electrical or hydraulic power fails.

SPEED BRAKE CONTROL SWITCH. The speed brake control switch (figure 1–25) is a three-position thumb switch located on the right-hand throttle handle. The positions of the switch are aft-for-open (momentary), center-for-stop, and forward-for-close. Moving the switch aft energizes the two solenoids on the selector valve which positions the valve to open the brakes. Releasing the switch positions it in the stop position, energizing one solenoid on the selector valve which closes all the valve ports. This feature allows intermediate positioning of the speed brakes anywhere between the fully closed and the 40-degree fully opened position. Moving the switch forward de-energizes both solenoids of the selector valve and positions the valve to close the brakes.

SPEED BRAKE WARNING LIGHT. A red push-to-test warning light (LIGHT ON — SPEED BRAKE OPEN) is located on the left-hand console (figure 1–25). The warning light is actuated by microswitches at each speed brake when either brake is open more than ½ inch.

MAIN AND NOSE LANDING GEAR SYSTEM.

GENERAL. *(See figure 1–28.)* The main and nose gears form a conventional tricycle system. In the retracted position, the three gears are enclosed by doors. When the gears are extended the doors remain open. The gears and their doors are operated hydraulically; hydraulic sequence valves delay the closing of the doors until the gears are retracted. The main gears and main gear doors are equipped with mechanical locks. The nose gear and nose gear doors have actuating cylinders with internal locks.

Nine position indication switches (three for each gear) are mechanically actuated by the gears, and, when actuated, complete the position indicating circuit to ground. The positions of the gears is indicated on the landing gear and slats position indicator and by the warning light.

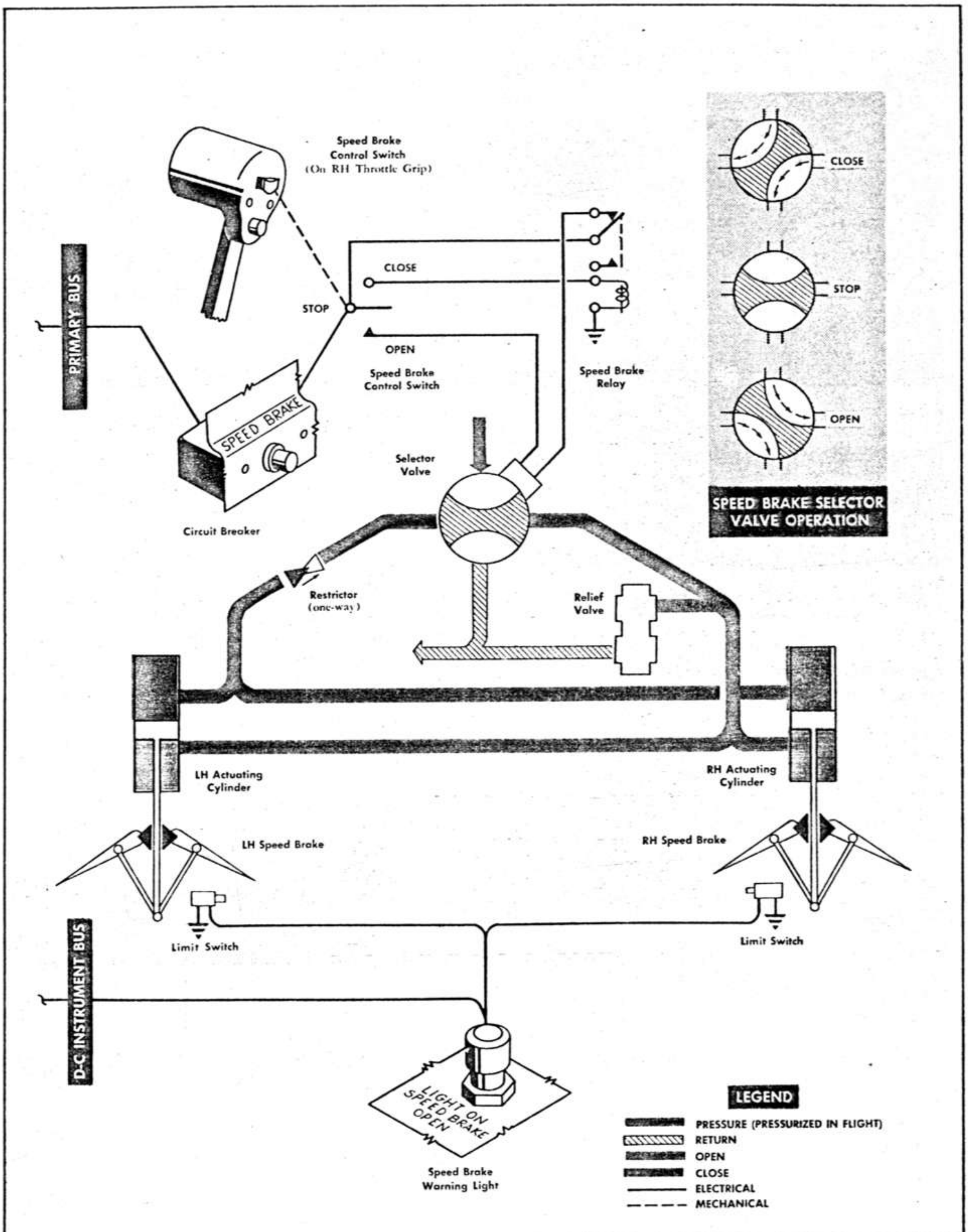


Figure 1–26. Speed Brake Control System Schematic

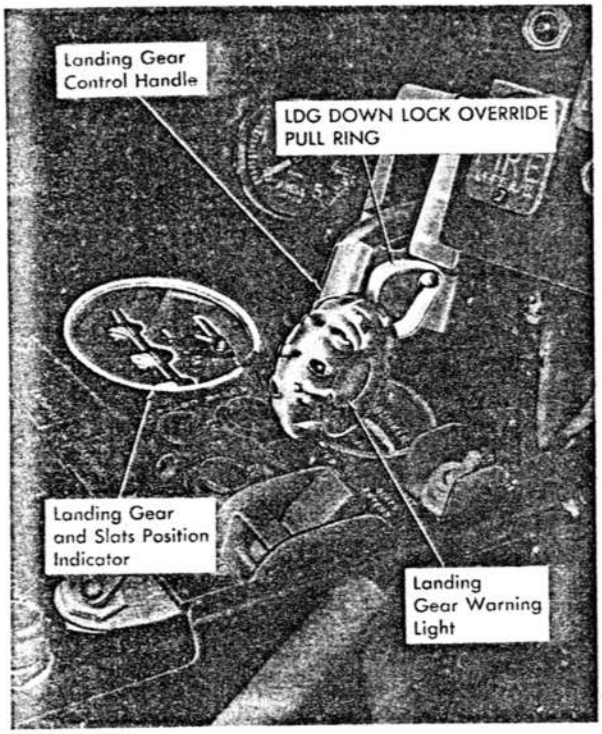


Figure 1–27. Main and Nose Landing Gear System Indicator and Controls

An emergency air pressure system is installed in the airplane to provide a means of extending the gears in case the hydraulic system is inoperative. The air pressure (3,000-psi, stored in two 200-cubic-inch cylinders) enters the landing gear hydraulic circuit at shuttle valves located in the gear and door cylinder extend lines. A manually reset by-pass valve is also actuated by emergency air pressure, eliminating the possibility of hydraulic pressure being trapped in the retract lines and acting against the air pressure. The by-pass valve has to be reset after the air pressure system is used or the hydraulic system will not function properly.

The nose wheels are rotated during landing approach to reduce spin-up loads and to permit higher airplane sinking speeds. Operation of the prerotation system is accomplished automatically by means of an electrical circuit. When the landing gear control handle is placed in "WHEELS DN" and either throttle is retracted to a position less than 95 percent engine rpm, the prerotation circuit is energized. This opens an air valve to route air pressure to the nose gear and direct it against the vanes of turbines on the wheels. The pressurized air is taken from the cabin air-conditioning and pressurization system. The system is designed to rotate the dual nose gear wheels at 2,160 rpm (approximately 88.5 mph). The air pressure stops after landing when the right-hand main gear oleo strut is compressed approximately 1.5 inches. The nose wheel prerotation circuit is interrupted under any of three conditions:

Landing gear handle	"WHEELS UP"
Throttles	Both throttles advanced to more than 95 percent engine rpm
Right-hand main gear	Compressed more than 1.5 inches

LANDING GEAR CONTROL HANDLE. The tire-shaped landing gear control handle (figure 1–27) extends through an opening in the inclined panel of the left-hand console. When the airplane is on the ground, the handle is locked in "WHEELS DN" by a lock pin controlled by an electrical solenoid. When the airplane is airborne, a switch in the right-hand main gear is actuated as the strut extends. This energizes the handle lock circuit and the locking pin is retracted to unlock the handle.

Moving the control handle to either "WHEELS UP" or "WHEELS DN" mechanically controls the position of a hydraulic selector valve to direct utility hydraulic system pressure to either the retract or extend side of the actuating cylinders. When the landing gear handle is in "WHEELS DN," other systems in the airplane are affected as follows:

a. Armament circuits are interrupted.

b. When generators are not operating, secondary bus relay is energized, providing electrical power to all essential nonflight equipment.

c. Approach light circuit energized.

d. Utility hydraulic shut-off circuit interrupted; this pressurizes the "depressurized-in-flight" line.

Turning the landing gear control handle clockwise and pulling outward mechanically opens the air valve in the emergency air pressure system.

Note

> A landing gear and slat control interlock actuates the slat control switch to extend the slats whenever the landing gear control handle is moved to "WHEELS DN."

LANDING GEAR DOWN LOCK OVERRIDE PULL RING. The LDG DOWN LOCK OVERRIDE PULL RING (figure 1–27) is located just below the landing gear handle. When pulled outward, it manually retracts the lock pin holding the landing gear control handle in "WHEELS DN."

LANDING GEAR AND SLATS POSITION INDICATOR. The landing gear and slats position indicator (figure 1–27) is located on the left-hand console. The indicator has three windows, one for each gear. The word "UP" appears in each window when its respective gear is up and locked. Miniature wheels appear when the gears are down and locked. Red-shaded areas appear as the gear is retracted or extended or when electrical power is off. Electrical power for the landing gear and slats position indicator circuit is received from the primary bus and the circuit is protected by a circuit breaker on the left-hand console.

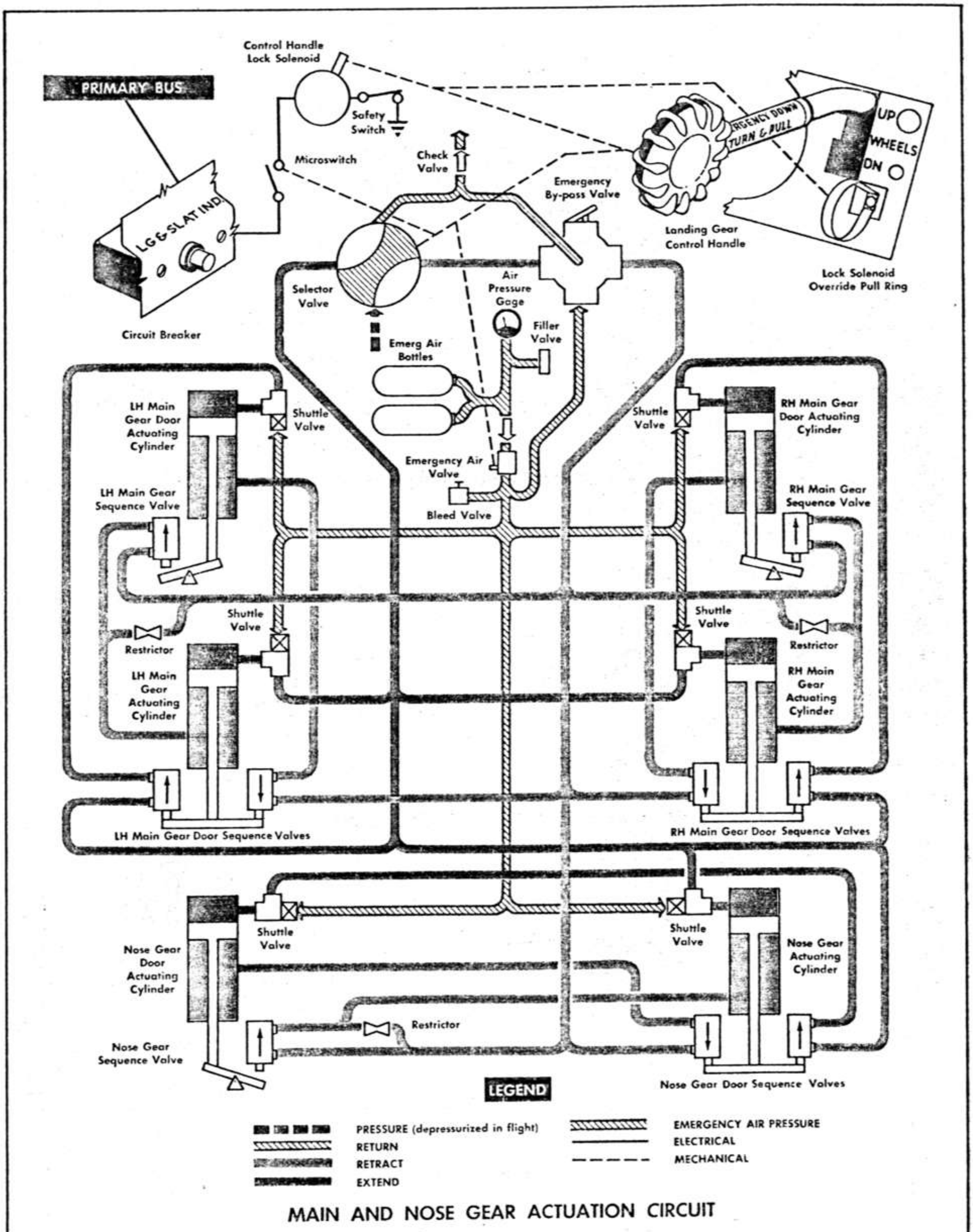


Figure 1–28. Main and Nose Landing Gear System Schematic

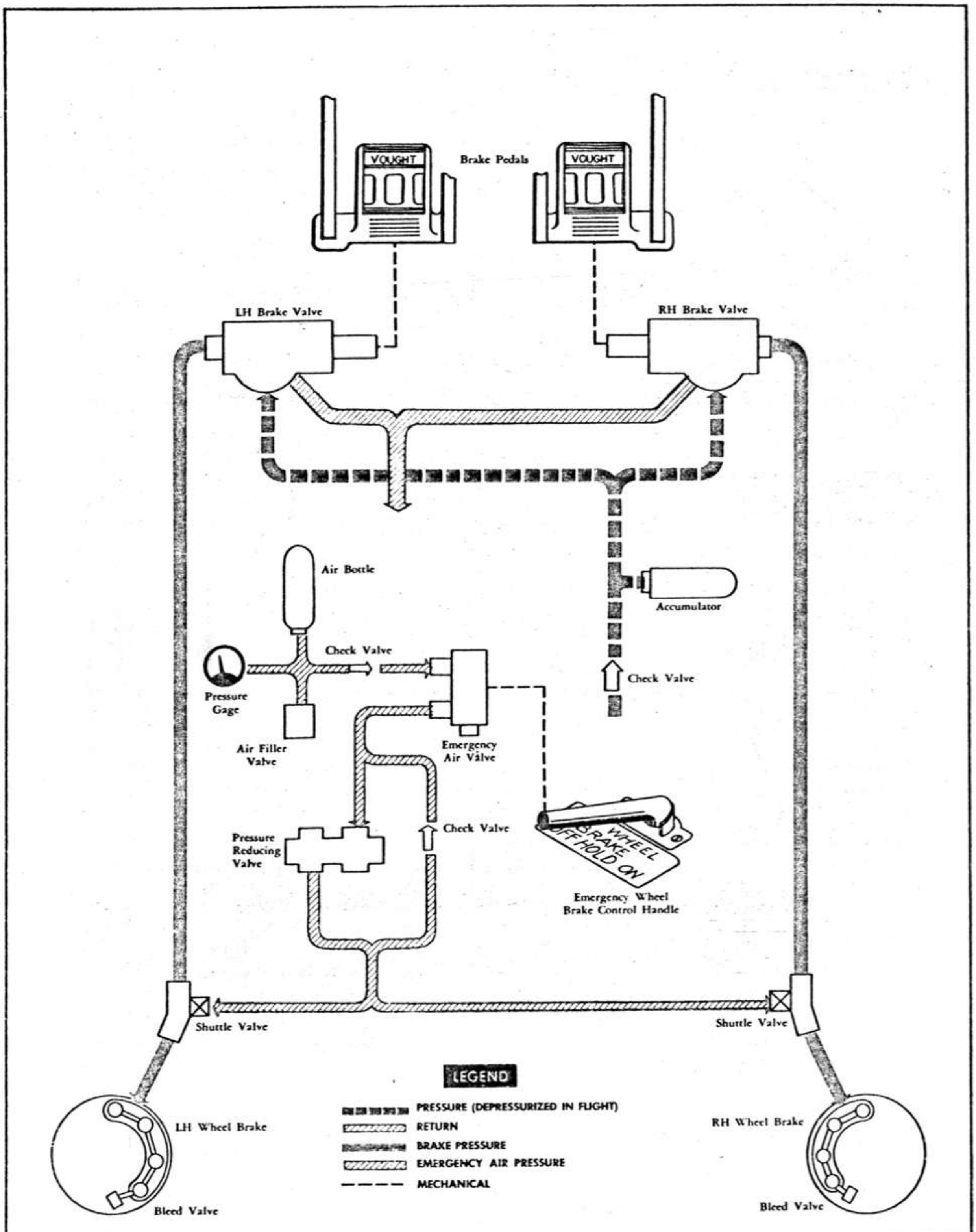


Figure 1–29. Wheel Brake System Schematic

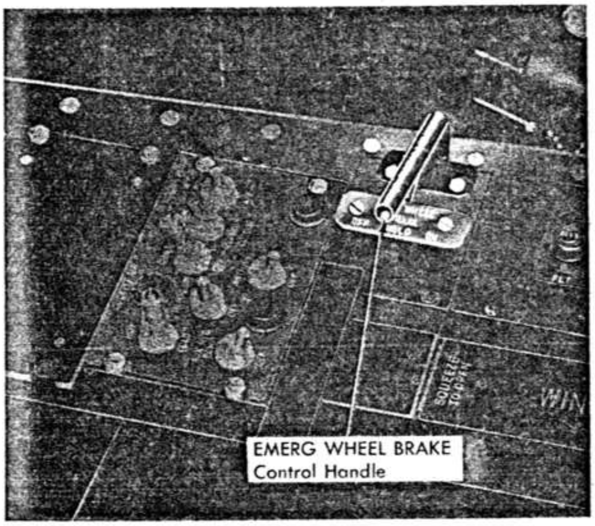


Figure 1–30. Wheel Brake Emergency Control Handle

LANDING GEAR WARNING LIGHT. The red landing gear warning light (figure 1–27) is located in the tire-shaped plastic end of the landing gear control handle. The light is illuminated as the gear is extended or retracted and remains on until each of the three gears is locked in its correct position.

WHEEL BRAKE SYSTEM.

GENERAL. *(See figure 1–29.)* Wheel brakes are located on the inboard side of each main gear wheel. Each brake is independently controlled by its corresponding rudder pedal. Pressing the toe plate of the rudder pedals mechanically actuates hydraulic brake valves. Brake pressure is delivered from the valves to the brakes in proportion to the exerted pedal pressure. An accumulator is located in the utility hydraulic system pressure line between the brake valves and a check valve. If hydraulic pressure drops momentarily, the accumulator energy provides sufficient pressure to operate the brakes.

An emergency air pressure system is installed in the airplane to permit brake operation in case of hydraulic system failure. The 1,800-psi air pressure for the system is stored in a 96-cubic-inch cylinder. A pressure reducing valve reduces this pressure to a brake operating pressure of 850 psi.

EMERGENCY WHEEL BRAKE CONTROL HANDLE. The EMERG WHEEL BRAKE control handle (figure 1–30) is located on the aft section of the right-hand console. The handle is secured in "OFF" by a cotter pin. Moving the handle (against the holding action of the cotter pin) to "ON" opens the emergency air valve and actuates the wheel brakes by air pressure. When the handle is released, it returns to "HOLD," locking the air pressure at the brakes. Pressure is relieved by turning the control handle to "OFF."

ARRESTING GEAR SYSTEM.

GENERAL. *(See figure 1–32.)* The arresting gear is locked in the retracted position by a mechanical up lock mechanism. The gear is extended by its own weight, aided by air pressure acting against the extend side of the two arresting gear actuating cylinders. The actuating cylinders also have a dashpot which dampens any bouncing action of the gear after extension or during arrested landings. The dashpot is located on the extend side of the actuating cylinder and uses hydraulic fluid stored in its own reservoir. The arresting gear is retracted by hydraulic pressure from the utility hydraulic system. As the gear is retracted, it engages the up lock linkage. An air-oil shock strut is installed in the airplane to absorb the impact loads of the gear during arrested landings.

ARRESTING GEAR CONTROL HANDLE. The hook-shaped arresting gear control handle (figure 1–31) is located on the forward end of the right-hand console. Moving the handle to "HOOK DOWN" releases the tension on the control cable, releasing the arresting gear up lock. The handle also actuates the control handle microswitch. This energizes the arresting hook safety relay which pressurizes the utility hydraulic system depressurized-in-flight line, interrupts the armament circuits, and completes the ap-

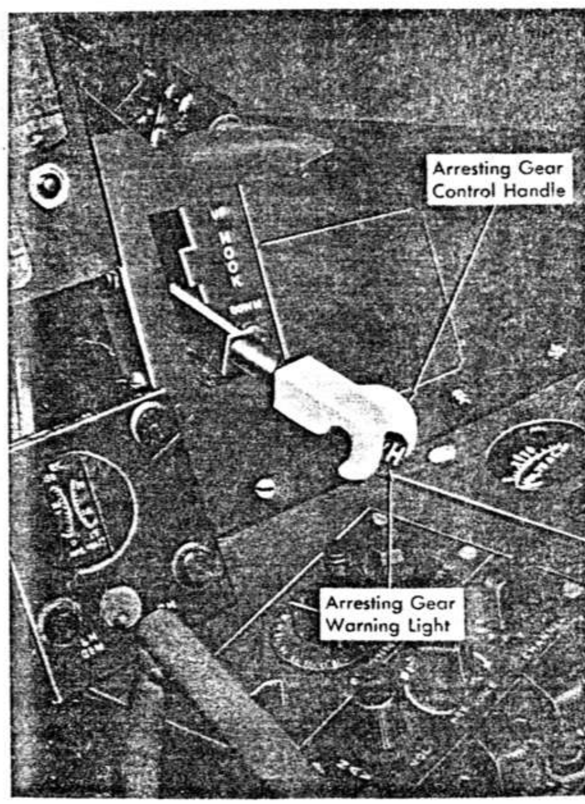


Figure 1–31. Arresting Gear Control and Indicator

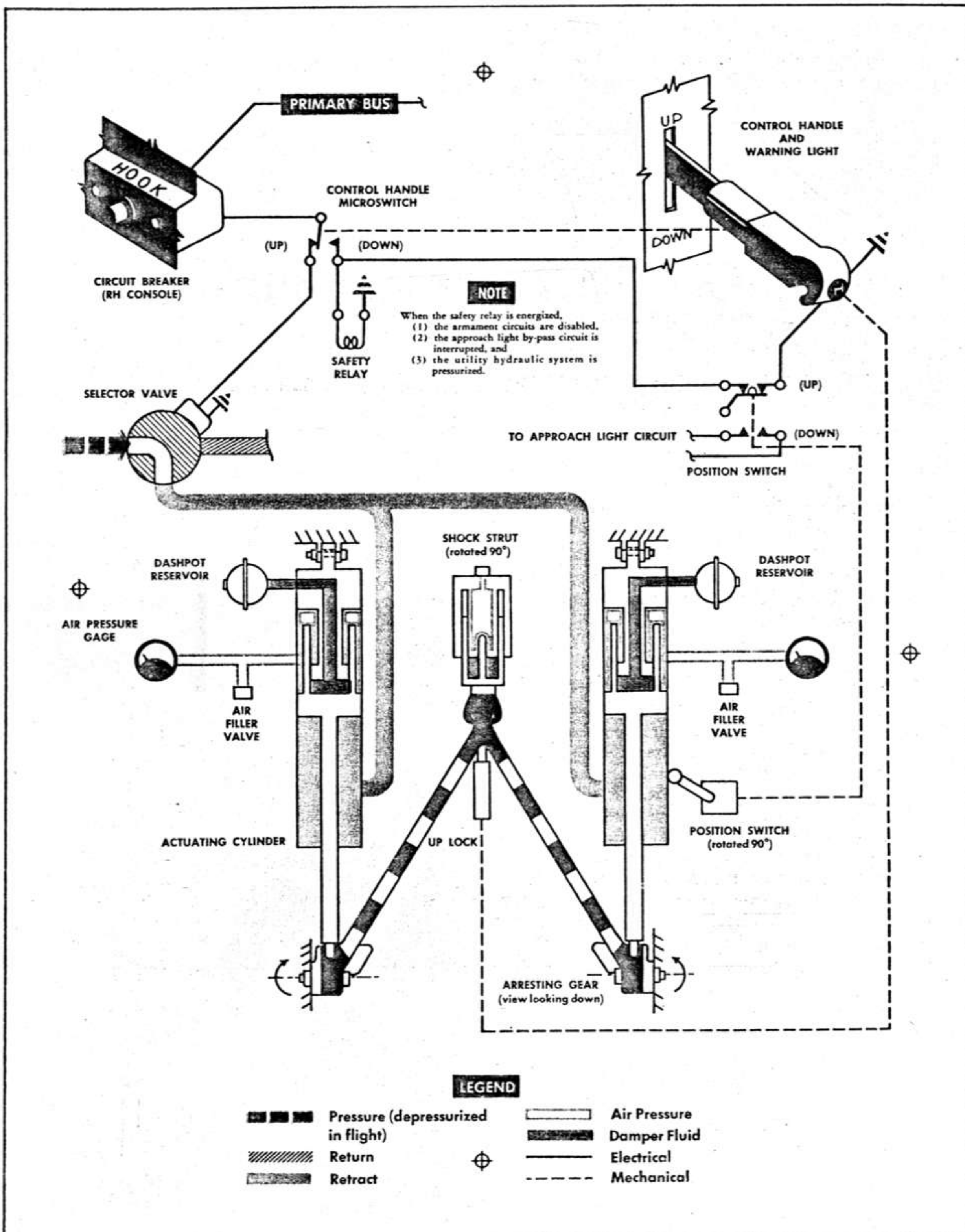


Figure 1–32. Arresting Gear System Schematic

proach light circuit (provided the main and nose gears are also extended).

Note

The approach light will burn steadily when the main and nose gear and the arresting gear are extended. The light will blink if just the main and nose gears are extended.

When the control handle is moved to "HOOK UP," it actuates the control handle microswitch, energizing a hydraulic selector valve solenoid which positions the selector valve to direct hydraulic pressure to the retract side of the actuating cylinders. The handle also actuates the control cable to lock the arresting gear up lock mechanism.

ARRESTING GEAR WARNING LIGHT. The arresting gear warning light (figure 1–31) is located in the arresting gear control handle. The warning light is illuminated when the control handle is in "HOOK DOWN" and the arresting gear is not completely down.

CATAPULT PROVISIONS.

The catapult provisions consist of a catapult hook on each side of the fuselage, a catapult holdback fitting just forward of the arresting hook point location, and a pilot's catapult handgrip (figure 1–33) on the left-hand console. The handgrip may be extended to give the pilot a means of holding the throttles in their full forward positions during catapulting.

INSTRUMENTS.

GENERAL. The airplane is equipped with a full complement of power plant, flight, and navigation instruments as well as miscellaneous instruments and associated equipment required for flight. The instruments pertaining to specific systems of the airplane are covered in the discussion of those systems.

GYRO HORIZON INDICATOR. The gyro horizon has a fast-erection circuit which is controlled by a power control switch (figure 1–34). When the switch is "ON," the fast-erection circuit is energized and a time delay relay starts timing out 40 seconds. At the end of this period the gyro should be erected and the relay breaks the circuit. A warning light (figure 1–34) is illuminated when the circuit is energized. If the warning light remains on for more than 1 minute, it is an indication of trouble and the power control switch should be turned "OFF."

TURN-AND-BANK INDICATOR. The turn-and-bank indicator (figure 1–34) is the conventional needle-ball type and shows the direction, rate, and coordination of turns. Air for spinning the gyro is supplied by engine compressed air tapped off the anti-blackout line. A differential pressure control unit automatically compensates for variations in compressed air pressure and cockpit air pressure.

AIRSPEED INDICATOR. The maximum allowable airspeed indicator (figure 1–34) incorporates a primary pointer which measures airspeeds up to 650 knots and a secondary pointer (white and black) which constantly shows the maximum allowable airspeed at the existing flight altitude. A subdial indicates the critical Mach number for which the indicator has been set. The airspeed indicator is connected to the pitot and static air lines.

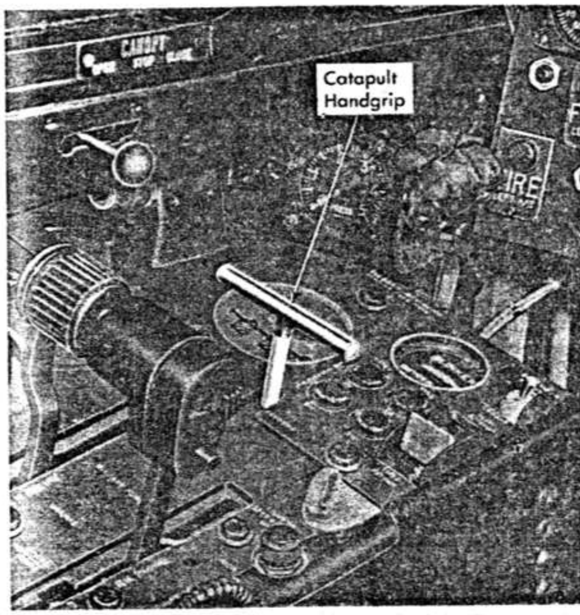


Figure 1–33. Catapult Handgrip

ALTIMETER. Under standard conditions of atmospheric temperature and pressure, the sensitive altimeter (figure 1–34) indicates the height of the airplane above sea level. A knob is provided to adjust the pointers, the setting marks, and the barometric scale. The altimeter is connected to the static air line.

RATE-OF-CLIMB INDICATOR. The rate-of-climb indicator (figure 1–34) indicates vertical speed of the airplane. The instrument is connected to the static air line.

ACCELEROMETER. The accelerometer (figure 1–34) is a self-contained instrument used to check the forces imposed on the airplane structure when permissible maneuvers such as climbs, dives, or turns are executed. The instrument has three pointers. At all times the main pointer shows the accelerations imposed on the airplane. The plus hand indicates only maximum positive accelerations, and the minus hand indicates negative accelerations. The plus and minus hands hold their maximum positions until reset with the knob provided.

ANGLE-OF-ATTACK INDICATOR. The angle-of-attack indicator (figure 1–34) provides indications of the angle of attack of the airplane during flight. The indicator is operated by electrical signals which originate at an air stream direction detector. The air stream direction detector probe is heated by the circuit controlled by the ANTI-ICE switch on the right-hand console.

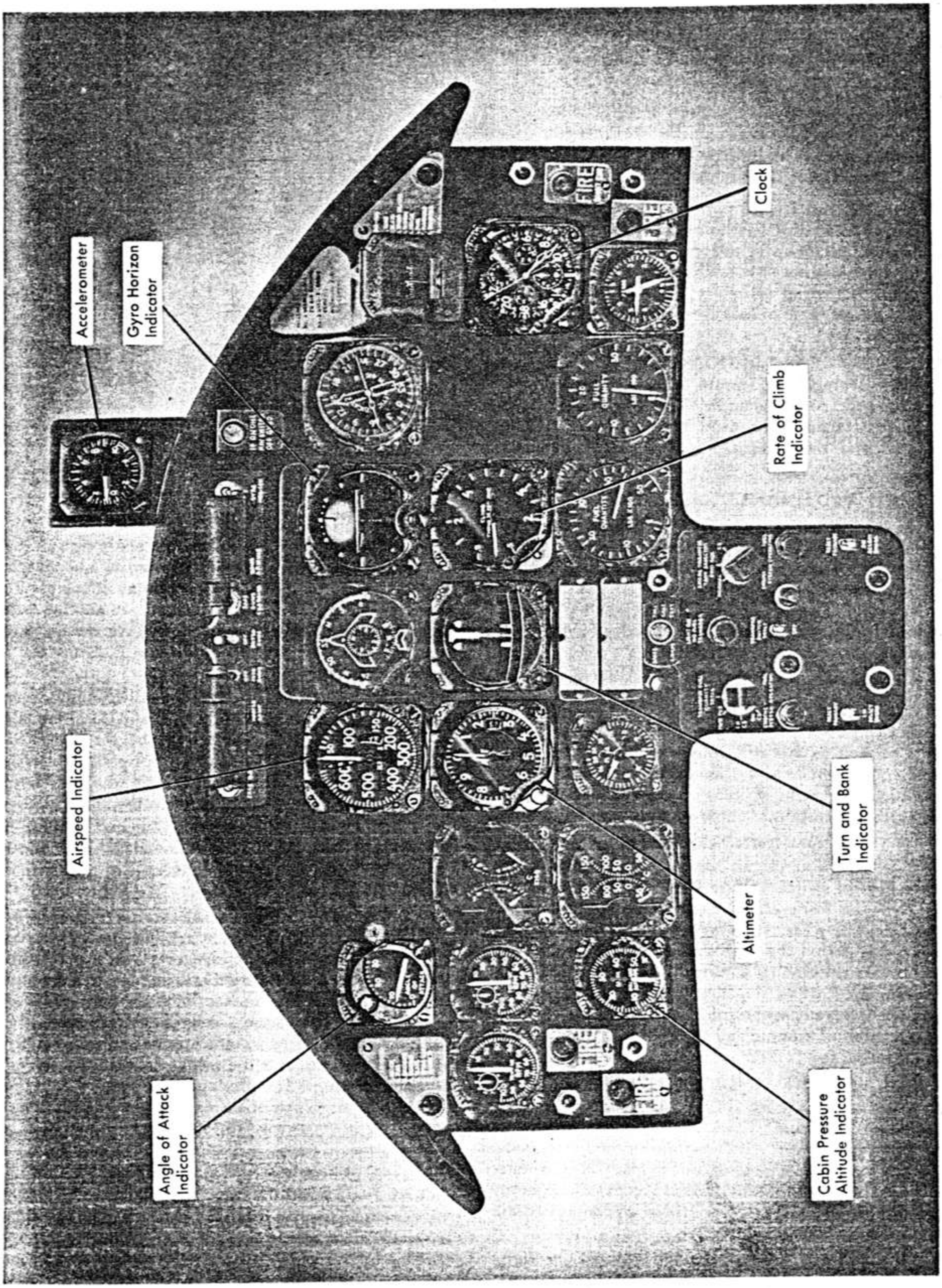


Figure 1–34. Instruments

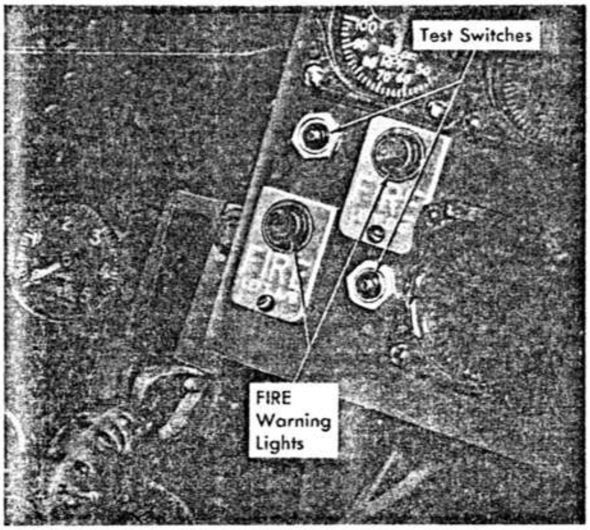


Figure 1–35. Fire Detector Lights and Test Switches

CABIN PRESSURE ALTITUDE INDICATOR. The cabin pressure altitude indicator (figure 1–34) is an altimeter which is vented to the atmosphere within the pressurized cockpit and indicates the pressure altitude of the cockpit in thousands of feet.

FIRE DETECTOR SYSTEM.

GENERAL. The fire detector system is an automatic visual fire warning system provided to detect the presence of fire in each of the forward and aft engine compartments. Electrical power for the system comes from the primary bus and the circuit is protected by a circuit breaker on the right-hand console.

TEST SWITCHES. A test switch (figure 1–35) is located adjacent to each of the four fire warning lights on the instrument panel. When these switches are pressed, their respective warning lights should be illuminated.

FIRE WARNING LIGHTS. The two right-hand compartment fire warning lights (RIGHT ENG and RIGHT A/B) are located on the right-hand side of the instrument panel. The two left-hand compartment fire warning lights (LEFT ENG and LEFT A/B) are located on the left-hand side of the instrument panel. "FIRE" is indicated by the applicable warning light when any of the three detector switches in its circuit is subjected to a temperature in excess of 450°F.

CANOPY CONTROL SYSTEM.

GENERAL. *(See figure 1–37.)* The canopy is normally opened and closed by hydraulic pressure. It can also be opened and closed manually. If the canopy cannot be opened normally, or conditions do not allow the use of manual controls, it can be opened by emergency air pressure. During ejection seat operation, the canopy is jettisoned by emergency air pressure. The canopy is held in the closed position by internal locks in the hydraulic system and is held in the open position by a 40-g lock mechanism (overcome by hydraulic pressure or by a manual control). The canopy is also prevented from moving too far aft by a stop mechanism (overcome by emergency air pressure during jettison operation or by a manual control).

CANOPY CONTROL HANDLE. The CANOPY control handle (figure 1–36) is located in the cockpit on the forward part of the left-hand canopy track. The handle has three positions, "OPEN," "STOP," and "CLOSE," and controls a solenoid selector valve for opening, closing, and stopping the canopy in any intermediate position.

GROUND-OPERATED CANOPY CONTROL SWITCH. The ground-operated canopy control switch is located in the left-hand gun bay door behind a small spring-loaded access door. This switch opens and closes the canopy in the same manner as the CANOPY control handle.

CANOPY MANUAL RELEASE HANDLE (INTERIOR). The interior canopy manual release handle (figure 1–36) is located on the left-hand forward corner of the canopy. Pulling the handle releases a lock securing the piston of the canopy actuating cylinder and allows the canopy to be opened manually.

CANOPY MANUAL RELEASE HANDLE (EXTERIOR). The exterior canopy manual release handle projects through a slot in the top of the aft section of the canopy. Pulling this handle aft disengages the end of the actuating cylinder piston from the canopy and allows the canopy to be opened manually.

CANOPY LOCK MANUAL RELEASE HANDLE. The canopy lock manual release handle (figure 1–36) is located on the left-hand canopy track. When the handle is moved forward, it unlocks the 40-g lock mechanism and permits the canopy to be closed manually.

CANOPY STOP MANUAL RELEASE HANDLE. The canopy stop manual release handle (figure 1–36) is located on the right-hand canopy track. It is used in removing the canopy from the airplane.

EMERGENCY CANOPY RELEASE HANDLE. The T-shaped EMERG CANOPY release handle (figure 1–36) is located to the left of the instrument panel. When pulled, the handle mechanically operates an air pressure valve which delivers compressed air (3,000 psi) to the canopy actuating cylinder to open the canopy.

EJECTION SEAT.

GENERAL. The ejection seat enables the pilot to abandon the airplane regardless of airspeed and flight attitude. The ejection seat is mounted on tracks and is attached to the upper end of the catapult assembly. The base of the catapult assembly is secured to the airplane structure. During ejection, the canopy is jettisoned, the catapult is fired, and the seat and pilot are

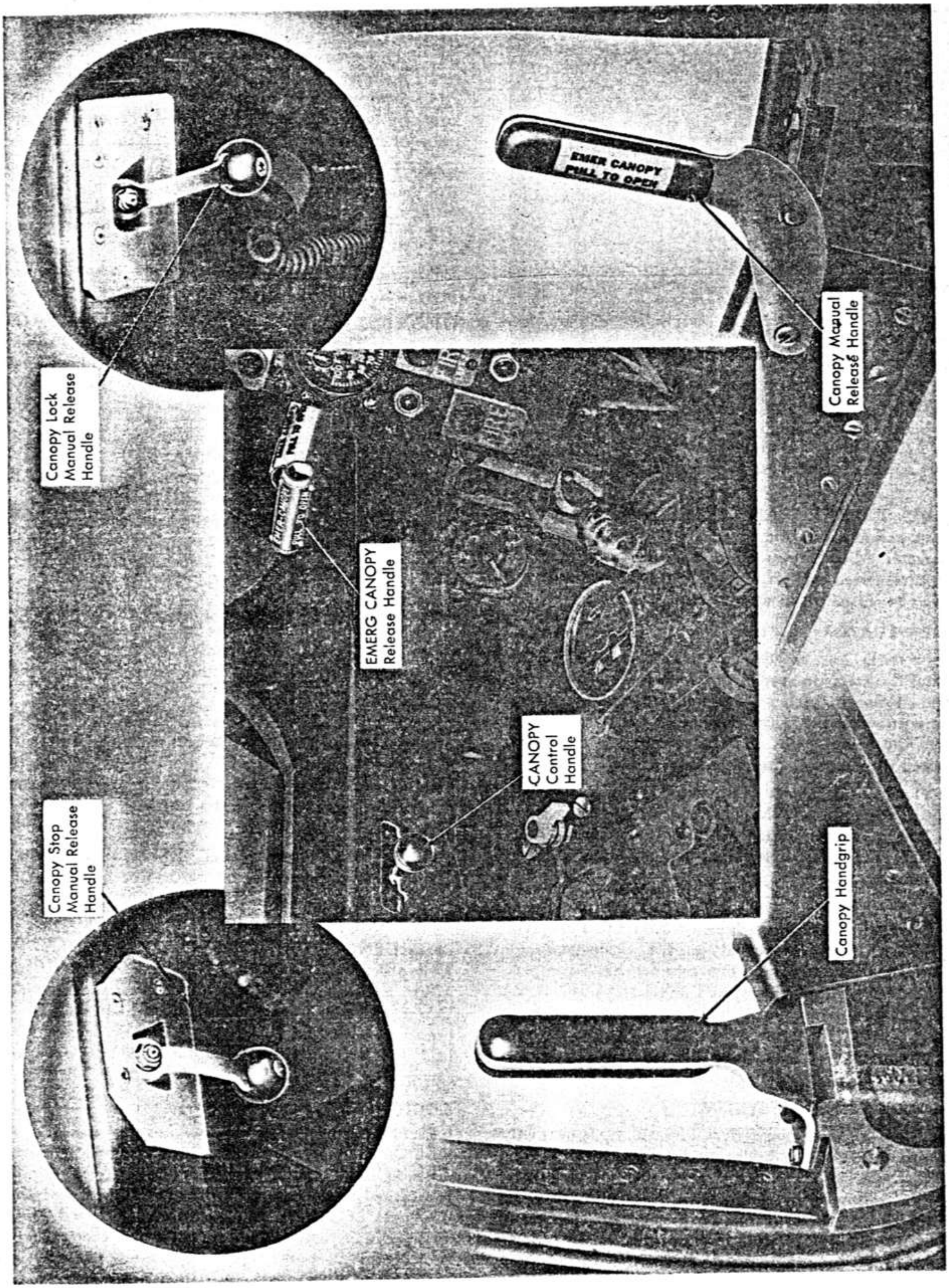


Figure 1–36. Canopy Controls

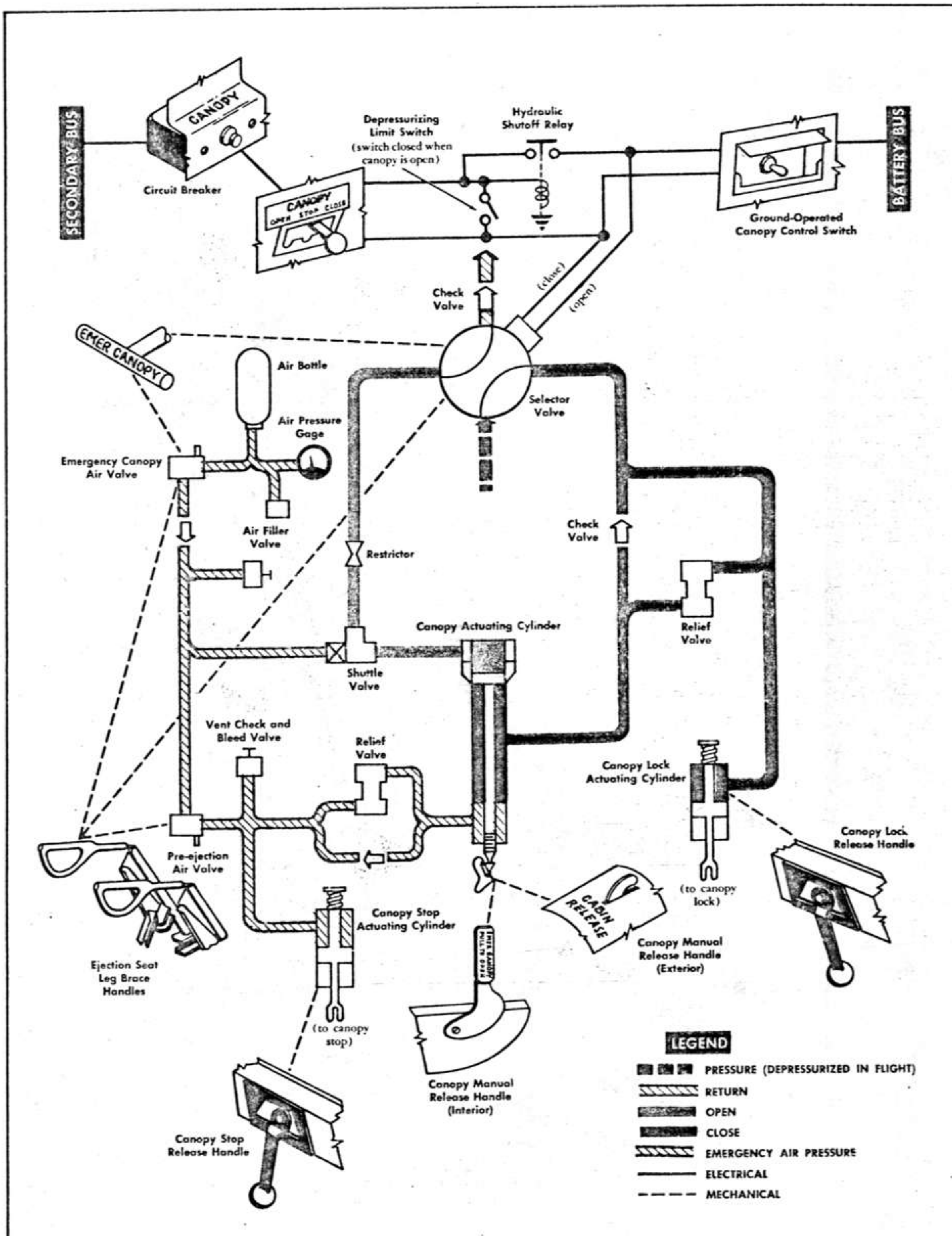


Figure 1–37. Canopy Control System Schematic

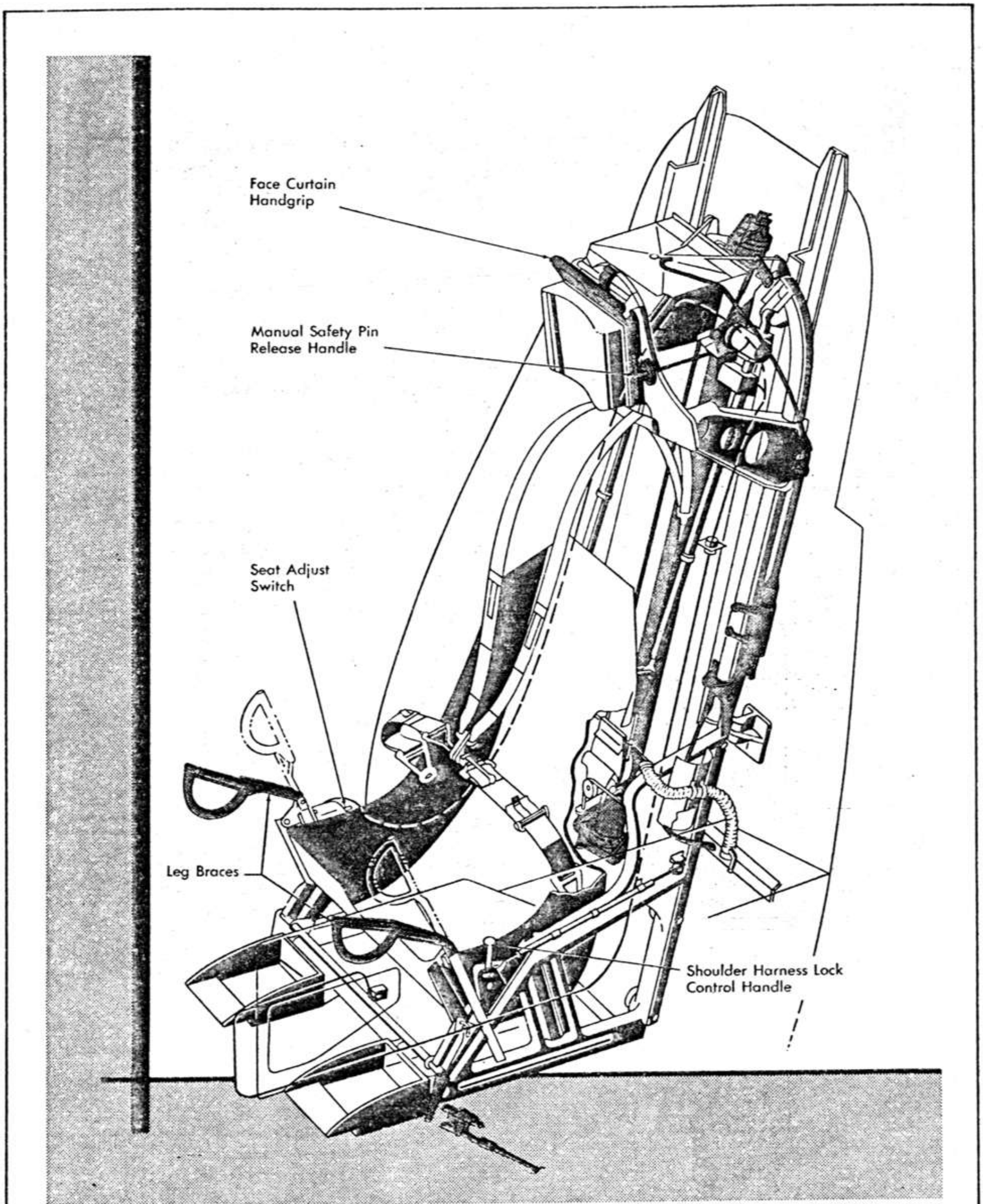


Figure 1–38. Ejection Seat Controls

ejected. A drogue parachute gun is tripped by a 30-foot cable as the seat is ejected, and the drogue parachute is released. The drogue parachute keeps the seat and pilot from tumbling.

A bucket seat is mounted in tracks on the ejection seat chassis. The bucket seat can be adjusted up or down within a range of 7 inches.

An inertia reel controls the forward movement of the shoulder harness; when unlocked it allows the shoulder harness to move, when locked it restricts all forward shoulder harness motion. The inertia reel may be locked or unlocked manually by the control handle on the left-hand side of the seat chassis. It also locks automatically whenever the shoulder harness is jerked forward, as in a crash or a hard landing; or whenever the left-hand leg brace is actuated, as in seat ejection.

PILOT'S LEG BRACES. The pilot's leg braces (figure 1–38) are mounted on the ejection seat chassis and, when pulled up in place, they protect the pilot's legs during ejection. The left-hand leg brace is the pre-ejection control and is safety wired to prevent inadvertent actuation. When the leg braces are pulled up into the ejection position, a crank attached to the left-hand leg brace actuates a bell crank which starts the canopy jettison operation (refer to discussion under CANOPY CONTROL SYSTEM), and a connecting link moves the shoulder harness lock control handle to the lock position. As the canopy moves aft during the jettison operation, it arms the catapult.

PILOT'S FACE CURTAIN. The pilot's face curtain (figure 1–38) consists of a nylon curtain and a red handgrip and is located immediately above the pilot's headrest. The nylon curtain protects the pilot's face against the strong pressure of the air as he is ejected. When the face curtain is pulled down to almost its full travel a ribbon attached to the face curtain fires the catapult. The face curtain is held in the retracted position by elastic cords which pull the curtain away from the pilot's face when he releases the handgrip.

SEAT CATAPULT SAFETY PIN MANUAL RELEASE HANDLE. If the canopy jettisons but fails to arm the catapult by pulling the safety pin, the safety pin can be removed by pulling the safety pin manual release handle (figure 1–38). The handle is located immediately to the left of the pilot's headrest.

BUCKET SEAT ADUST SWITCH. The bucket seat adjust switch (figure 1–38) is located on the right-hand leg brace. The up and down positions of the switch are momentary and the center position is off or stop. Holding the switch up moves the seat up and slightly forward; holding the switch down moves the seat down and slightly aft.

SHOULDER HARNESS LOCK CONTROL LEVER. The shoulder harness lock control lever (figure 1–38) is located on the lower left-hand side of the seat. Moving the lever down and forward locks the shoulder harness inertia reel through mechanical linkage.

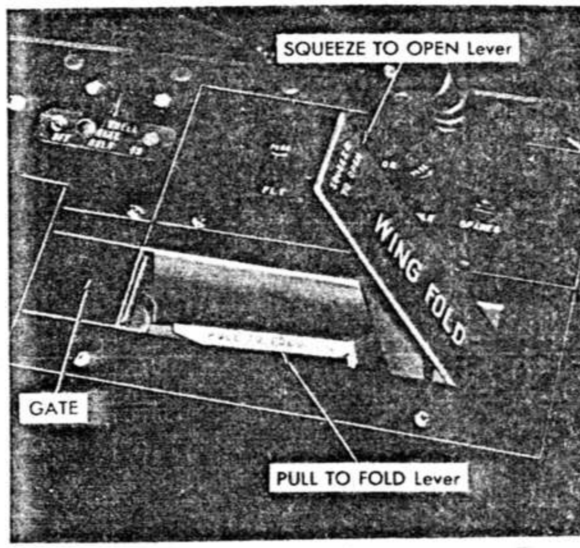


Figure 1–39. Wing Folding Controls

WING-FOLDING SYSTEM.

GENERAL. *(See figure 1–39.)* The wing outer panels can be folded to conserve storing and parking space. The wings are unlocked and locked mechanically and folded and spread hydraulically. A red warning flag at the wing fold is raised whenever the outer panel hinge pin is not locked. When one of the hydraulic power control systems is pressurized the ailavators are centered automatically during wing folding. The wing-fold and ailavator jury struts must be installed when the wings are folded. The wing-locking control is a SQUEEZE TO OPEN lever at the aft end of the right-hand console. The wing-folding control is a PULL TO FOLD lever located underneath the SQUEEZE TO OPEN lever.

SQUEEZE TO OPEN LEVER. The SQUEEZE TO OPEN lever (figure 1–39) is locked flush with the right-hand console. It is unlocked by squeezing its forward end. Pulling it open actuates control rods and Teleflex controls which pull a lock pin from the outer panel hinge pin. The red warning flag will appear at this time. Pushing the control lever back in place replaces the lock pin. When the lock pin engages the hinge pin, the warning flag disappears.

Note

The lock pin cannot engage the hinge pin until the hinge pin is "home."

PULL TO FOLD LEVER. The inner PULL TO FOLD lever (figure 1–39) mechanically operates a hydraulic selector valve. When the lever is pulled up, the selector valve is positioned, allowing hydraulic pressure from the utility hydraulic system to actuate an actuating cylinder to pull out the hinge pin. Pulling out the hinge pin actuates a sequence valve, allowing hydraulic pressure to actuate the wing folding cylinder. Pushing

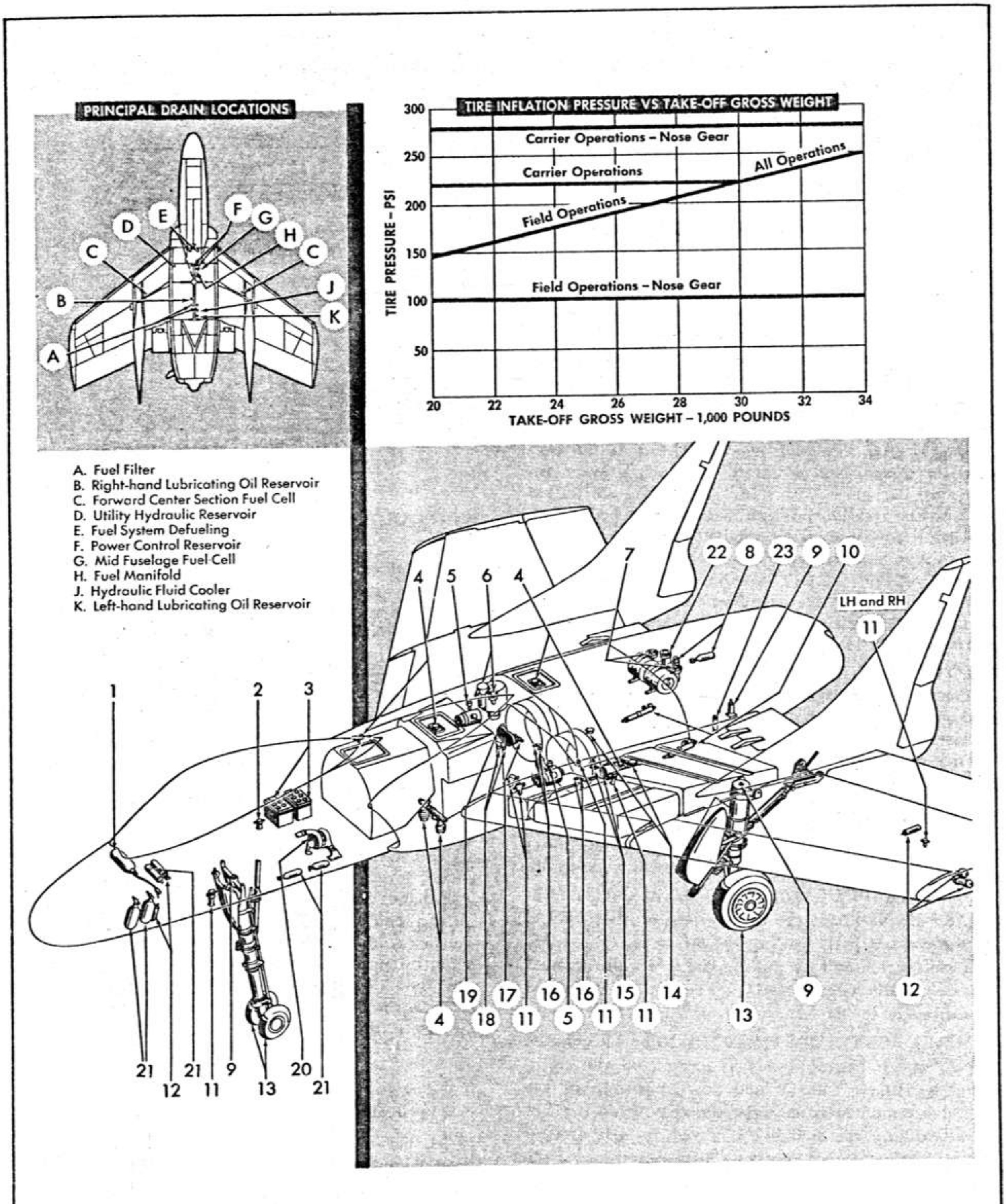


Figure 1–40. Servicing Diagram (Sheet 1 of 2)

SERVICING CHART

INDEX NO.	COMPONENT	SERVICING PROCEDURE	SERVICING MATERIAL	MATERIAL SPEC. AND GRADE
PREFLIGHT (check special servicing instructions for applicable items)				
3	Batteries (2)	Check specific gravity of at least one cell (correct for temperature). Replace battery if specific gravity is below 1.240 or above 1.310. Add water as required.	Distilled water or pure drinking water	—
1	Oxygen cylinder	Top off cylinder pressure to equivalent of 1,800 psi at 70°F as required.	Aviators' breathing oxygen	AN-O-1, Grade 1
21	Emergency air bottles (5)*	Add pressure as required.	Nitrogen or clean dry air	—
‡12	Hydraulic accumulators (8)	Add pressure as required (service when there is no hydraulic system pressure).	Nitrogen or clean dry air	—
8	Gun pneumatic system air bottles	Add pressure as required (2,800-3,000 psi).	Clean dehydrated air	—
4	Fuel cells (7)	Fill all cells.	Turbine and jet aircraft engine fuel	MIL-F-5624, Grade JP-3
†6	Utility hydraulic system reservoir	Fill to "FULL" mark as required.	Hydrolube H-2 hydraulic fluid	MIL-F-7083
†5	Power control hydraulic system reservoirs (2)	Fill to "FULL" mark as required.	Hydrolube H-2 hydraulic fluid	MIL-F-7083
7	Oil tanks (2)	Fill as required.	Jet engine oil	MIL-O-6081, Grade 1010
10	Arresting hook actuating cylinders (2)	Add air pressure as required. Fill reservoirs as required.	Clean compressed air Hydraulic fluid (red)	— MIL-O-5606
9	Landing gear shock struts (3) and arresting gear shock strut	Add fluid as required. Add air as required.	Hydraulic fluid (red) Clean compressed air	MIL-O-5606 —
13	Tires (4)	Add air pressure as required (see tire pressure graph in this illustration).	Compressed air	—
POSTFLIGHT (service all items specified for preflight servicing)				
INTERMEDIATE (check special servicing instructions for applicable items)				
21	Emergency air bottles (5)	Remove and drain excess moisture, reinstall and recharge.	Nitrogen or clean dry air	—
‡12	Hydraulic accumulators (8)	Add pressure as required (service when there is no hydraulic system pressure).	Nitrogen or clean dry air	—
†6	Utility hydraulic system reservoir	Replace filter element and clean filler neck strainer and reservoir. Refill as necessary.	— Hydrolube H-2 hydraulic fluid	— MIL-F-7083
5	Power control hydraulic system reservoirs (2)	Clean filler neck strainers and reservoirs. Refill as necessary.	Hydrolube H-2 hydraulic fluid	MIL-F-7083
11	Hydraulic filters (9)	Replace filter elements.	—	—
22	Gun pneumatic system air compressor	Check oil reservoir level Add oil as necessary	—	MIL-O-6085
MAJOR (check special servicing instructions for applicable items)				
‡12	Hydraulic accumulators (8)	Remove and test if possible. Recharge as required.	Nitrogen or clean dry air	—
2	Antiblackout filter	Check and replace if necessary.		
SPECIAL				
3	Batteries (2)	At each 25 hours, or weekly, whichever is sooner, check specific gravity of all cells. Replace battery if specific gravity is below 1.240 or above 1.310 or if any cell is 20 points different from any of the other cells. Refill as necessary. At end of each 90 days, remove batteries from airplane for capacity test. Adjust specific gravity as necessary.	Distilled water or pure drinking water Distilled water or pure drinking water and electrolyte solution	— —
7	Oil tanks (2)	Drain and refill at each 25-hour engine inspection.	Jet engine oil	MIL-O-6081, Grade 1010
16	Engine accessory cases (2)	Check finger screens and magnetic drain plugs at each 25-hour engine inspection.	—	—
19	Power take-off gear boxes (2)	Drain and refill at each 25-hour engine inspection.	PRL3161 lubricating oil (without viscosity index improved)	MIL-L-7808
17	Accessory case oil filters (2)	Check at each 25-hour engine inspection.	—	—
18	Main and emergency fuel filters (4)	Check at each 25-hour engine inspection.	—	—
15	Engine inlet fuel filters (2)	Check at each 25-hour engine inspection.	—	—
14	Oil manifold filters (2)	Check for metal particles, 5 hours after installing new pump or after major engine overhaul.		
20	Refrigeration package unit lubrication reservoir	Check and fill as necessary at each 250 hours.	Master Lubricants Co., Grease M-34	—
23	Gun pneumatic system air filter	Replace element as necessary		

*All emergency air bottles are serviced at a filler-gage installation on the left-hand side of the nose wheel well.

†CAUTION: Utility and power control hydraulic system reservoirs should be depressurized before removing the filler cap.

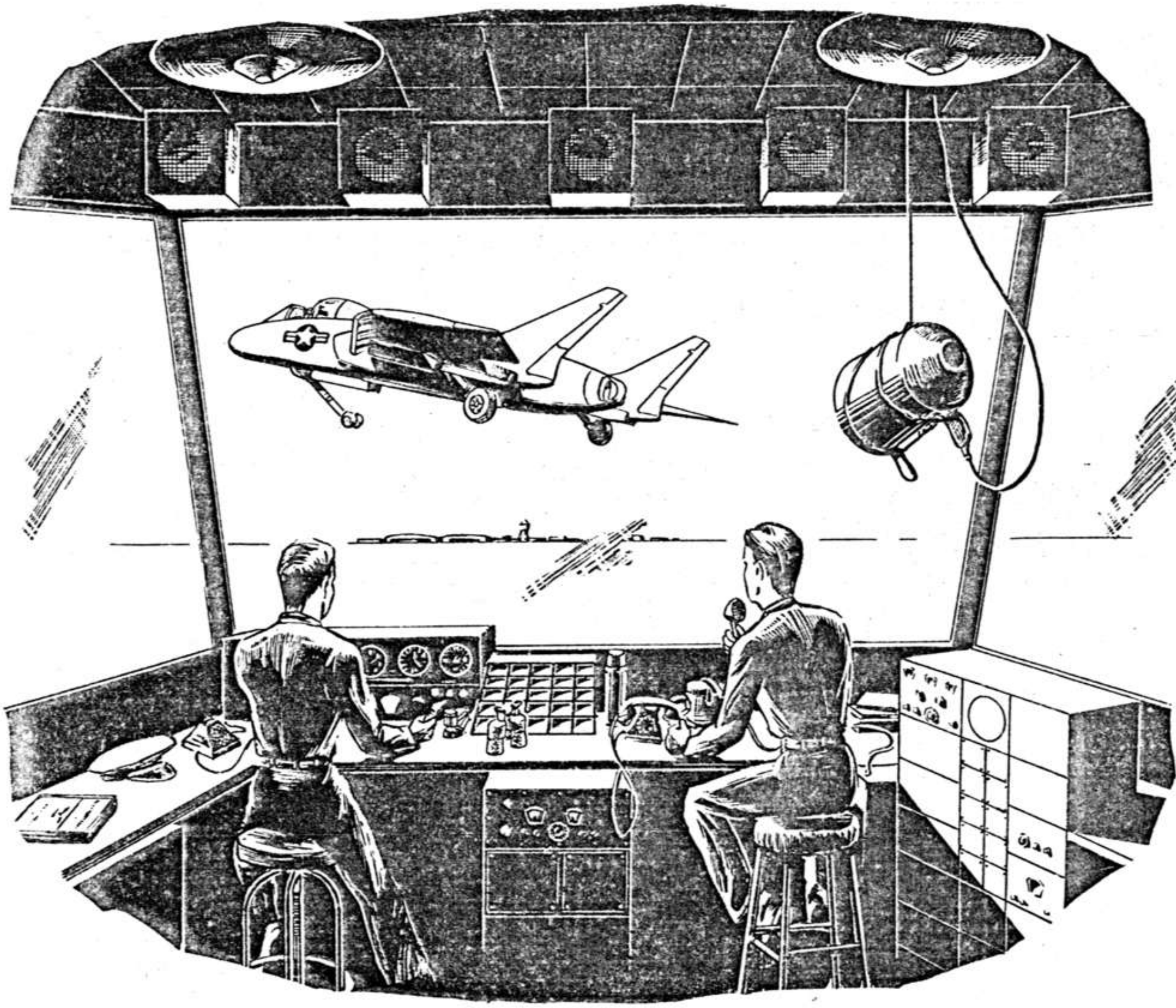
‡The power control accumulators are serviced at a centralized point adjacent to the two outboard accumulators. Decalcomanias identify these servicing points and specify servicing instructions.

Figure 1—40. Servicing Diagram (Sheet 2 of 2) the lever back in place to spread the wings reverses the folding sequence.

AUXILIARY EQUIPMENT.

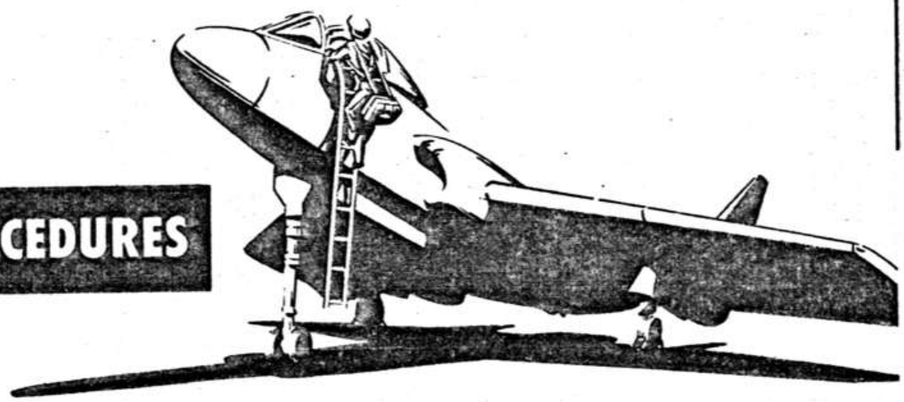
The following auxiliary equipment is covered in section IV:

Cabin Air-Conditioning, Defogging, and Pressurization System
Anti-Icing System
Communication and Associated Electronic Equipment
Lighting System
Oxygen System
Navigation Equipment
Armament Equipment
Miscellaneous Equipment



Section II

NORMAL PROCEDURES



BEFORE ENTERING AIRPLANE.

FLIGHT PLANNING. Data necessary to flight planning for all types of flights in this airplane are presented in the appendix.

FLIGHT RESTRICTIONS. Refer to section V for limitations and restrictions which govern flight in the airplane.

CRUISE CONTROL. Cruise control data for the type of flight planned may be found in the appendix.

WEIGHT AND BALANCE. Weight and balance control data must be thoughtfully determined for each flight in this airplane. Routine fuel use and payload expenditure can easily cause center-of-gravity shifts which approach critical values. *Always* obtain *both* take-off and anticipated landing gross weight and balance before flying the airplane. Always determine, during preflight inspections, that loading is as shown on the flight Weight and Balance Clearance (Form F). Additional information concerning center-of-gravity and weight limitations on the airplane is presented in section V. Basic information which explains weight and balance control and its importance is presented in the Handbook of Weight and Balance Data, AN 01-1B-40 and AN 01-1B-40F.

PREFLIGHT EXTERIOR INSPECTION. The preflight exterior inspection is performed by the pilot to determine, for his own satisfaction, that there are no visually apparent defects of the airplane or its parts which would jeopardize safe flight. Perform the exterior inspection as indicated in figure 2–1.

ENTRANCE. Enter the cockpit normally by means of the cockpit access ladder shown in figure 2–1. If an access ladder is not available, emergency entrance may be made by the method shown in figure 2–2.

ON ENTERING AIRPLANE.

COCKPIT CHECK (ALL FLIGHTS). Perform the following checks after entering the cockpit:

Armament

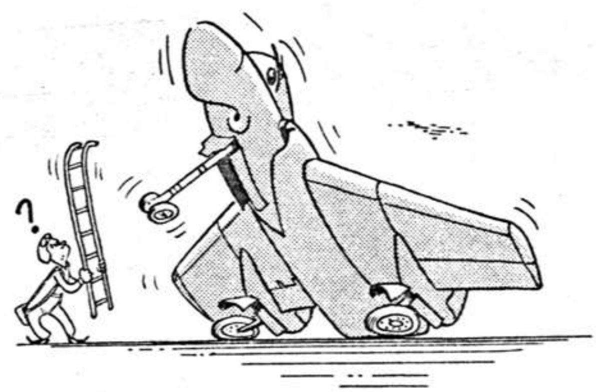
MASTER ARMT switch........"OFF"
INBD GUNS selector switch........"OFF"
OUTBD GUNS selector switch........"OFF"
GUN CHARGING selector switch........"OFF"
BOMB ARMING selector switch........"SAFE"
BOMBS/ROCKETS selector switch........"OFF"
Rocket quantity selector switch........"OFF"
PYLON STA SEL switches........"OFF"
APG/30 radar power selector switch........"OFF"
Sight control unit selector switch........"OFF"

Electrical

External 28-volt d-c power source........Connected
All console panel circuit breakers........In
Electrical power control switch...."GEN & BAT"
Inverter transfer switch........"MAIN"

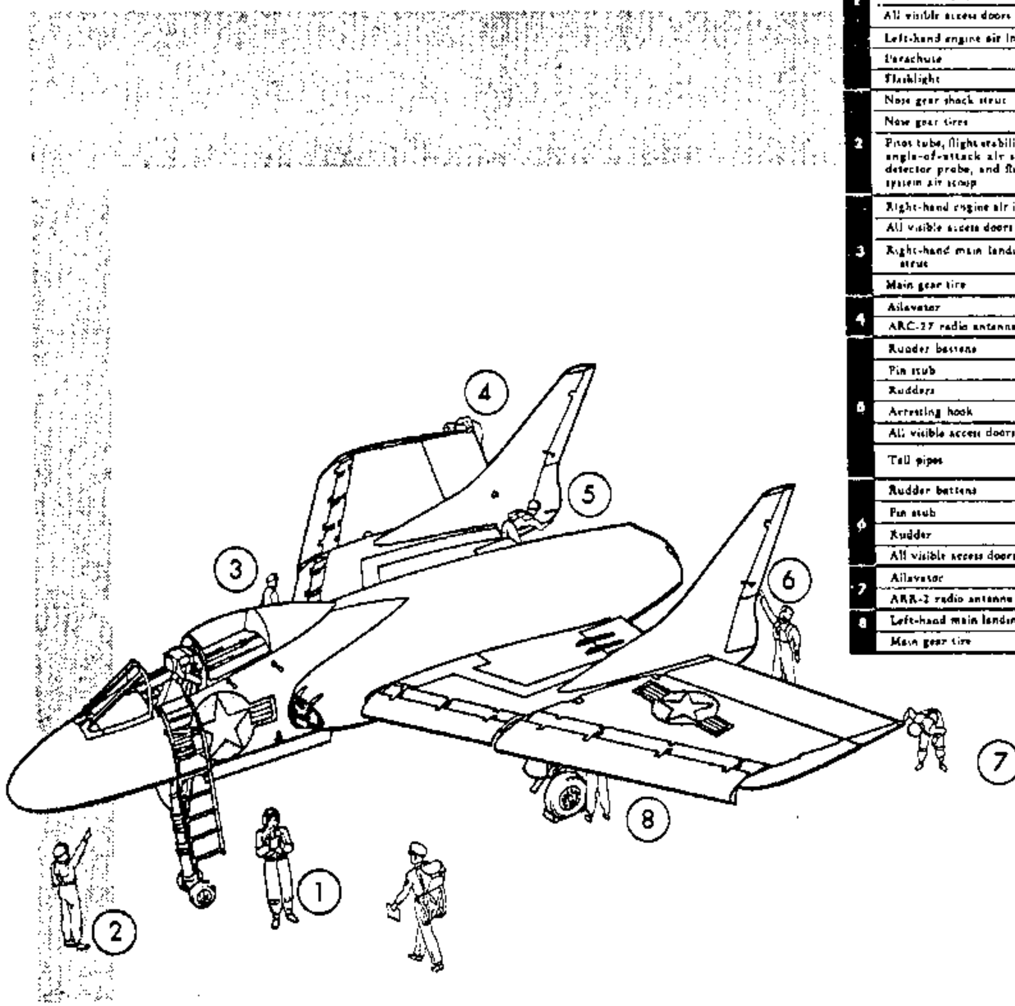
Fuel

EMERG TRANSFER TANK SELECTOR switch........"NORMAL"
TRANSFER switch........Centered (neutral)
Fuel pump selector switches....Centered (neutral)
TRANSFER FUEL QUANTITY selector switch........"TOTAL"
FUEL TRANSFER WARNING light........"OFF"



During preflight inspections, always determine that the airplane is loaded according to form F.

1	Weight and balance	... Loading same as Form F
	NavAer yellow sheet	... Airplane flight status
	Two 28-volt d-c electrical power sources	... Standing by
	Wheels	... Chocks in place
	Excessive oil, hydraulic fluid or fuel leaks	... Puddles under airplane
	All visible access doors and panels	... Closed
	Left-hand engine air intake duct screen	... In place
	Parachute	... Pararaft kit if over-water flight
	Flashlight	... If night flight
2	Nose gear shock strut	... Proper extension
	Nose gear tires	... Proper inflation No tread damage
	Pitot tube, flight stabilization system and angle-of-attack air stream direction detector probe, and flight stabilization system air scoop	... Dust covers removed
3	Right-hand engine air intake duct screen	... In place
	All visible access doors and panels	... Closed
	Right-hand main landing gear shock strut	... Proper extension Excessive leakage
	Main gear tire	... Proper inflation No tread damage
4	Ailevator	... Damage to underside
	ARC-27 radio antenna	... Any visible damage
5	Rudder battens	... Removed
	Fin stub	... Damage to underside
	Rudders	... Freedom of movement
	Arresting hook	... Up and latched
	All visible access doors and panels	... Closed
	Tail pipes	... Covers removed No evidence of hot-spots or other damage
6	Rudder battens	... Removed
	Fin stub	... Damage to underside
	Rudder	... Freedom of movement
	All visible access doors and panels	... Closed
7	Ailevator	... Damage to underside
	ARR-2 radio antenna	... Any visible damage
8	Left-hand main landing gear shock strut	... Proper extension
	Main gear tire	... Proper inflation No tread damage



WARNING

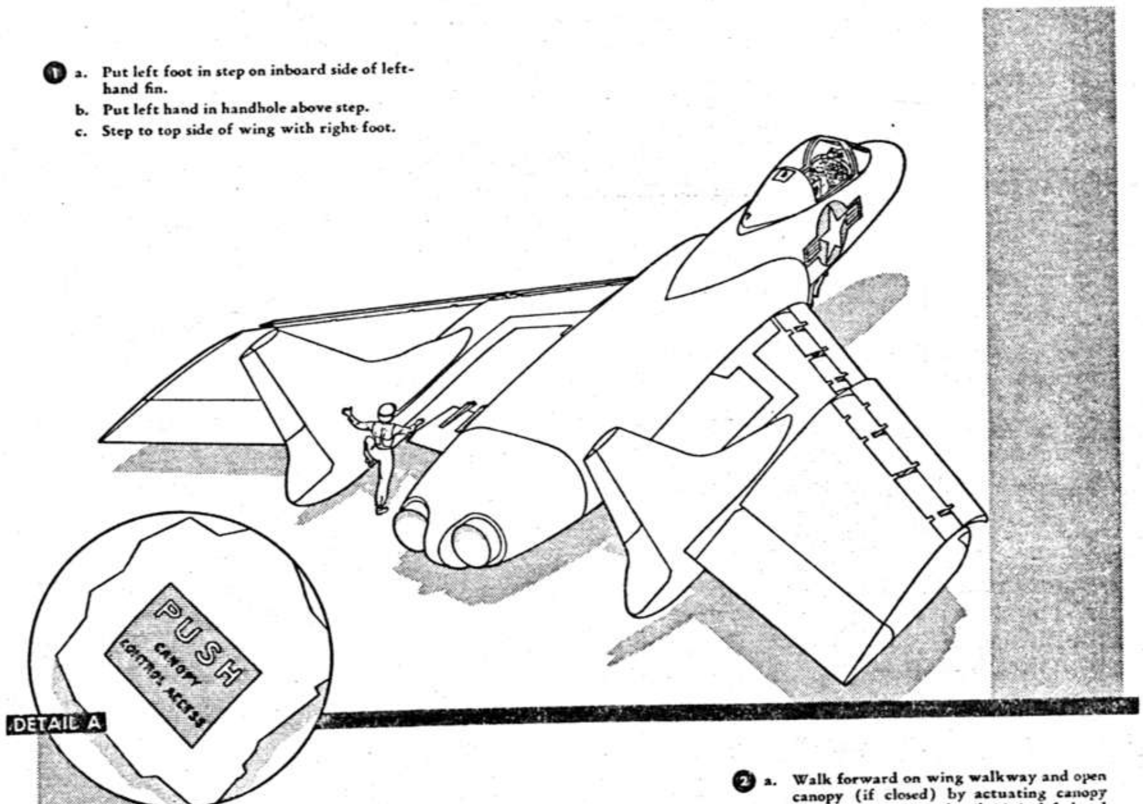
Before clearing the airplane for flight, be absolutely certain that the UNDERSIDE FUELING-FUEL TRANSFER circuit breaker on the d-c power panel is pushed in and the power panel cover is closed. This is a safety of flight requirement.

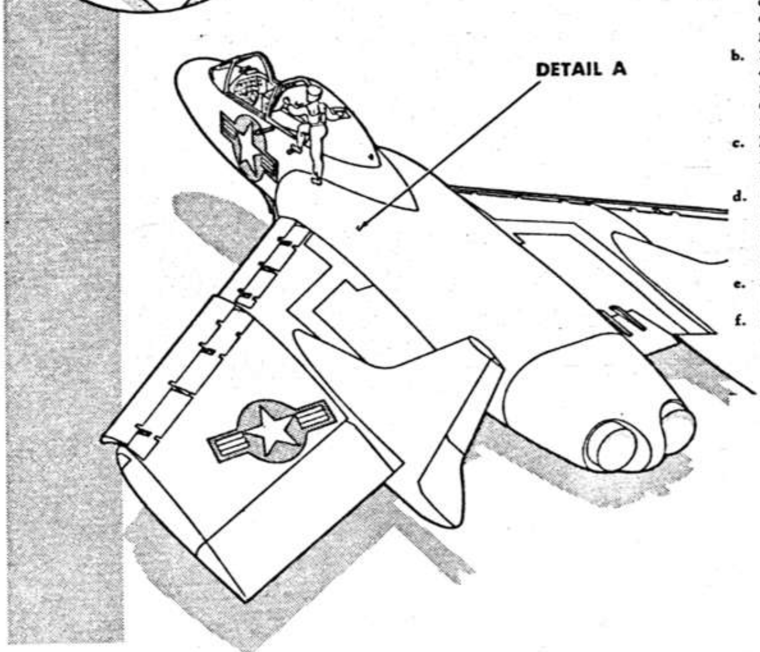
Figure 2-1. Exterior Inspection

1 a. Put left foot in step on inboard side of left-hand fin.

b. Put left hand in handhole above step.

c. Step to top side of wing with right foot.





2 a. Walk forward on wing walkway and open canopy (if closed) by actuating canopy control switch (see detail A) in left-hand gun bay access door.

b. Step to top of fuselage, grasp handhole in canopy with right hand, and place right foot on first cockpit access step (step should only be out far enough to accommodate foot).

c. Maintain grip on canopy handhole, place left foot on second step, and move step out as far as it will go.

d. Continue to maintain grip on canopy handhole and place right foot in "duckfoot" fashion between left foot and fuselage skin. Grasp front end of canopy simultaneously with left hand.

e. Swing left leg over canopy rail and step on pilot's seat.

f. Put all weight on left foot and bring right leg into cockpit.

CAUTION

Do not use this method to enter cockpit if there is any other means of access available.

Figure 2–2. Cockpit Access

Air Conditioning and Pressurization

Air-conditioning system control switch........"OFF"
Temperature control switch....Centered (neutral)
DEFOG switch ...."OFF"
OVERRIDE CUTOUT switch............"NORMAL"
FUEL TANK & CABIN PRESS. switch ...."NORMAL"

Engine

MASTER ENGINE SWITCHES ...."OFF"
Throttles ...."OFF"

Radio

All equipment ....As required

Instruments

G-2 COMPASS switch.............."G-2 COMPASS"
G-2 compass indicator.............Set to magnetic heading of airplane
GYRO HORIZON switch........."OFF" if warning light burns more than 1 minute
Gyro horizon indicator...............Trim indicator set to desired position

Miscellaneous

Landing gear control handle........"WHEELS DN"
Hook control handle.."UP"
ANTI-ICE switch ...."OFF"
AUX HYD PUMP switch........................."OFF"
EMERG WHEEL BRAKE control handle..."OFF" (safety pin in place)
All warning lights.........................Proper indication

Oxygen

Refer to section IV for a complete oxygen system check-out procedure which shall be performed before each flight.

Personnel Facilities

Antiblackout suit connection.....................Connected
Oxygen and radio (microphone and headset) connections ....Connected
Lap safety belt and shoulder safety harness ....Latched and secure
Seat ....Adjusted as desired
Rudder pedals.....................................Adjusted as desired

COCKPIT CHECK (NIGHT FLIGHTS). Perform the preceding cockpit checks, then perform the following additional checks:

FLT, NON-FLT, and CONSOLE interior lighting switches.................Set for brightness as desired

Exterior lights switches...........On "BRT" or "DIM" and "STDY," "FLSH," or "CODE" as required

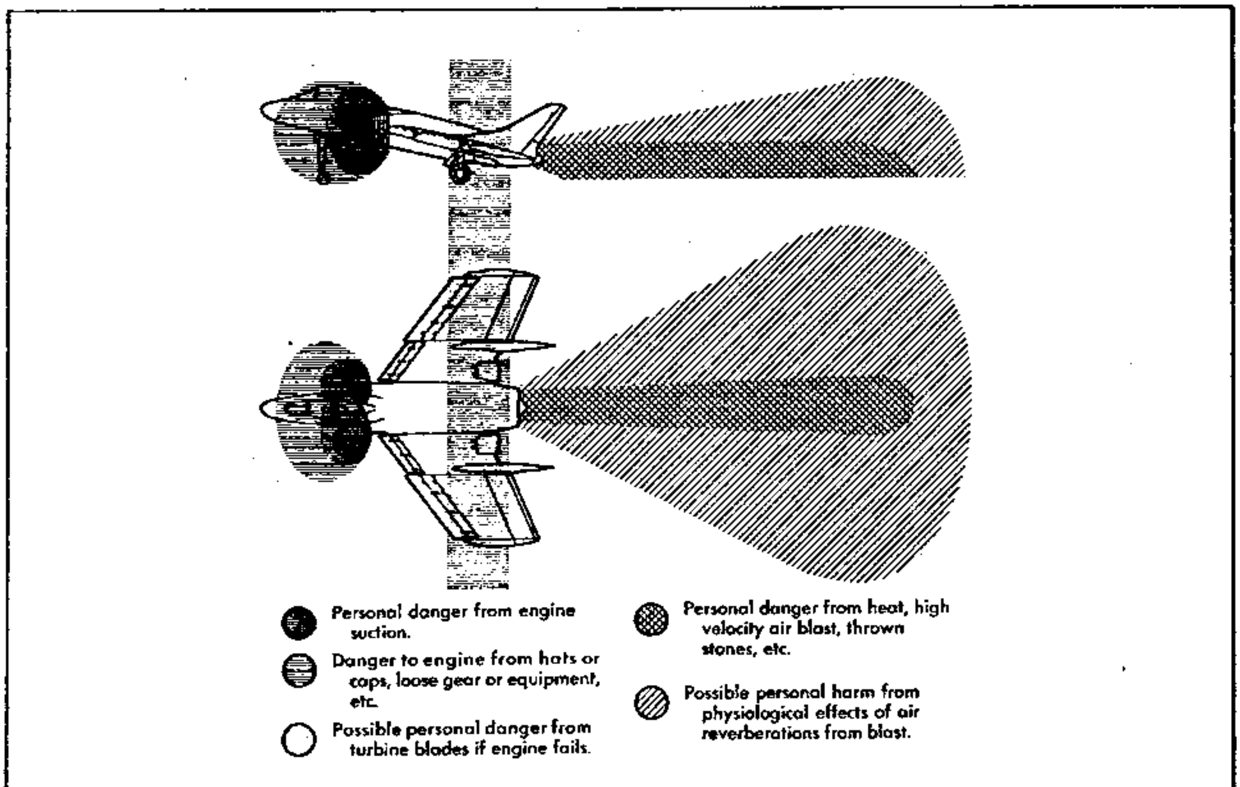


Figure 2–3. Danger Areas

Console floodlights .... Brightness adjusted as required

Flashlight .... Fresh batteries and easy to reach

BEFORE STARTING ENGINES.

Before starting the engines, observe the following precautions:

Engine air intake ducts .... Screens installed (as required)

WARNING

Before starting engines, always make certain that personnel and/or loose equipment are not within the danger areas in front of the engine air intake ducts. Be certain also that personnel are not within the danger area behind the engine tail pipes. (Danger areas are shown in figure 2–3.)

Fire guards .... Properly posted with suitable fire fighting equipment

External 28-volt d-c starting power source .... Connected

STARTING ENGINES.

NORMAL STARTING PROCEDURE. Engine starting sequence is normally left-hand engine first, then right-hand. To start each engine, perform the following steps:

CAUTION

Exhaust temperatures in excess of 1,000°C during starting operations automatically disqualify an engine for flight until it has been cleared for flight by maintenance personnel.

For engine starting precautions in below-freezing temperatures, refer to section IX.

MASTER ENGINE SWITCH .... "ON"

Throttle .... Push outboard to "CRANK"; then hold at "OFF" until engine is turning at 7½ percent rpm

Oil pressure indicator .... Pressure increasing

CAUTION

If some oil pressure is not evident at 7½ percent rpm, return MASTER ENGINE SWITCH to "OFF" and report difficulty to maintenance personnel.

Throttle .... Push forward and outboard to "EMERG IGNITE"

Note

During the 30-second ignition cycle, the oil and fuel pressure and the fuel quantity indicators are inoperative.

Exhaust temperature indicator .... Temperature increasing

CAUTION

If exhaust temperature fails to increase within 5 seconds after throttle is moved to "EMERG IGNITE," return the throttle and the MASTER ENGINE SWITCH to "OFF." Refer to paragraph entitled "STARTING PROCEDURE WHEN ENGINE FAILS TO IGNITE" for further instructions.

If exhaust temperature rises to over 900°C but is less than 1,000°C, a "hot start" has been made and must be so recorded in the engine log book. The airplane may be flown if not more than five "hot starts" have been made since the engine was last inspected. A fifth "hot start" automatically disqualifies an engine for further flight until after it has been inspected. A flaming start is not necessarily a hot start.

Throttle .... Forward to adjust engine speed to 70-72 percent rpm

Oil pressure indicator .... At least 15 psi with maximum fluctuation of 3 psi

Oil temperature indicator .... 140°C (maximum)

CAUTION

If oil pressure is less than 15 psi at 70 percent rpm or if pressure fluctuation exceeds 3 psi (total), stop the engine and report difficulty to maintenance personnel.

Fuel pump selector switch .... "RESET PRIMARY"

ENGINE EMERG FUEL SYSTEM OPERATING warning light .... "OFF"

STARTING PROCEDURE WHEN ENGINE FAILS TO IGNITE. After a failure to start is experienced and the throttle and MASTER ENGINE SWITCH have been returned to "OFF," wait for 3 minutes before cranking the engine again. This allows time for the starter to cool. When the 3-minute period is over, purge the engine in the following manner:

MASTER ENGINE SWITCH .... "ON"
Throttle .... Outboard to "CRANK"
MASTER ENGINE SWITCH .... "OFF" after 25 seconds

After purging the engine, wait 3 more minutes, then follow starting procedure outlined in paragraph entitled "STARTING ENGINES." Only three successive starting failures with their intervening cooling-purge-cooling periods are allowed. A 30-minute waiting period must be observed after each third attempt. This limit is imposed to prolong useful starter life and to allow sufficient combustion chamber drainage.

GROUND TESTS.

Prior to taxiing out to take-off position, the following checks should be performed with engines running:

External power supply sources .... Removed
Antiblackout valve .... Press in valve override button for functional test
Oxygen regulator .... Refer to section IV for oxygen test procedures
Utility hydraulic system pressure .... 3,000 psi
Speed brakes .... Open, then close
Speed brake warning light .... Glows when speed brakes are open
Slats position indicator .... Proper indication
POWER CONTROL systems pressure warning lights .... Off
Canopy control .... "CLOSE"
FIRE warning circuits .... Press test switches (fire warning lights should glow)
Air-conditioning system control switch .... "CONTR"
Cockpit air temperature control switch .... "HOT" or "COLD" to adjust temperature as desired

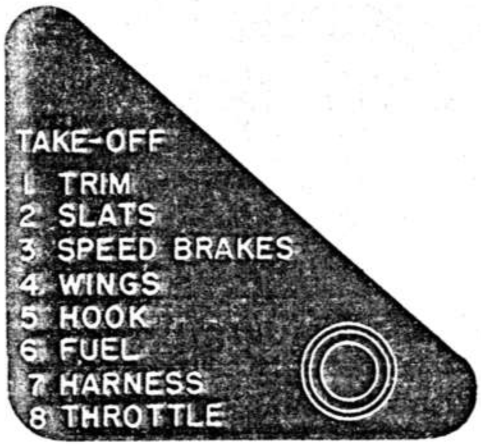


Figure 2–4. Take-off Checklist

Note

To prevent fogging in the cockpit during take-off and climb in humid weather with the air-conditioning system operating, run the engines at maximum allowable take-off rpm and hold cockpit air temperature control switch in "HOT" until fogging stops.

Generator output .... 27.5 volts in LH or RH position
Generator warning lights .... Off
Inverters MAIN and STDBY .... 115 volts
Radio equipment .... Check, as necessary
Wings .... Spread
Warning flags .... Not visible
Intake screens .... Removed (as required)
Wheel chocks .... Removed

TAXIING INSTRUCTIONS.

While taxiing, steer the airplane by use of the wheel brakes. To prevent excessive side loads on the nose gear strut, avoid making fast short-radius turns or turns from a standstill. Use brakes sparingly to prolong brake life and limit taxi time as much as possible in order to save fuel.

BEFORE TAKE-OFF.

PRETAKE-OFF ENGINE CHECK. Perform the following engine checks before taking off:

Throttles .... "NORMAL"
- Engine tachometer indicators .... 95.6 percent rpm
- Oil pressure indicators .... 24-45 psi (minimum)
- Oil temperature indicators .... 140°C (maximum)
- Fuel manifold pressure indicators .... 225 (± 15) psi
- Exhaust gas temperature indicators .... Not over 900°C for over 30 seconds during acceleration

Throttles .... "MILITARY"
- Engine tachometer indicators .... 100 percent rpm
- Oil pressure indicators .... 25-45 psi (minimum)
- Oil temperature indicators .... 140°C (maximum)
- Fuel manifold pressure indicators .... 280 (± 20) psi
- Exhaust gas temperature indicators .... Not over 900°C for over 30 seconds during acceleration or not over limits given in section V

PRETAKE-OFF AIRPLANE CHECK. The following airplane checks should be performed prior to take-off:

Ailavator and rudder controls .... Freedom of movement and proper response (check visually)
Trim .... Nose up (as required). Check both left- and right-hand position indications. Adjust lateral trim as necessary

Slats position indicator .... Proper indication (check slats visually)
Shoulder safety harness .... Locked

TAKE-OFF.

If all previous checks of airplane functions and operations have proved satisfactory for flight, align the airplane with the runway, hold in take-off position with brakes, and advance throttles to take-off power. (Refer to section V for operating limitations of engines.) When engines have stabilized at take-off rpm, release the brakes and take off. Maintain directional control by use of brakes and rudder during the first part of the take-off and by rudder alone as soon as the rudders become effective. You will note that the airplane has a moderate tendency to turn into the wind when making a cross-wind take-off and that strong cross-winds will require the use of brakes at higher speeds than is usual in other airplanes. The airplane has good initial acceleration and tends to use up runway fast. At approximately 105 to 110 knots, start applying a slight amount of back pressure to the stick. This will raise the nose wheel from the runway slightly and the main gear will follow through to break contact with the ground at approximately 120 to 130 knots. As the airplane leaves the ground, lower the nose slightly to pick up additional speed. For information concerning procedures to be followed in take-off emergencies, refer to section III.

AFTER TAKE-OFF.

As soon as the airplane is airborne, brake the wheels and retract the landing gear. Retract the slats before reaching 175 knots. Retraction of the gear and slats will require additional slight trim changes to maintain an established climb attitude. The landing gear retraction cycle is completed in approximately 6 seconds after actuation of the landing gear control handle.

CLIMB.

Accelerate to best climbing airspeed and climb to altitude. Conventional climb techniques may be employed to attain the performance shown in the climb chart in the appendix.

FLIGHT CHARACTERISTICS.

Refer to section VI for information concerning the flight characteristics of the airplane.

SYSTEMS OPERATION.

Refer to section VII for information concerning operation of the various airplane systems during flight.

DESCENT.

Normal techniques may be used to attain the descent characteristics on the descent chart in the appendix. Optimum descents may be accomplished by the use of speed brakes. If objectionable buffeting is encountered while speed brakes are being used, it may be overcome by partly closing the speed brakes.

PRETRAFFIC PATTERN CHECK.

Before entering the traffic pattern to land, check the fuel expended and the status of the payload to determine that the center of gravity is within normal landing limits.

TRAFFIC PATTERN CHECK.

While in the traffic pattern, perform the following prelanding checks (figure 2–6):

Canopy .... "OPEN" at less than 215 knots
Landing gear .... "WHEELS DN" at less than 175 knots
Landing gear warning light .... Off (Check main gear visually)
Slats .... Automatically extended when gear is extended
Slats position indicator .... Slats extended (Check slats visually)
Trim .... As required
Shoulder safety harness .... Locked
Exterior lights .... On "BRT" (as required)
Interior lights .... On (as required)

LANDING.

Use conventional landing techniques to equal the landing performance shown on the landing graph in the appendix. A high angle-of-attack landing attitude permits touching the main gear down first. The landing approach should be planned so that the airplane will touch down at approximately 110 to 135 knots. After touching down, use slight back pressure on the stick to prevent the nose gear from settling to the runway too fast. After the nose wheels are on the ground, use the brakes as necessary.

GO-AROUND.

A jet-engine airplane has a characteristically slow thrust recovery time when acceleration from a low-

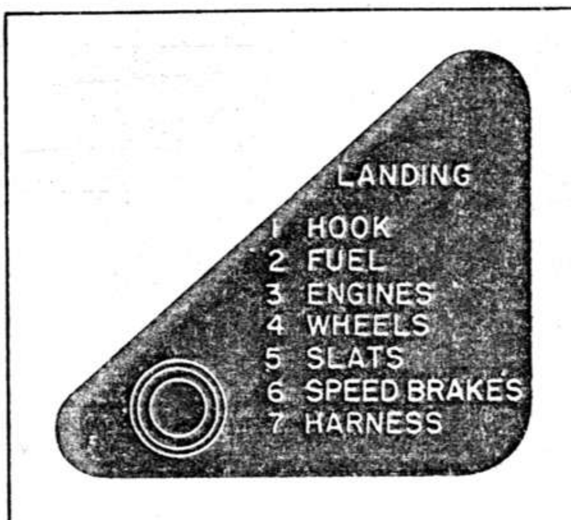


Figure 2–5. Landing Checklist

flying speed becomes necessary. Keep your approach engine speeds as high as possible until definitely sure that your landing can be carried through. If there is any indication that you may not be able to land safely, retract your gear immediately and apply maximum allowable power. Make your decision concerning a go-around promptly and carry it through without hesitation.

Note

> To use higher engine speeds and thus maintain better thrust recovery characteristics when landing, the speed brakes may be extended. The additional drag created will require higher engine speeds to maintain landing approach speeds.

POSTFLIGHT ENGINE CHECK.

Perform a check of the engines at 70 to 72 percent rpm before shutting them down. Report any unusual noises, vibrations, or instrument indications to maintenance personnel.

BEFORE STOPPING ENGINES.

Perform the following check before stopping the engines:

Air valve on oxygen regulator...."100% OXYGEN"
OXYGEN SUPPLY valve....Off
FLT, NON-FLT, and CONSOLE light switches...."OFF"
Exterior lights switches...."OFF"
IFF MASTER switch...."OFF"
Air-conditioning system control switch...."OFF"
Radio switches...."OFF"
Wings....Folded

STOPPING ENGINES.

The engines should be run at 80 to 83 percent rpm for 1 minute prior to stopping. This procedure will ensure maximum scavenging of oil from the engine in the airplane's ground attitude. Be certain that fire guards are posted, then stop engines in the following manner:

Throttles...."OFF"
MASTER ENGINE SWITCHES...."OFF"
Electrical power control switch...."OFF"

CAUTION

> To prevent damage to engine-driven fuel pumps whenever it becomes necessary to shut an engine down, pull the throttle to the rear, wait until the engine stops turning, then turn MASTER ENGINE SWITCH to "OFF."

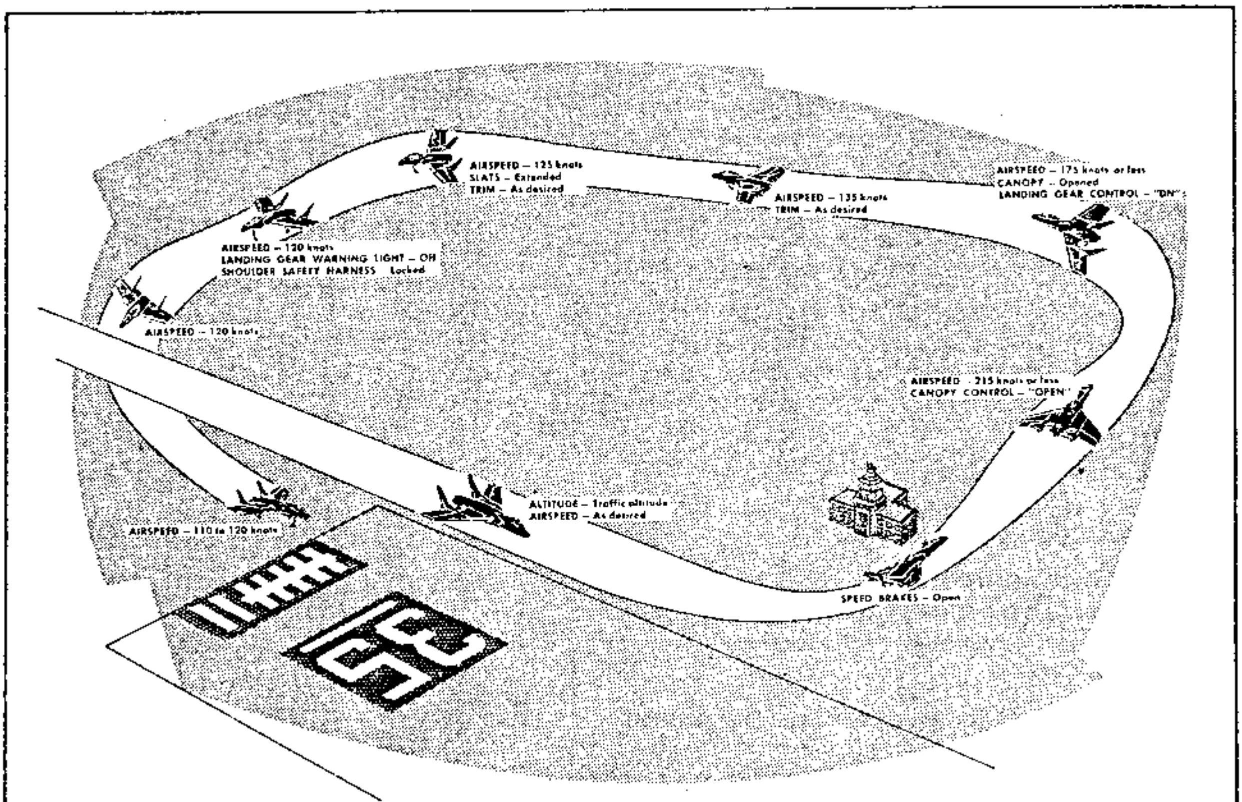
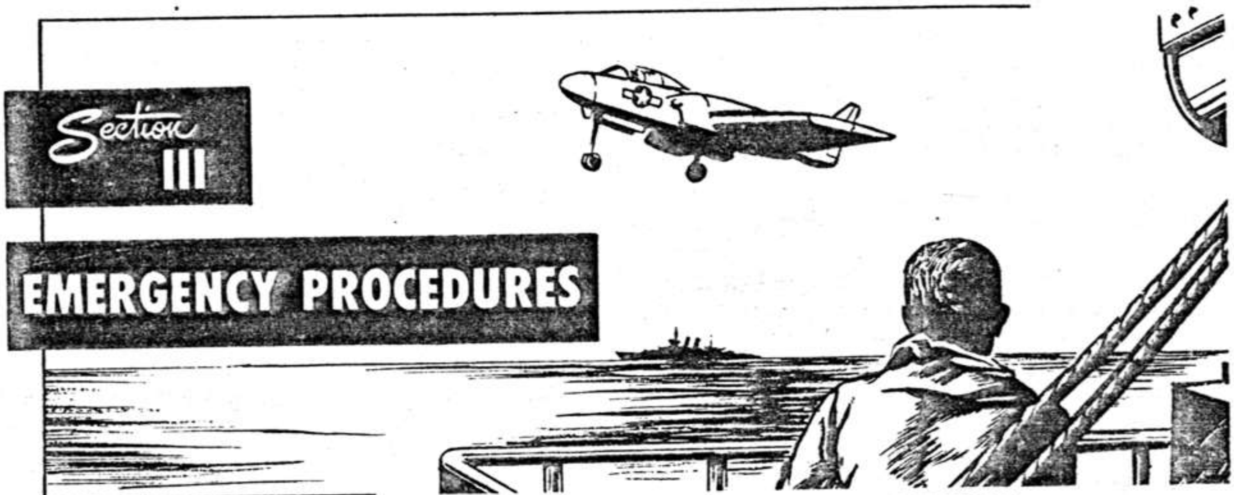


Figure 2–6. Landing Pattern Diagram



Section III
EMERGENCY PROCEDURES

POWER FAILURE.

Emergency procedures, flight characteristics, air-starting procedures, and shutdown procedures for all possible conditions of engine failure are discussed in this section.

FLIGHT CHARACTERISTICS UNDER PARTIAL POWER CONDITIONS. The following warning lights may turn on soon after an engine fails: POWER CONTROL, EMERG FUEL SYSTEM OPERATING, and GEN WARN. The tachometer will indicate a reduction in engine speed and airplane thrust will be noticeably reduced. The ailavator control system will continue to function but at a slightly reduced rate because of the decreased flow of hydraulic fluid from the two pumps on the inoperative engine. Ailavator control will be adequate for normal flight maneuvers at airspeeds over 200 knots with both engines windmilling. At lower airspeeds the emergency pump should be turned on. *This pump will operate for about 3 minutes so it should be saved for the emergency landing approach with windmilling engines, altitude below 2,000 feet and airspeed below 200 knots.*

PROCEDURE TO BE FOLLOWED WHEN PARTIAL POWER FAILURE OCCURS. When partial power failure occurs, the affected engine should be shut down immediately. Observe all power plant instruments and warning lights to determine the cause of the failure. Effort should also be made to determine the presence of any abnormal vibration in the airplane which might be caused by the loss of "thrown" engine parts. To shut down an engine, proceed as follows:

Throttle .... "OFF"
MASTER ENGINE SWITCH .... "OFF"

AIR-STARTING PROCEDURE. When both engines have failed and an attempt is to be made to start them, the engine instruments should be checked to see which of the two engines is likely to start with the least difficulty.

CAUTION

Do not attempt an air start if any of the following conditions prevails:

Indication of engine fire
Abnormally low oil pressure
Abnormally high oil temperature
Engine vibration

To attempt to air-start a disabled engine, proceed as follows:

Note

If both engines have failed, the INVERTER transfer switch must be placed in "STDBY" to provide electrical power to the ignition circuit.

a. Reduce altitude to less than 20,000 feet for best results.

b. Pull airplane up into a nose-high attitude to drain off excess fuel.

c. Reduce airspeed to approximately 200 knots to windmill engine at approximately 15 percent rpm. Do not reduce airspeed to less than 200 knots.

d. Turn MASTER ENGINE SWITCH to "ON" and move throttle forward and to the left to "EMERG IGNITE."

e. Observe exhaust temperature. When exhaust gas temperature begins increasing, move throttle forward to 70 percent rpm and observe operation of the engine.

Note

If exhaust temperature does not increase, return throttle and MASTER ENGINE SWITCH to "OFF" and repeat steps a through e.

f. Turn fuel pump selector switch to "RESET PRIMARY" and continue to observe engine operation.

Note

If the engine flames out at this point, it is an indication of engine primary pump element failure. Restart engine but do not turn switch to "RESET PRIMARY."

g. If all instrument and warning device indications observed are satisfactory, proceed with full use of the engine.

PARTIAL POWER FAILURE DURING TAKE-OFF. Stopping the airplane is the safest procedure if partial power failure occurs during take-off. To stop the airplane, perform the following operations:

Throttle of disabled engine...................."OFF"
MASTER ENGINE SWITCH of disabled engine...................."OFF"
Throttle of remaining engine...................."IDLE" (39 percent rpm)
Speed brakes....................Open
Wheel brakes....................Use as necessary
EMERG WHEEL BRAKE control handle....................Use if required

A single-engine take-off may be made after partial power failure if the runway is of sufficient length to allow the pilot to hold the airplane on the ground until it reaches the critical engine failure speed shown on the take-off emergency chart in the appendix. (Note that the values derived are provisional, and that, unless sea level standard day conditions on which the chart is based exist, the values will have to be adjusted.) If a single-engine take-off is to be made, observe the following:

Throttle of dead engine...................."OFF"
MASTER ENGINE SWITCH of dead engine...................."OFF"

Take off in the routine manner (refer to section II). Raise landing gear as soon as possible and climb slowly until best single-engine climb speed is attained. Retract slats before reaching 175 knots. Climb at best speed thereafter until sufficient altitude has been gained to attempt to air-start the disabled engine or to continue single-engine flight.

COMPLETE ENGINE POWER FAILURE DURING TAKE-OFF. If the airplane is not airborne when complete power failure occurs, perform the following steps:

Speed brakes....................Open speed brakes to achieve added braking effect
Wheel brakes....................If possible, use brake pedals to stop. If normal braking is insufficient, use emergency wheel brakes by moving EMER WHEEL BRAKE control handle to "ON" (operate handle between "ON" and "HOLD" for most efficient braking action)
Throttles...................."OFF"
MASTER ENGINE SWITCHES...................."OFF"

COMPLETE POWER FAILURE AFTER TAKE-OFF. If the airplane is airborne, at an altitude which prohibits the necessary maneuvering to land on the airfield or to attempt to air-start an engine, perform the following checks before crash landing:

All nonessential electrical equipment....................Off
AUX POWER control handle...................."ON SYS 1" or "ON SYS 2"
Landing gear control handle...................."UP"
Emergency slats control....................Pull
Canopy emergency handle....................Pull out
Throttles...................."OFF"
MASTER ENGINE SWITCHES...................."OFF"
Shoulder safety harness and lap safety belt....................Locked
Airspeed....................Maintain safe power-off airspeed (Refer to landing chart in appendix)

Note

Speed brakes may be used judiciously if overshooting appears possible.

PARTIAL POWER FAILURE IN FLIGHT. If partial power failure occurs in flight and attempts to air-start the disabled engine are unsuccessful, it will be necessary to complete the flight under partial power conditions. Best cruising airspeed, altitude, and fuel data may be derived from information in the appendix.

MAXIMUM GLIDE AFTER COMPLETE POWER FAILURE. If both engines fail during flight and shutdown of the engines results, maximum glide range may be obtained by maintaining the following speeds:

Gross Weight (Typical)	*Glide Speed (Landing Gear Up)*
24,000 lb (Main fuel tanks approximately full; transfer tanks empty)	204 knots
20,000 lb (Less than 25% main fuel remaining; transfer tanks empty)	183 knots

Lower the nose to pick up additional airspeed (approximately 200 knots) to cause engines to windmill faster. This increases ailavator responsiveness to provide the degree of control required.

CAUTION

Avoid use of the emergency hydraulic pump as the battery for the pump can supply enough power to operate it for only 3 minutes. It is recommended that the emergency hydraulic pump be reserved for the final landing stages.

LANDING WITH PARTIAL OR COMPLETE POWER FAILURE. When landing the airplane on an approved runway with *one* engine inoperative, follow the normal procedure in the paragraph in section II entitled LANDING, keeping the airspeed and exhaust temperature of the operating engine within the prescribed limits.

Single-engine approach speed should be slightly more than the normal approach speed. Engine speed should be kept as high as possible to assure good thrust recovery characteristics for go-around. (Use speed brakes to obtain the high engine speed desired.)

When landing the airplane on an approved runway with *both* engines inoperative, a minimum final approach airspeed of 150 knots must be maintained at a typical gross weight of 24,000 pounds (main tanks approximately full, transfer tanks empty) and 140 knots at a typical gross weight of 20,000 pounds (less than 25 percent main fuel remaining, transfer tanks empty). Observe the following procedure:

All nonessential electrical equipment........Off
Landing gear control handle...."DN" and locked (use emergency air system if required)
Slat........Pull emergency slat control ring
AUX POWER control handle........"ON SYS 1" or "ON SYS 2" (Use as airspeed drops below 200 knots
Canopy........Open (use emergency air if required)
Throttles ...."OFF"
MASTER ENGINE SWITCHES........"OFF"
EMER WHEEL BRAKE control handle......"HOLD"
Shoulder safety harness and lap safety belt........Locked

GO-AROUND WITH PARTIAL POWER FAILURE. If during the landing approach with one engine inoperative the decision is made to attempt a go-around, the following procedure is recommended:

Throttle handle (operative engine) ...."MILITARY POWER"
Landing gear control handle........"UP"

CAUTION

Since the acceleration during go-around for jet-propelled airplanes is inferior to that of propeller-driven airplanes, the go-around decision should be made as early as possible.

FIRE.

ENGINE FIRE ON THE GROUND. If an engine fire occurs (FIRE warning light glows) when the airplane is on the ground, perform the following steps:

Throttles ...."OFF"
MASTER ENGINE SWITCHES........"OFF"
Electrical power control switch........"OFF"
Abandon the airplane.

ENGINE FIRE IN THE AIR. If an engine fire occurs while the airplane is airborne, perform the following checks:

Throttle of burning engine........"OFF"
MASTER ENGINE SWITCH of burning engine ...."OFF"

If the fire does not go out, abandon the airplane.

WING FIRE. If a wing fire occurs in flight, perform the following procedures:

EMERG TRANSFER TANK SELECTOR switch........"NORMAL"
TRANSFER SWITCH ...."OFF"
FUSL, WING, TAIL, and FORM light switches........"OFF"

Slip airplane away from wing fire in an attempt to keep fire away from fuselage and to extinguish the blaze.

ELECTRICAL FIRE. If an electrical fire occurs while the airplane is in flight, turn all electrical switches off, except the electrical power control switch and master engine switches. As switches are turned on again, watch for signs of fire.

DISSIPATION OF SMOKE AND/OR FUMES. To rid the cockpit of smoke or fumes, turn the air-conditioning system control switch to "OFF" and, if airspeed is less than 215 knots, open the canopy.

Note

Whenever smoke or toxic fumes contaminate the cockpit air and the canopy cannot be opened immediately, move the air supply valve on the oxygen regulator to "100% OXYGEN" and use SAFETY PRESSURE.

EMERGENCY ENTRANCE

The canopy is equipped with a manual external release handle which projects through a slot in the top of the canopy. Pull this handle aft to unlock the canopy and roll the canopy aft by hand until it engages the lock mechanism.

BARRIER CRASH.

Whenever barrier and/or barricade engagement appears imminent, you should keep your head forward and down in the cockpit to prevent being injured by the upper loading strap. It is possible for this strap to enter the open cockpit when the airplane engages the barricade in a severely yawed attitude or when it is out of control. If the upper loading strap does enter the cockpit it will most likely lodge at the back of the seat or the headrest.

BAIL-OUT

Observe the following procedure when it is necessary to abandon the airplane:

Reduce airspeed as much as possible.
Safety belt and shoulder harness........Locked
Feet........On foot rest
Leg braces........Pull up (canopy will be jettisoned)

Note

If the canopy does not jettison, roll it off the tracks manually by operating the canopy manual release handle and the stop release handle. If the canopy still cannot be jettisoned, the ejection seat may be used to blast through the plastic shell of the *fully closed* canopy by pulling the catapult arming safety pin manual release handle before pulling down the face curtain.

WARNING

Do *not* attempt to fire the ejection seat catapult cartridge when the canopy is in half or full open position. Such action might result in fatal injuries.

Face curtain ....Pull down over face (seat should eject)

Note

If the seat is not ejected when the face curtain is pulled, reach up to the left of the headrest and pull the catapult arming safety pin manual release handle. If necessary, give the face curtain an additional pull to eject the seat. *If the seat still does not eject, roll the airplane over on its back, release the safety belt, and bail out.*

After ejection, the stabilizing drogue parachute will open automatically as the pilot and seat clear the airplane. When the seat has decelerated sufficiently, unfasten the safety belt and shoulder harness. When sufficiently clear of the seat, pull the parachute rip cord.

WARNING

To avoid the effects of anoxia and cold when a bail-out is made at high altitudes, it is imperative that the pilot fall free to a safe altitude before opening his parachute.

FUEL SYSTEM EMERGENCY OPERATION.

Refer to the paragraph in section VII entitled FUEL MANAGEMENT.

LANDING GEAR SYSTEM EMERGENCY OPERATION.

Emergency air extension of the landing gear is accomplished by turning the landing gear control handle clockwise and pulling aft.

Note

If the landing gear handle does not unlock after the airplane takes off or if it is desired to raise the landing gear for an emergency take-off stop while the airplane's weight is still on the landing gear, pull the LDG DOWN LOCK OVERRIDE PULL RING aft. This unlocks the handle and permits it to be placed in the "WHEELS UP" position.

WHEEL BRAKES EMERGENCY OPERATION.

If it is necessary to use the emergency wheel brakes, place the EMERG WHEEL BRAKE control handle in the aft ("ON") position as required. Operate between "ON" and HOLD to conserve air.

SLATS SYSTEM EMERGENCY OPERATION.

The slats may be extended by emergency air pressure by pulling the emergency slat pull ring which is located immediately aft of the slat control switch. The position of the slat control switch has no effect on emergency operation.

Note

Do not extend the slats for normal landings at speeds in excess of 175 knots.

CANOPY CONTROL SYSTEM EMERGENCY OPERATION.

If the canopy does not open by normal operation of the CANOPY control switch, pull the red T-shaped EMER CANOPY release handle aft. This opens the canopy by air pressure.

EMERGENCY MANUAL CANOPY OPENING. The canopy may be opened manually at low airspeeds by pulling the manual release handle on the left-hand side of the canopy.

EMERGENCY MANUAL CANOPY JETTISONING. If the canopy does not jettison during pre-ejection procedure, it may be rolled off the tracks manually by operating the canopy manual release handle and the stop release handle.

EMERGENCY COCKPIT ENTRY. Entrance to the cockpit when the canopy is closed may be accomplished by pulling an external release handle which projects through a slot in the top of the aft section of the canopy.

AILAVATOR CONTROL SYSTEM EMERGENCY OPERATION.

AILAVATOR HYDRAULIC POWER CONTROL SYSTEM FAILURE. The four warning lights for the ailavator control system warn the pilot of mechanical or system failures which may cause partial or complete loss of hydraulic power. If any one of the lights glows, the pump for the indicated power control system and engine has probably failed. If two laterally paired lights glow, the indicated engine has probably failed. If two longitudinally paired lights glow, the indicated power control system has failed. An emergency hydraulic pump, powered by a battery with a life of 3 minutes, provides an additional source of hydraulic power. The emergency pump is to be used when landing with windmilling engines, at altitudes below 2,000 feet and airspeed below 200 knots. The emergency hydraulic pump is operated by moving the AUX POWER handle to "ON SYS 1" or "ON SYS 2."

AILAVATOR CONTROL LINKAGE FAILURE. If the ailavator control linkage is damaged or disconnected (but not jammed), the controls may be operated by the ailavator trim switch on the stick provided that adequate hydraulic pressure is available. This allows restricted controllability of the airplane.

AILAVATOR STICK TRIM SWITCH FAILURE. If the ailavator stick trim switch is disabled, pitch trim may still be achieved by use of the EMERG TRIM switches on the left-hand console.

RUDDER CONTROL SYSTEM.

FAILURE OF RUDDER CONTROL LINKAGE. If the rudder control linkage is damaged or disconnected (but not jammed), limited directional control of the airplane may be obtained through use of the rudder trim switch.

D-C ELECTRICAL SYSTEM EMERGENCY OPERATION.

EXCESSIVE GENERATOR VOLTAGE. If generator voltages are excessively high, move the electrical power control switch to "BAT ONLY" and turn off all nonessential electrical equipment.

Note

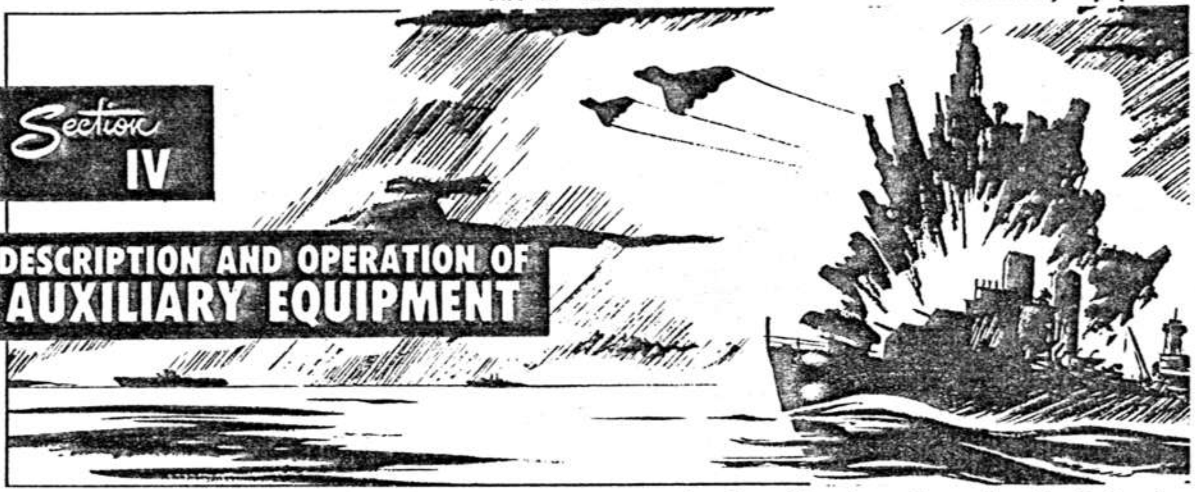
> If the battery becomes weakened by the electrical load, place power control switch in "GEN & BAT" for short periods of time to recharge the battery.

INSUFFICIENT GENERATOR VOLTAGE. If both GEN WARN lights are illuminated during normal flight it indicates that the generators are malfunctioning. This condition cannot be corrected but it can be alleviated by turning all nonessential electrical equipment off and switching the electrical power control switch to "BAT ONLY."

ELECTRICAL CIRCUIT MALFUNCTION. If an electrical circuit is malfunctioning or if a short circuit exists, the applicable circuit breaker should pop out when the current exceeds the breaker rating. If the short circuit was momentary, power to the system may be restored by pushing the circuit breaker in. Do not hold the breaker button in. A breaker button may be pulled out manually if it is necessary to disconnect a branch circuit from the power bus.

A-C ELECTRICAL SYSTEM EMERGENCY OPERATION.

INVERTER FAILURE. The main inverter normally supplies power for all a-c circuits except the IFF radar set. If the inverter warning light comes on, the main inverter has failed. Place the transfer switch in "STDBY." The warning light should go out. If the warning light does not go out, the stand-by inverter has probably failed also. Check the voltmeter with the PHASE SEL switch in each "STDBY" phase position. Return to airport if stand-by inverter has also failed.



AIR-CONDITIONING, DEFOGGING, AND PRESSURIZATION SYSTEM.

GENERAL. *(See figures 4–1 through 4–3.)* The air-conditioning, defogging, and pressurization system, which utilizes compressed air supplied by the engines and ram air from an air intake scoop, accomplishes the following:

a. Controls the temperature of the cabin by refrigerating part of the hot engine air and then mixing the refrigerated air with hot engine air to obtain the desired air temperature.

b. Controls the cabin pressure by varying the area of an air exhaust port to produce the normal and combat pressurization schedules shown in figure 4–2.

c. Defogs the windshield and the windshield side panels by mixing cabin temperature control air with additional hot engine air to obtain the desired defogging air temperature.

d. Cools electrical and electronic equipment with ram air.

e. Provides a means of ventilating the cabin with ram air when the main system is malfunctioning, when smoke or fumes are admitted with conditioned air, or when fog is produced which cannot be dissipated by increasing the air temperature.

Note

When on ram air ventilation, the cockpit cannot be pressurized or heated, nor can the windshield be defogged with hot engine air.

f. Provides hot engine air for gun bay heat and for the operation of the canopy seal, the nose wheel prerotation system, the turn-and-bank indicator, and the antiblackout system.

AIR-CONDITIONING SYSTEM CONTROL SWITCH. The air-conditioning system control switch (figure 4–1) is located on the right-hand console. Placing the switch in "CONTR" closes the cabin pressure dump valve and opens the engine bleed air valve to allow hot engine air to flow through the system. Placing the switch in "OFF" opens the dump valve to depressurize the cabin, closes the engine bleed air valve to stop the flow of hot engine air, and opens the ram air valve to allow ram air to ventilate the cabin.

CABIN AIR TEMPERATURE CONTROL SWITCH. The cabin air temperature control switch (figure 4–1) is located on the right-hand console. It has three positions: neutral, "HOT," and "COLD." The normal position of this switch is neutral. Momentarily holding this switch in "HOT" or "COLD" increases or decreases cabin air temperature as required.

CABIN AIR OVERRIDE CUTOUT SWITCH. The cabin air override cutout switch (figure 4–1) is located on the right-hand console. Placing the switch in "NORMAL" actuates a safety override circuit to keep

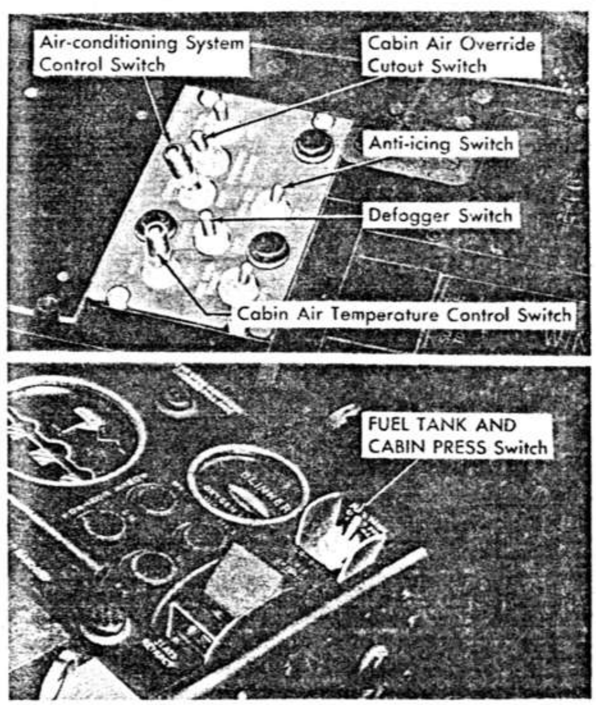


Figure 4–1. Cockpit Air Controls

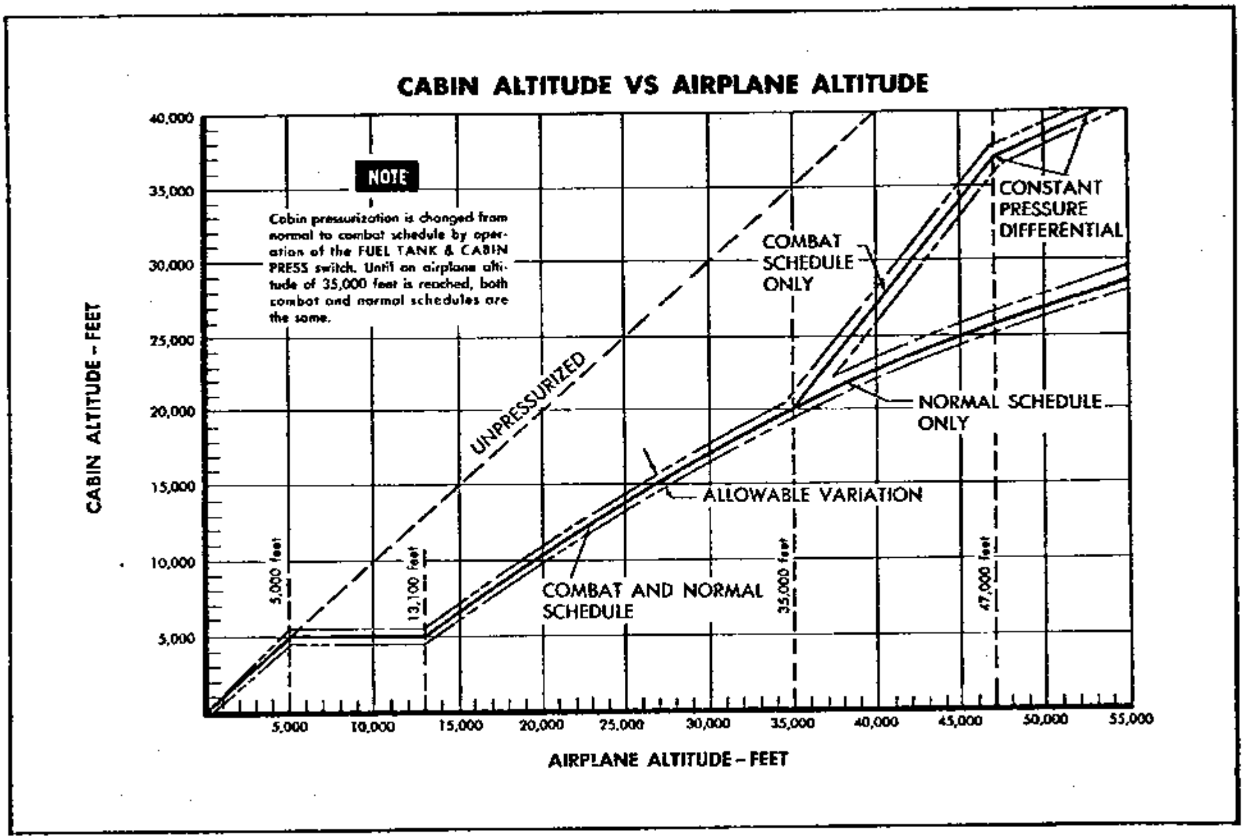


Figure 4–2. Pressurization Schedule

cabin temperature within a comfortable range. Placing the switch in "OVERRIDE CUTOUT" removes the safety temperature control feature and leaves control of temperature entirely to the pilot.

DEFOGGER SWITCH. The defogger switch (figure 4–1) is located on the right-hand console. The switch has three positions: "DEFOG" (momentary), neutral, and "OFF." Placing the switch in "DEFOG" increases the temperature of the defogger air by opening a defogger valve in the hot engine air line. When the switch is released, it returns to neutral and the air valve retains the degree of opening selected. Placing the switch in "OFF" closes the valve, shutting off all hot engine air to the defogger duct.

Note

> Defogging air should be brought up to the required temperature gradually by operating the switch for intervals of about 1 second each until the windshield begins to clear.

FUEL TANK AND CABIN PRESSURIZATION SWITCH. The FUEL TANK AND CABIN PRESS switch (figure 4–1) is located on the left-hand console. During routine flight conditions, it is placed in "NORMAL" and cabin pressurization follows the normal schedule shown in figure 4–2. Placing the switch in "COMBAT" switches cabin pressurization over to the combat schedule shown in figure 4–2 and dumps the fuel cell vent system pressure.

NORMAL OPERATION.

- CANOPY control switch .... "CLOSE"
- FUEL TANK AND CABIN PRESS switch .... "NORMAL"
- Air-conditioning system control switch...."CONTR"
- Cabin air temperature control switch........................neutral (momentarily to "HOT" or "COLD" as desired)
- Cabin air override cutout switch........"NORMAL"
- Defogger switch ....Neutral (momentarily to "DEFOG" as desired)

During flight, the cabin air temperature control switch and the defogger switch may have to be used to adjust the cabin air and the defogger air to the desired temperatures.

Note

> The air-conditioning system may produce fog in the cabin on days with rain or high humidity. If this fog cannot be stopped by increasing cabin air temperature, immediately put the air-conditioning system control switch in "OFF" position.

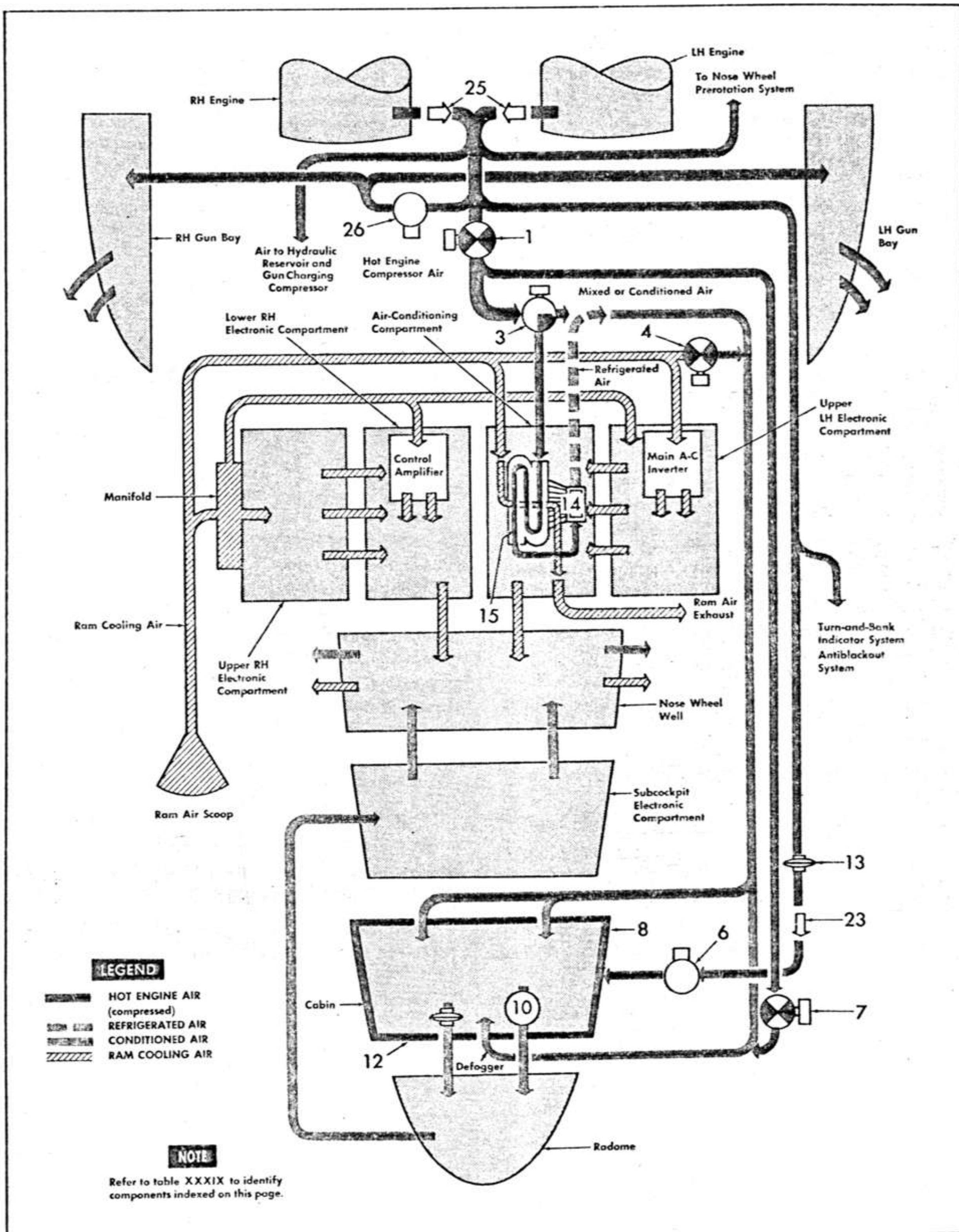


Figure 4–3. Air-Conditioning, Defogging, and Pressurization System Schematic Diagram

COMBAT OPERATION.

FUEL TANK AND CABIN PRESS switch .... "COMBAT"

EMERGENCY OPERATION. To obtain emergency ram air ventilation of the cockpit, proceed as follows:

Cockpit air control switch .... "OFF"

If the cabin air temperature becomes too high or too low with the cabin air override cutout switch in "NORMAL," proceed as follows:

Cabin air override cutout switch .... "OVERRIDE CUTOUT"

Cabin air temperature control switch .... Momentarily to "HOT" or "COLD" as desired

Note

Under this condition the pilot has sole control over cabin air temperature and regulates it by means of the cabin air temperature control switch.

ANTI-ICING SYSTEM.

GENERAL. The anti-icing system prevents the formation of ice on the pitot tube and the probes of the two air stream direction detectors (angle-of-attack and flight stabilization systems). Electrical power for the circuit comes from the secondary bus and the circuit is protected by a circuit breaker on the right-hand console. The heating elements for the two air stream direction detector probes are de-energized when the airplane is on the ground.

ANTI-ICING SWITCH. The anti-icing switch (figure 4–1) is located on the right-hand console. When the switch is placed in "ANTI-ICE" the circuit is energized.

COMMUNICATION AND ASSOCIATED ELECTRONIC EQUIPMENT.

The airplane is equipped with the electronic equipment listed in the table below.

RADIO SET AN/ARC-27.

GENERAL. With this equipment two-way radio telephone communication on any one of 1,750 frequencies between 225.0 and 399.9 mc are possible. Any eighteen of these frequencies may be preset for remote selection. Constant monitoring of a guard frequency is provided. The radio set control is also used for control of the AN/ARA-25 equipment (ADF Homing). All the controls for the equipment are located on the forward part of the right-hand console. Electrical power for the AN/ARC-27 radio set comes from the secondary bus and the circuit is protected by a circuit breaker on the right-hand console.

FUNCTION SWITCH. The function switch (figure 4–5) has four positions as follows:

"OFF" .... Transmitter-receiver and ADF off

"T/R" .... Transmitter on (in stand-by), main receiver on, ADF in stand-by

"T/R + 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

CHANNEL SELECTOR SWITCH. The CHANNEL selector switch (figure 4–5) permits selection of any one of eighteen preset frequencies.

AUDIO VOLUME CONTROL. The audio VOLUME control (figure 4–5) adjusts the amplitude of the audio signals delivered to the headset circuit.

MICROPHONE BUTTON. The microphone button (figure 4–5) is located on the right-hand engine throttle and is depressed for transmission.

NORMAL OPERATION.

Function switch .... "T/R"

Note

Allow 1-minute warm-up time.

COMMUNICATION AND ASSOCIATED ELECTRONIC EQUIPMENT

Type	*Designation*	*Function*	*Range*	*Fig. No.*	*Remarks*
UHF Radio Communication	AN/ARC-27	Two-way radio telephone communication	Line of sight	4–5	Frequency range 225.0 to 399.9 megacycles
ADF Homing Radio (Air-to-air)	AN/ARA-25	Provides indication of relative direction of arrival of r-f signals	Line of sight		Used in conjunction with AN/ARC-27 and ID-250/ARN indicator
Radio Navigation	AN/ARN-6	1. Homing compass 2. Position finding (automatic or aural-null) 3. Radio receiver (antenna or loop)	Variable	4–6	Frequency range 100 to 1,750 kilocycles
Radio Receiver	AN/ARR-2A	Homing navigation	Line of sight	4–7	Frequency range 234 to 259 megacycles
Radar Identification (IFF)	AN/APX-6	Enables airplane to identify itself automatically as friendly when challenged by interrogating station	Line of sight	4–8	
Radar-Range	AN/APG-30	Provides automatic and continuous range to a range servo for operation of the gunsight	200 to 800 yards		Discussed under AERO 5A FIRE CONTROL SYSTEM

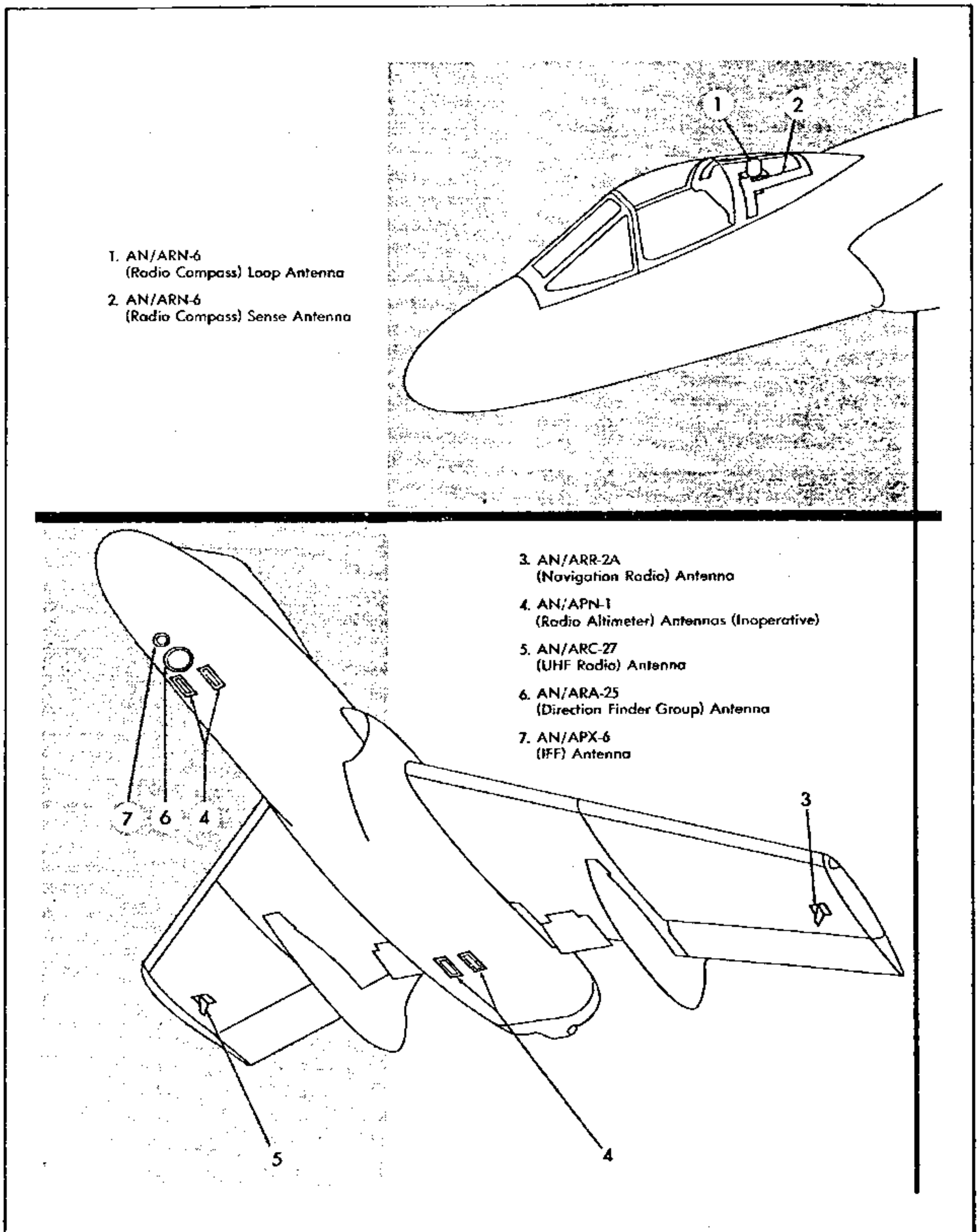


Figure 4–4. Antenna Locations

Function switch........"T/R+G REC"
CHANNEL selector switch........Desired preset channel

Note

If reception or transmission on a particular channel fails, try other channels.

To operate on guard frequency:
Function switch........"T/R"
CHANNEL selector switch........"G"

To stop the equipment:
Function switch........"OFF"

DIRECTION FINDER (ADF) GROUP AN/ARA-25.

GENERAL. This equipment provides a continuous indication of the relative direction of arrival of r-f signals (A-A Homing). The equipment must be used with the AN/ARC-27 radio set. It is operated entirely from the AN/ARC-27 controls (figure 4–5). The continuous indication is given on pointer No. "1" of the radio-magnetic indicator (figure 4–6) which serves also as an indicator for the G-2 compass system and the AN/ARN-6 radio compass.

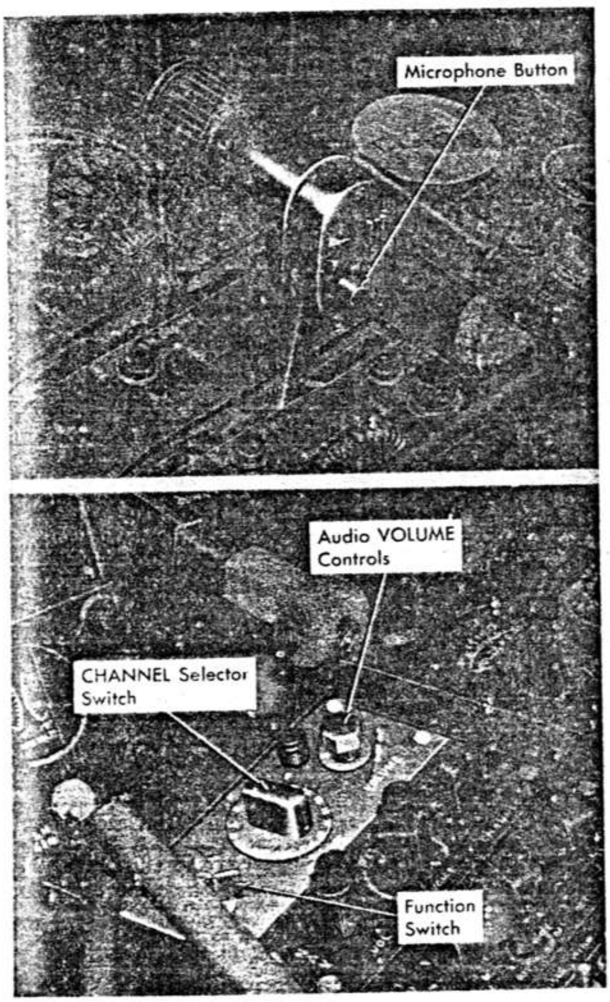


Figure 4–5. AN/ARC-27 Controls

NORMAL OPERATION. For stand-by operation:
AN/ARC-27 function switch........"T/R" or "T/R+G REC"

To start equipment:
Function switch........"ADF"

To stop equipment:
Function switch........"OFF"

RADIO COMPASS AN/ARN-6.

GENERAL. The radio compass equipment can be used as a homing compass for position finding or as a radio receiver. Electrical power for the equipment comes from the secondary bus and the circuit is protected by a circuit breaker on the right-hand console.

CONTROLS. The controls for the radio compass are shown in figure 4–6.

RADIO-MAGNETIC INDICATOR. The radio-magnetic indicator (figure 4–6) is used for three systems. The dial rotates for G-2 compass indications, the pointer marked "1" is used for AN/ARA-25 homing indications, and the pointer marked "2" is used with the radio compass AN/ARN-6.

NORMAL OPERATION. To operate the equipment as a homing compass, proceed as follows:
Function switch........"ANT"
Band switch........Desired frequency band
Tuning crank........Desired station frequency. Tune for maximum swing of tuning meter.
Function switch........"COMP"

Note

Greater accuracy in tuning may be obtained by placing the CW-VOICE switch in "CW." After tuning, return switch to "VOICE."

AUDIO control........Desired headset level. Make sure correct station is being received.

The equipment may be operated as an automatic indicating position finder or as an aural-null position finder. To set up for automatic operation, set the function switch to "COMP" and then tune in to the three selected stations. To set up for aural-null operation, set the function switch to "LOOP" and then tune in to the desired stations.

The equipment may be operated as a radio receiver using antenna reception or loop reception. To operate as a receiver on antenna, proceed as follows:
Function switch........"ANT"
Band switch........Desired frequency band
TUNING crank........Desired station
AUDIO control........Desired headset volume

To operate as a receiver on loop, proceed as follows:
Function switch........"LOOP"

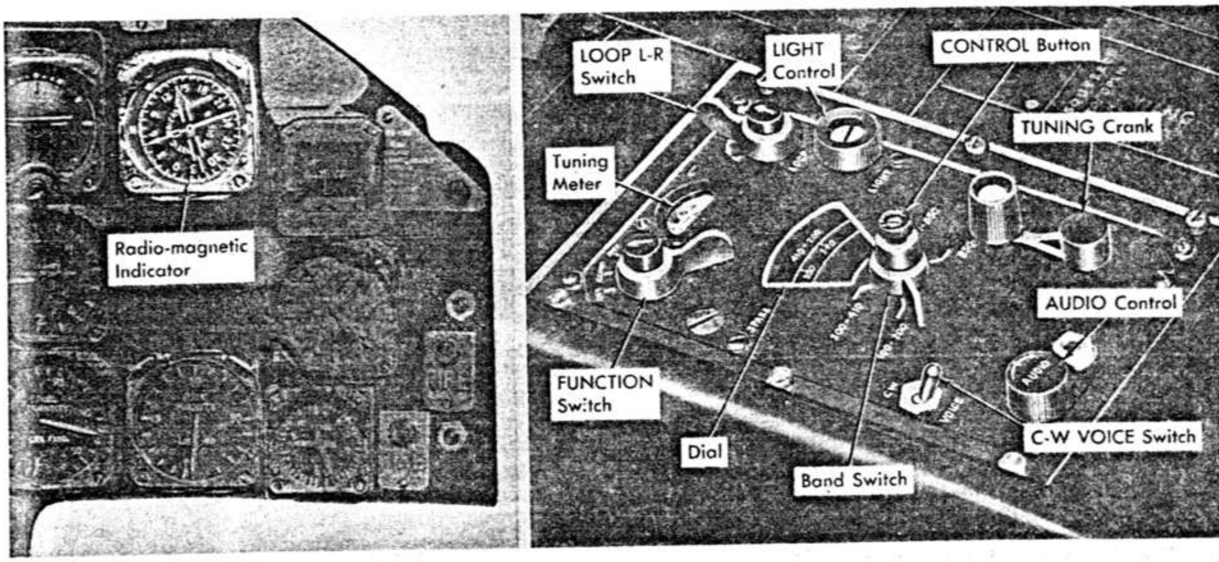


Figure 4–6. Radio Compass AN/ARN-6 Controls

Band switch............Desired frequency band
CW-VOICE switch............"CW" if station is unmodulated
TUNING crank............Desired station
LOOP L-R switch............Rotate loop until maximum signal is obtained
AUDIO control............Desired headset volume

To stop the equipment:
Function switch............"OFF"

RADIO RECEIVER AN/ARR-2A.

GENERAL. This equipment is provided for remote control operation only. All necessary controls for complete operation on any one of the six channels are located on the control unit on the right-hand console.

NAV-VOICE-PITCH CONTROL. The NAV-VOICE-PITCH control (figure 4–7) is the main control for the equipment. When the control is in "NAV," the beat note oscillator functions and a navigation signal is heard. The "PITCH" range is for varying the pitch or tone of the observed navigation signal. The "VOICE" position is not used for navigating. If "VOICE" is to be used, instructions will ordinarily be given prior to take-off.

CHANNEL SELECTOR. The CHANNEL selector (figure 4–7) is used for selecting any one of the six channels.

VOLUME CONTROL. The VOL control (figure 4–7) limits the audio output to a comfortable level.

NORMAL OPERATION.

CHANNEL control............Desired channel
NAV-VOICE-PITCH control............"NAV"
VOL control............Turn clockwise (slowly) until noise or signals of moderate strength are heard
NAV-VOICE-PITCH control............Adjust "PITCH" for a clear tone
VOL control............Turn counterclockwise until only the desired signal is obtained

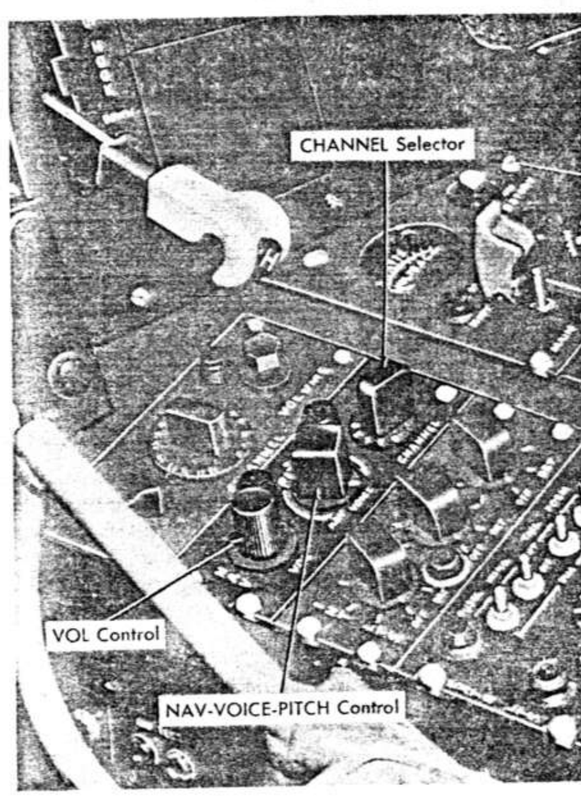


Figure 4 7. AN/ARR-2A Controls

RADAR IDENTIFICATION SET AN/APX-6.

GENERAL. The AN/APX-6 radar identification set is an airborne transpondor and is one of several equipments which may be operated together to provide a system of electronic identification and recognition. The purposes of the equipment are:

a. To identify the airplane in which it is installed as friendly when correctly challenged by an interrogator-responsor associated with friendly shore, shipboard, and airborne radars.

b. To permit surface tracking and control of aircraft in which it is installed.

Functionally the AN/APX-6 receives challenges which are initiated by an interrogator-responsor and transmits replies back to the interrogator-responsor where the replies are displayed along with the associated radar targets, on the radar indicators. When a radar target is accompanied by a proper IFF reply, as transmitted by the AN/APX-6, that target is considered friendly.

MASTER SWITCH. The MASTER switch (figure 4–8) is located on the right-hand console. It is a five-position rotary switch and permits selection of operational characteristics as follows:

"OFF" — In this position, the equipment is in the secured condition and no primary power is applied to it.

WARNING

Regardless of the setting of the MASTER switch, destructors will be fired if the DESTRUCT switch is turned on or if the impact switch is tripped.

"STDBY" — All primary power is turned on and tubes are heated and ready for immediate operation, but 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 nearby interrogations.

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

"EMERGENCY" — In this position, the receiver is operated at full sensitivity and four-pulse emergency replies are transmitted when any mode of interrogation is received, regardless of the settings of the MODE 2 and MODE 3 controls.

Note

To prevent accidental switching of the AN/APX-6 into emergency operation, a push-button guard is located immediately adjacent to the MASTER switch.

MODE 2 SWITCH. The MODE 2 switch (figure 4–8) is located on the right-hand console. It has three positions and permits activating of the Mode 2 features of the AN/APX-6 as follows:

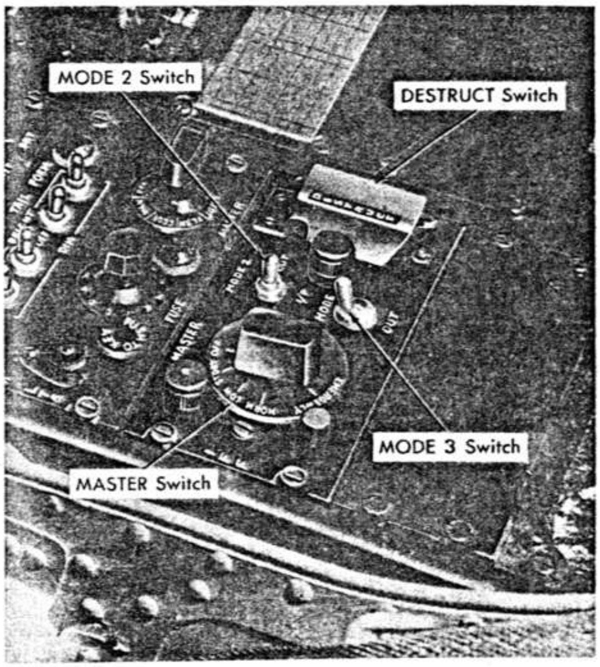


Figure 4–8. IFF Controls

"OUT" — Equipment will transmit normal Mode 1 replies to Mode 1 interrogations.

"MODE 2" — Equipment will provide normal Mode 1 operation and will transmit normal Mode 2 replies to Mode 2 interrogations.

"I/P" — Equipment will transmit normal Mode 2 replies to Mode 2 interrogations whenever the AN/ARC-27 radio transmitter is operated.

MODE 3 SWITCH. The MODE 3 switch (figure 4–8) is located on the right-hand console. It has two positions and energizes the Mode 3 features of the AN/APX-6 as follows:

"OUT" — Equipment will provide normal Mode 1 operation and normal Mode 2 operation (if MODE 2 control is so positioned).

"MODE 3" — Equipment will provide normal Mode 1 operation, normal Mode 2 operation (if MODE 2 control is so positioned) and will transmit normal Mode 3 replies to Mode 3 interrogations.

DESTRUCT SWITCH. The DESTRUCT switch (figure 4–8) is located on the right-hand console. It is a two-position guarded switch and when placed in "ON" energizes the destruct circuit.

Note

The impact switch when actuated will energize the destruct circuit regardless of the position of the DESTRUCT switch.

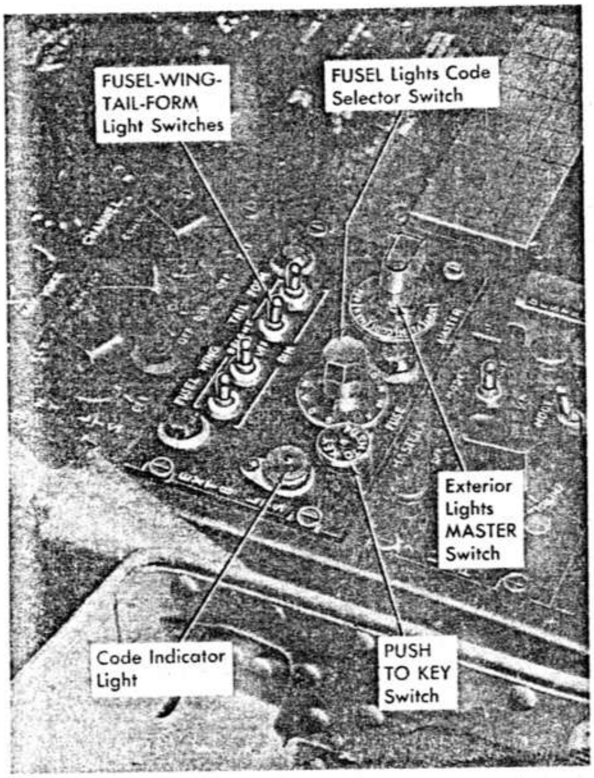


Figure 4–9. Exterior Light Controls

NORMAL OPERATION. To place the AN/APX-6 equipment in operation, proceed as follows unless instructed otherwise:

MASTER switch .... "NORM"
MODE 2 switch .... "OUT"
MODE 3 switch .... "OUT"

To discontinue operation, turn MASTER switch "OFF."

EMERGENCY OPERATION.
MASTER switch .... "EMERGENCY"

DESTRUCT OPERATION.
DESTRUCT switch .... "ON"

EXTERIOR LIGHTS SYSTEM.

GENERAL. The exterior lights provided on the airplane are as follows:

Fuselage position lights (two) — White lights, one on top of fuselage and one on bottom of fuselage.

Wing position lights (two) — Red on left-hand wing tip; green on right-hand wing tip.

Tail position lights (four) — White and yellow grouped on each side of tail cone.

Formation lights (two) — Lunar white, one on underside of each wing outer panel.

Approach light — Red, amber, and green filters change color of lights for nose-down, normal, and nose-high airplane attitudes. Used to give airplane attitude indications to landing signal officer. Approach light is installed on left main gear fairing.

The approach light, in addition to providing a color indication of airplane attitude, will indicate the position of the main and nose gear and the arresting gear to the landing signal officer as follows:

Light off — Main and nose gear not down and locked.

Light flashing — Main and nose gear down and locked; arresting gear not down.

Light on — Main and nose gear down and locked; arresting gear down.

Note

For field practicing of carrier landings at night, the flashing feature of the approach light can be disengaged by pressing the approach light push-button switch on the d-c power panel in the nose wheel well.

EXTERIOR LIGHTS MASTER SWITCH. The exterior lights MASTER switch (figure 4–9) is located on the right-hand console. It is a five-position rotary switch and controls the mode of operation of the lights as follows:

"OFF" — Shuts off electrical power from exterior lights circuit.

"MAN" — Connects electrical power to the WING, TAIL, and FORM light toggle switches, and connects the PUSH TO KEY switch into the fuselage lights circuit so that when the FUSEL toggle switch is actuated, the two fuselage lights can be controlled manually by the PUSH TO KEY switch.

"CODE" — Connects electrical power to the WING, TAIL, and FORM light toggle switches, and connects the flasher coder into the fuselage lights circuit so that when the FUSEL toggle switch is actuated, the two fuselage lights continuously flash the code letter selected by the FUSEL code selector switch.

"FLSH" — Connects electrical power to the FORM light toggle switch and connects the flasher coder into the wing, tail, and fuselage light circuits so that when their respective toggle switches are actuated, the lights will flash. (The wing tip and the white tail lights will flash off and on alternately with the yellow tail lights and the fuselage lights.)

"STDY" — Connects electrical power to the FUSEL, WING, TAIL, and FORM light toggle switches. The lights will burn steadily when their respective switches are actuated.

Note

The approach light is illuminated whenever the MASTER switch is in a position other than "OFF."

FUSEL, WING, TAIL, AND FORM LIGHT SWITCHES. These four toggle switches (figure 4–10)

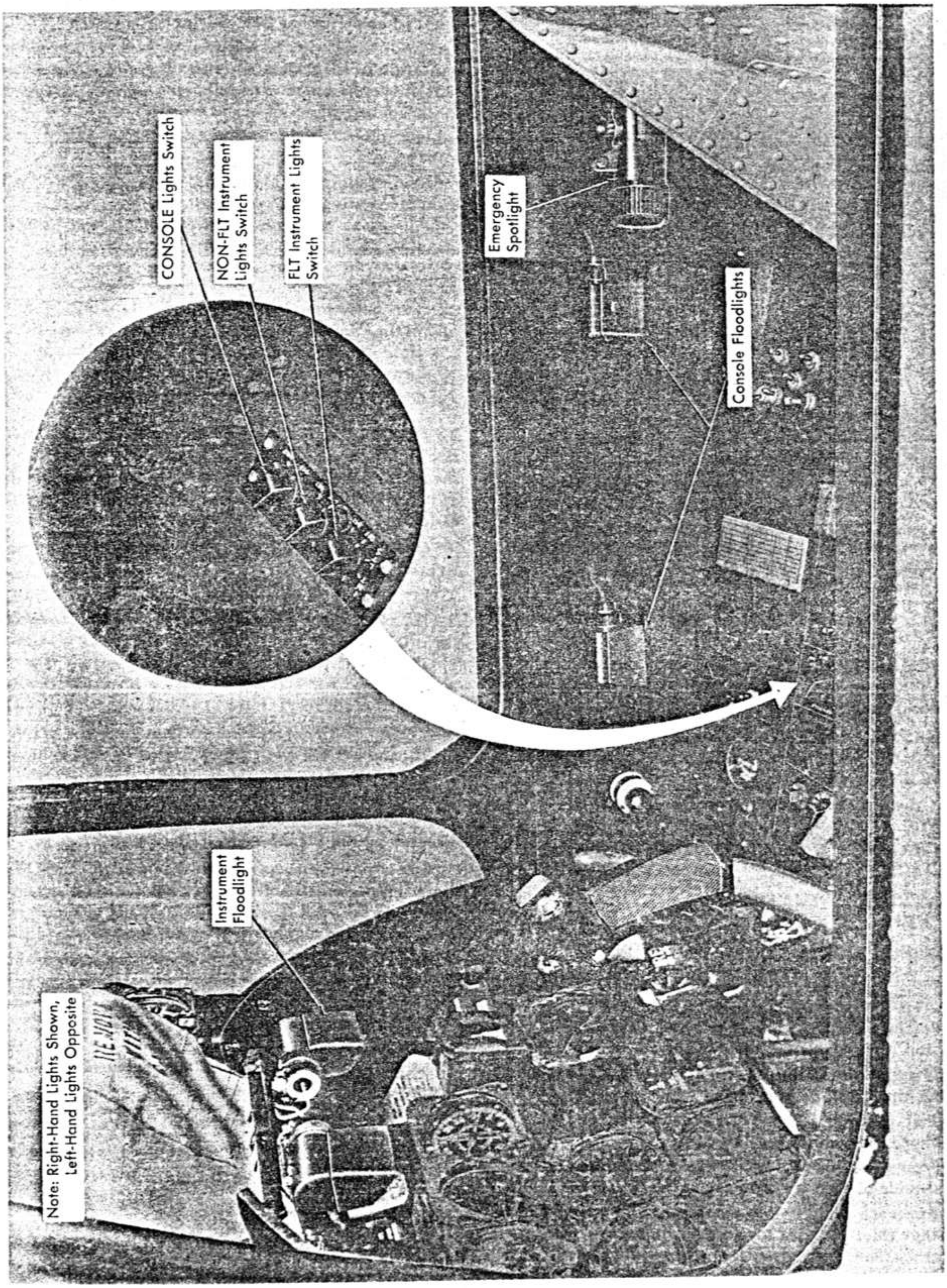


Figure 4–10. Interior Light Controls

are located on the right-hand console. The switches are labeled and are used to turn on and control the intensity of their respective lights. All four switches have positions for "OFF," "BRIGHT," and "DIM."

FUSEL LIGHTS CODE SELECTOR SWITCH. The FUSEL lights code selector switch (figure 4–9) is located on the right-hand console. It is used to select the letter to be blinked in Morse code by the upper and lower fuselage lights. There are 12 code letters that can be selected: "A," "D," "G," "I," "K," "M," "N," "O," "R," "S," "U," and "W."

PUSH TO KEY SWITCH. The PUSH TO KEY switch (figure 4–9) is used to operate manually the upper and lower fuselage lights in sending out coded signals.

CODE INDICATOR LIGHT. The red code indicator light (figure 4–9) blinks the code signals being transmitted to the fuselage lights by the PUSH TO KEY switch.

NORMAL OPERATION.

MASTER switch ....."FLSH" or "STDY" as required
FUSEL, WING, and TAIL
light switches ...."BRIGHT" or "DIM" as required

INTERIOR LIGHTS.

GENERAL. Electrical power for the interior lights is supplied by 115-volt 400-cycle C-phase alternating current from the main inverter. The voltage is reduced to 28 volts by a transformer. The circuit is protected by a circuit breaker in the nose wheel well and by fuses on the right-hand console. Spare lamps are provided on the instrument board and left-hand console for use in flight.

FLIGHT INSTRUMENT LIGHTS SWITCH. The FLT instrument lights switch (figure 4–10) turns on and controls the brightness of all flight instrument lights. The flight instruments are:

Radio-Magnetic Indicator
Airspeed Indicator
Gyro Horizon Indicator
Radio Altimeter
Turn-and-Bank Indicator
Angle-of-Attack Indicator
G-2 Compass Indicator
Altimeter
Rate-of-Climb Indicator
Exhaust Temperature Indicator

The FLT instrument lights switch also controls the intensity of the automatically dimmed warning lights.

Note

When the FLT instrument lights switch is on, the INT LTS panel lights are turned on and their intensity is controlled by the rotation of the switch.

NONFLIGHT INSTRUMENT LIGHTS SWITCH. The NON-FLT instrument lights switch (figure 4–10) turns on and controls the brightness of all nonflight instrument lights. The nonflight instruments are:

Tachometer Indicators
Oil Temperature Indicator
Fuel Pressure Indicator
Oil Pressure Indicator
Clock
Stand-by Compass
Cabin Pressure Altitude Indicator
Fuel Quantity Indicators

The NON-FLT instrument lights switch also controls the TAKE-OFF and LANDING check list panel lights.

CONSOLE LIGHTS SWITCH. The CONSOLE lights switch (figure 4–10) turns on and controls the brightness of the four red console floodlights (figure 4–10) and the cockpit panel edge lights. Turning on the CONSOLE switch connects power from the d-c instrument bus to the INT LTS panel lights but the lights are not dimmed by rotation of the switch.

EMERGENCY SPOTLIGHTS. Emergency spotlights (figure 4–10), located on each side of the cockpit, receive power from the primary bus and their circuit is protected by a circuit breaker on the right-hand console. The spotlights, which are removable for use as flashlights, are controlled by a built-in switch.

EMERGENCY CONSOLE AND INSTRUMENT FLOODLIGHTS. The emergency console and instrument floodlights (figure 4–10) are lighted when the main inverter fails. Electrical power for the circuit comes from the primary bus and the circuit is protected by a circuit breaker on the right-hand console.

OXYGEN SYSTEM.

GENERAL. The oxygen system consists of a cylinder with a capacity of 514 cubic inches, an automatic positive-pressure diluter-demand regulator, and a repeater oxygen flow indicator. Oxygen controls and indicator are grouped on the left-hand console outboard of the throttle quadrant. Flexible tubing connects the outlet side of the regulator to the quick-disconnect assembly fitting on the left-hand console. The oxygen passage in the quick-disconnect assembly is connected to the tube of the oxygen mask. An oxygen refill check valve permits replenishment of the system supply and an automatic self-opening oxygen cylinder valve permits replacement of a partially exhausted cylinder if the refilling provisions are not used. The type A-13A pressure-breathing mask shall be used.

The oxygen regulator supplies an air-oxygen mixture to the pilot on demand (inhalation by the pilot) until a cabin pressure altitude of approximately 30,000 feet is reached. The proportion of oxygen to air increases as the altitude increases. At cabin pressure altitudes of approximately 30,000 feet to 43,000 feet (the ceiling of the equipment), the automatic positive-pressure mechanism in the regulator supplies a continuous flow of pure oxygen to the mask. The pressure of the oxygen flow increases as the altitude increases.

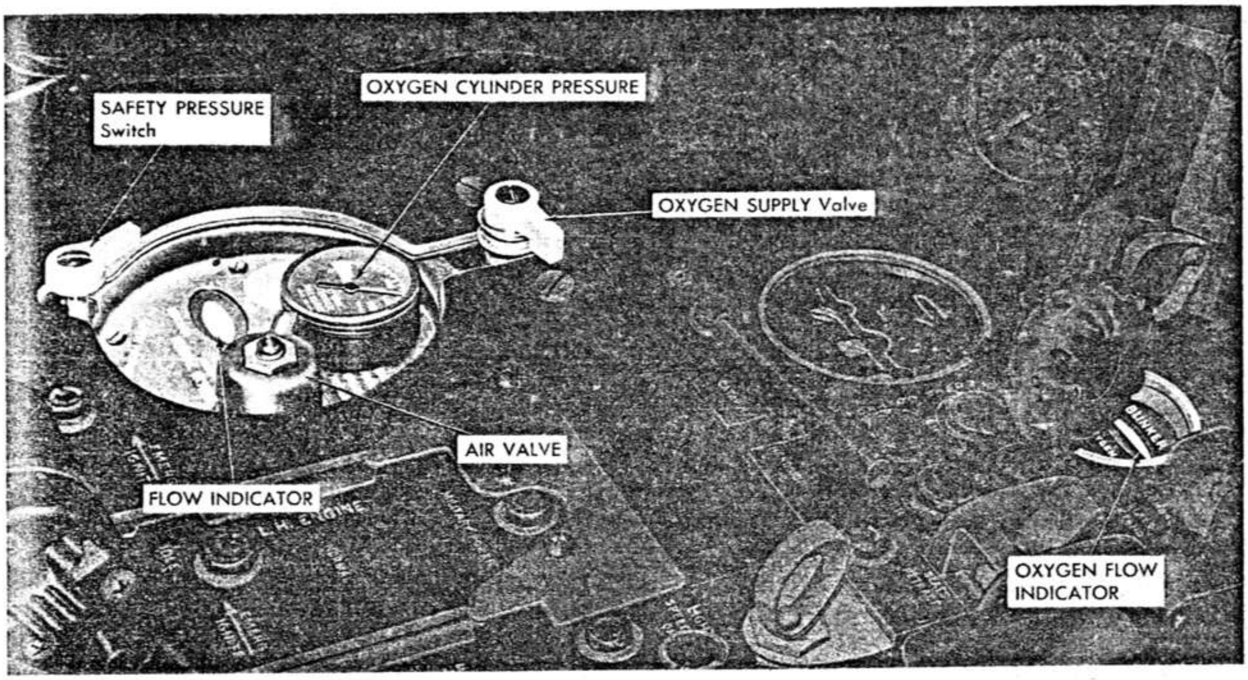


Figure 4–11. Oxygen Controls

The table below shows the duration of the oxygen supply at different altitudes and cylinder pressures. Use of the system for other than normal purposes will shorten the times shown proportionately.

OXYGEN CONSUMPTION DATA

Approx Cyl Press (Psi)	*Hours of Oxygen — One Man — Air Valve "NORMAL OXYGEN"*							
	Altitude in Feet							
	5,000	*10,000*	*15,000*	*20,000*	*25,000*	*30.000*	*35,000*	*40,000*
1,800	7.5	9.0	8.5	6.9	4.1	3.1	4.2	4.2
1,500	6.0	7.5	6.7	5.5	3.2	2.4	3.3	3.3
1,200	4.5	5.4	5.1	4.1	2.4	1.8	2.5	2.5
900	3.0	3.6	3.4	2.7	1.6	1.2	1.6	1.6
600	1.5	1.8	1.7	1.3	0.8	0.6	0.8	0.8
300	Descend below 10,000 feet							
One 514-Cu-In. Cylinder — Automatic Positive-Pressure Diluter-Demand Regulator								

OXYGEN SUPPLY VALVE. The OXYGEN SUPPLY valve (figure 4–11) is located on the forward part of the regulator and acts as a shutoff valve between the oxygen cylinder and the regulator. The valve should be turned "ON" during the preflight oxygen check and turned off at the end of the flight. The position of the OXYGEN SUPPLY valve does not affect the reading of the OXYGEN CYLINDER PRESSURE gage.

AIR VALVE CONTROL. The air valve control (figure 4–11) is located in the center of the regulator. When the control is turned to the "NORMAL OXYGEN" position, it controls the air-oxygen mixture ratio which supplies the pilot with an air-oxygen mixture up to a cabin pressure altitude of 30,000 feet and pure oxygen at higher altitudes. When the control is turned to the "100% OXYGEN" position, the air supply is cut off and pure oxygen is supplied to the pilot regardless of the altitude. Oxygen flow is indicated by the blinking of the flow indicators (figure 4–11).

Note

The second flow indicator was added to provide the pilot with a more easily seen indicator.

SAFETY PRESSURE SWITCH. The SAFETY PRESSURE switch (figure 4–11), located on the aft part of the regulator, is normally in the "OFF" position. When the switch is in the "ON" position, a pressure of 1¾ (±¼) inches of water is built up inside the regulator. A steady stream of oxygen will be supplied to the pilot until the required internal regulator pressure is obtained; thereafter, enough oxygen will flow to the pilot (in addition to that demanded by inhalation) to maintain the required pressure. The pressure built up in the regulator increases the pressure inside the mask and prevents inboard leakage at the mask. The SAFETY PRESSURE switch does not function above 30,000-foot cabin pressure altitude since the automatic pressure breathing mechanism automatically increases the internal regulator pressure and supplies a steady stream of oxygen to the pilot at altitudes above 30,000 feet.

PREFLIGHT INSTRUCTIONS. Oxygen shall be used during all day flights at altitudes over 10,000 feet. Oxygen shall be used constantly during night, combat, and simulated combat flights when above 5,000 feet. The following procedures should be closely followed before any flight during which it is expected that oxygen will be used.

OXYGEN CYLINDER PRESSURE gage............1800 (±50) psi
Oxygen mask............In place

Note

Test mask for leakage by placing hand over hose coupling and inhaling. The mask should be drawn tightly against the face and definite resistance to inhalation should be experienced.

OXYGEN SUPPLY valve............"ON"
Mask hose coupling............Inserted in upper disconnect of quick-disconnect assembly.
Air valve............"NORMAL OXYGEN" — "100% OXYGEN"

Note

Take several deep breaths with air valve in each position. No resistance to breathing should be experienced. Check functioning of flow indicators when air valve is in "100% OXYGEN" position; blinkers should open and close with inhalation and exhalation.

SAFETY PRESSURE switch............"ON"
(Oxygen should flow to mask and pressurize it slightly)

SAFETY PRESSURE switch............"OFF"
Air valve control............"NORMAL OXYGEN"

Note

Attach the oxygen breathing tube clip to the nearest strap of the shoulder harness so that free head movement is possible without stretching the mask tube.

FLIGHT INSTRUCTIONS. When oxygen is being used, frequently check the following:

OXYGEN CYLINDER PRESSURE gage; refer to oxygen consumption data table.
FLOW INDICATOR
Mask fit
Engagement of disconnect coupling

EMERGENCY INSTRUCTIONS. If excessive carbon monoxide or other noxious or irritating gas is present, the air valve should be switched to "100% OXYGEN" regardless of altitude. If symptoms suggestive of anoxia occur, the SAFETY PRESSURE switch should be turned "ON." If for any reason the regulator becomes inoperative in flight, the oxygen bail-out equipment should be activated and descent should be made to below 10,000 feet.

POSTFLIGHT INSTRUCTIONS. At the end of each flight, check to see that the oxygen regulator controls are in the following positions:

OXYGEN SUPPLY valve............Off
Air valve control............"100% OXYGEN"
SAFETY PRESSURE switch............"OFF"

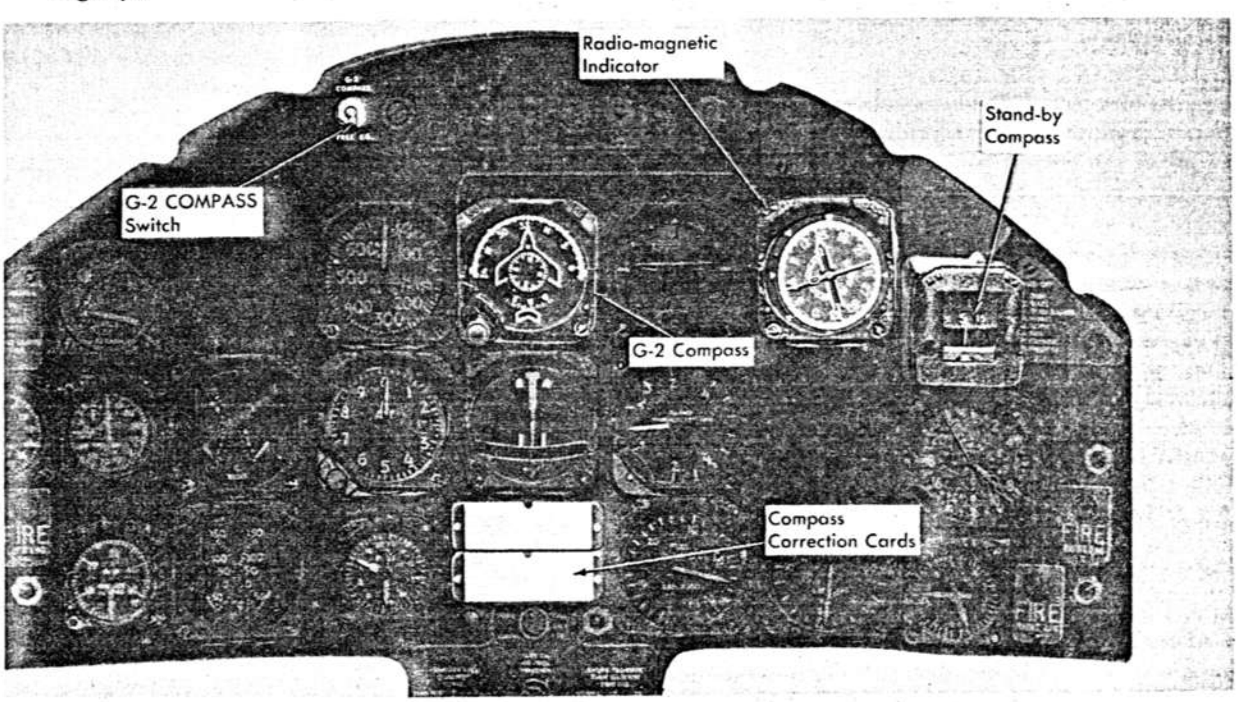


Figure 4–12. Navigation Instruments and Controls

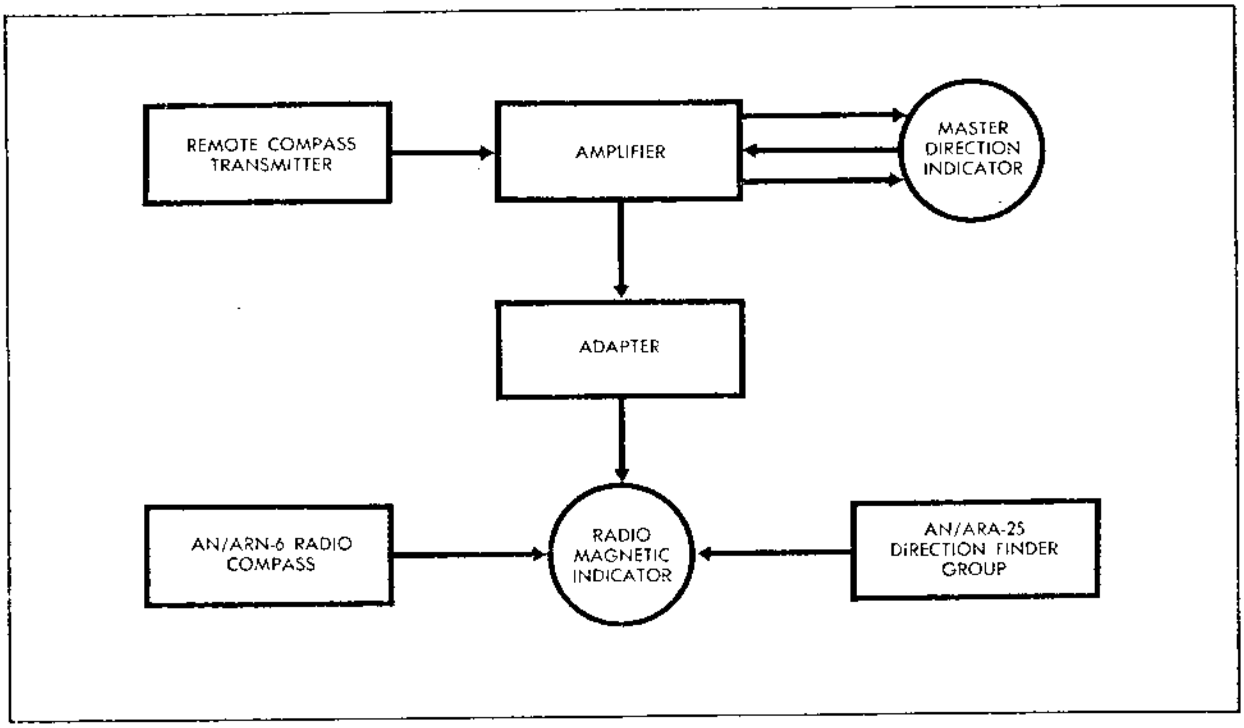


Figure 4–13. Block Diagram — Navigation Equipment

NAVIGATION EQUIPMENT.

GENERAL. Navigation equipment consists of the G-2 compass, the radio-magnetic indicator, and the stand-by compass.

G-2 COMPASS. *(See figure 4–12.)* The G-2 compass consists of a master direction indicator, a remote compass transmitter in the right-hand wing tip, and an amplifier. An adapter is also used to convert the transmitter signals to the type of current necessary for operation of the radio-magnetic indicator. The G-2 compass is essentially a directional gyro which is slaved to a magnetic compass to provide a stabilized directional indication which is at all times accurate to within ± 3 degrees of the compass heading of the airplane. The indicator may also be operated alone as a directional gyro (no slaving action) in magnetically unreliable places such as polar geographical areas or aboard ship. Control of the mode of operation of the unit is accomplished by movement of the G-2 COMPASS switch. When the switch is turned to "G-2 COMPASS," the slaving feature is in operation. If the switch is turned to "FREE D-G," the unit then operates as a conventional directional gyro.

RADIO-MAGNETIC INDICATOR. The radio-magnetic indicator (figure 4–12) combines indications of the ARN-6 radio compass, the ARA-25 direction finder group, and the G-2 compass system's remote compass transmitter to provide all information needed by a pilot to determine magnetic bearings in radio direction finding. The remote compass indications are presented by the movement of the rotating instrument face past an index mark at its top. Indications of the ARA-25 and ARN-6 radio equipments are provided by pointers numbered 1 and 2, respectively.

ARMAMENT SYSTEMS.

GENERAL. The armament systems are the fire control, gunnery, bomb, and rocket systems. All armament systems except the fire control system are controlled by the master armament circuit.

Note

Rocket system information is to be supplied at a later date.

AERO 5A FIRE CONTROL SYSTEM.

GENERAL. The Aero 5A fire control system (figure 4–14) consists of an AN/APG-30 radar system and a MK 6, Mod 0, sight control system interconnected by a range servo unit. The radar system automatically searches, locks on, and tracks a target in range; warns the pilot when tracking; and provides target range signals to operate the sight unit. The sight control system provides lead angle information for precision aiming of guns or rockets. The sight unit may be operated manually as well as automatically.

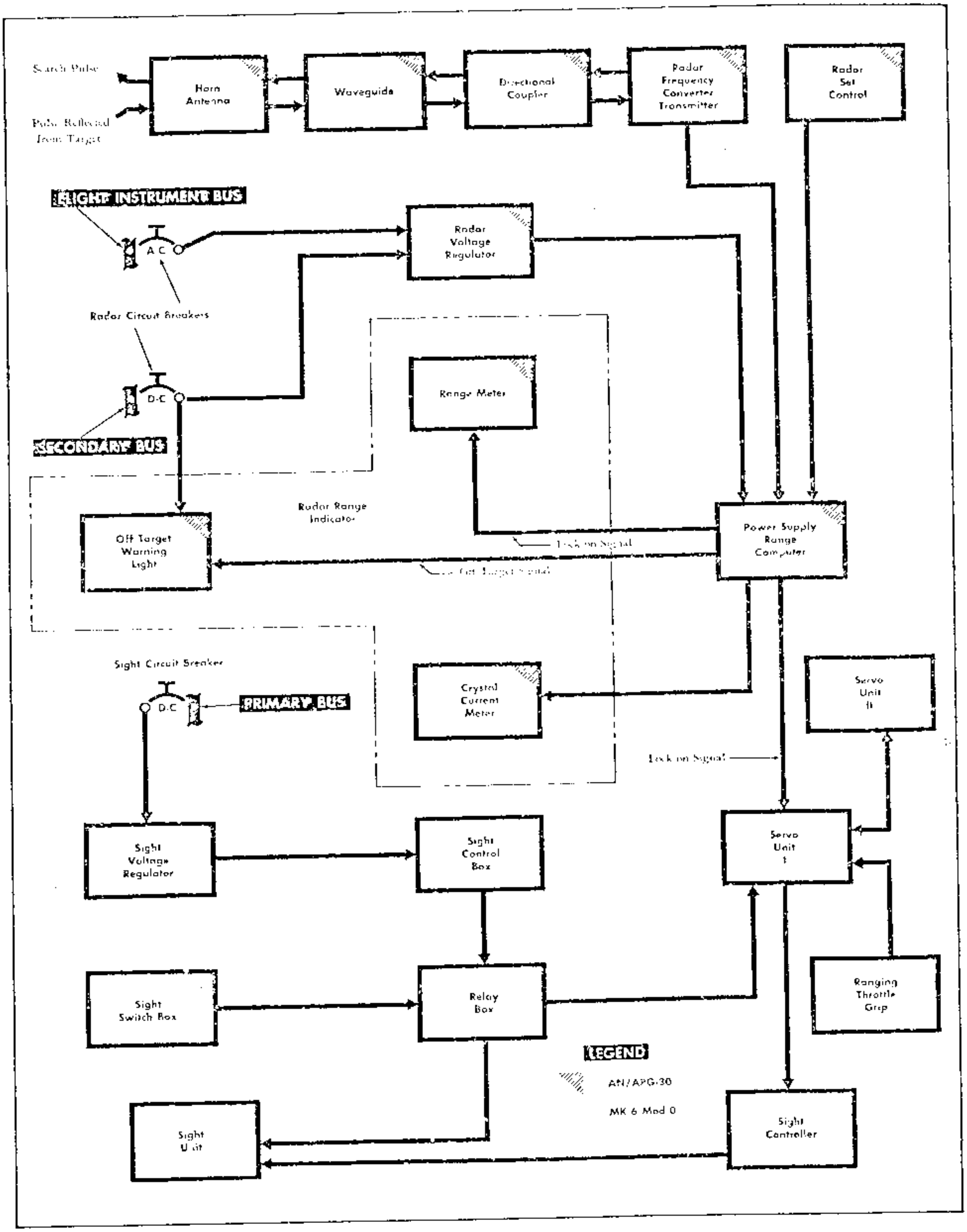


Figure 4--4. Block Diagram--Aero 5A Fire Control System Controls

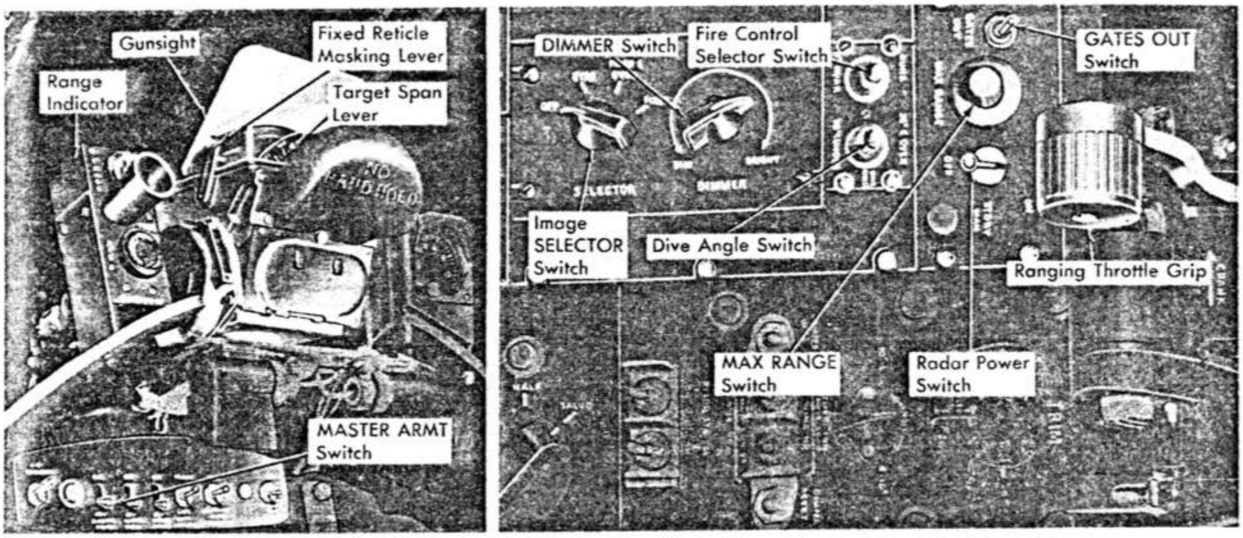


Figure 4-15. Aero 5A Fire Control System Controls

RANGING THROTTLE GRIP. A ranging throttle grip (figure 4–15) is an integral part of the left-hand throttle control lever. During manual operation of the fire control system, the grip electrically controls the range dial and gyro image of the sight unit. When the grip is at maximum range position (clockwise), the sight unit gyro is caged.

TARGET SPAN LEVER. A target span lever (figure 4–15), located on the aft end of the sight unit, varies the diameter of the gyro reticle image. Prior to attack, the lever must be preset to the approximate dimension of the target aircraft to be spanned.

FIXED RETICLE MASKING LEVER. A fixed reticle masking lever (figure 4–15) is located on the left-hand side of the sight unit. Actuation of the lever blanks out the fixed image (except the cross) to simplify the fixed and gyro image pattern.

RANGE INDICATOR. A range indicator unit, consisting of two meters and an indicator light (figure 4–15), is mounted on the instrument cowl on the left-hand side of the sight unit. The light is illuminated except when the radar system is tracking a target. Range and system operating indications are displayed by the meters. Target range is indicated on the range meter only while the system is tracking.

RADAR POWER SWITCH. The radar power switch (figure 4–15) is located on the left-hand console on the radar set control box. Switch positions are "ON," "STDBY MAN," and "OFF." Placing the switch in "STDBY MAN" holds the radar equipment ready for operation while the mechanical range system is used.

MAXIMUM RANGE SWITCH. A MAX RANGE switch (figure 4–15) is located on the left-hand console on the radar set control box. This rotary switch permits adjustment of the maximum range to which range tracking circuits may search when the equipment is not tracking a target.

GATES OUT SWITCH. The GATES OUT switch (figure 4–15) is located on the left-hand console on the radar set control box. Actuation of the switch disconnects the tracking circuit from the present target signal so that the next farther target in range may be automatically acquired.

FIRE CONTROL SELECTOR SWITCH. A fire control selector switch (figure 4–15) is located on the left-hand console on the sight switch box. The switch permits the fire control system to be selected for gun or rocket firing. Switch positions are "GUNS" and "5″ HVAR."

DIVE ANGLE SWITCH. A DIVE ANGLE switch (figure 4–15) is located on the sight switch box on the left-hand console. The switch permits the fire control system to be adjusted to the dive angle for rocket firing. Switch positions are "35° and OVER" and "35° and UNDER."

IMAGE SELECTOR SWITCH. The image SELECTOR switch (figure 4–15) is located on the sight control box on the left-hand console. This rotary switch permits energizing of the sight control system and selects the desired image in the sight unit. Switch positions are "OFF," "GYRO," "FIXED & GYRO," and "FIXED."

DIMMER SWITCH. A DIMMER switch (figure 4–15) is located on the sight control box on the left-hand console. This rotary switch varies the brightness of the gyro and fixed images.

AUTOMATIC GUNSIGHT OPERATION. Automatic operation of the fire control system as a gunsight during flight is accomplished as follows:

Radar power switch .... "STDBY MAN"
Radar power switch (after 3 minutes) ...."ON"

Note

When immediate emergency radar transmission is required or when radar is malfunctioning after warm-up period, the following procedure is recommended: Radar power switch . . . "ON" to "STDBY MAN" to "OFF" to "STDBY MAN" (as rapidly as possible) to "ON." If radar is not transmitting, repeat procedure.

SELECTOR switch .."GYRO" or "FIXED & GYRO"
Fire control selector switch ...."GUNS"
DIMMER switch.............................As desired
Target span lever ....Span of expected target
MAX RANGE switch ....As desired

Note

Proper setting of the MAX RANGE switch varies with altitude of aircraft; adjust so range gates do not lock on ground reflections.

Range indicator light .... On (Light will be off during tracking)

To switch to an alternate target:

GATES OUT switch ....Operate momentarily

AUTOMATIC ROCKET SIGHT OPERATION. Information to be added at a later date.

MANUAL GUNSIGHT OPERATION. Manual operation of the fire control system as a gunsight during flight is accomplished as follows:

Radar power switch ...."STDBY MAN"
SELECTOR switch ."GYRO" or "FIXED & GYRO"
DIMMER switch ....As desired
Fire control selector switch.................."GUNS"
Throttle ranging grip ...Maximum (fully clockwise)
Target span lever .... Span of expected target

After sighting target, proceed as follows:

Throttle ranging grip ......Rotate slightly counterclockwise to uncage gyro, then rotate as needed to keep gyro image diameter equal to target span.

MANUAL ROCKET SIGHT OPERATION. Information to be added at a later date.

GUNNERY SYSTEM.

GENERAL. The gunnery system (figure 4–16) consists of four 20-mm guns which are pneumatically charged and electrically fired at a rate of 1,000 rounds per minute. The system permits simultaneous firing of all guns or firing of only inboard or outboard guns. Approximately 157 rounds of ammunition may be provided for each gun. Engine exhaust air is utilized to heat the gun compartments.

MASTER ARMAMENT SWITCH. The MASTER ARMT switch, (figures 4–17 and 4–18) located at the top of the instrument panel, is a circuit-breaker switch with "ON" and "OFF" positions. It energizes the master armament circuit when in the "ON" position. If the switch is "ON" when the arresting hook handle is placed in "DOWN," the guns are set automatically to the safe position. The MASTER ARMT switch flips off automatically when the landing gear handle is placed in "WHEELS DN." For ground firing of guns, the MASTER ARMT switch must be reset; an armament safety disabling switch in the nose wheel well must be depressed first.

GUN SELECTOR SWITCHES. The INBD and OUTBD gun selector switches (figure 4–17) permit firing of guns in pairs, rather than simultaneously. The switches, located on top of the instrument panel, have "ON" and "OFF" positions.

GUN CHARGING SWITCH. A GUN CHARGING switch (figure 4–17), located on top of the instrument panel, permits charging of the guns. The switch has "SAFE," "OFF," and "READY" positions.

TRIGGER SWITCH. The trigger switch (figure 4–17), located on the forward side of the control stick grip, closes the firing circuit to fire the guns.

GUN CHARGING AND FIRING. To charge and fire guns, proceed as follows:

Note

Guns are inoperative when landing or arresting gear handles are down.

MASTER ARMT switch ...."ON"
INBD and OUTBD GUN selector switches ......"ON"

Note

To fire only one pair of guns, place respective gun selector switch in "ON."

GUN CHARGING switch ....cycle to "SAFE" to "READY"
Trigger switch ....Depress

To fire guns on the ground, depress armament safety disabling switch in nose wheel well and follow above procedure.

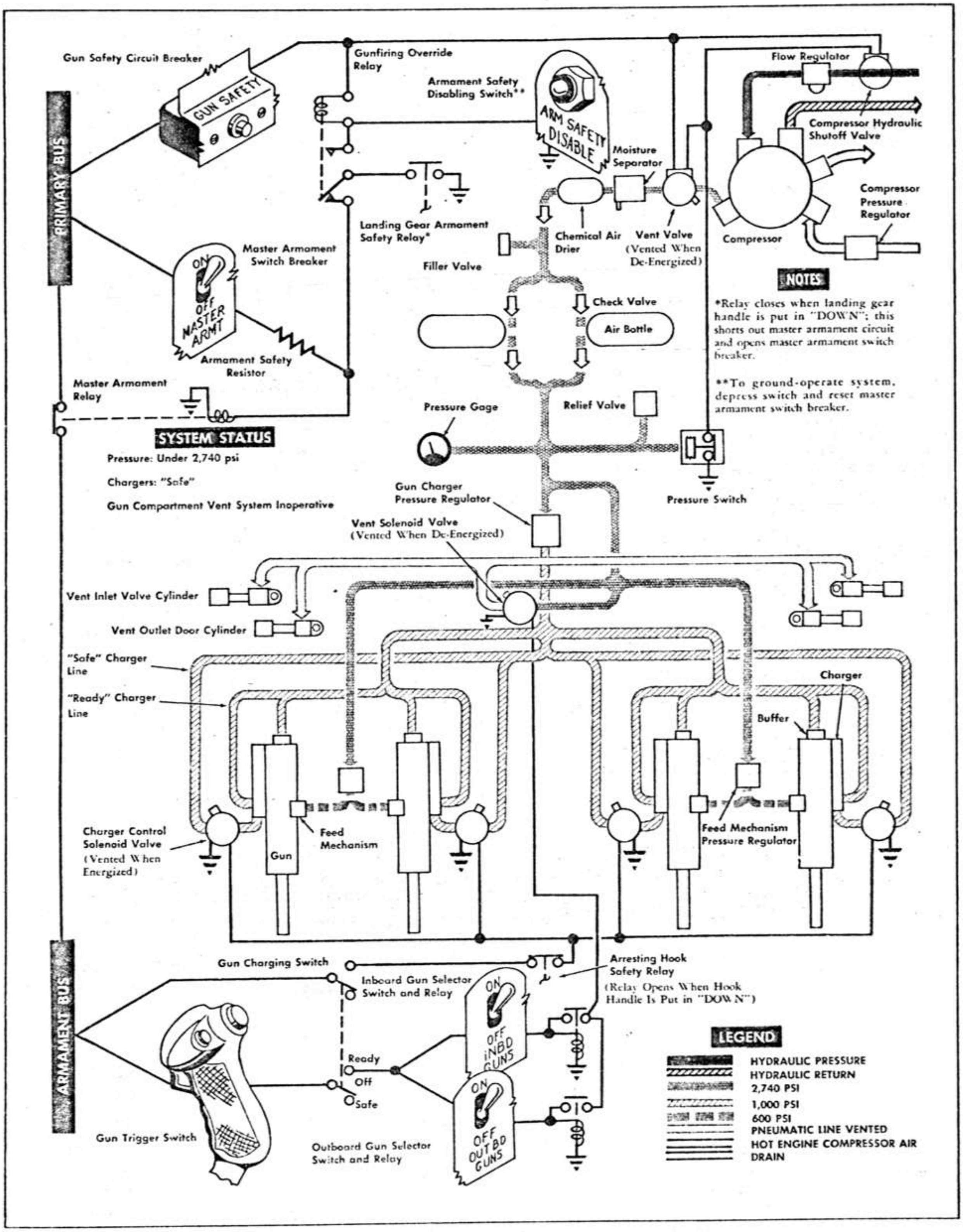


Figure 4-16. Gunnery System (Sheet 1 of 2)

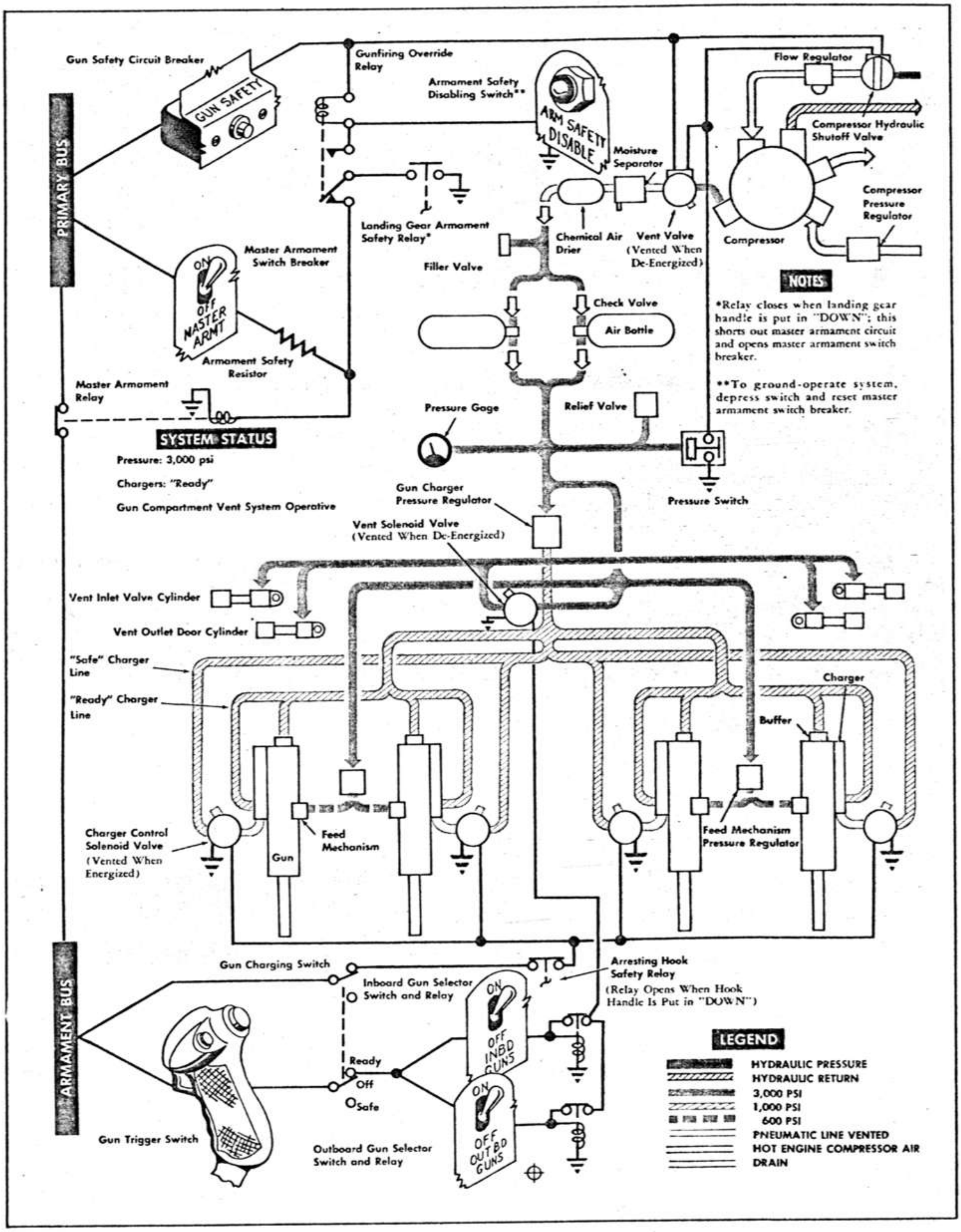


Figure 4–16. Gunnery System (Sheet 2 of 2)

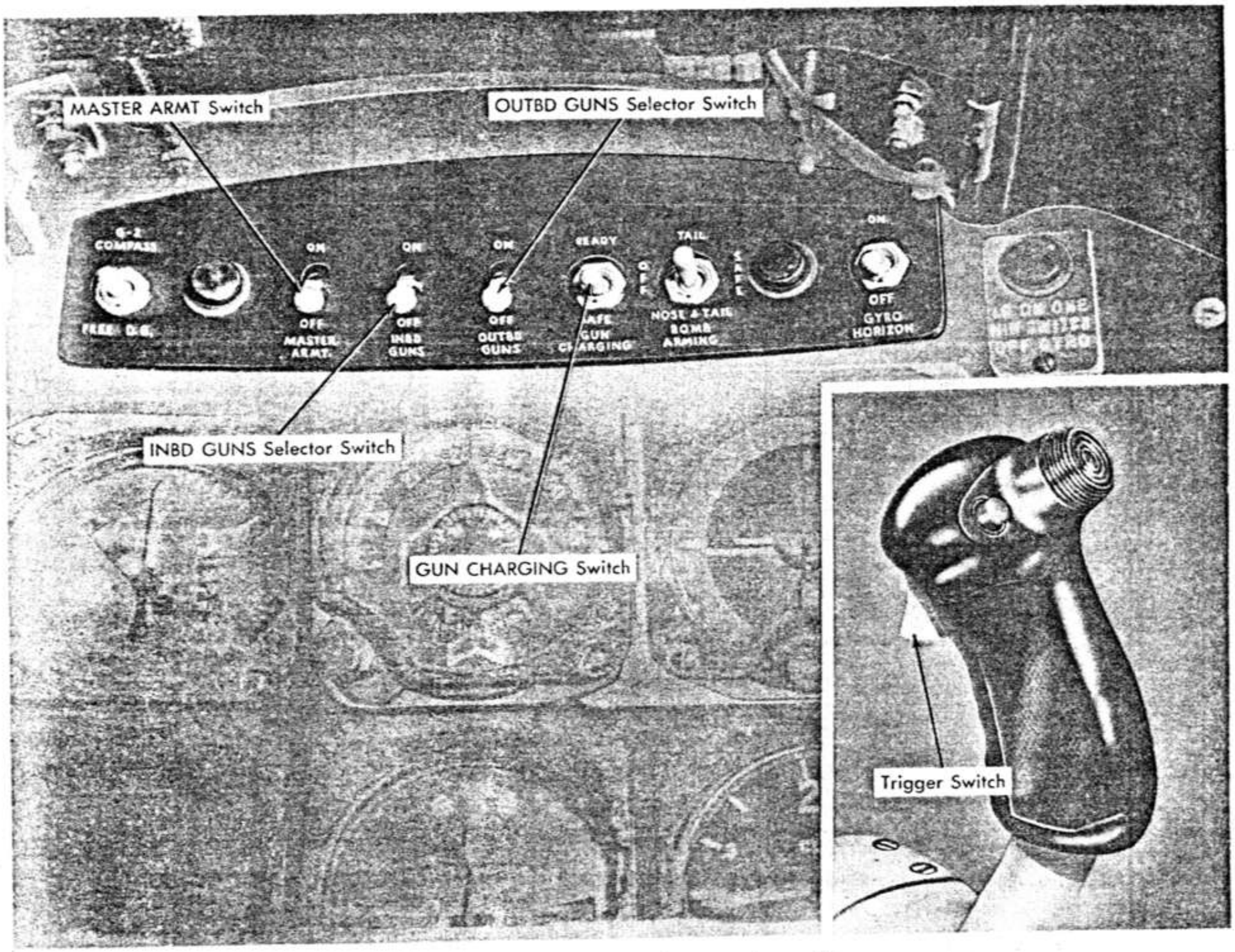


Figure 4–17. Gunnery System Controls

GUN SECURING. To secure guns, proceed as follows:

MASTER ARMT switch........"OFF"

INBD and OUTBD GUN selector switches...."OFF"

GUN CHARGING switch........"SAFE"

EMERGENCY PROCEDURE. If trigger should stick, causing uncontrolled firing, place MASTER ARMT switch in "OFF" position. In case of a misfire, wait 30 seconds and recharge gun.

BOMBING SYSTEM.

GENERAL. The bombing system consists of two center section pylons each incorporating mounting provisions for a bomb rack. A bomb weighing up to approximately 2,000 pounds can be accommodated by each pylon. (See Limitations, page 90.) Selection and arming of nose and tail fuses are controlled electrically. The bombs are released electrically; in an emergency they may be jettisoned manually.

BOMB-ROCKET SELECTOR SWITCH. A bomb-rocket selector switch (figure 4–18), located on the inboard aft end of the left-hand console, permits selection of the bomb or rocket circuit to be energized. Switch positions are "OFF," "BOMBS," and "ROCKETS."

PYLON STATION SELECTOR SWITCHES. Two PYLON STA SEL switches (figure 4–18) are located on the inboard aft end of the left-hand console. The selector switches permit simultaneous operation of both pylon bombing circuits or operation of only the No. 1 (left-hand) or No. 2 (right-hand) pylon bombing circuit. Switch positions are "ON" and "OFF."

BOMB ARMING SWITCH. A BOMB ARMING switch (figure 4–18) is located on the upper right-hand side of the instrument panel. The switch controls selection and arming of the nose and tail fuzes. Switch positions include "TAIL," "SAFE," and "NOSE & TAIL."

BOMB RELEASE BUTTON. The bomb release button (figure 4–18), located on the aft left-hand side of the control stick, closes the bomb circuit to release the bombs.

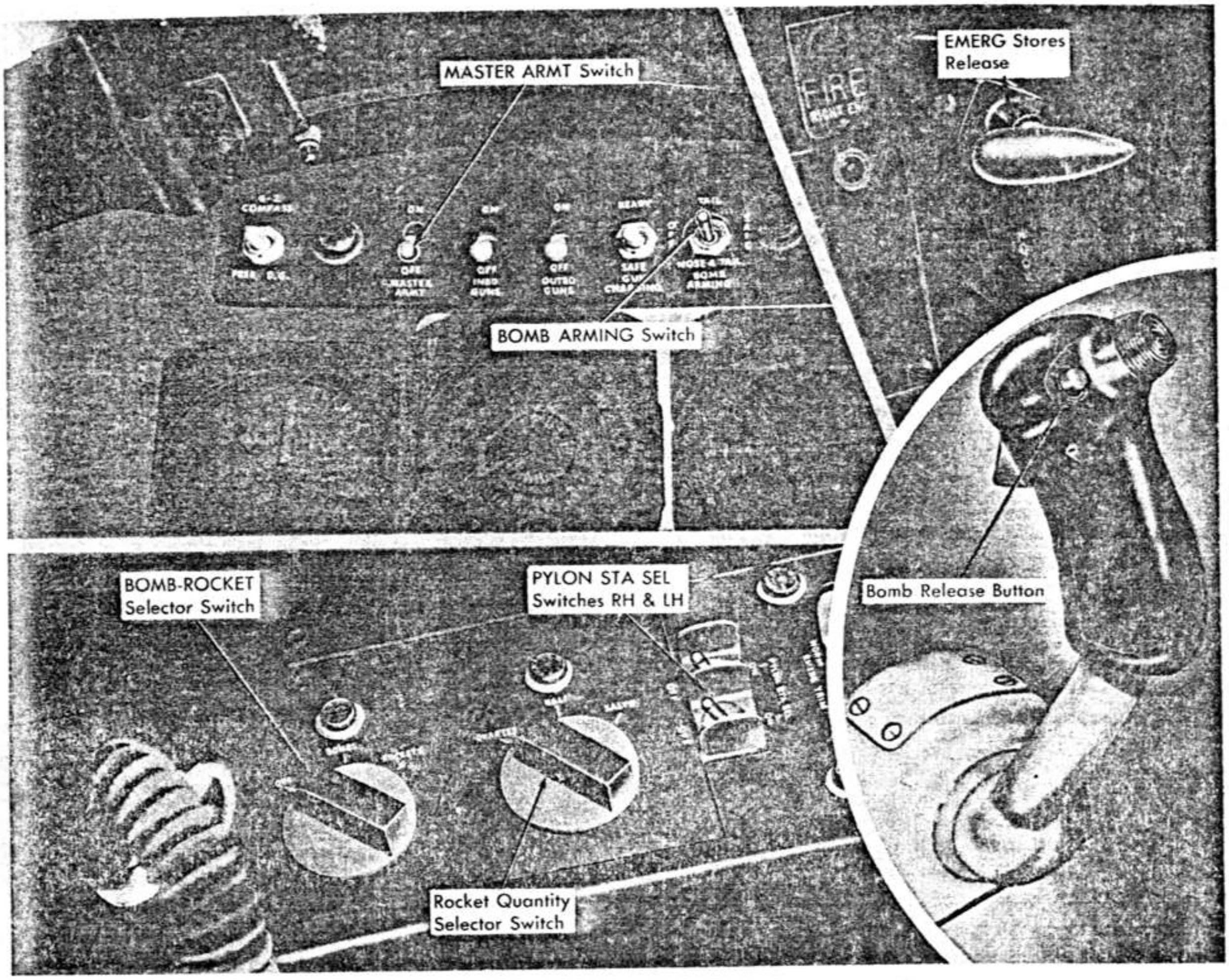


Figure 4–18. Pylon-Mounted Equipment Controls

EMERGENCY BOMB RELEASE HANDLE. An emergency bomb release handle (figure 4–18) is located on the upper end of the right-hand inclined panel. In an emergency, the bombs may be jettisoned manually by pulling the release handle. The bombs are released unarmed when the arming circuit is inoperative or the BOMB ARMING switch is in "SAFE."

BOMB ARMING AND RELEASE. To arm and release bombs, proceed as follows:

MASTER ARMT switch .... "ON"
PYLON STA SEL switches, No. 1 (LH) and No. 2 (RH) .... "ON"

Note

To release bomb from only one pylon, place respective pylon selector switch in "ON."

BOMB ARMING switch .... "SAFE," "TAIL," or "NOSE & TAIL"
Bomb-rocket selector switch .... "BOMBS"
Bomb release button .... Depress

EMERGENCY RELEASE. In an emergency, unarmed bombs can be manually released as follows:

BOMB ARMING switch .... "SAFE"
Emergency bomb release handle .... Pull

ROCKET SYSTEM. This information to be supplied at a later date.

MISCELLANEOUS EQUIPMENT.

ANTIBLACKOUT SYSTEM. The antiblackout system provides automatic operation of the pilot's antiblackout suit during flight. The air used is compressed air from the engine compressors. The antiblackout controls (figure 4–19) are located on the left-hand console. The manual valve adjustment can be set for either "LO" or "HI" range operation. "LO" range provides a pressure of 1 psi for each unit of gravity over 1.75g while the "HI" range provides a pressure of 1.5 psi for each unit of gravity over 1.75g. The high pressure limit under both "LO" and "HI" range operation is 10 psi. For testing, the manual valve override allows manual operation of the valve at less than 1.75g.

REAR-VISION MIRRORS. Two rear-vision mirrors are mounted on the canopy forward frame. Each mirror can be adjusted by loosening the attaching bolts.

REFLECTION SHIELDS. An adjustable reflection shield projects from under the cowl to prevent the instrument lights from casting reflections on the canopy. A snap socket, which mates with a snap button on the canopy track, is attached to each of the side shields to hold it in the extended position.

PILOT'S QUICK-DISCONNECT ASSEMBLY. The pilot's quick-disconnect assembly allows emergency separation of oxygen, radio, and antiblackout connections between airplane and pilot during seat ejection. The assembly is secured to the aft end of the left-hand console.

PILOT'S RELIEF TUBE. The pilot's relief tube horn is held in a clip on the aft side of the ailavator control stick. The relief horn contains a valve and lever mechanism to ensure pressurization of the cabin.

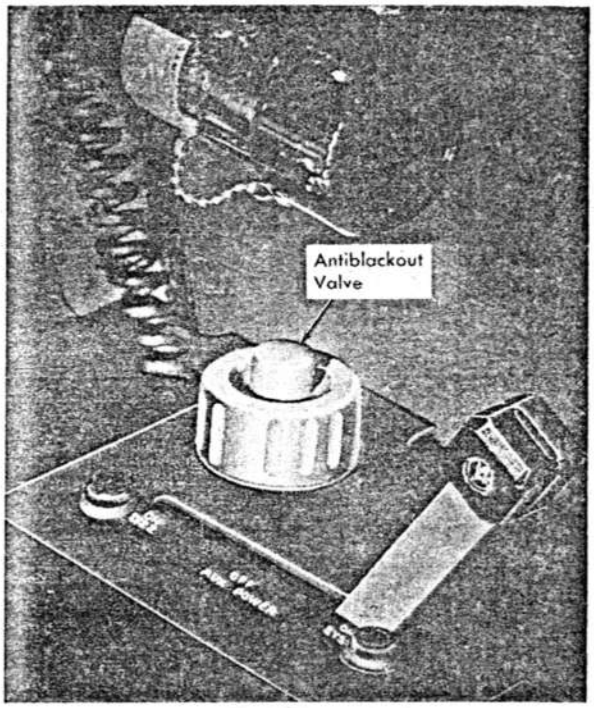
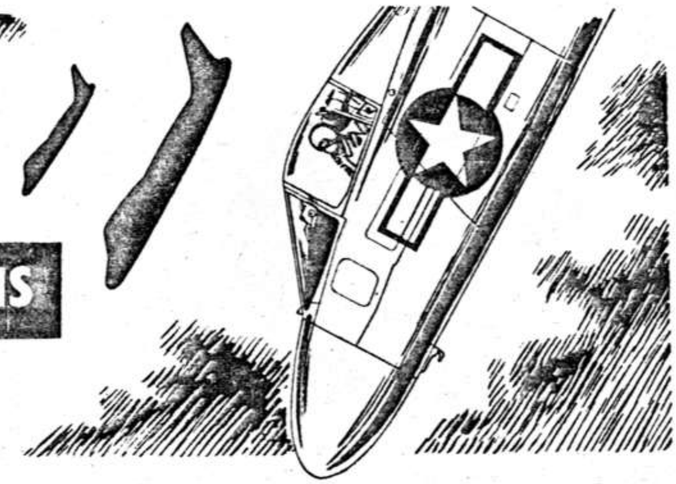


Figure 4–19. Antiblackout Suit Control

Section V
OPERATING LIMITATIONS



INTRODUCTION.

This section covers all important limitations that must be observed during normal operation. The instrument markings (figure 5–1) should be noted since they represent limitations that are not necessarily repeated in the text. When necessary, an explanation of an instrument's marking will be found under the heading dealing with its limitation.

ENGINE LIMITATIONS.

Maximum Exhaust Gas Temperature Limits*

Starting temperature	900°C
Periods over 30 minutes at 95.6 percent rpm	651°C True
Absolute maximum stabilized temperature	712°C True
Absolute maximum momentary (less than 30 seconds) acceleration temperature	900°C

*Whenever the compressor inlet temperature exceeds 100°F, the engine may have to be throttled down to prevent exceeding these limits.

Maximum Engine Power/Time Limits

Continuous time at military speed	30 minutes
Continuous engine speed	95.6 percent rpm

Maximum Engine Overspeed Limits

Stabilized	102 percent rpm
Momentary	104 percent rpm

Starter Limits

Maximum continuous operating time	1 minute
Minimum cooling time between attempted starts	3 minutes
Minimum cooling time after each third attempted start	30 minutes

Engine Oil System Limits

Oil pressure range — engine speeds above 71.7 percent rpm and altitudes up to 50,000 feet	15-45 psi
Maximum oil temperature	140°C

Minimum Fuel Quantity for Various Maneuvers

Violent zooms or slips (normal slipping for landing is permissible)	1,835 pounds (25 percent total fuel)
Dive angle exceeding 70 degrees	740 pounds (10 percent total fuel)
Dive angle of 90 degrees	1,835 pounds (25 percent total fuel)
Negative g flight (30 seconds maximum)	3,670 pounds (50 percent total fuel)

AIRSPEED LIMITATIONS.

Airspeed limitations for smooth or moderately turbulent air at various altitudes and in different airplane configurations are given in the table below. At any time that buffeting is encountered at any speed less than that noted, the airspeed should be reduced immediately.

Clean Condition

Altitude	Maximum indicated airspeed
5,000 feet or below	525 knots
10,000 feet	500 knots
20,000 feet	450 knots
30,000 feet	380 knots
40,000 feet	300 knots

With External Stores

Altitude	Maximum indicated airspeed
5,000 feet or below	400 knots
10,000 feet	360 knots
20,000 feet	300 knots
30,000 feet	240 knots
40,000 feet	190 knots

Airspeed limitations for operation of components are given in the table below. At any time that buffeting is encountered at any speed less than that noted, the airspeed should be reduced immediately.

Equipment	Maximum indicated airspeed
Speed brakes	480 knots
Landing gear	175 knots
Slats	175 knots
Arresting hook	175 knots
Canopy (normal operation)	150 knots
Canopy (emergency operation)	No limitation

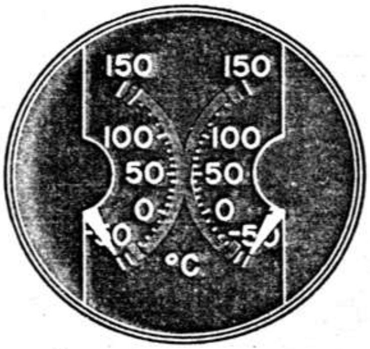
In severe turbulence, speeds in the range from 200 to 400 knots IAS are recommended.

PROHIBITED MANEUVERS

INTENTIONAL SPINNING of the airplane is prohibited.

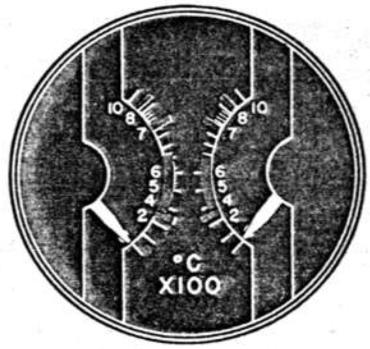
BANKING in excess of 45 degrees is prohibited.

SLIPPING OR SKIDDING. Slipping or skidding of the airplane shall be avoided.



OIL TEMPERATURE

−50°C	Minimum
−50°C to 140°C	Continuous
140°C	Maximum



EXHAUST GAS TEMPERATURE

300°C	Minimum
300°C to 651°C	Continuous
712°C	Take-off and military power (30 minutes maximum)
899°C	Maximum (during starting and acceleration only)

ENGINE SPEED

38%	Minimum operating speed
38% to 95.6%	Continuous
95.6%	Maximum continuous (Operation at faster speed limited to 30 minutes maximum)
100%	Take-off and military power

FUEL PRESSURE

50 psi	Minimum
50 psi to 500 psi	Continuous
500 psi	Maximum

OIL PRESSURE

15 psi	Minimum
15-45 psi	Continuous
45 psi	Maximum

ACCELERATION

+ 5 G's	Maximum positive acceleration
0 G	Maximum negative acceleration

(Smooth air)

DELETED

DELETED

DELETED

Figure 5–1. Instrument Markings

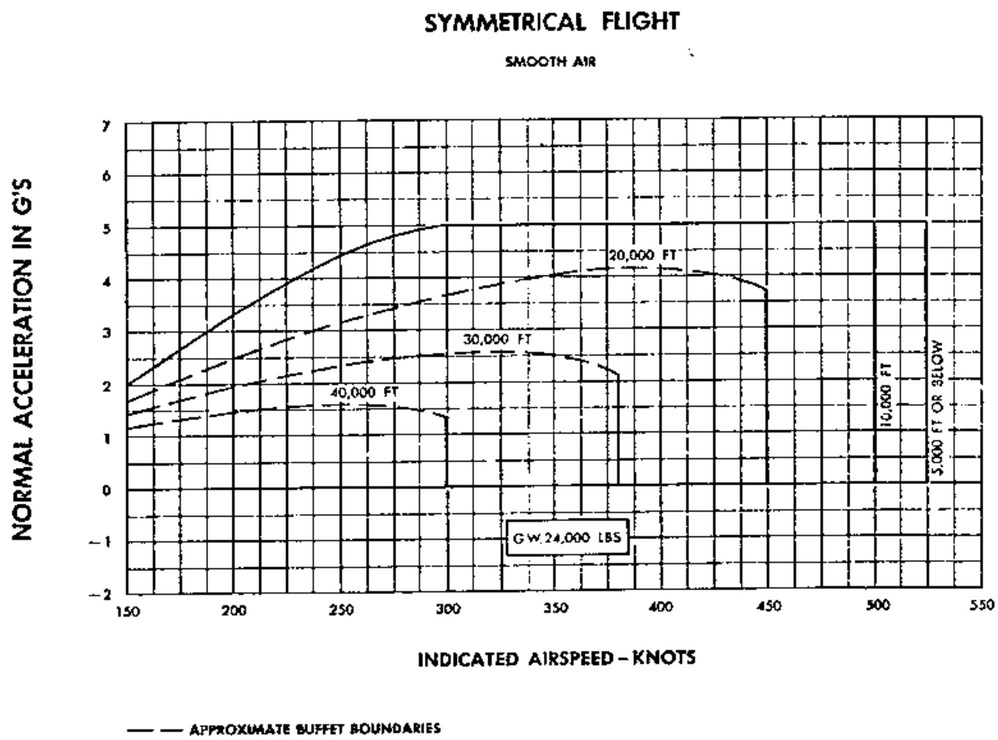


Figure 5–2. Operating Flight Strength Diagram (Sheet 1 of 3)

Information will be furnished at a later date.

Figure 5–2. Operating Flight Strength Diagram (Sheet 2 of 3)

Information will be furnished at a later date.

Figure 5–2. Operating Flight Strength Diagram (Sheet 3 of 3)

CONTROLS OPERATION. Flight controls shall not be moved abruptly.

INVERTED FLIGHT. The airplane shall not be flown in inverted flight.

ACCELERATION LIMITATIONS.

Acceleration limitations for symmetrical flight at an airplane gross weight of 24,000 pounds are given in the following table and in figure 5–2. As gross weights are increased to greater than 24,000 pounds, permissible accelerations decrease. To determine maximum permissible accelerations at gross weights in excess of 24,000 pounds, multiply the allowable accelerations shown on figure 5–2 or the allowable acceleration for moderately turbulent air by the ratio of 24,000 pounds to the new gross weight.

Symmetrical Flight — Clean Condition

Maximum positive acceleration limit	5.0g
Negative acceleration limit	0g

In Moderately Turbulent Air

Maximum positive acceleration limit	4.0g
Negative acceleration limit	0g

With External Stores

Maximum positive acceleration limit	2.0g

GROSS WEIGHTS.

Maximum recommended gross weights are as follows:

Condition	*Gross weight*
Field take-offs	32,500 pounds
Field landings	26,000 pounds

CENTER OF GRAVITY LIMITATIONS.

The forward limit for catapult take-off with external stores is 12.6 percent MAC. The maximum forward limit is 11.2 percent MAC. The maximum aft limit is 15.8 percent MAC.

To maintain center of gravity control, the airplane should be fueled to either of the following two conditions: (1) main system full and transfer system empty, or (2) main system full and transfer system full.

Note

Refer to the Handbook of Weight and Balance, AN 01-1B-40, for complete operating weight and balance data.

LANDING CONDITION LIMITATIONS.

Arrested field carrier type landings shall not be performed until incorporation of a production type shimmy damper.

Maximum acceleration shall not exceed 2g.

ROLL LIMITATIONS.

Roll rates greater than 115 degrees per second shall not be exceeded when 1,000-pound general purpose bombs are hung on the center section pylons. The following restrictions shall also be observed with the yaw damper on or off and with 6-degree gyro tilt.

Up to 180 knots calibrated airspeed	Full lateral stick throw is permitted
From 180 knots to 300 knots calibrated airspeed	Three-quarter lateral stick throw shall not be exceeded
From 300 knots to 430 knots calibrated airspeed	One-half lateral stick throw shall not be exceeded
Above 430 knots calibrated airspeed	One-quarter lateral stick throw shall not be exceeded

EXTERNAL STORES LIMITATIONS.

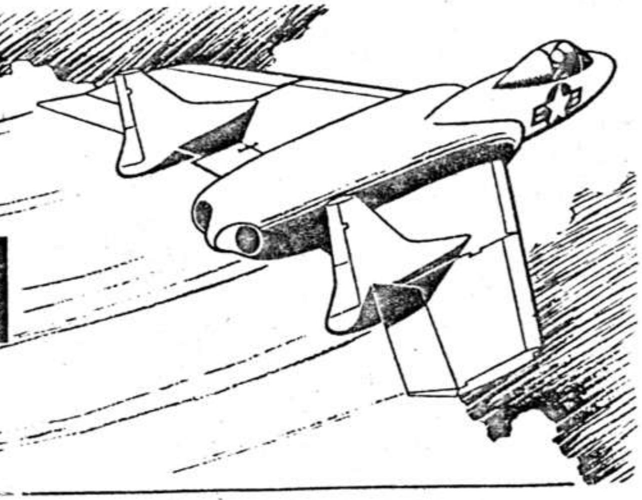
Two thousand pound stores shall not be carried until existing pylons are modified.

OTHER LIMITATIONS.

A rudder pedal and/or brake pedal force of 200 pounds shall not be exceeded.

Section VI

FLIGHT CHARACTERISTICS



GENERAL.

The low-aspect-ratio swept-wing configuration of the airplane provides excellent stability and control characteristics throughout its speed range. In its clean configuration, the airplane is designed to be unrestricted with respect to speed; however, temporary restrictions are imposed on the airplane until completion of static and flight tests (refer to section V) The wing slats provide excellent low-speed characteristics and the speed brakes provide good speed control during level flight and in dives.

STALLS.

STALLS WITH GEAR DOWN AND SLATS EXTENDED. Stalls in the landing condition are preceded by mild rudder buffeting. At the stall, which might not occur if the airplane's center of gravity is far enough forward, the airplane pitches down gently, then catches itself, the result being a mild porpoising. There is no yawing or rolling tendency and aileron action is fully effective throughout the stall.

STALLS WITH GEAR UP AND SLATS RETRACTED. Clean condition stalls are preceded by mild rudder buffeting and a mild controllable yaw. At the stall, the yaw becomes uncontrollable and the wing in the direction of yaw drops sharply. There is aileron control up to the stall.

ACCELERATED STALLS WITH GEAR UP AND SLATS RETRACTED. Accelerated stalls are preceded by generally heavy buffeting of the airplane.

SPINS.

NORMAL SPINS. Flight tests of spinning characteristics have not been made. However, normal spins performed in F7U-1 airplanes and wind tunnel tests of F7U-1 and F7U-3 models indicate that it will be difficult to hold the airplane in a spin.

GROSS WEIGHT \ ANGLE OF BANK	0°	15°	30°	45°
TAKE-OFF CONDITION				
32,000 LB	121	123	130	144
28,000 LB	113	115	122	135
24,000 LB	105	107	113	125
CRUISE CONDITION				
30,000 LB	133	135	142	158
26,000 LB	123	126	133	147
22,000 LB	113	116	122	135

GROSS WEIGHT \ ANGLE OF BANK	0°	15°	30°	45°
LANDING CONDITION				
28,000 LB	113	115	122	135
24,000 LB	105	107	113	125
20,000 LB	96	98	103	114

STALLING SPEEDS ARE CALIBRATED AIRSPEED IN KNOTS

DATA BASED ON: Estimates

DATA AS OF: 1 November 1952

Figure 6–1. Power Off Stalling Speeds

INVERTED SPINS. Data on inverted spins are not available. It is improbable that such spins are possible since available down elevator is insufficient to trim the airplane to an inverted stall.

SPIN RECOVERY. To recover from a spin, use normal spin recovery procedures. Should the spin be entered with aileron and/or forward stick, neutralize the aileron and move the stick full aft before initiating recovery. Reduce throttle to idle to prevent excessive altitude loss. Following recovery, keep the nose down to retain flying speed. If a spin is inadvertently entered with stores on the pylons, use normal recovery procedure. If spin does not stop immediately, jettison the stores and repeat normal recovery procedure. Always hold ailerons neutral during the spins. Recovery may be adversely affected by use of aileron. Open speed brakes will have little effect on spin and recovery characteristics, but they should be closed on spin entry to aid in picking up flying speed at the recovery.

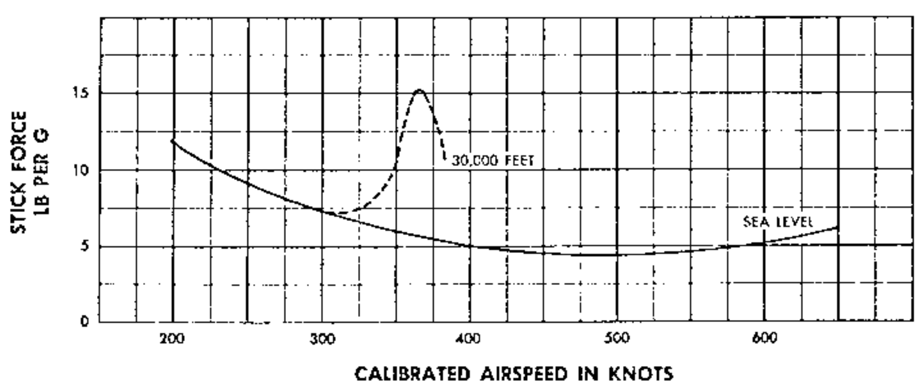
FLIGHT CONTROLS.

AILAVATORS. Both longitudinal and lateral control are attained through use of the ailavators. Lateral movement of the stick results in differential motion of the surfaces to produce roll. Fore and aft movements of the stick result in vertical motion of the surfaces to produce pitch. Control stick movement is the same as that of a conventional airplane.

LONGITUDINAL CONTROL. All of the power required to move the surface controls is supplied by a hydraulic power system. This type of control requires a separate feel system to provide the pilot with the stick force variations necessary for good control. The force variation is normal under all conditions except at higher Mach numbers, where its variation with speed becomes slightly unstable. There is a tendency of the airplane to tuck under at a Mach number of about 0.88. This, combined with reduced elevator effectiveness in the transonic range, results in an increasing stick pull force as speed is increased from Mach number 0.88 to 0.97. At any point, however, this force can be trimmed to zero so that a pull force is required to pull additional g's. There is no tendency for stick forces to lighten with increasing g's. (Refer to section V for temporary speed limitations.)

LATERAL CONTROL. The rate of roll produced through the use of aileron is very high. Abrupt lateral stick motion at moderate to high speeds results in a high rolling acceleration, and, under some conditions, a yawing tendency. Large lateral stick deflections should not be attempted until thoroughly familiar with the airplane. (Refer to section V for roll limitations.)

FEEL SYSTEM. The feel system is an independent mechanical system, in which stick force is determined by the surface deflection required. An additional longitudinal force, which is a function of the g's being pulled, is also added. The additional force required to pull g's increases with reduced speed because of the increased elevator required. This causes the controls to appear to become heavier as speed is reduced.



DATA BASED ON: Estimated

DATA AS OF: 1 November 1952

Figure 6–2. Stick Forces Diagram

RUDDER CONTROL. The rudders are connected directly to the pilot's rudder pedals by a mechanical linkage, and have no boost. The rudders are effective at low speeds. At high speeds, rudder forces become high; however, since little rudder is required for maneuvering at higher speeds, the required pedal force is not excessive.

TRIM. Longitudinal and lateral trim is provided through a trim button on the stick which actuates a mechanism that repositions the "zero force point" of the feel system. There are no tabs on the ailavators. Directional trim is provided through the auxiliary rudders. Through the directional trim knob, position of the auxiliary rudders can be adjusted to the desired trim position.

FLIGHT STABILIZATION SYSTEM. The flight stabilization system is connected to the ailavators and the auxiliary rudders to provide additional stability for the airplane. In the case of a directional or longitudinal oscillation, the system introduces deflection of the auxiliary rudder or the ailavator to damp out the oscillation. In addition, at low speed, the system imparts an auxiliary rudder deflection against sideslip for increased directional stability.

AUXILIARY RUDDER. The auxiliary rudders are the surfaces directly below the primary rudders, and perform the function of directional trim, yaw damping, and yaw stiffening, as previously discussed.

SLATS. The slats improve the low-speed characteristics of the airplane, both in speed and in handling qualities. With the slats extended, the airplane can be controlled laterally to and beyond the stall. The slats are interconnected with the landing gear, and extend when the gear is extended. They are manually retracted after the gear is retracted at the pilot's discretion.

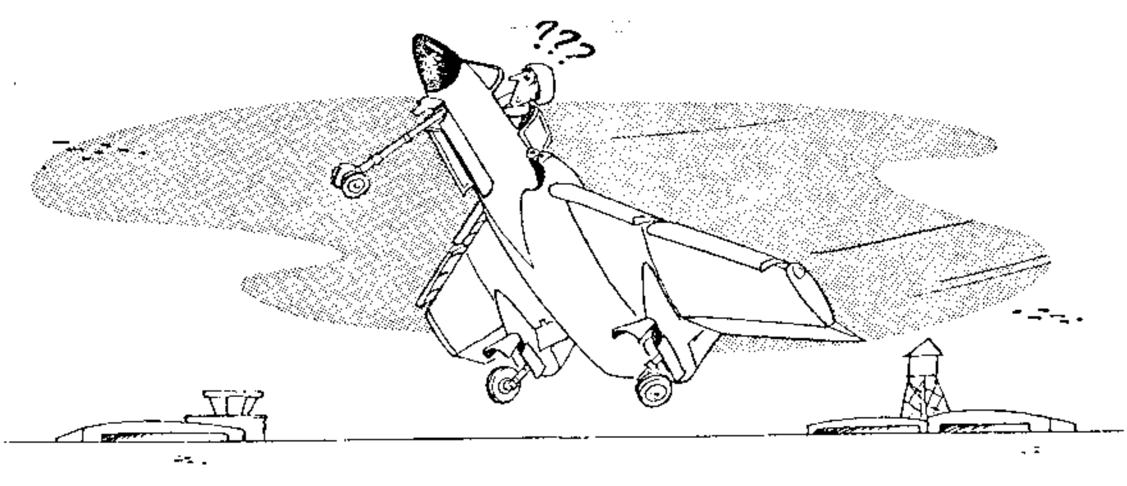
DIVE BRAKES. The dive brakes provide additional drag for speed control. Operation of the dive brakes is restricted to 480 knots maximum or to any lower speed at which buffeting occurs. The brakes are very effective, and shoulder straps should be tight during their operation. Little or no trim change is encountered on opening the brakes at other than large deflections.

LEVEL FLIGHT CHARACTERISTICS.

LOW SPEED. Stalling characteristics and handling qualities at low speed are very good. The primary difference between this airplane and a straight-wing fighter is the much higher angle of attack required for take-off and landing.

HIGH SPEED. This airplane is capable of very high speeds and high rates of ascent, and is easily controlled through the transonic speed region up to the maximum attainable speed of the airplane. Stability and control are essentially unaffected up to a Mach number of 0.88. Above this point, a pull force will be required to hold the nose up as speed is increased. No uncontrollable adverse characteristics are felt throughout the transonic speed range. (Refer to section V for temporary speed limitations.)

DIVING. In high Mach number dives, stability and handling qualities are very good. The stick forces are



The primary difference --------------- is the much higher angle of attack required for take-off and landing.

positive and stable, and the airplane is easily controlled at all Mach numbers.

DIVE RECOVERY. Dive recovery is accomplished by application of the pressure necessary to effect the desired pull-out. Speed brakes may be used in the dive to keep the speed from building up.

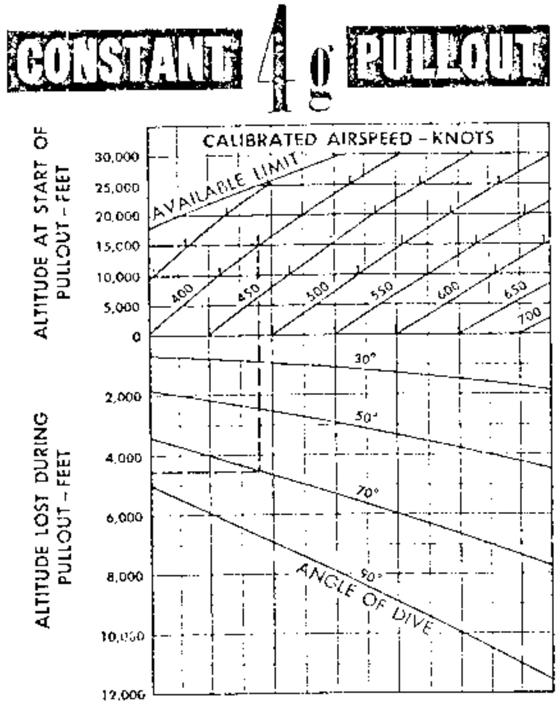
CHARACTERISTICS WITH EXTERNAL STORES.

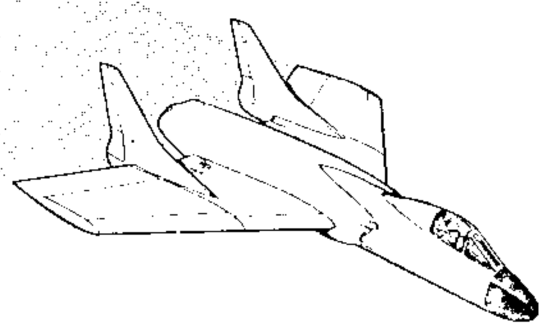
ROCKET PACK. Information will be supplied when flight tests are complete.

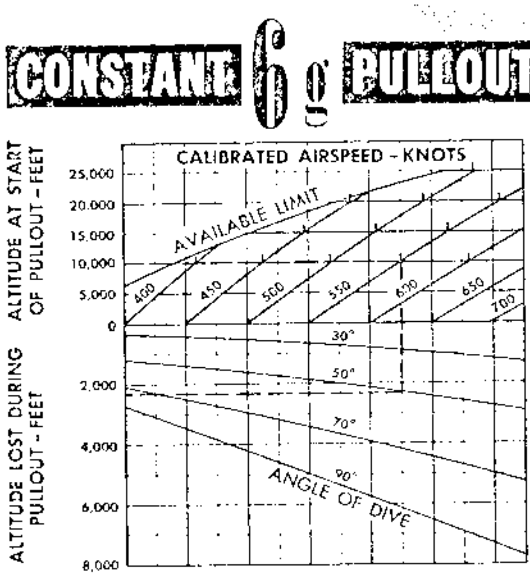
PYLON-MOUNTED STORES. Information will be supplied when flight tests are complete.

EXAMPLE

If you are at 15,000 feet at 400 knots in a 70 degree dive, you will require 4,600 feet to make a constant 4G pullout.







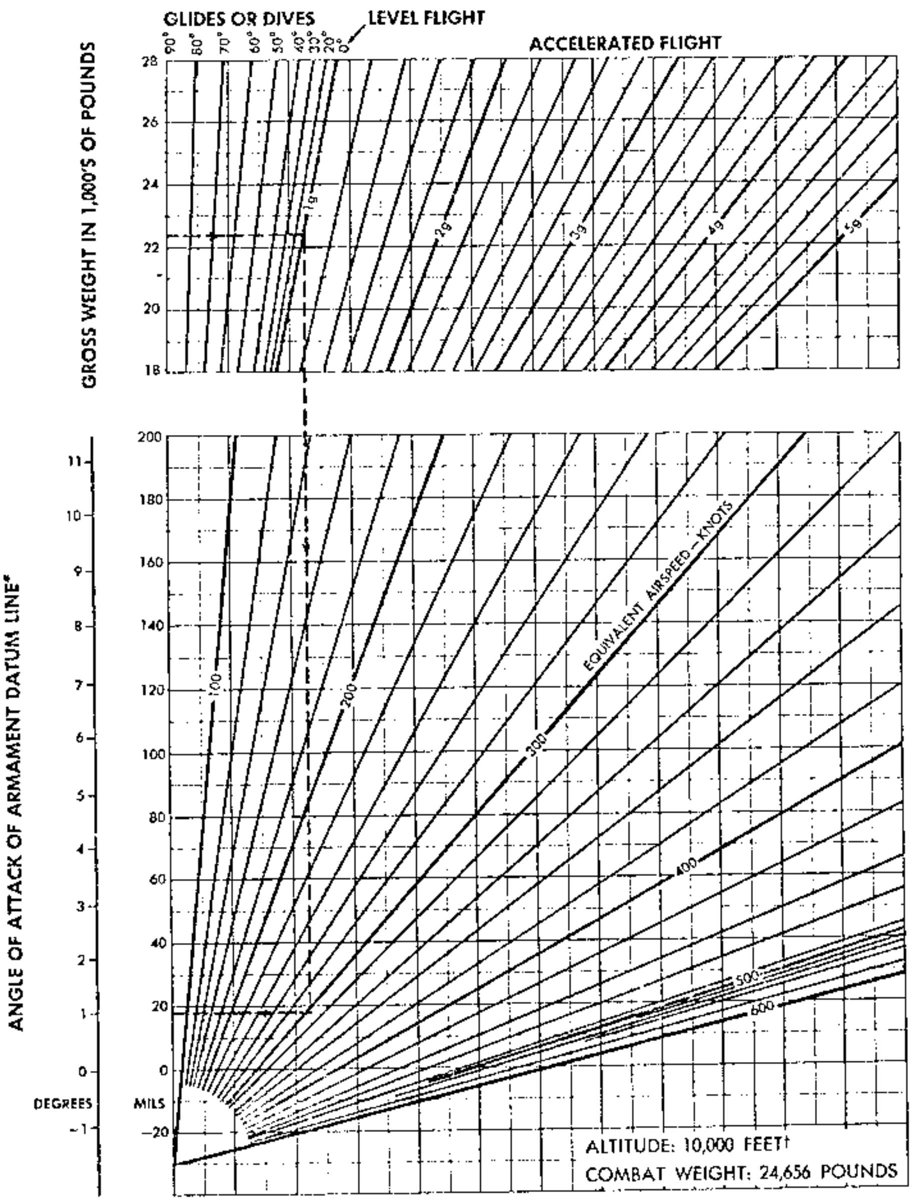
EXAMPLE

If you are at 10,000 feet at 550 knots in a 50 degree dive, you will require 2,400 feet to make a constant 6G pullout.

DATA BASED ON: Estimated

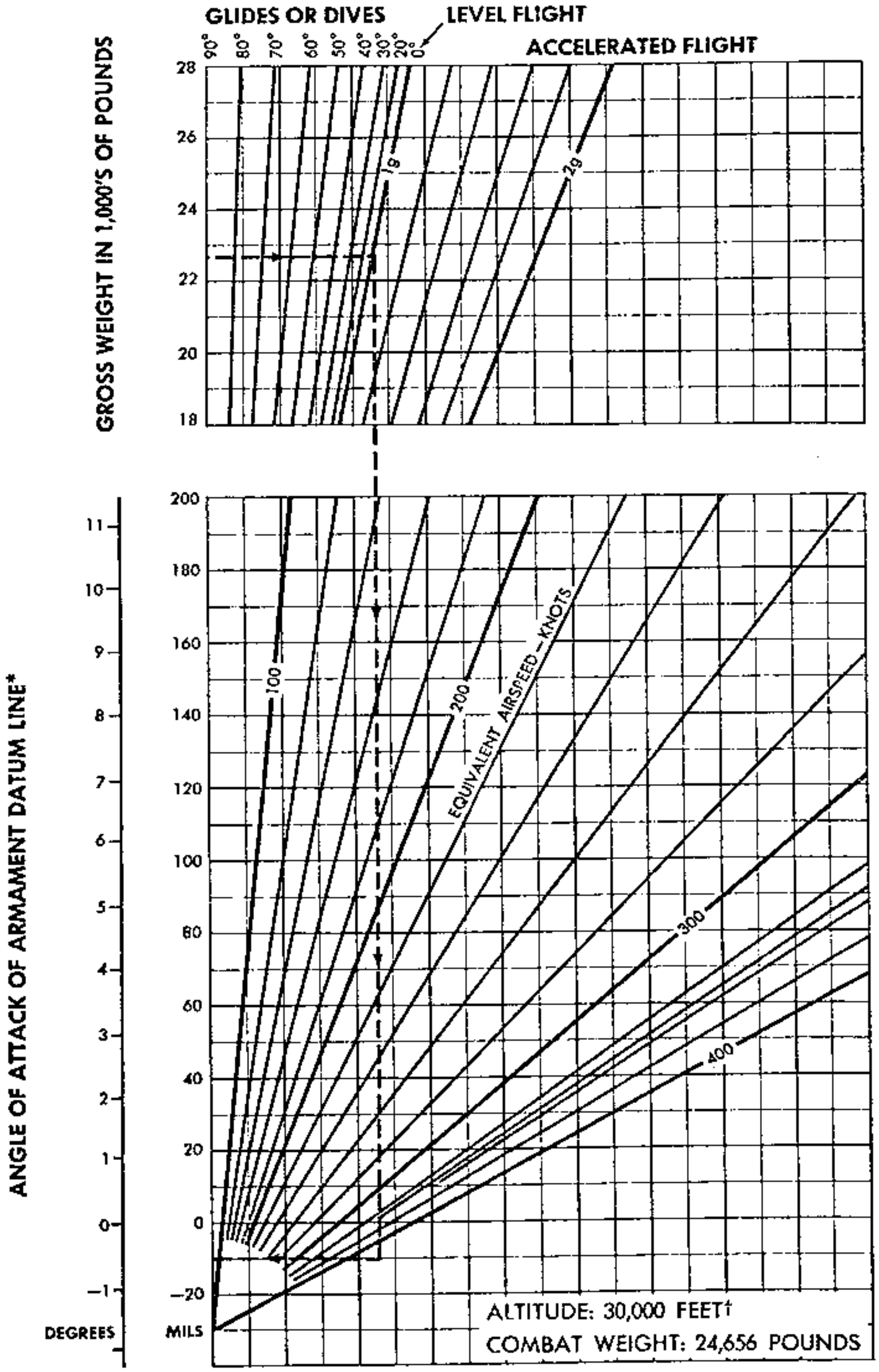
DATA AS OF: 1 November 1952

Figure 6–3. Dive Recovery Chart



*Add 1.7° (30 mils) to obtain fuselage reference line.
†Chart applies to altitudes ranging from sea level to 20,000 feet.

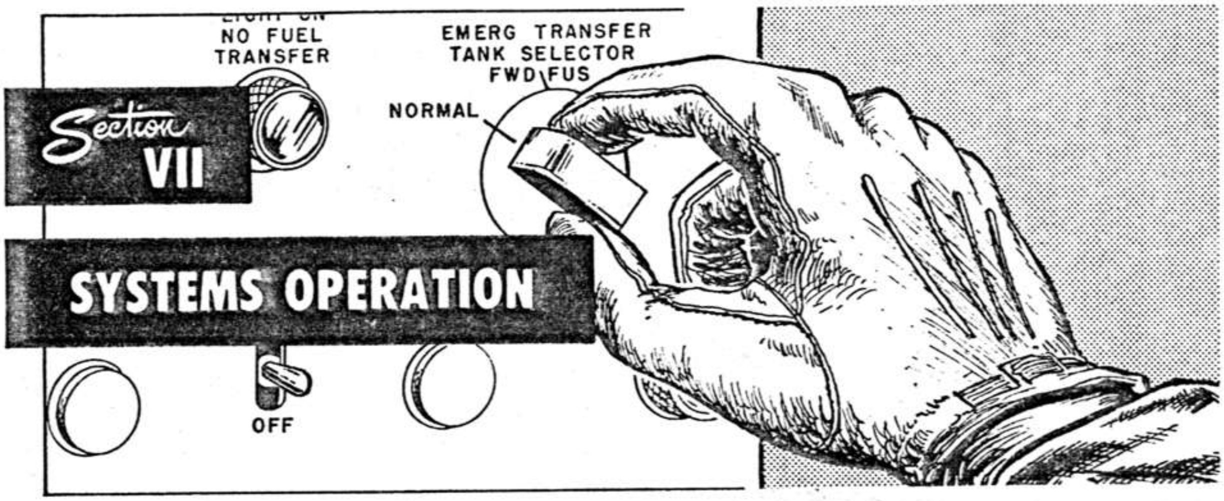
Figure 6-4. Angle-of-Attack Chart (Sheet 1 of 2)



*Add 1.7° (30 mils) to obtain fuselage reference line.
†Chart applies to altitudes above 20,000 feet.

Figure 6–4. Angle-of-Attack Chart (Sheet 2 of 2)

Section VII
SYSTEMS OPERATION



FUEL SYSTEM MANAGEMENT.

The in-flight fuel system management in this airplane is limited to observation of the two (main and transfer) fuel system quantity indicators, operating the TRANSFER FUEL QUANTITY tank selector switch, operating the TRANSFER SWITCH, and operating the EMERG TRANSFER TANK SELECTOR switch. Figure 7–1 shows the normal indicator reading, warning light actuation, and switching that occur during flight.

Malfunctioning of the transfer system may be indicated by lighting of the NO FUEL TRANSFER light or by airplane nose or tail heaviness since the fuel transfer sequence is designed to limit extreme center-of-gravity changes. If indications of fuel transfer malfunctioning are noted, measure the transfer fuel quantity and compare with the values given in figure 7–1. Correct discrepancies by selecting the tank or tanks which have not drained properly.

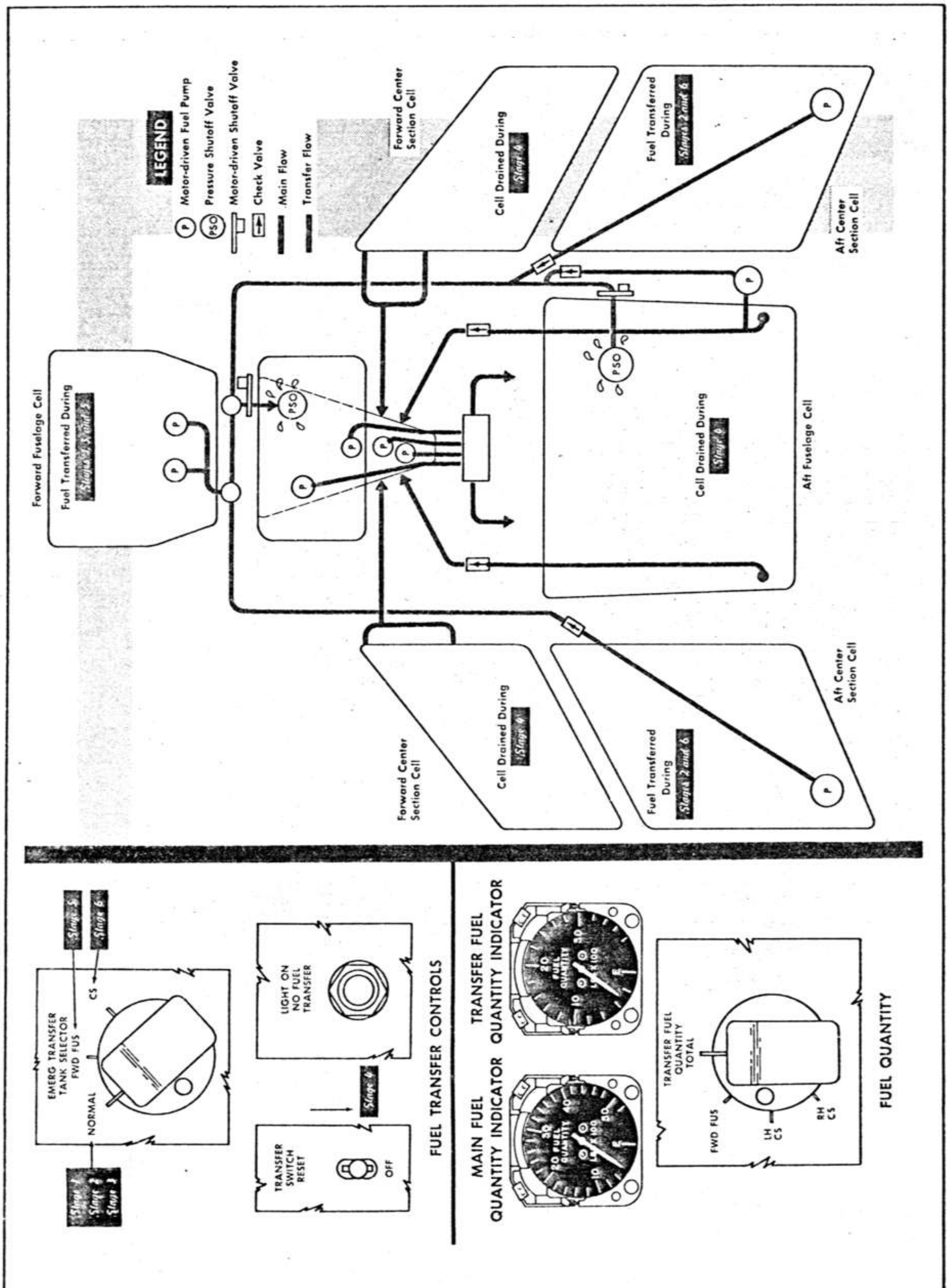


Figure 7–1. Fuel System Management (Sheet 1 of 2)

Stage	MAIN FUEL QUANTITY		TRANSFER FUEL QUANTITY							
	(TOTAL ONLY)		TOTAL		FWD FUS		LH CS		RH CS	
	INDICATED	ACTUAL	INDICATED	ACTUAL	INDICATED	ACTUAL	INDICATED	ACTUAL	INDICATED	ACTUAL
Prior to Flight	4060	4580	3455	3444	1690	1584	1025	930	1025	930
1	3760	4265	2200	2180	340	320	1025	930	1025	930
2	3760	4265	340	320	340	320	E	E	E	E
3	3760	4265	E	E	E	E	E	E	E	E
NO FUEL TRANSFER warning light comes on. Turn TRANSFER switch to "OFF."										
4	3760 to E	4265 to E	E	E	E	E	E	E	E	E

NOTES:

Stage 1 202 gallons transferred from FWD FUS cell.
Stage 2 All fuel transferred from LH and RH CS cells.
Stage 3 Remaining fuel transferred from FWD FUS cell.
Stage 4 Main fuel system is evacuated.

SWITCH SETTINGS:

TRANSFER FUEL QUANTITY Cell Selector Switch — as required to obtain above readings. Leave switch in "TOTAL" position normally.

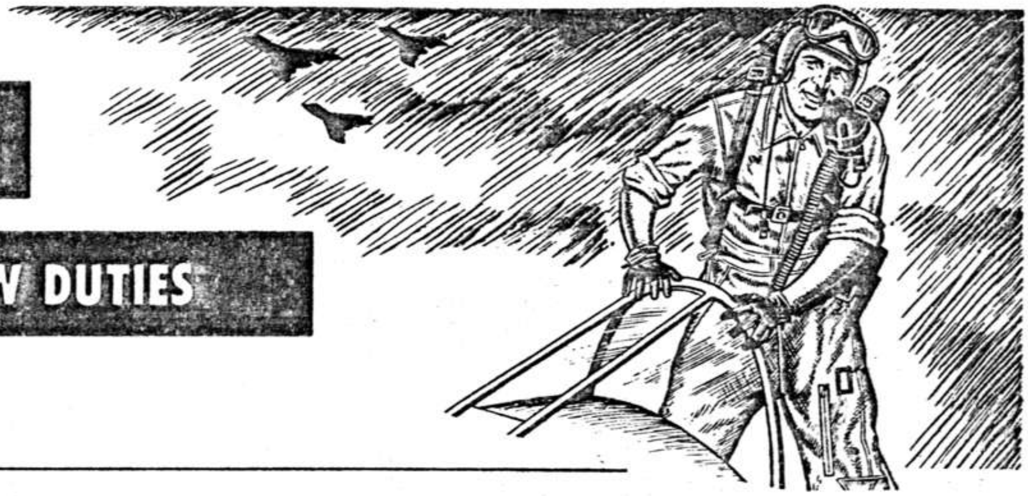
TRANSFER switch — Neutral until after *Stage 3*, then momentarily to "OFF."

EMERG TRANSFER TANK SELECTOR Switch "NORMAL." If any cell fails to transfer properly (as detected by selective gaging), turn switch to position corresponding to cell and pump in *Stage 5 or 6* (sheet 1). Turn switch back to "NORMAL" when transfer is completed.

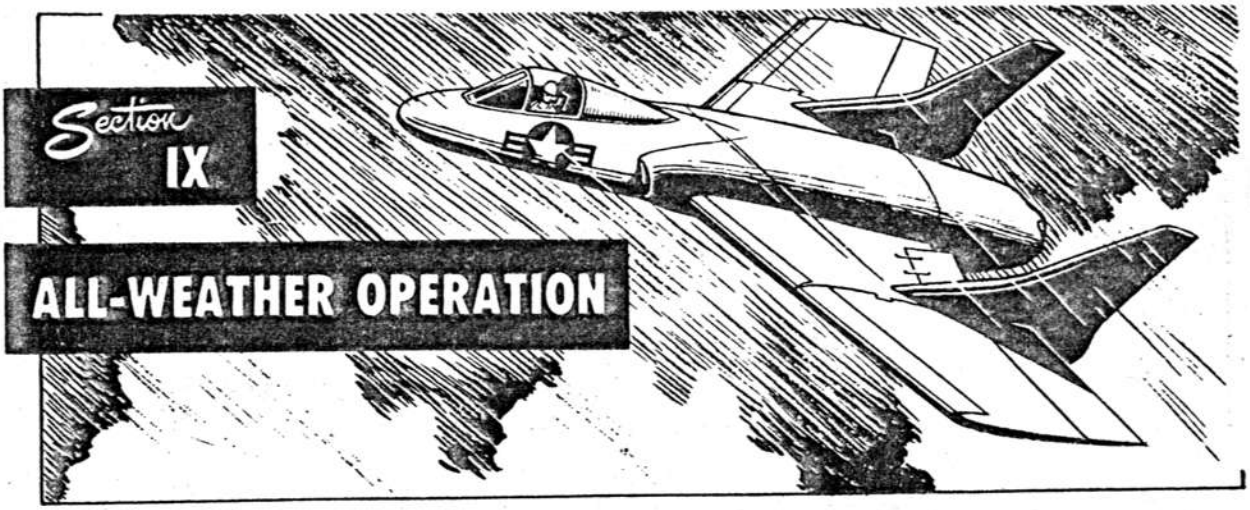
Figure 7-1. Fuel System Management (Sheet 2 of 2)

Section VIII

CREW DUTIES



Not applicable



INTRODUCTION.

This section sets forth proper techniques and procedures to be employed under conditions of instrument flight and approach (including snow, ice, and rain), ground control approach, turbulent air flight, and for operation under various extremes of weather and climate. Some information contained in section II is repeated in this section for emphasis, clarity, or continuity of thought in procedures that differ from or are supplementary to the normal operating instructions contained in section II. Discussions relative to systems operations are included in section VII.

INSTRUMENT FLIGHT PROVISIONS.

COCKPIT LIGHTING. Lighting for night or instrument flight is provided by individual instrument lights, edge-lighted panels and floodlights. Red light is used throughout to provide adequate illumination, yet allow good "dark accommodation" of the pilot's vision. The flight group instrument lights, selected warning lights, and the INT LTS control panel lights are controlled by the FLT lights switch on the INT LTS control panel. Auxiliary instruments are illuminated by lights controlled by the NON-FLT lights switch. All lights are dimmed by counterclockwise rotation of their respective control switches. Full counterclockwise movement of the switches turns the lights off.

GLARE PROTECTION. Reflected glare of instrument and flood lights from the windshield and the canopy sliding section may be prevented by use of the glare shields that are secured beneath the windshield cowl. These shields may be pulled aft and attached to the canopy track to prevent the cockpit lights from striking the windshield and canopy.

INSTRUMENT FLIGHT PROCEDURES.

GENERAL. Although the airplane is not designated as an all weather fighter, it is fully equipped with all instruments and radio equipment necessary for point-to-point or local instrument flight from fixed or floating bases. The airplane itself is unrestricted for instrument flight with the exception that it should not be flown into known icing conditions (the airplane has no engine or flight surface anti-icing provisions) or into moderate or severe turbulence at airspeeds greater than those shown in figure 9–2. High fuel consumption rates of jet airplanes limit their ability to meet instrument flight requirements. Because of such limitations, each pilot should use carefully all of the information presented in the appendix in planning an instrument flight.

INSTRUMENT TAKE-OFF. When performing an instrument take-off, be sure to use the G-2 compass in "FREE-DG" in order to provide the best directional control reference for the take-off run. As soon as the airplane is airborne, retract the landing gear, and, within the limitations imposed by terrain features, allow the airplane to accelerate to best single engine climbing speed as soon as possible.

INSTRUMENT CLIMB. For best instrument climb performance, refer to the appendix. Use gently banked (no more than 30-degree) turns during the climb.

CRUISING FLIGHT. Cruising flight speeds, altitudes, and power settings should be determined by reference to cruise and range data in the appendix.

RADIO AND NAVIGATION EQUIPMENT. The AN/ARC-27 radio operates at a frequency range which usually permits line-of-sight communications only. If communications with a surface station are interrupted because line-of-sight transmission is no longer possible, they may be re-established by flying toward the station or by climbing to a higher altitude. Since the AN/ARA-25 direction finder group also operates on AN/ARC-27 frequencies, the same procedure may be followed when ARA-25 radio/magnetic indicator indi-

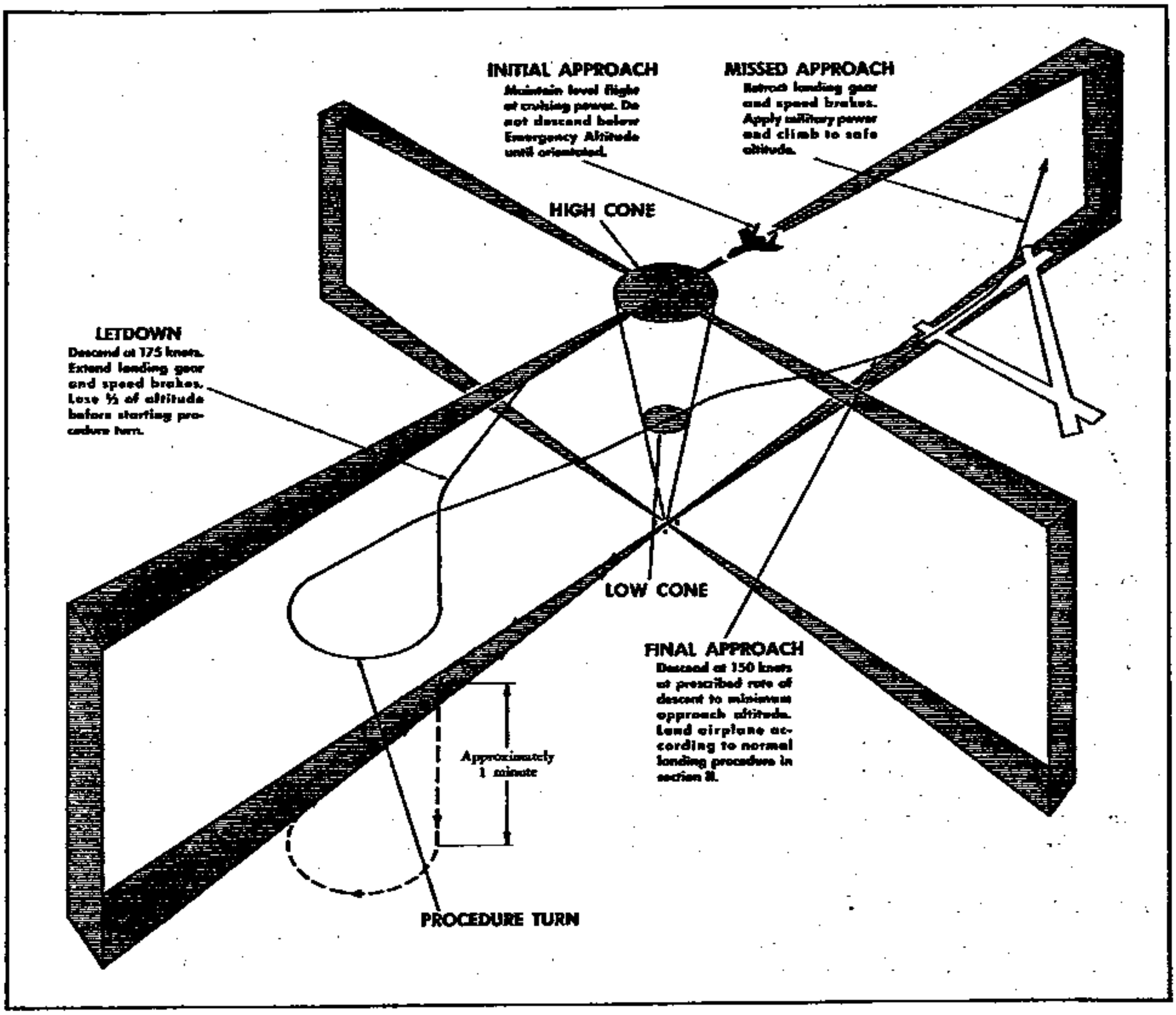


Figure 9–1. Instrument Approach

cations become erroneous. Radio compass indications should be cross-checked with other equipment at high altitudes whenever high static-producing conditions such as haze, dust, or thin overcasts are encountered.

DESCENT AND HOLDING. Descent rates normally may be selected for maximum range or minimum time. Jet airplanes usually are assigned a priority clearance to descend and land during instrument flight, and holding is therefore made unnecessary. Optimum descents may be made with the use of speed brakes and low power settings. Under conditions when it becomes necessary to hold before approach clearance is given, the airplane should be flown at best power and speed conditions for maximum endurance. Applicable information may be found in the appendix.

INSTRUMENT APPROACH PROCEDURES.

RADIO RANGE LETDOWN. If a radio range letdown procedure must be employed, proceed as follows:

a. Stay above radio range emergency altitude until positive of position on range. Then descend to initial approach altitude.

b. Upon crossing high cone, turn to outbound heading of approach leg. Extend speed brakes to reduce speed to approximately 175 knots.

c. As soon as speed is reduced to 175 knots, extend landing gear and begin descending to final approach altitude.

d. Continue outbound on approach leg for at least one minute or until approximately one-third of altitude between high and low cone has been lost, then perform a procedure turn.

e. When final approach altitude is reached, hold altitude until low cone is reached. Maintain airspeed of 175 knots.

f. After crossing low cone, reduce airspeed to 150 knots and descend to minimum approach altitude. Be sure that shoulder safety harness and lap safety belt are securely fastened. Land airplane in accordance with instructions in section II.

MISSED APPROACH PROCEDURE. If you miss your approach, increase power to "MILITARY" immediately, retract landing gear and speed brakes, and climb to minimum safe altitude.

GROUND CONTROLLED APPROACH. A ground controlled approach is usually the most satisfactory type of approach for jet airplanes since it eliminates the lengthy procedures involved in the use of a radio range or an ILS localizer and glide path. The GCA crew can vector the airplane directly to the proper position for initiation of a final approach to the field. Although procedures vary somewhat, a typical ground controlled approach procedure is similar to the following:

a. Maintain cruising altitude and airspeed until within range of the GCA search unit.

b. When cleared to descend to approach altitude by GCA, reduce power, extend speed brakes and descend at maximum "no buffet" speed to approach altitude.

c. Level off at approach altitude, retract speed brakes, and adjust power to maintain approximately 250 knots.

d. When advised to perform prelanding check by GCA, reduce speed to 175 knots, extend landing gear, then adjust power to maintain altitude at a speed of 150 knots.

e. On receiving instructions to turn to final approach heading, make a 3-degree-per-second turn and continue to hold altitude until final approach controller advises that you are approaching the glide path.

f. On reaching glide path, extend speed brakes and adjust power to maintain constant rate of descent in accordance with final approach controller's instructions. Be sure shoulder safety harness and lap safety belt are fastened securely.

g. After making visual contact with the runway, continue approach and land airplane in accordance with instructions in section II.

MISSED APPROACH PROCEDURE. If you miss your approach, increase power to "MILITARY," retract the speed brakes and landing gear, begin to climb, and contact GCA for further instructions.

FLIGHT IN TURBULENCE AND THUNDERSTORMS.

PREPARATION. Flight in extreme turbulence such as that found in well developed thunderstorms is not inherently dangerous, but should be avoided if possible. If a storm cannot be circumnavigated, and the flight must continue, prepare the airplane as follows:

a. Reduce speed to a safe value as given under AIRSPEED LIMITATIONS, Sec. V. The speeds on this chart are based on ability of the airplane structure to withstand gust velocities of thunderstorm intensity.

b. Press emergency disconnect ("DAMPER OFF") switch to disconnect the flight stabilization system.

WARNING

Do not use the flight stabilization system while in turbulent air. Normal control responses of the system can supplement the effect of a sequence of reciprocally acting gusts to create greater shear forces on the airplane structure than are permissible.

c. Turn all cockpit lights on bright.

d. Turn G-2 compass switch to "FREE DG" position.

e. Turn ANTI-ICE switch on.

f. Turn GYRO HORIZON switch "OFF."

FLIGHT PROCEDURE. Approach the storm on a heading which is calculated to get you through as rapidly as possible at the altitude where least turbulence will be encountered. Most severe turbulence is apt to be encountered at approximately 14,000 to 16,000 feet. Turbulence is likely to be at a minimum at approximately 6,000 feet or in the "anvil top" of the storm. Maintain initial heading through the storm. Do not attempt to control altitude, but maintain a safe altitude and hold airspeed within the limits given under AIRSPEED LIMITATIONS, Sec. V. Control direction as closely as possible and keep wings level.

COLD WEATHER PROCEDURES.

PREFLIGHT EXTERIOR INSPECTION. Perform the preflight exterior inspection outlined in section II. Perform the following inspections with particular care:

Pitot tube, static ports, ailavator control stop mechanism air scoop, and flight stabilization and angle-of-attack air stream direction detector probes	Examine closely for presence of ice, snow, mud, or water in openings
Engine air intake ducts and tail pipes	Examine closely for presence of ice, snow, or water in openings
All overboard vent lines	Examine closely for presence of ice, snow, mud, or water in openings
All flying surfaces	Examine for presence of ice, snow, frost, or moisture
Underside of ailavators and ARC-27 and ARR-2A antennas	Examine for damage from flying ice, etc.
Fuel cell drains	Be sure that they are drained to remove water
Wheels	Be sure, if airplane is parked on slush, mud, or ice, that tires are not frozen to surface.

BEFORE STARTING ENGINES. Before starting engines, be sure immersion heaters (if any) are removed from oil tanks. Be sure that engine air intake duct and tail pipe covers are removed.

WILL BE FURNISHED AT A LATER DATE

ALTITUDE (FEET)	HIGH GUSTS (43 fps Max) TRUE AIRSPEED (Knots)		AVERAGE GUSTS (30 fps) TRUE AIRSPEED (Knots)	
	Maximum	Minimum	Maximum	Minimum
SEA LEVEL	400	200	400	200
10,000	400	200	400	200
20,000	400	200	400	200
30,000	400	200	400	200
40,000	400	200	400	200

Figure 9–2. Turbulent Air Penetration Chart

STARTING ENGINES. When outside air temperature is less than 32°F, caution should be observed to prevent attempted cranking of an engine when its rotor is locked by ice. This condition can be detected by the unusual noise created or by low or zero engine cranking speed. As soon as such a condition is discovered, return the throttle and MASTER ENGINE SWITCH to "OFF." Hot air should then be blown through the engine for at least 15 minutes before another start is attempted.

TAXIING INSTRUCTIONS. Taxi the airplane slowly on slush or wet snow to prevent moisture from being thrown into the main gear wheel wells where it can freeze on operating components of the airplane.

CABIN TEMPERATURE. Cabin temperature may be adjusted for comfort by the cabin temperature switch on the COCKPIT AIR control panel.

LANDING. Use caution when applying brakes on landing surfaces where the possibility of ice is suspected.

HOT WEATHER PROCEDURES.

Hot weather procedures do not ordinarily differ from those used during normal weather conditions except for one possibility. During hot weather at higher elevations, available thrust for take-off can be so seriously reduced that required distance for take-off exceeds runway length. When this condition prevails, take-off must be delayed until it can be accomplished safely.

Appendix I

OPERATING DATA CHARTS

Refer to CO 01-45HFC-1A "Operating Data for Navy Model F7U-3 Airplane"

INDEX

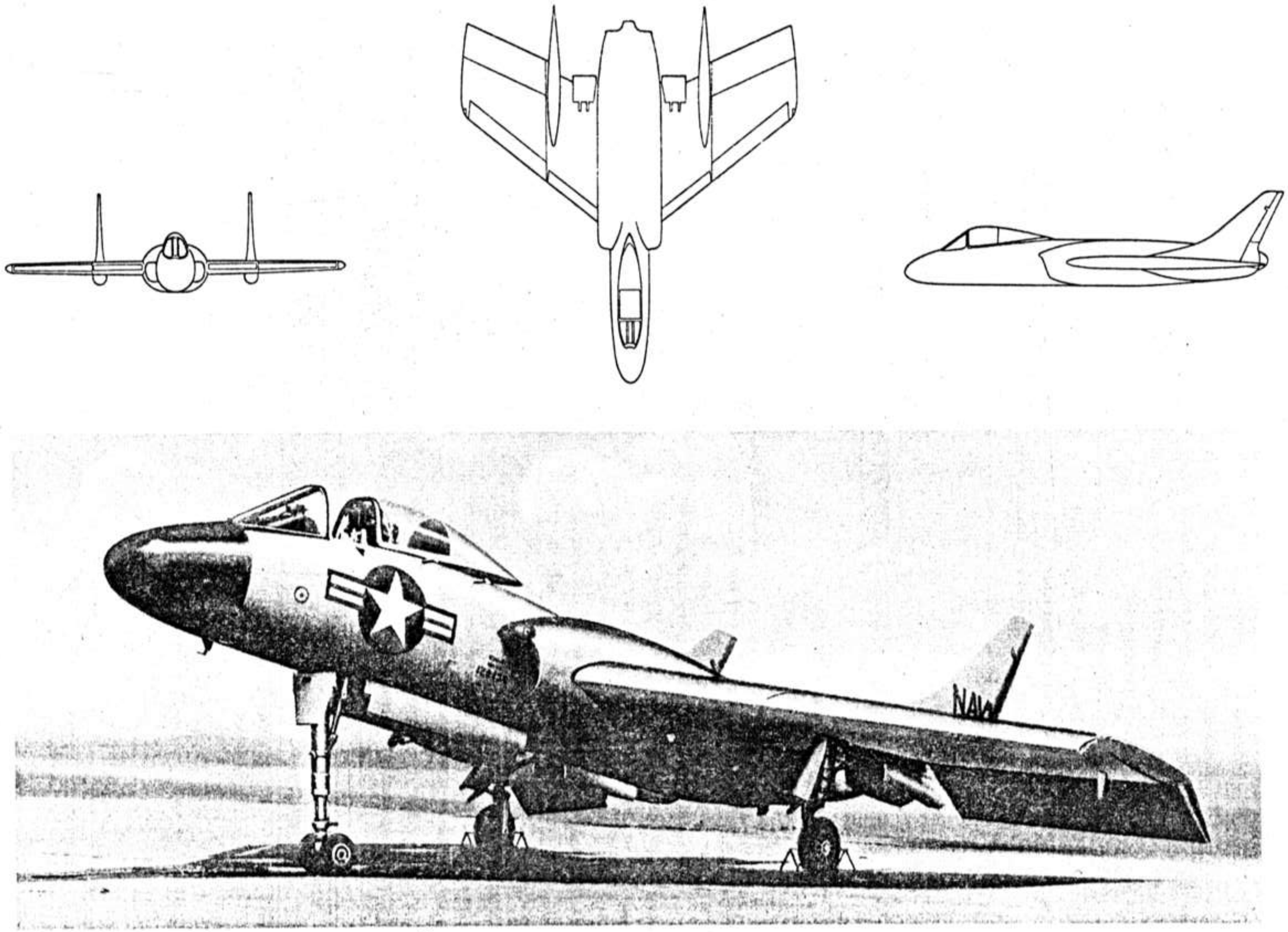


Figure 1-1. F7U-3 Airplane

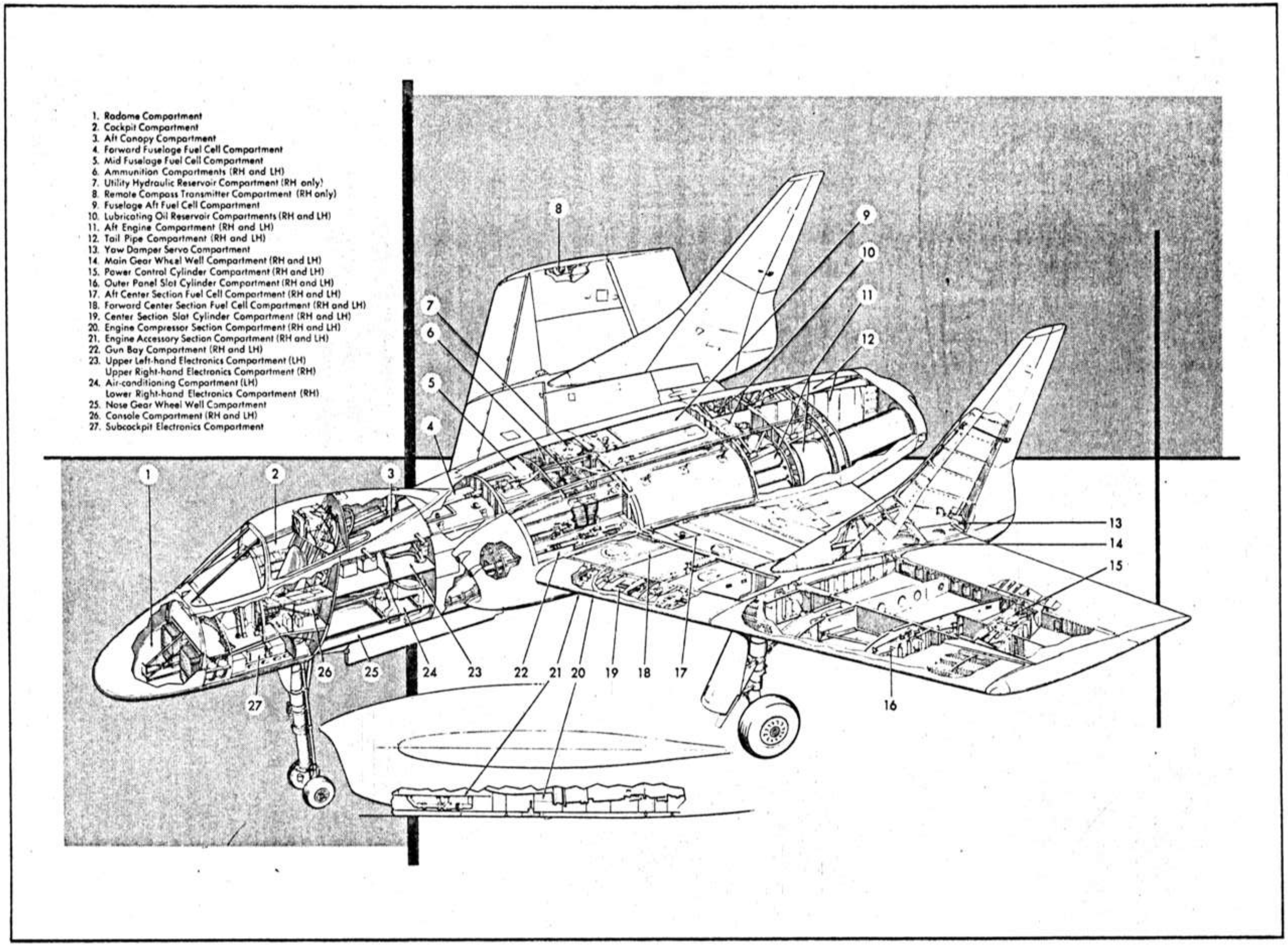


Figure 1–2. General Arrangement and Compartment Diagram

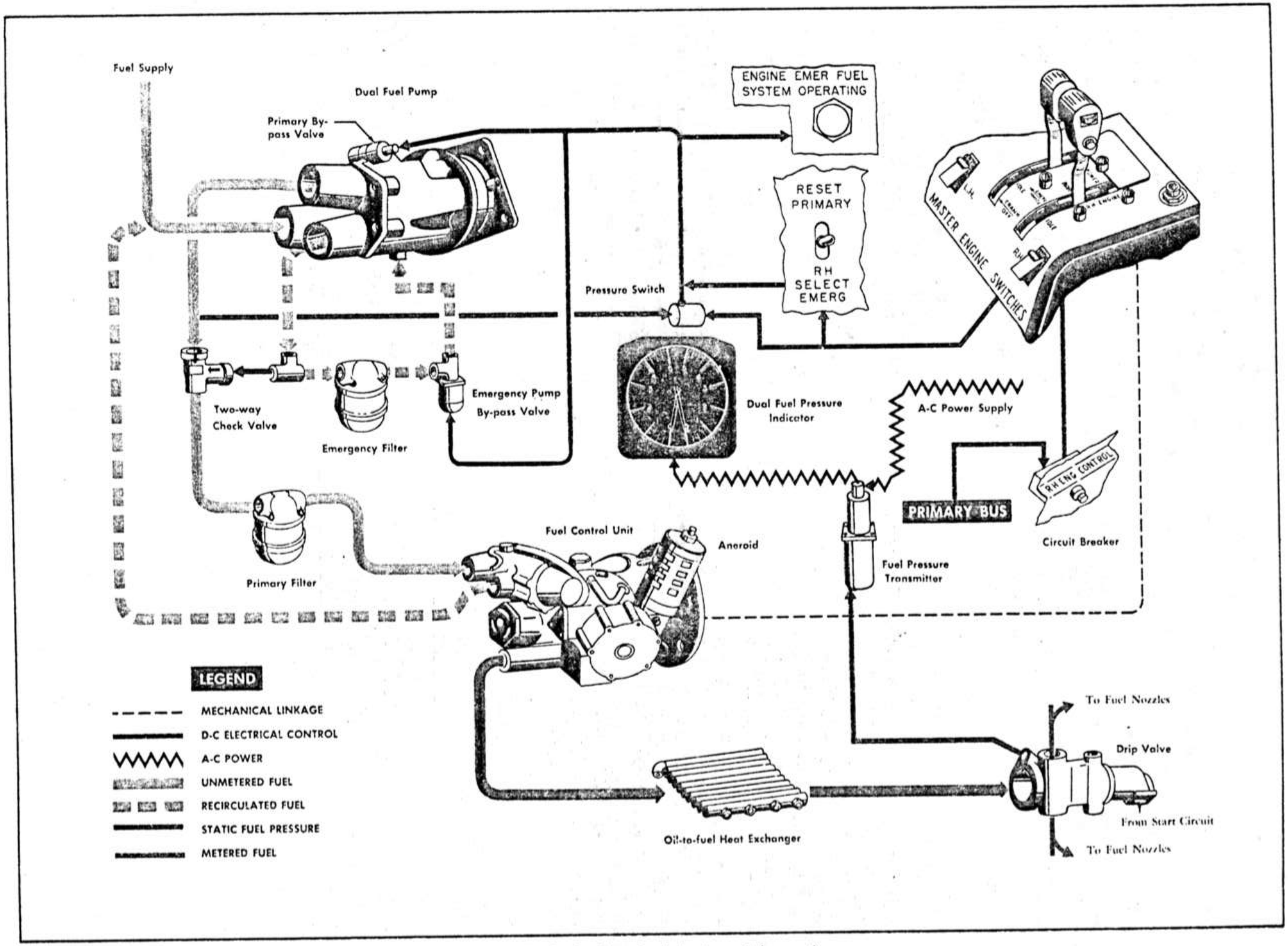


Figure 1–5. Engine Fuel System Schematic

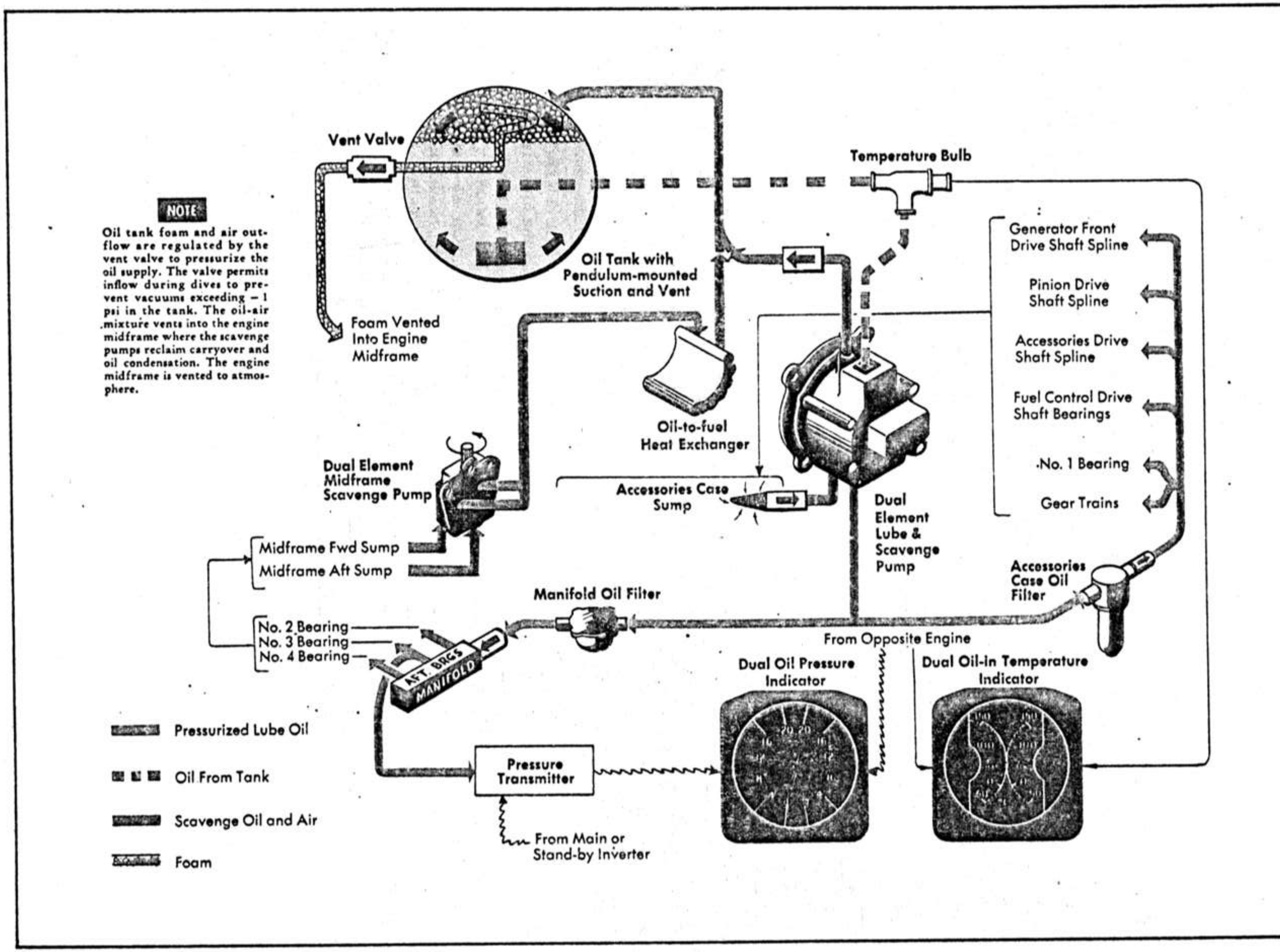


Figure 1–6. Oil System Schematic

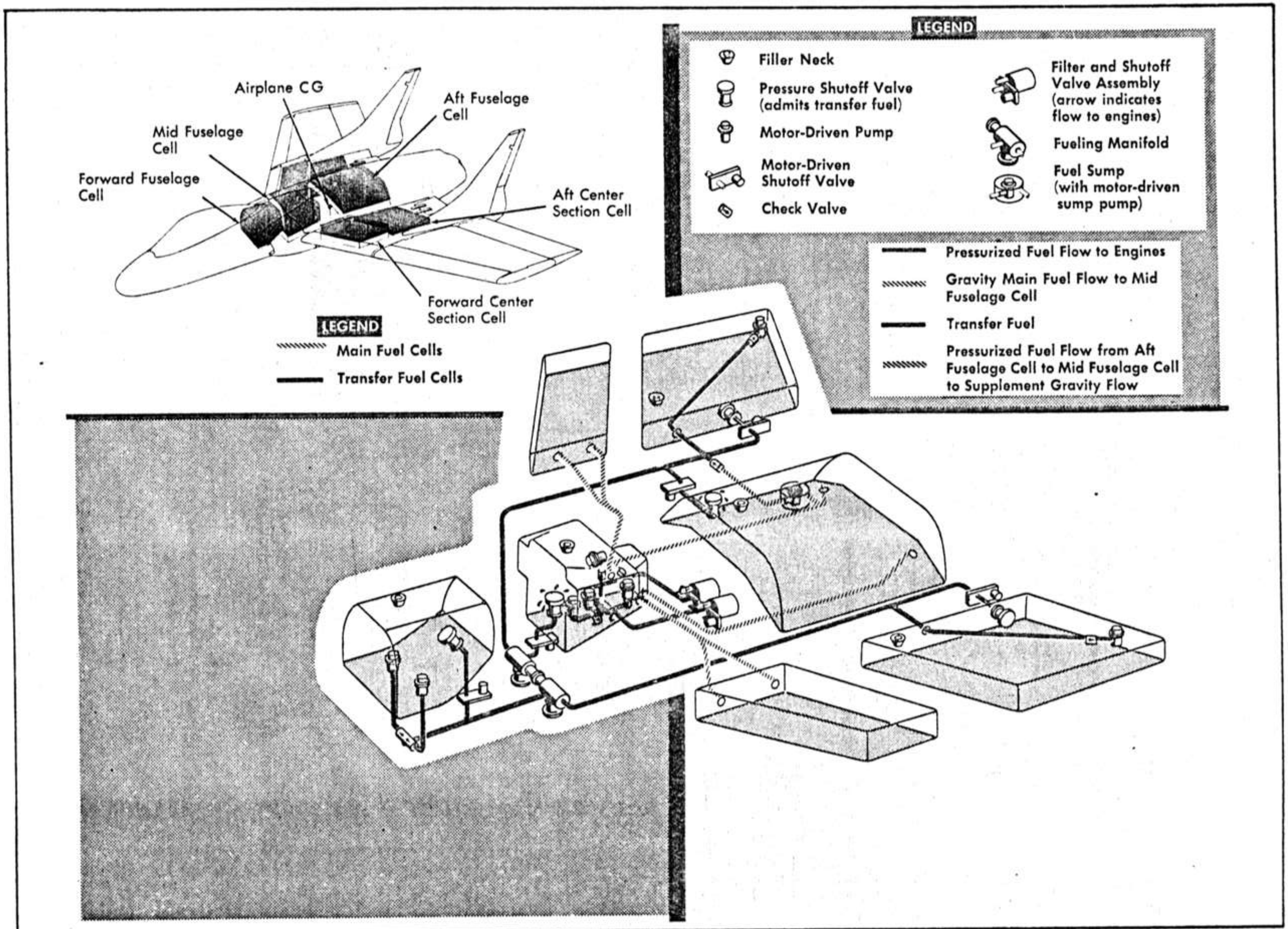


Figure 1-7. Fuel System Flow Schematic

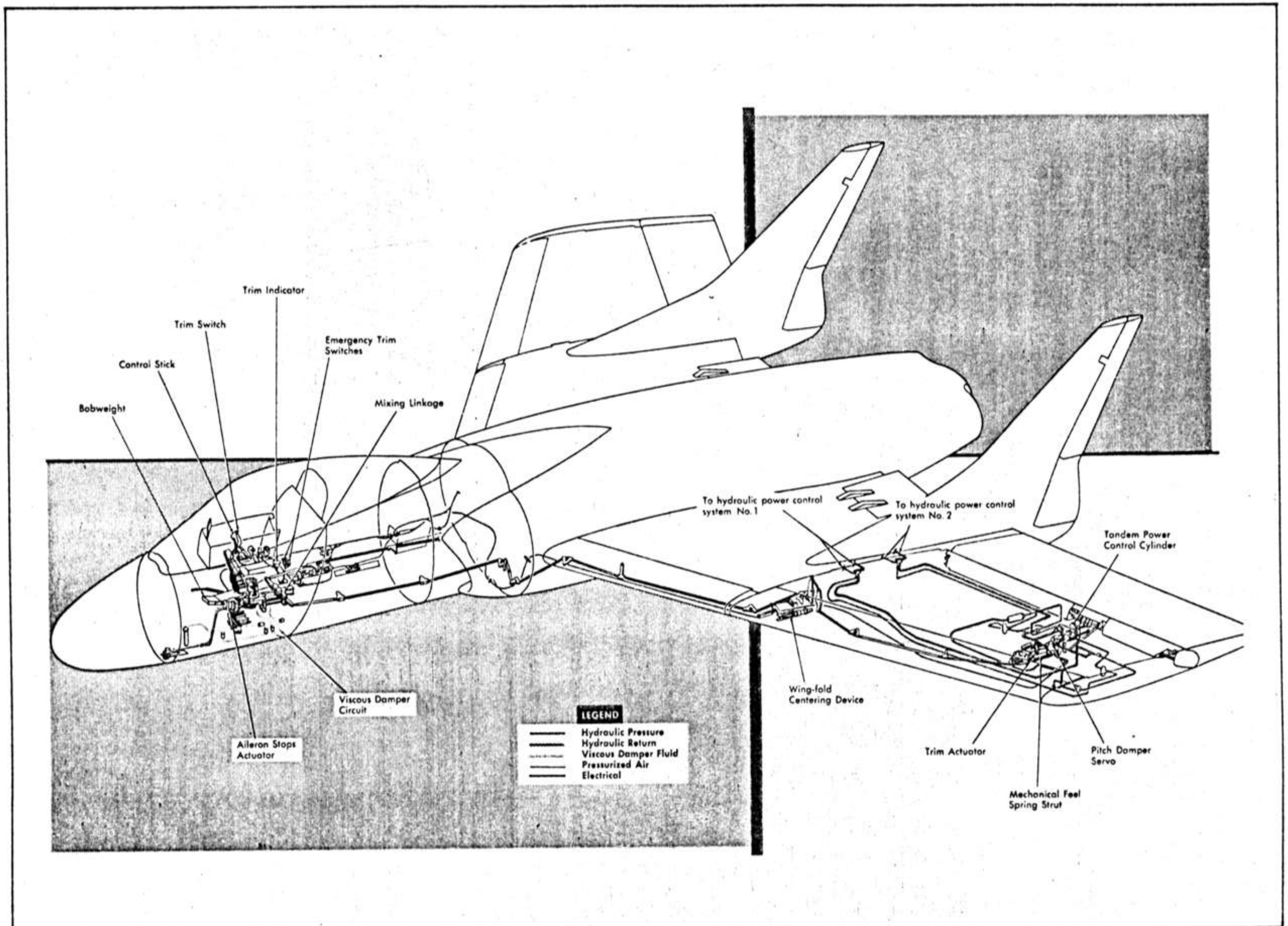


Figure 1–19. Ailavator Control, Feel, and Trim System

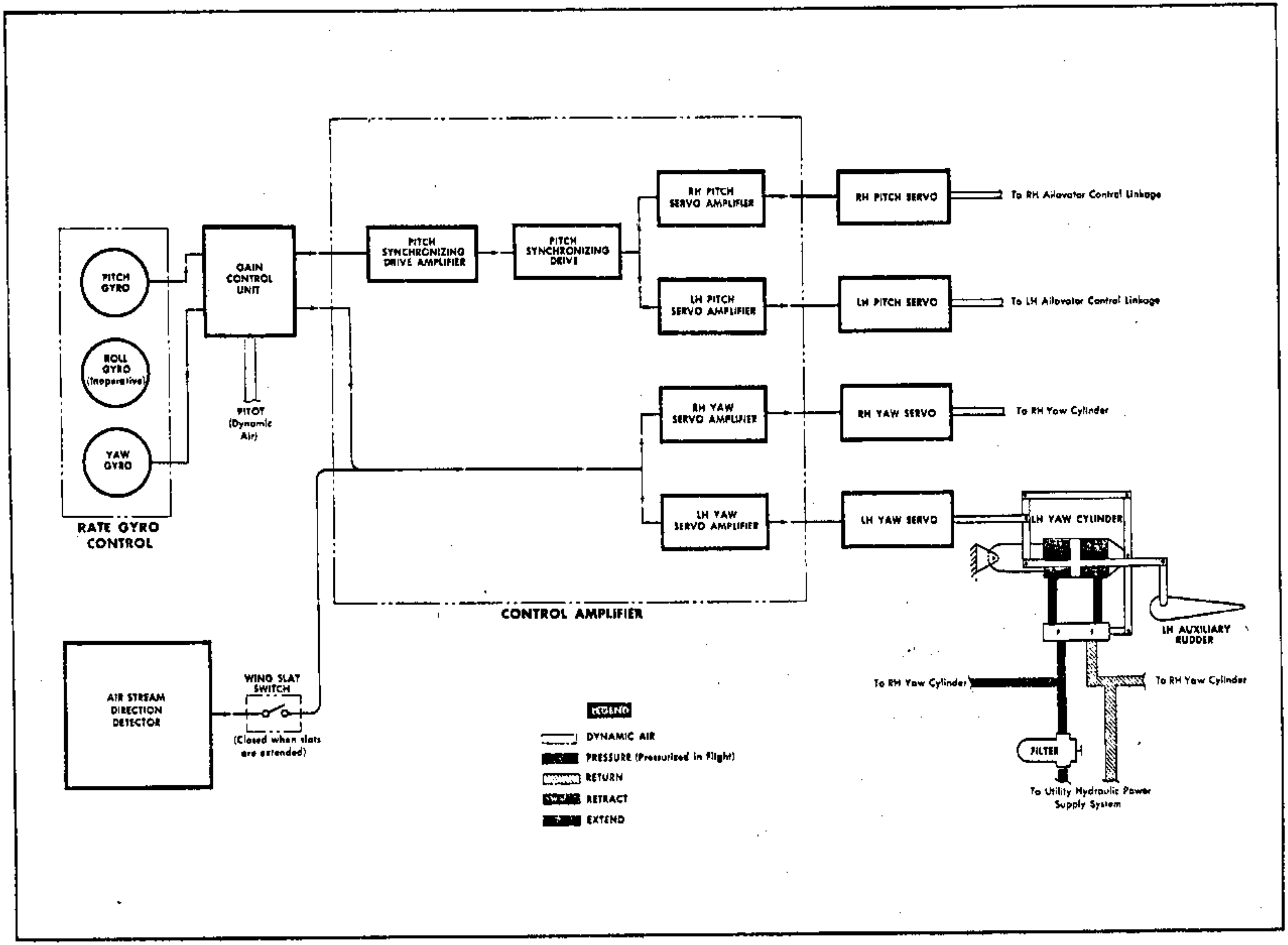


Figure 1–21. Flight Stabilization System Schematic

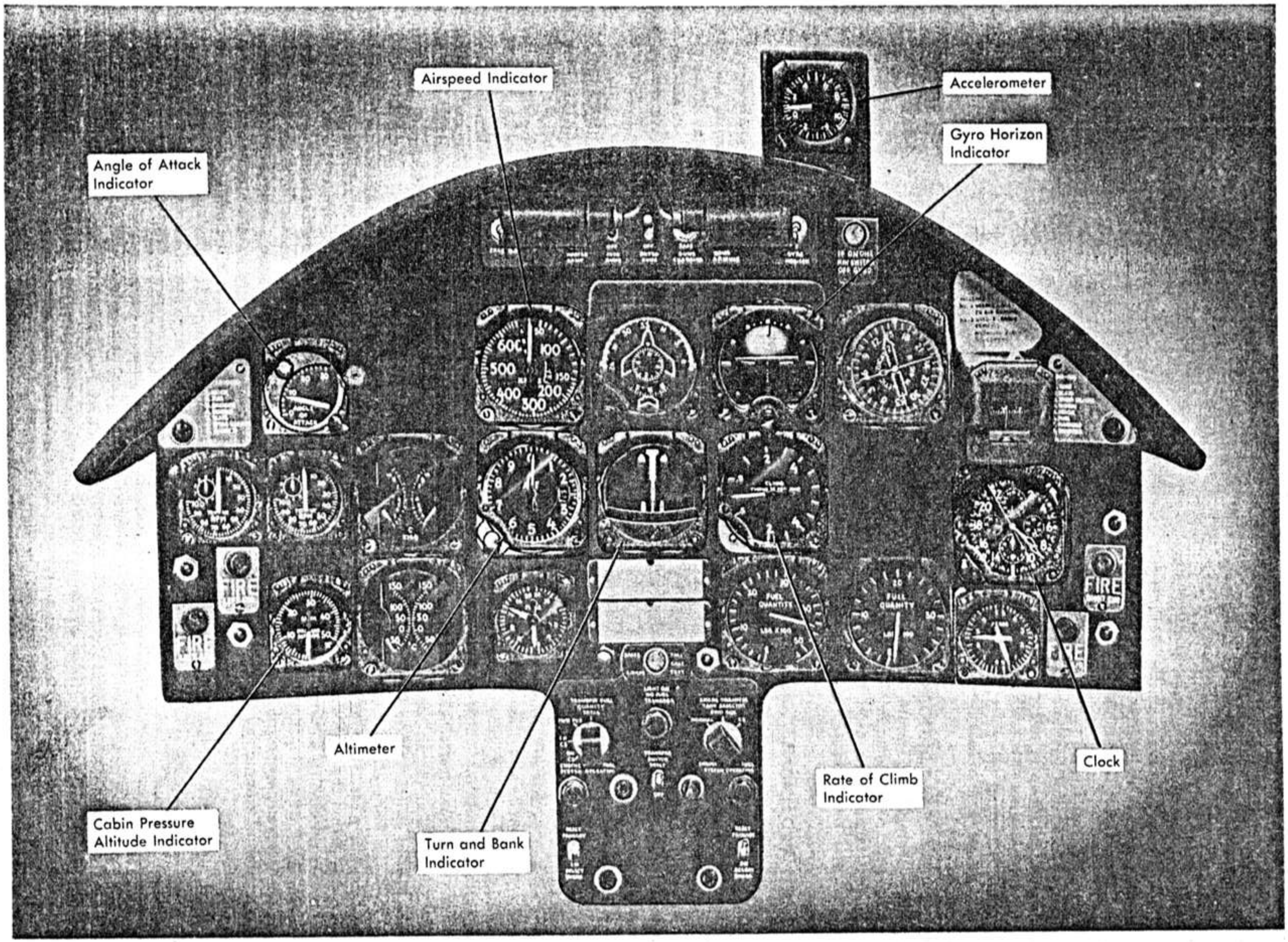


Figure 1–34. Instruments

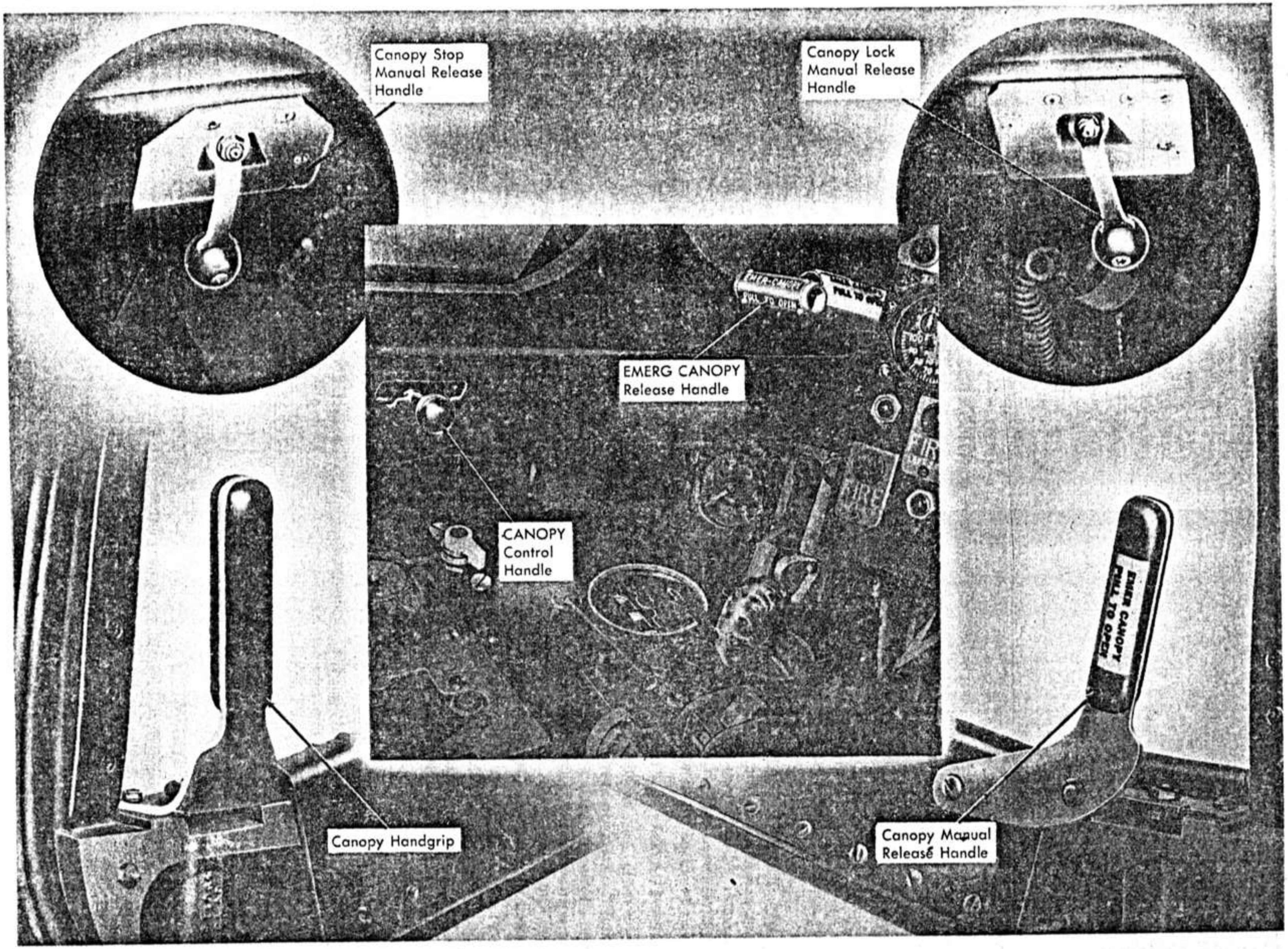
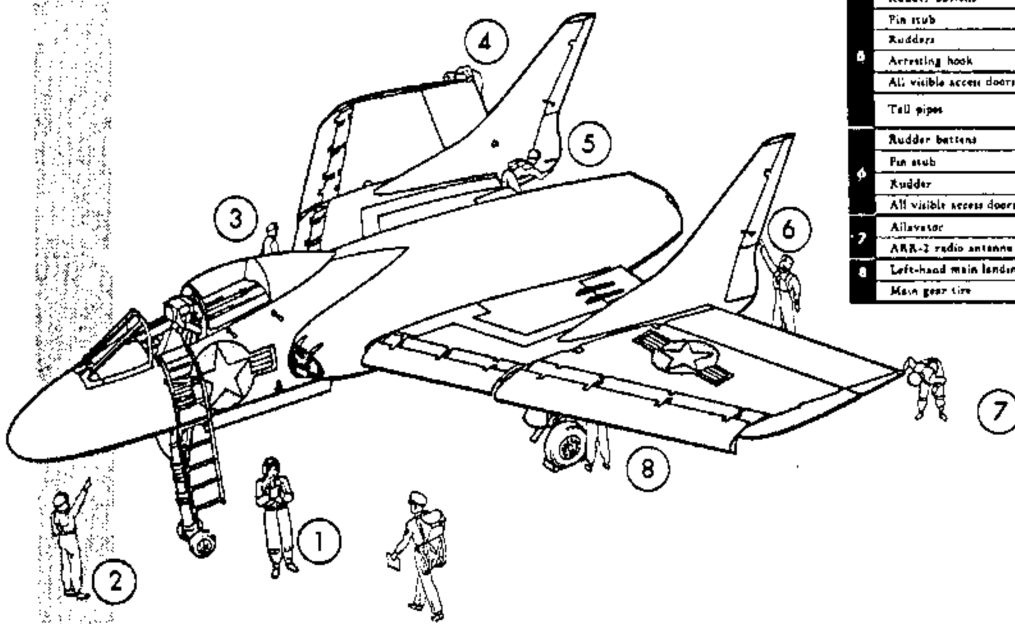


Figure 1–36. Canopy Controls

	Weight and balance	... Loading same as Form F
1	NavAer yellow sheet	... Airplane flight status
1	Two 28-volt d-c electrical power sources	... Standing by
1	Wheels	... Chocks in place
1	Excessive oil, hydraulic fluid or fuel leaks	... Puddles under airplane
1	All visible access doors and panels	... Closed
1	Left-hand engine air intake duct screen	... In place
1	Parachute	... Liferaft kit if over-water flight
1	Flashlight	... If night flight
2	Nose gear shock strut	... Proper extension
2	Nose gear tires	... Proper inflation No tread damage
2	Pitot tube, flight stabilization system and angle-of-attack air stream direction detector probe, and flight stabilization system air scoop	... Dust covers removed
3	Right-hand engine air intake duct screen	... In place
3	All visible access doors and panels	... Closed
3	Right-hand main landing gear shock strut	... Proper extension Excessive leakage
3	Main gear tire	... Proper inflation No tread damage
4	Ailevator	... Damage to underside
4	ARC-27 radio antenna	... Any visible damage
5	Rudder battens	... Removed
5	Fin stub	... Damage to underside
5	Rudders	... Freedom of movement
5	Arresting hook	... Up and latched
5	All visible access doors and panels	... Closed
5	Tail pipes	... Covers removed No evidence of hot-spots or other damage
6	Rudder battens	... Removed
6	Fin stub	... Damage to underside
6	Rudder	... Freedom of movement
6	All visible access doors and panels	... Closed
7	Ailevator	... Damage to underside
7	ARR-2 radio antenna	... Any visible damage
8	Left-hand main landing gear shock strut	... Proper extension
8	Main gear tire	... Proper inflation No tread damage



WARNING

Before clearing the airplane for flight, be absolutely certain that the UNDERSIDE FUELING-FUEL TRANSFER circuit breaker on the d-c power panel is pushed in and the power panel cover is closed. This is a safety of flight requirement.

Figure 2–1. Exterior Inspection

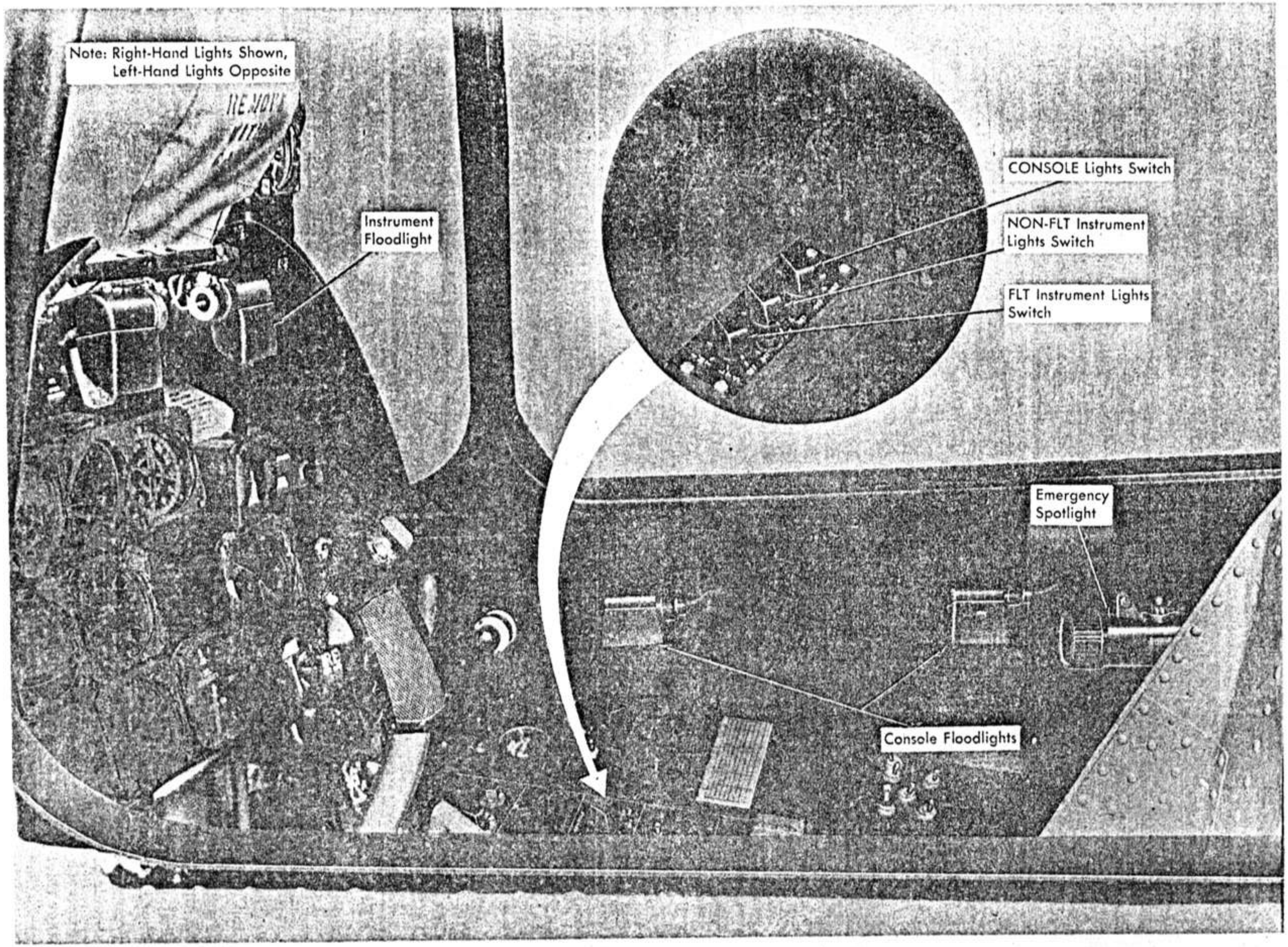


Figure 4–10. Interior Light Controls

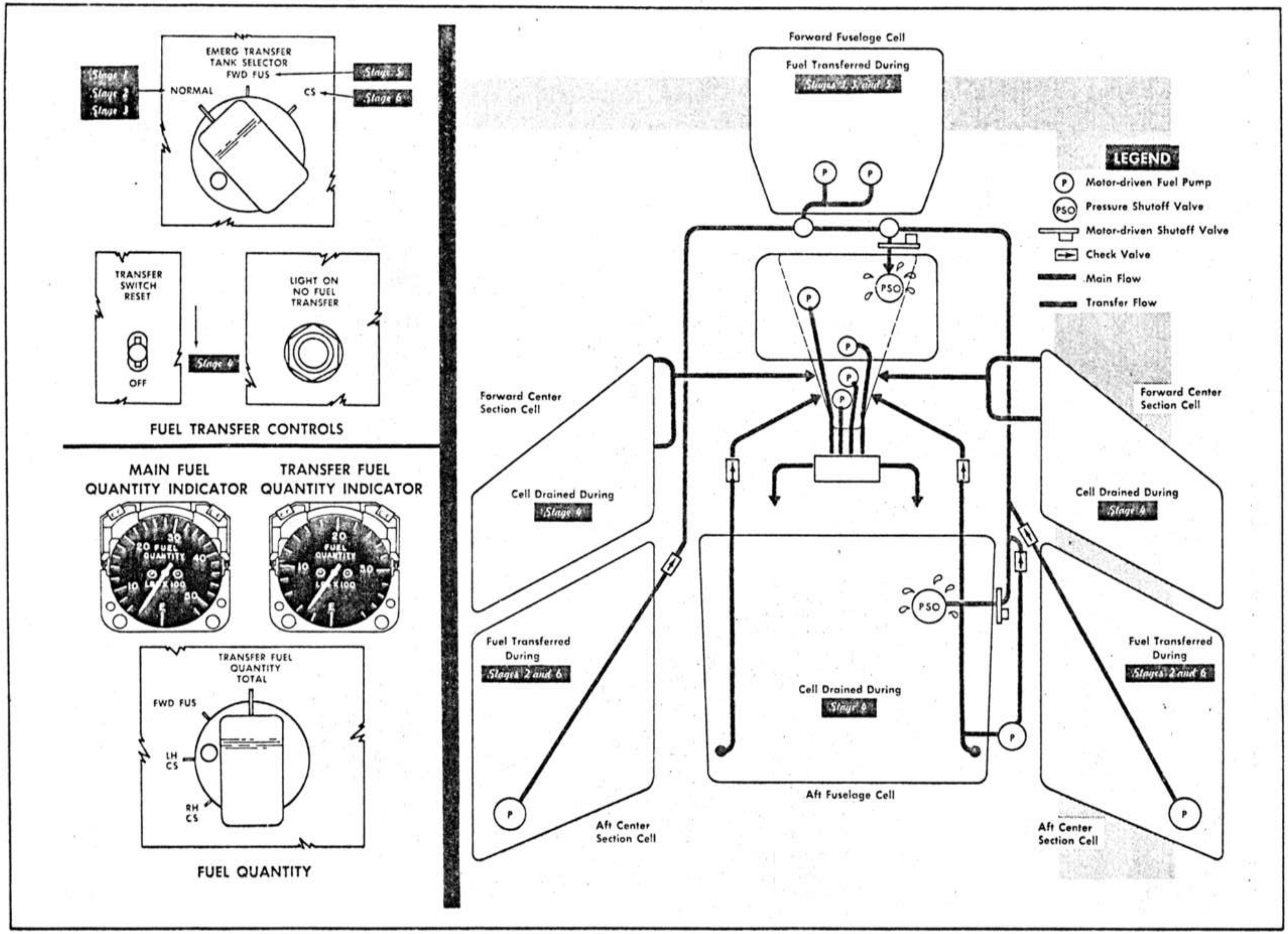


Figure 7–1. Fuel System Management (Sheet 1 of 2)

Stage	MAIN FUEL QUANTITY (TOTAL ONLY)		TRANSFER FUEL QUANTITY							
			TOTAL		FWD FUS		LH CS		RH CS	
	INDICATED	ACTUAL	INDICATED	ACTUAL	INDICATED	ACTUAL	INDICATED	ACTUAL	INDICATED	ACTUAL
Prior to Flight	4060	4580	3455	3444	1690	1584	1025	930	1025	930
1	3760	4265	2200	2180	340	320	1025	930	1025	930
2	3760	4265	340	320	340	320	E	E	E	E
3	3760	4265	E	E	E	E	E	E	E	E
NO FUEL TRANSFER warning light comes on. Turn TRANSFER switch to "OFF."										
4	3760 to E	4265 to E	E	E	E	E	E	E	E	E

NOTES:
- *Stage 1* 202 gallons transferred from FWD FUS cell.
- *Stage 2* All fuel transferred from LH and RH CS cells.
- *Stage 3* Remaining fuel transferred from FWD FUS cell.
- *Stage 4* Main fuel system is evacuated.

SWITCH SETTINGS:

TRANSFER FUEL QUANTITY Cell Selector Switch — as required to obtain above readings. Leave switch in "TOTAL" position normally.

TRANSFER switch — Neutral until after *Stage 3,* then momentarily to "OFF."

EMERG TRANSFER TANK SELECTOR Switch "NORMAL." If any cell fails to transfer properly (as detected by selective gaging), turn switch to position corresponding to cell and pump in *Stage 5 or 6* (sheet 1). Turn switch back to "NORMAL" when transfer is completed.

Figure 7–1. Fuel System Management (Sheet 2 of 2)