Pilot's Handbook

for

NAVY MODEL

FH-1

AIRPLANES

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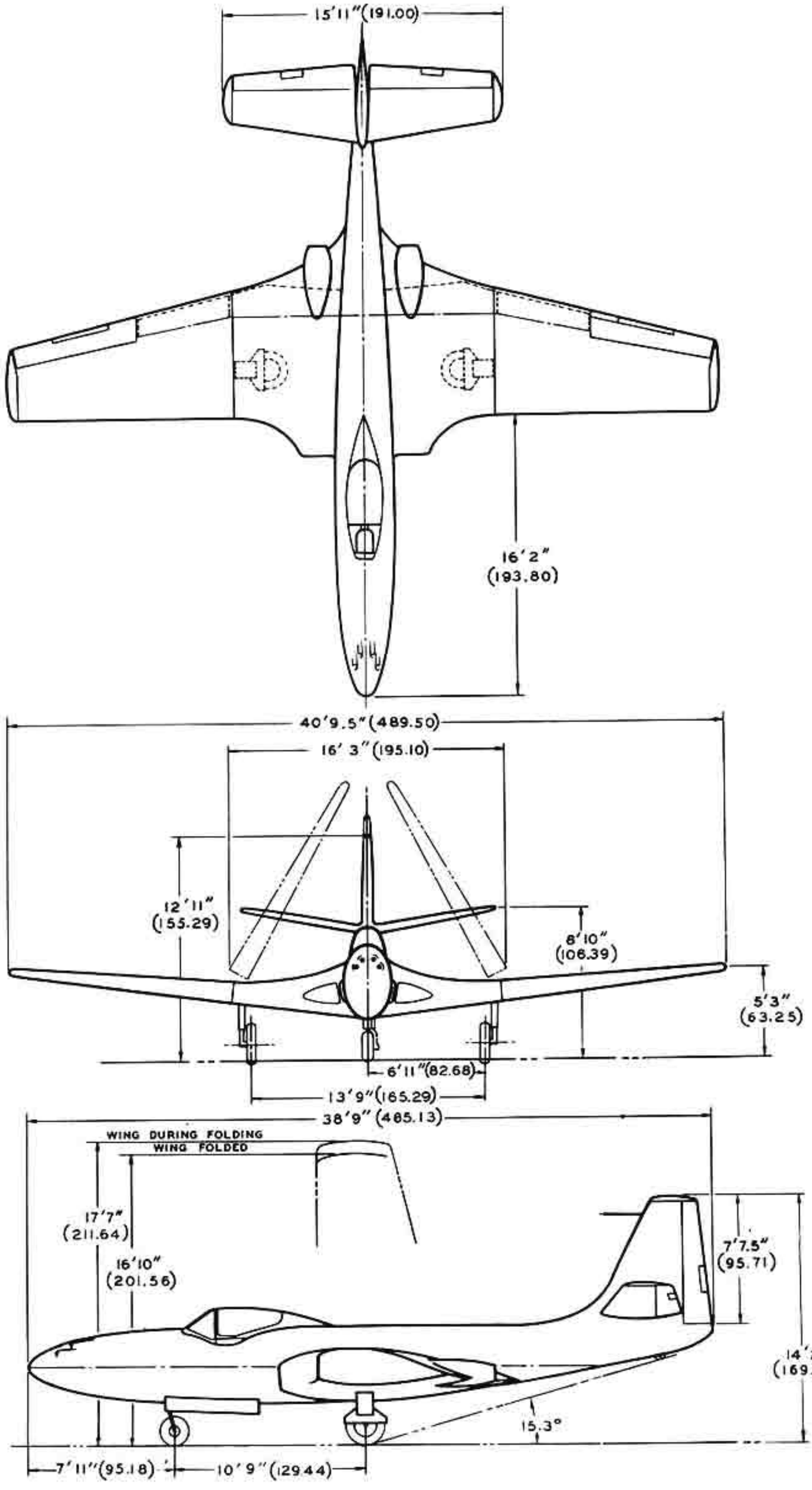
One-quarter View — Right Side

Three-quarter View — Right Side



Three View—FH-1

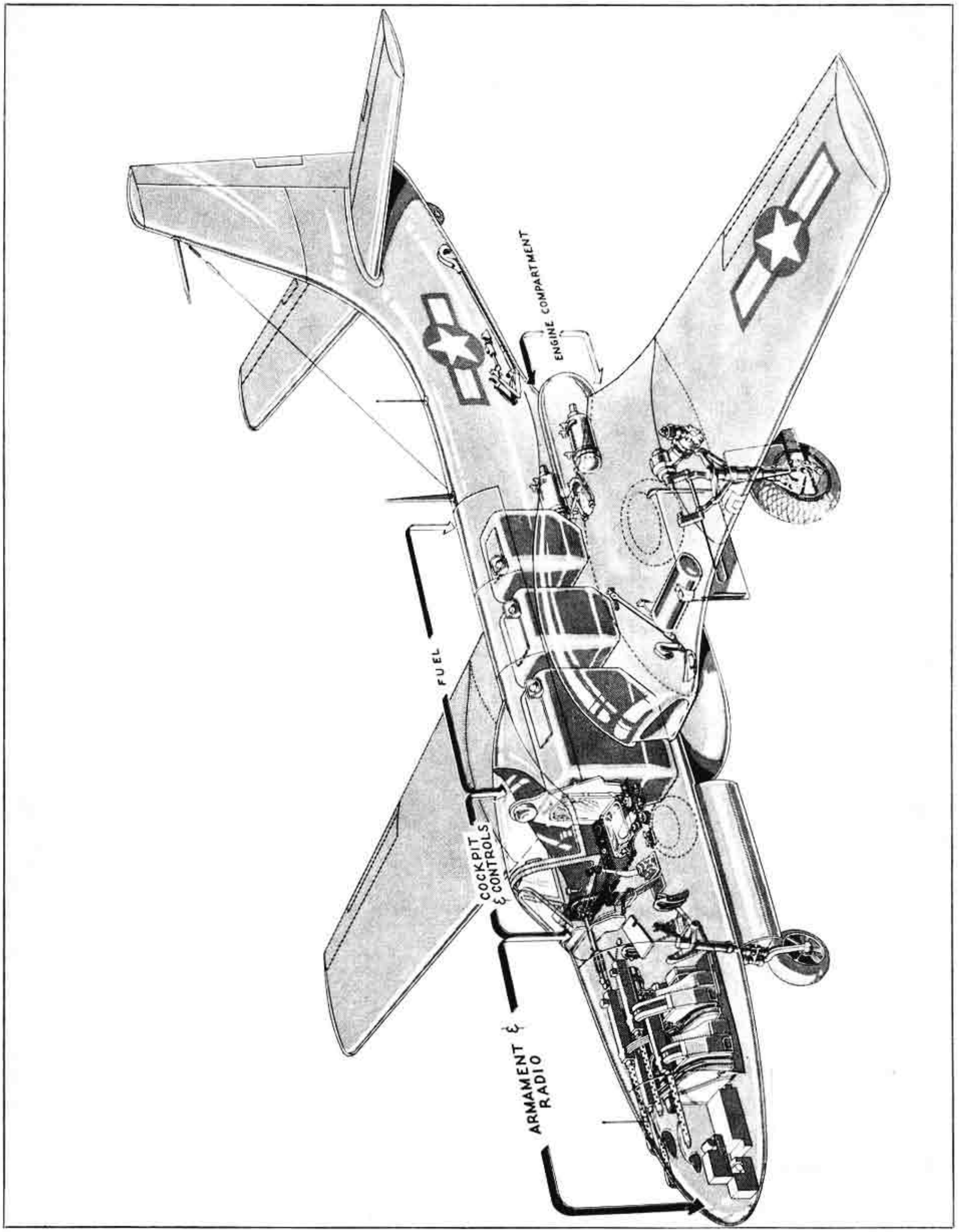


Figure 1. Fuselage Contents Arrangement

SECTION I
DESCRIPTION

1-1. DESCRIPTION. The model FH-1 is a single place, twin engine, jet-propelled, carrier based, fighter airplane. The airplane is propelled by two Westinghouse, model J-30 turbo-jet engines. The airplane in the normal gross weight fighter condition (approx. 9975 lbs.) is loaded with 375 U. S. gallons (2250 lbs.) of fuel, contained in three self-sealing fuselage tanks. Provisions are made for carrying an external auxiliary fuel tank mounted on the under-side of the fuselage. For combat operations an auxiliary fuel

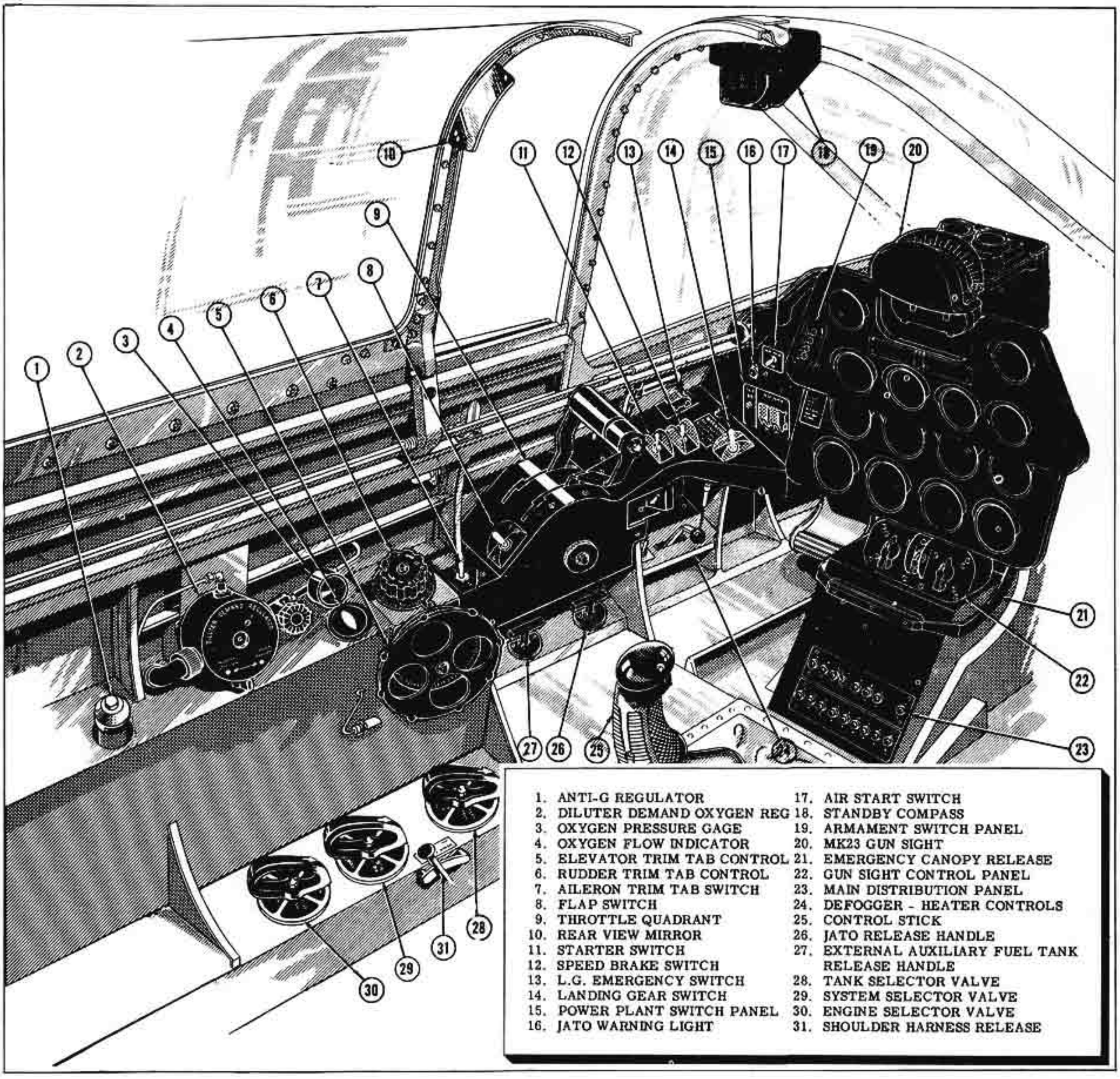


Figure 1-1. Cockpit — Left Side

tank having a capacity of 190 U. S. gallons (1140 lbs.) is used. For ferry operations an auxiliary fuel tank having a capacity of 295 U. S. gallons (1770 lbs.) is used. In the combat overload condition (approx. 11,275 lbs.) with the 190 gallon external auxiliary fuel tank installed, a total of 565 gallons (3390 lbs.) is carried. In the overload ferry gross weight condition (approx. 11,950 lbs.) with the 295 gallon external auxiliary fuel tank installed, a total of 670 gallons (4020 lbs.) is carried. The airplane is armed with four .50 caliber machine guns located in the fuselage nose. With the exception of the hydraulic brakes, all systems are electrically operated. The principal dimensions of the airplane are shown on "Three-View — FH-1."

1-2. BUBBLE CANOPY. The bubble canopy affords the pilot perfect visibility and eliminates the necessity for "S" turns while taxiing. The canopy may be jettisoned in flight and is capable of withstanding a 40g ditching load.

1-3. CONSOLE COCKPIT. The cockpit consoles hide normally exposed tubing, wiring, etc., to give the cockpit a cleaner, neater and less confusing appearance.

1-4. TRICYCLE LANDING GEAR. A tricycle type, electrically operated landing gear is provided. The shock struts are a conventionel oleo pneumatic type. The main wheels are equipped with single disc type, hydraulically operated brakes. The main gear is retracted inboard into the center section of the wing.

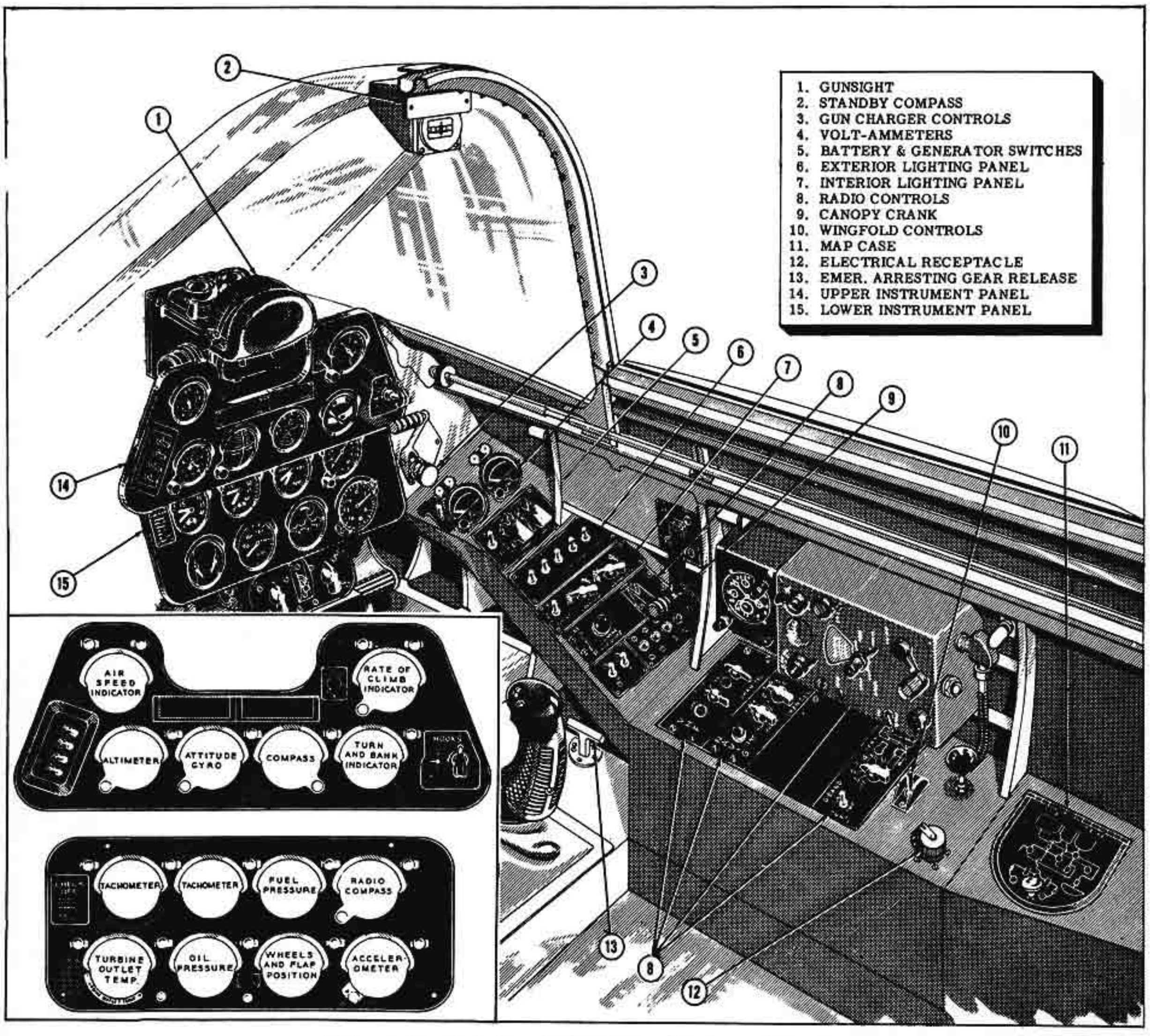


Figure 1–2. Cockpit — Right Side and Instrument Panel

To conserve space within the wing center section, each main gear strut is equipped with a compression strut to more fully compres the shock strut in the retracted position. The nose gear is equipped with a shimmy damper and centering device. A linkage arrangement is incorporated to twist the nose gear as it is retracted. Dead center linkage arrangements automatically lock the nose and main gear in the extended or retracted position. See Paragraph 1-44 for electrical control of the landing gear.

1-5. JATO UNITS. See Paragraph 1-68.

1-6. POWER PLANT.

1-7. THEORY OF TURBO-JET UNIT OPERATION. The turbo-jet propulsion engine described herein consists of an oil cooler, axial flow compressor, combustion chamber, turbine or bucket wheel, and an exhaust nozzle. See Schematic—Jet Unit Operation. Air drawn in by the compressor is compressed to approximately four times atmospheric pressure by the time it reaches the combustion chamber. In the combustion chamber, fuel injected by spray nozzles, mixes and burns with the compressed air, creating a temperature of about 1500°F. Disregarding outside factors (ambient air velocity, temperature, etc.), the speed of the airplane is directly dependent upon the rate of fuel flow into the combustion chambers of the engines. The turbine wheel provides power for driving the compressor; therefore, as the compressed and heated air expands through the turbine, a drop in pressure and temperature occurs. This is necessary as a portion of the energy must be utilized to drive the turbine wheel. As the high velocity gases leave the turbine at slightly above atmospheric pressure, the velocity is further increased in the exhaust section, where the gases are expanded down to atmospheric pressure. Thrust is provided by the reactionary force created by the exit of this high velocity gaseous jet.

WARNING

Caution should be exercised in the areas forward and aft of the turbo-jet engine to remain a safe distance from the inlet air duct and the exhaust nozzle. See Jet Temperatures and Velocities.

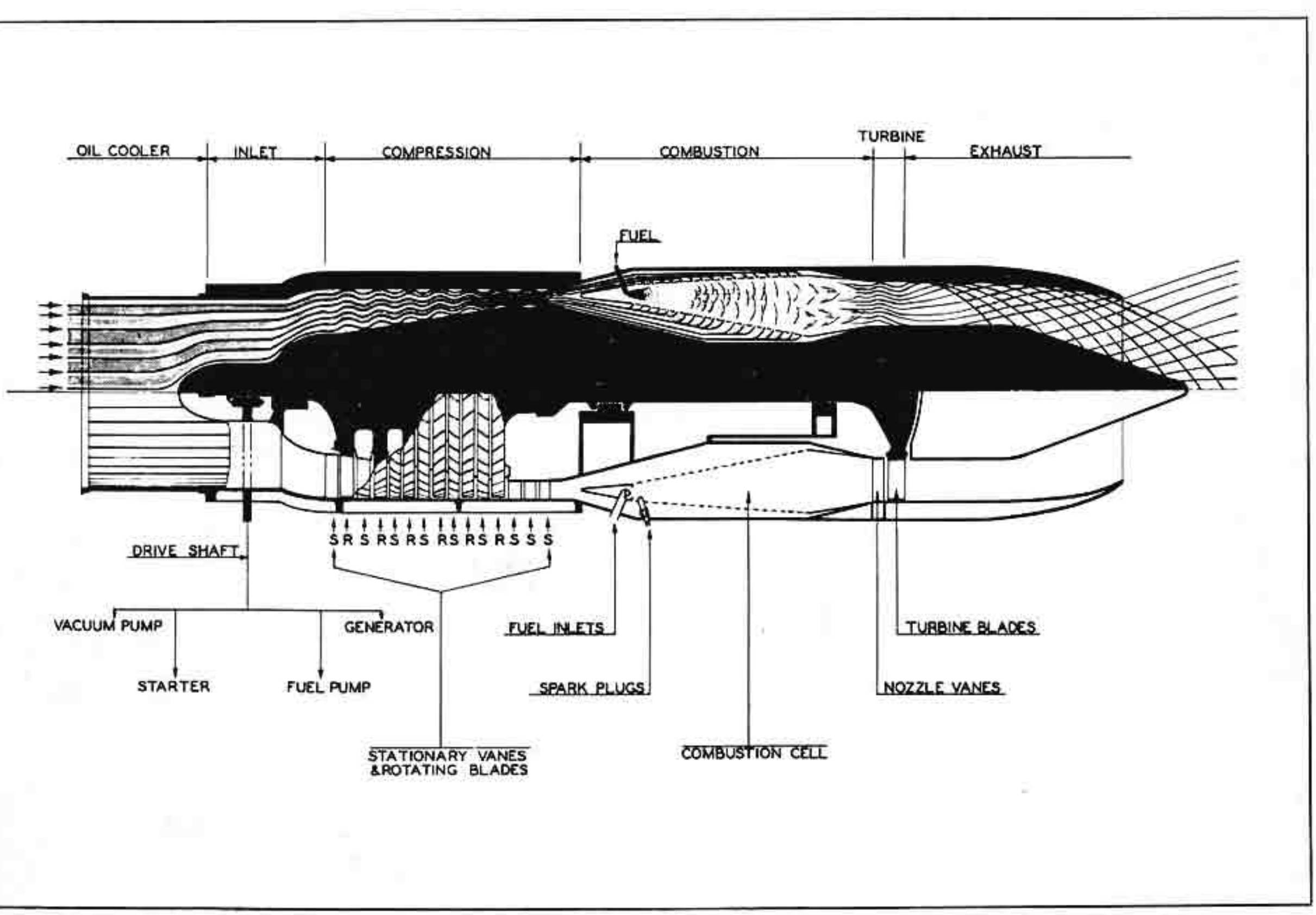


Figure 1-3. Schematic — Jet Unit Operation

Note

Serious damage or injury occurs only when the entire inlet air duct is obstructed, and a seal is formed over the leading edge of the duct.

1-8. GENERAL. Two Westinghouse J30 turbojet engines are installed in the wings, outboard of the fuselage. Air for combustion and cooling is supplied by an intake duct in the leading edge of each wing. Each duct is provided with a butterfly type valve to close the duct when the engines are not operating. A throttle control, butterfly valve (inlet air control), air start switch, and a starter switch constitute the power plant controls of each engine.

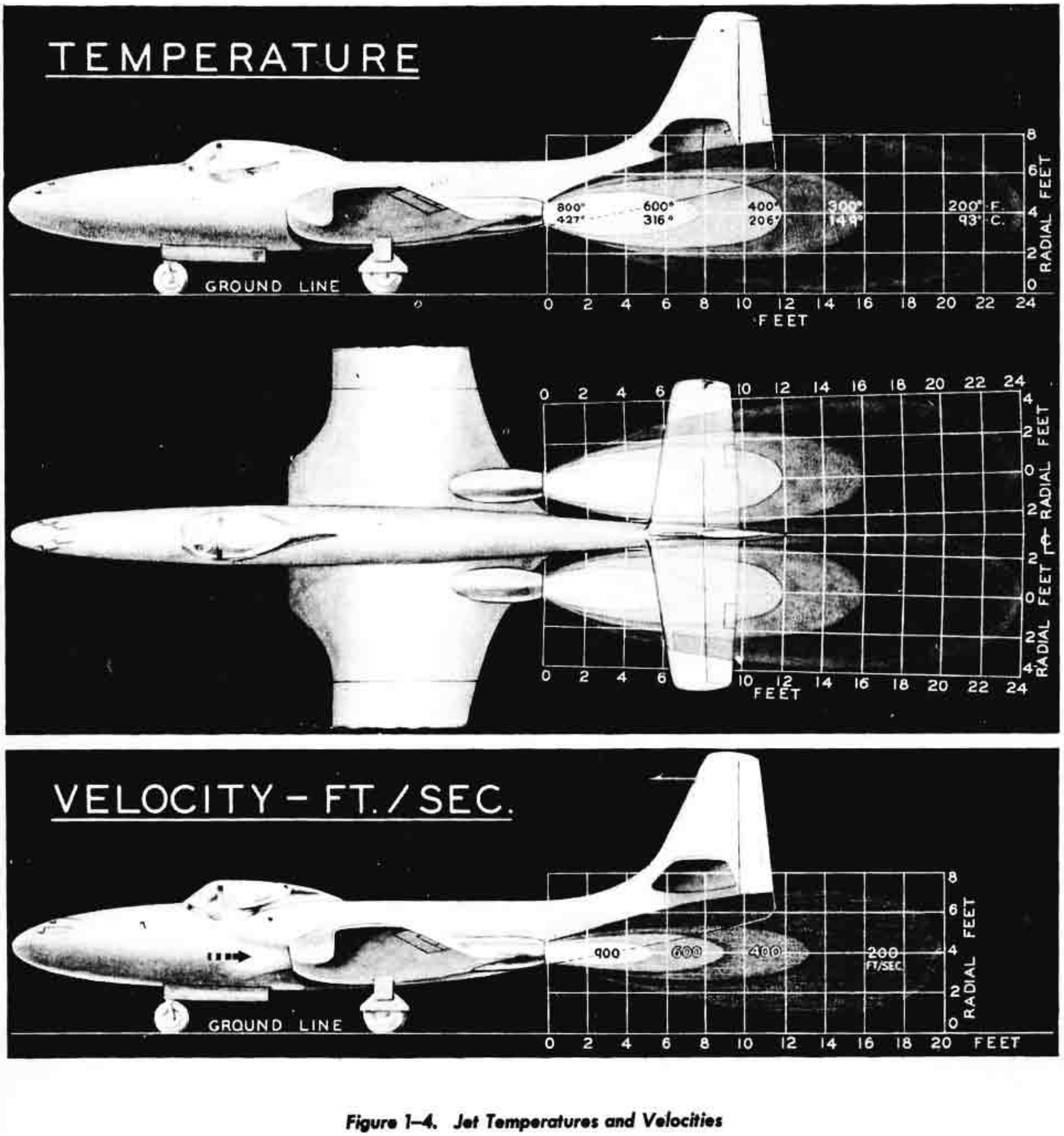


Figure 1–4. Jet Temperatures and Velocities

1-9. POWER PLANT CONTROLS.

1-10. THROTTLE CONTROL. The throttle control is conventional in appearance. The controls, one for each engine, are located on the left side of the cockpit, adjacent to the pilot's seat. The throttles have "CLOSE," "IDLE," and "OPEN" positions. Moving the throttle control forward to the "IDLE" position automatically opens the butterfly valve in the corresponding engine and actuates the submerged booster pump, thus turning on the fuel supply to the engine. The governor, which is integral with the throttle, functions to maintain a constant engine rpm setting. A spring loaded catapult grip which fits over the throttle handles is provided. The grip prevents involuntarily moving the throttle when the airplane is catapulted. The Jato switch is located on the catapult grip.

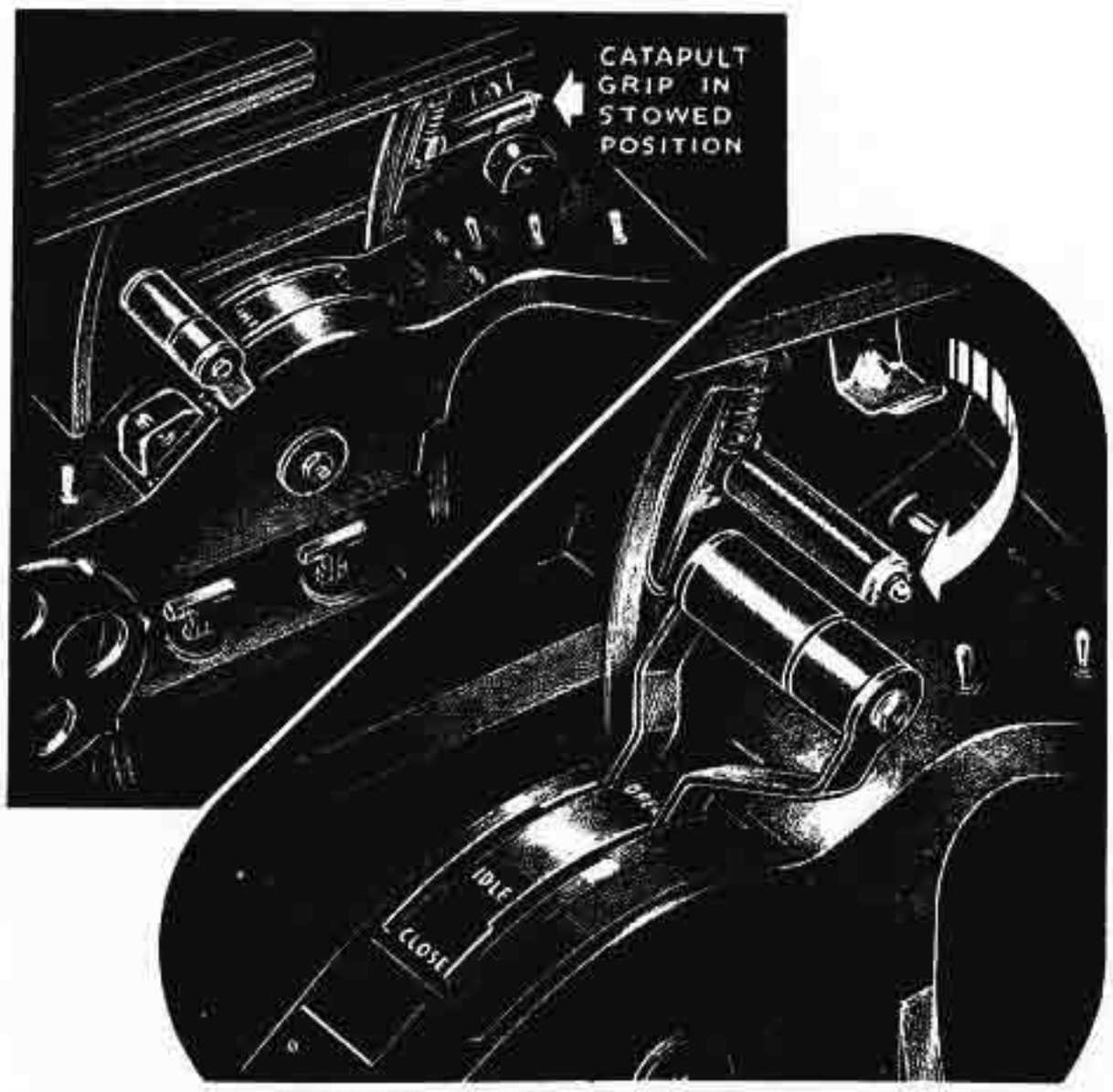


Figure 1–5. Throttle Controls

1-11. INLET AIR DUCT CONTROLS. Butterfly valves in the inlet air ducts are electrically actuated. Two toggle switches located on the power plant switch panel left side of the cockpit, outboard of the lower instrument panel, Figure 1-6, control the valves when the throttles are less than 12 degrees open. Limit switches actuated by the throttle levers override the toggle switches. Upon opening the throttles 12 degrees or more, the limit switches automatically open the butterfly valves in the intake ducts. The manual switches read "AIR DUCTS," and have "OPEN" and "SHUT" positions. Closing the throttles does not automatically close the valves. The toggle switches must be in the "SHUT" position in order to close the valve, regardless of the throttle position.

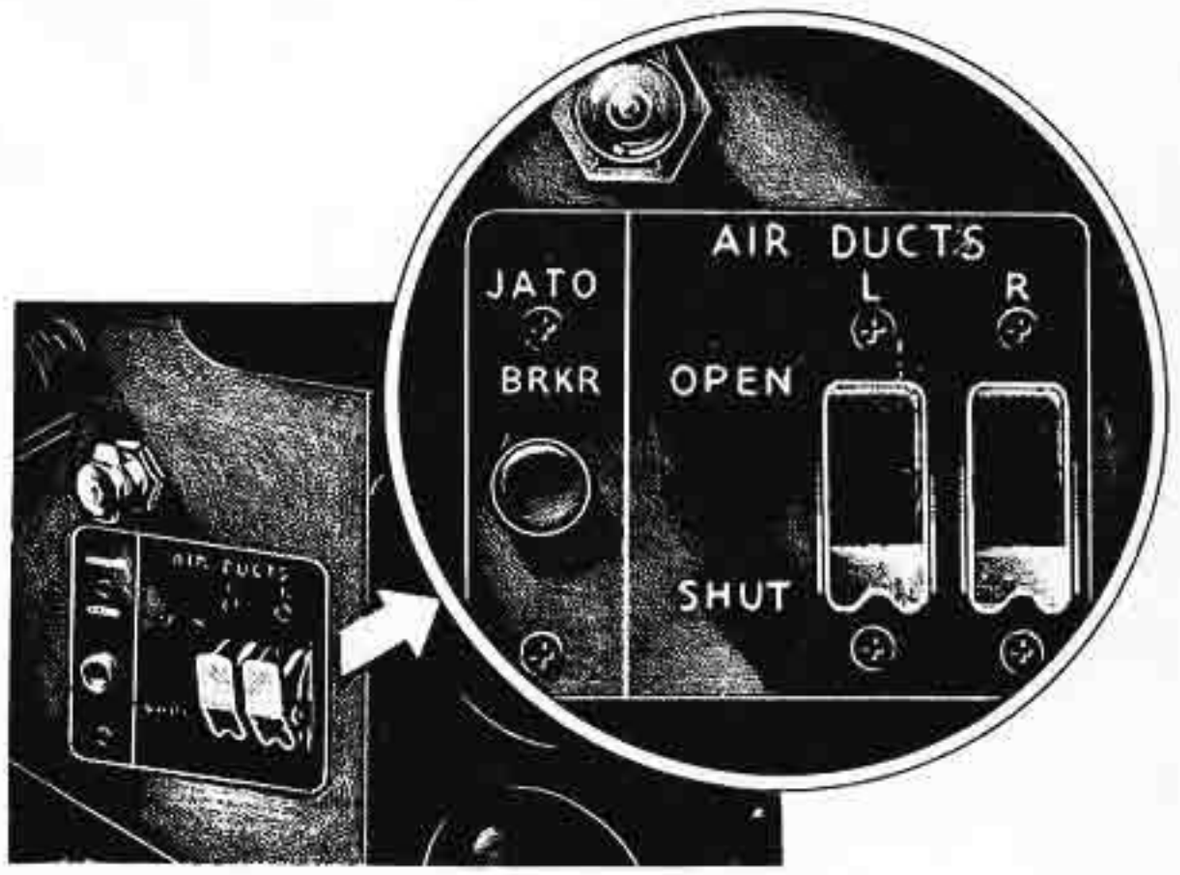


Figure 1–6. Power Plant Switch Panel

1-12. STARTING AND IGNITION. Each engine is brought up to starting speed by energizing the electric starter. The starting and ignition systems are integral. The ignition system for each engine consists of two spark plugs and two ignition coils which are used for initial combustion. Thereafter, combustion is self-supporting and the spark plugs cut out automatically when the timer cycle is complete. The starter switch is a momentary contact, two-throw type, toggle switch and is located on the front console panel, cockpit left side, forward of the throttle controls. See Figure 1-7. Attempts to start the engines should not be made if ambient temperature is below — 28.9°C(— 20° F.).

CAUTION

The starter switch should not be held on for longer than 10 seconds.

The starting cycle is automatically energized for 30 seconds, after which the starting controls automatically cut out.

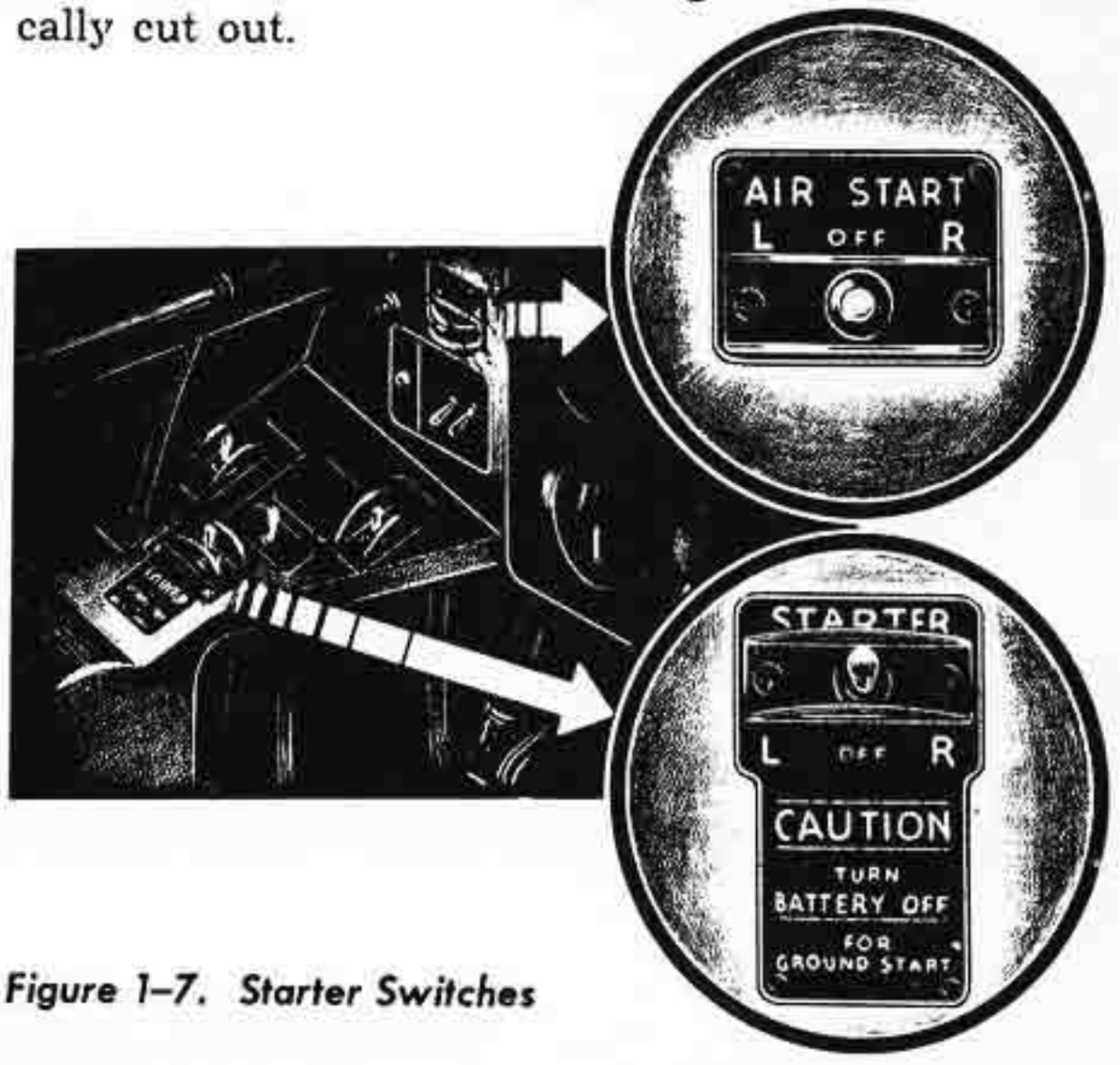


Figure 1–7. Starter Switches

1-13. AIR START SWITCH. An air start switch which supplies power to the booster coil directly from the battery and operates independently of the starter switch is provided. This switch enables starting the engine in flight by means of engine windmill rpm and a spark from the booster coil (with air ducts and throttles "OPEN") without "draining juice" from the battery for the starter motor. The switch is located above the power plant switch panel, and has "L," "OFF," and "R" positions. See Section II for specific operating instructions.

1–14. FLIGHT CONTROLS.

1-15. The ailerons and elevators are controlled in the conventional manner by the control stick. Fabric pressure seals are provided on the ailerons, and the elevators are equipped with metal, hinged, pressure seals. The rudder is conventionally controlled by means of rudder pedals. See Paragraph 1-72, Rudder Pedal Adjustment.

1–16. TAB CONTROLS.

1-17. AILERON SPRING TABS. Each aileron is equipped with a spring balance tab adjustable on the ground only. These tabs are actuated by spring loaded rods attached to the aileron push-pull rods.

1-18. AILERON TRIM TAB. An electric trim tab on the left aileron is controlled from the cockpit by means of a toggle switch. This switch, a momentary contact two-throw type, is located aft of the throttle quadrant and forward of the rudder trim tab control. See Figure 1-8.

1-19. RUDDER TRIM TAB. The rudder is provided with an adjustable trim tab. The tab is controlled by a conventional horizontal handwheel on the left side of the cockpit, aft of the throttle control. A clockwise movement of this wheel moves the nose of the airplane to the right.

1-20. ELEVATOR TRIM TABS. Each elevator is provided with a trim tab adjustable during flight. Clockwise motion of the conventional vertical handwheel directly below the rudder tab control results in a nose down condition of the airplane.

1–21. LANDING FLAPS. The landing flaps are conventional split type divided into four parts, and are attached to the outer and center wing panels. The flaps are electrically controlled by a momentary contact toggle switch, located on the left hand console panel, aft of the throttle. This switch is provided with a standard toggle switch guard, and has "UP," "DOWN" and "OFF" positions. See Figure 1-9. The flaps may be lowered or raised to intermediate positions (one-quarter, one-half, and three-quarters) by flipping the toggle switch to "UP" or "DOWN," and holding in this position until the desired flap setting is obtained. Flip the switch to "OFF" after the flaps have traveled to the desired position, as indicated on the flap position indicator, located on the instrument panel. See Figure 1-2.

The pilot has full control of the flaps up to approximately 156 knots ± 5 knots. If the flap switch is in the "DOWN" position at a speed less than 156 knots, and the speed is increased (above 156 knots), the airspeed switch overrides the toggle switch control and the flaps automatically move up to the fully closed position. Move switch to "UP" if flaps do not automatically close when speed is increased above 156 ± 5 knots IAS.

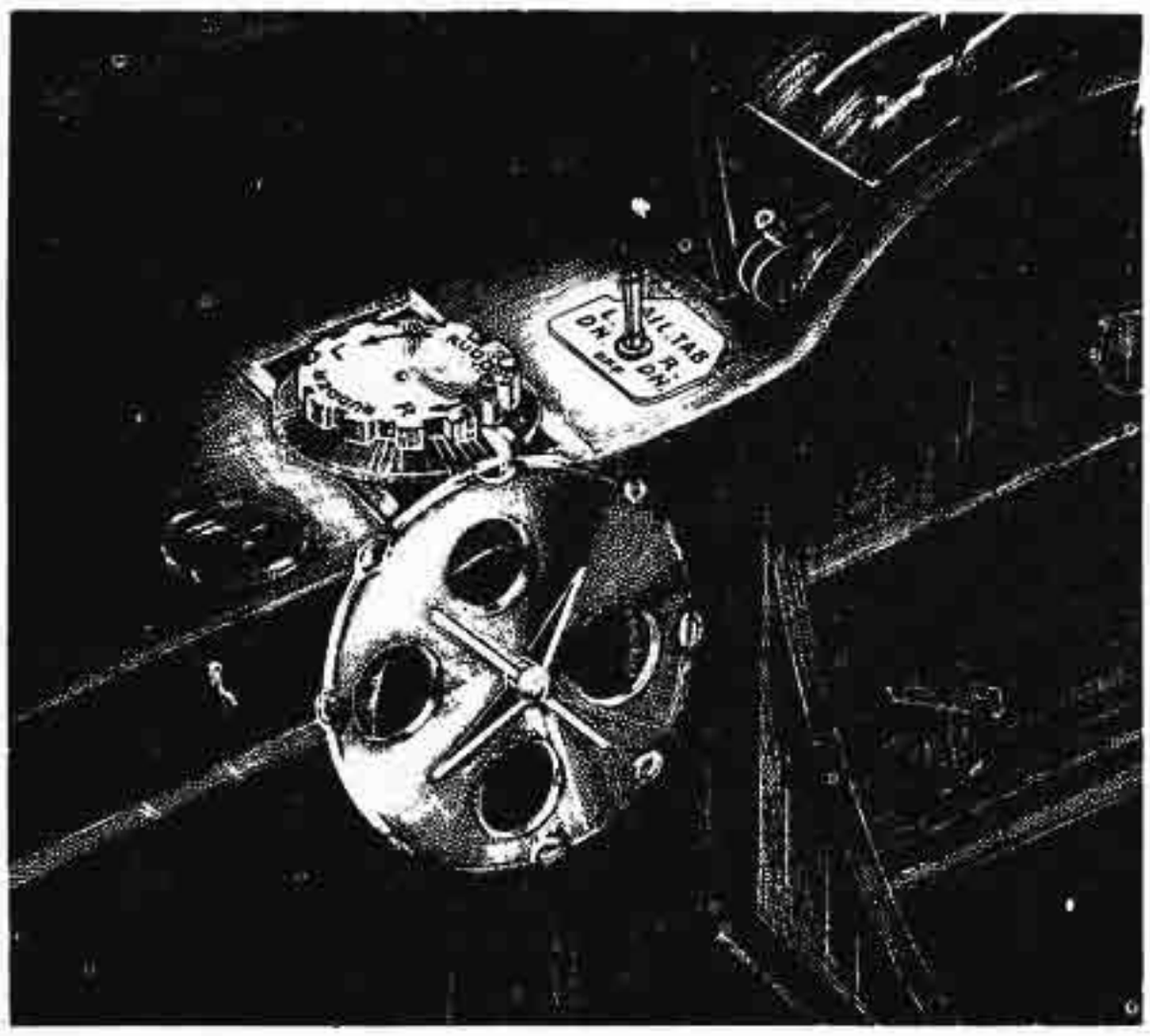


Figure 1–8. Tab Controls

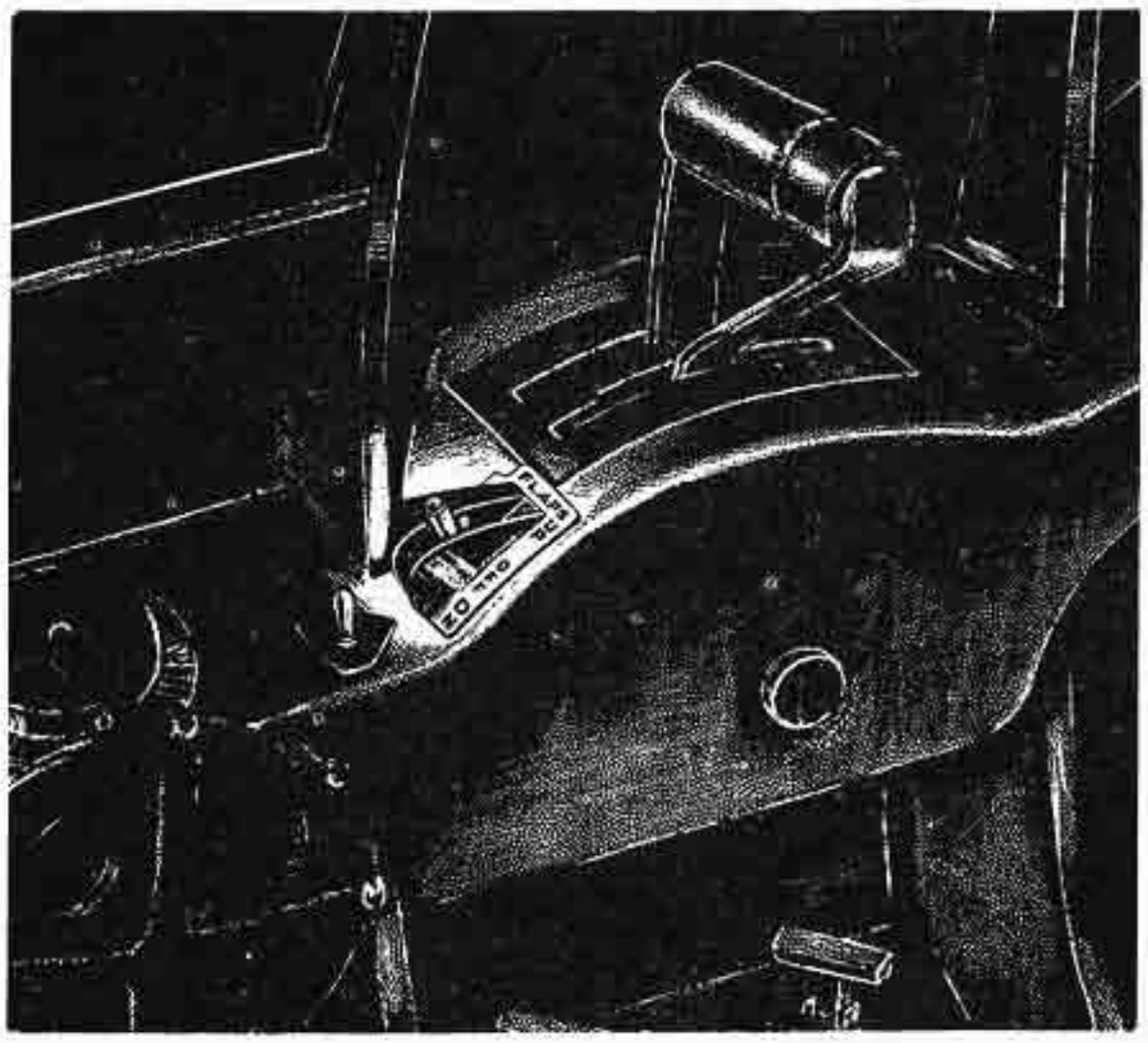


Figure 1–9. Wing Flap Switch

1–22. SPEED BRAKES. Electrically controlled speed brakes are incorporated in the upper and lower surfaces of the outer wing panel, forward of and operating independently of the outer panel landing flaps. The brakes are used to reduce the speed of the airplane during maneuvers and dives and to act as drag-increasing devices whenever desired by the pilot. The speed brakes are operated by means of a toggle switch located on the left hand forward console, forward of the starter switch. The switch has "OUT" and "IN" positions.

CAUTION

The maximum permissible accelerations for operations with speed brakes open are listed in Paragraph 2-1c.

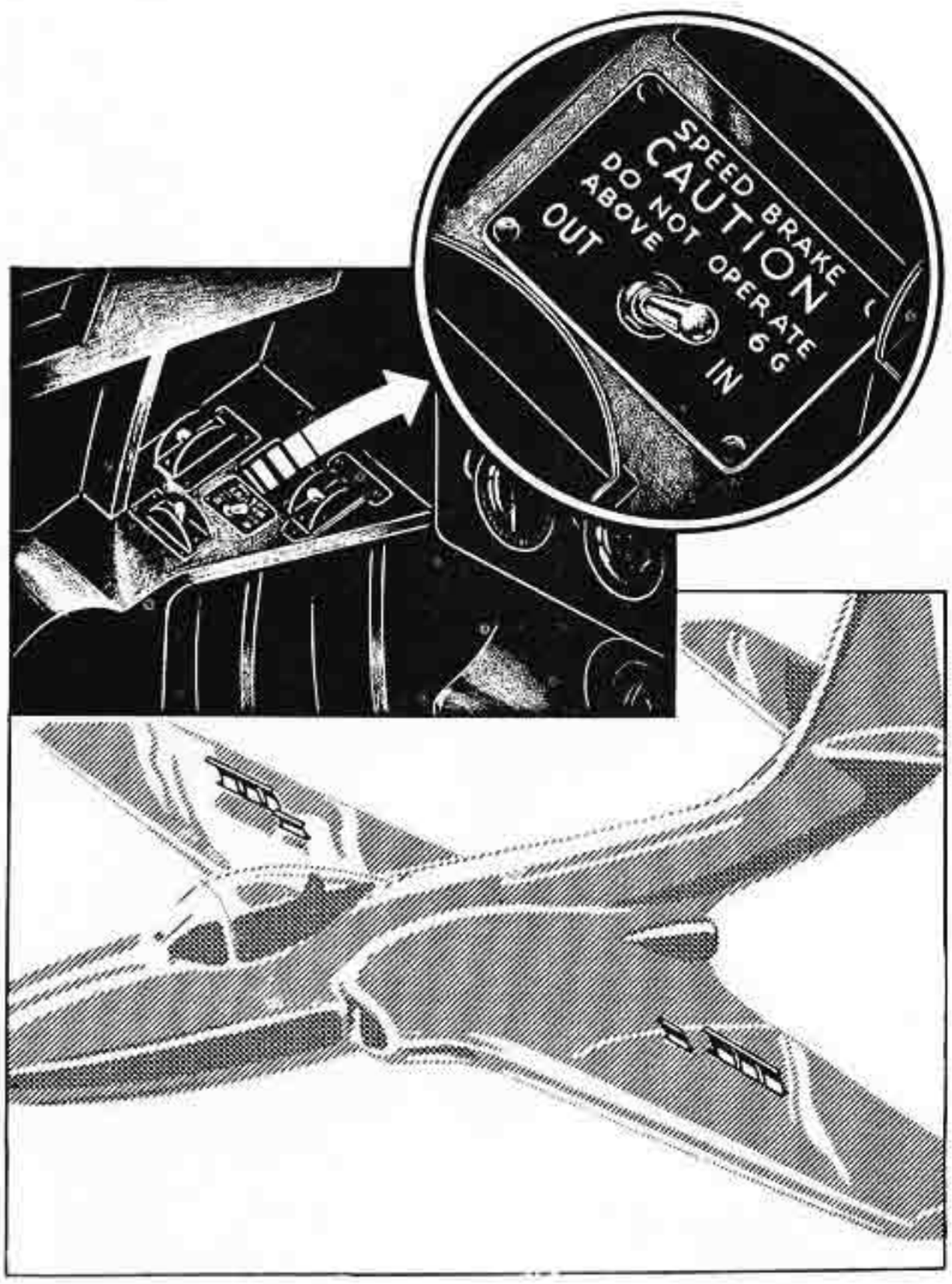


Figure 1–10. Speed Brake Switch

1–23. FUEL SYSTEM. Fuel conforms to Specification AN-F-48, cheapest grade available. The following sequence of tank selection must be observed: Ext. Aux.—Aft—Forward—Main. See Figure 1-11, Fuel System Diagram.

1–24. FUEL SYSTEM CONTROLS AND COMPONENTS.

1-25. FUEL TANK SELECTOR VALVE. The proper fuel tank is selected from the cockpit by means of the fuel tank selector valve. This control is located on the left hand console panel inboard of and below the elevator trim tab control. When selecting a fuel tank, feel for the "groove." This indicates proper seating of the selector valve. Operation of the transfer pump is automatic. Fuel is selected from the external auxiliary fuel tank by setting the selector at "EXT. AUX." When the fuel transfer warning light flickers on and off it indicates that the fuel outlet of the tank from which fuel is being transferred is alternately covered and uncovered. This condition is caused by a changing flight attitude of the plane in conjunction with a very small quantity of fuel remaining in the tank. Watch the light when flickering occurs and move the fuel selector valve to another tank as soon as the light remains on continuously.

Note

Either a 295 gallon tank (1770 lbs.) or a 190 gallon tank (1140 lbs.) can be interchanged on the "EXT. AUX." position of the valve.

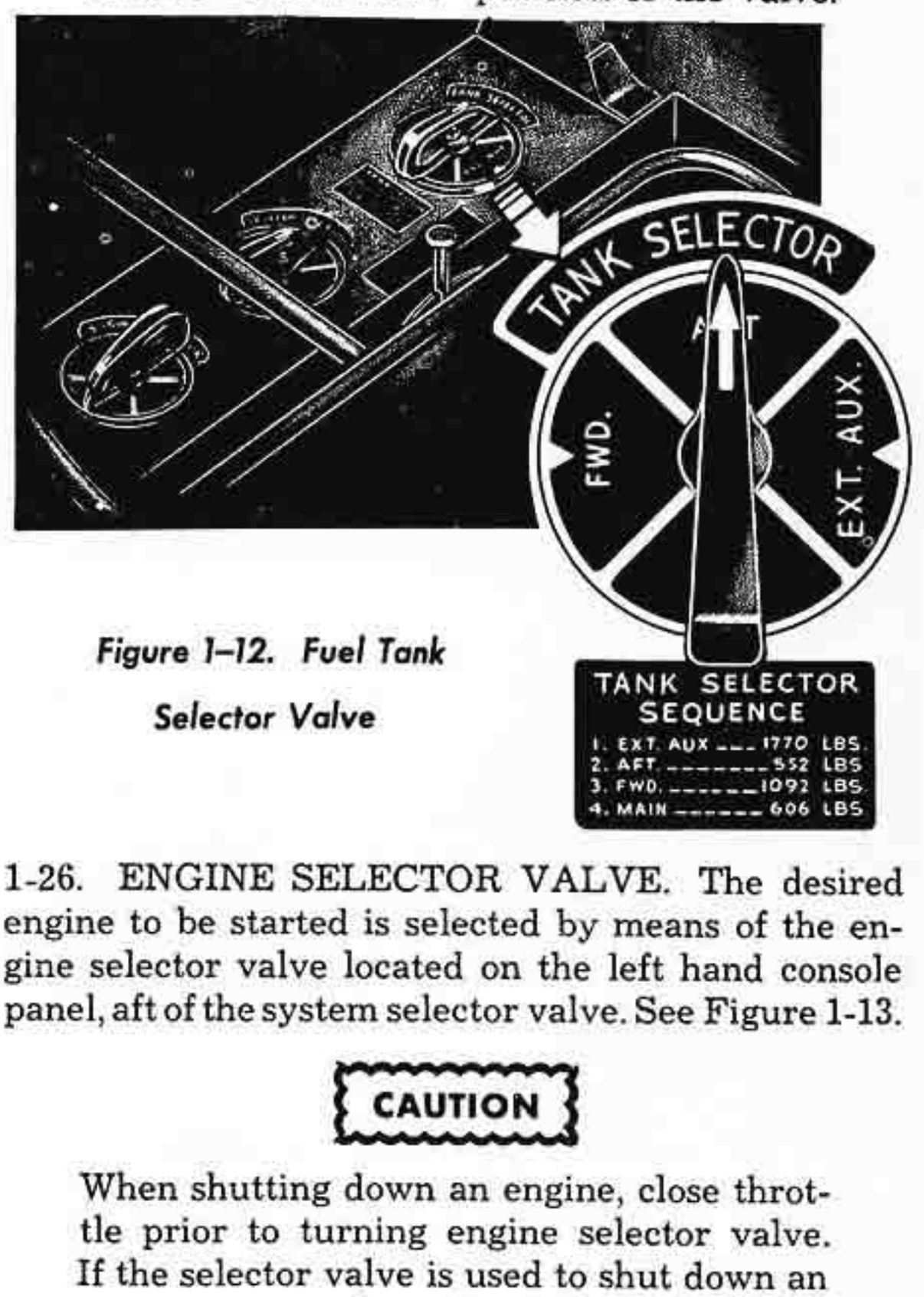


Figure 1–12. Fuel Tank Selector Valve

1-26. ENGINE SELECTOR VALVE. The desired engine to be started is selected by means of the engine selector valve located on the left hand console panel, aft of the system selector valve. See Figure 1-13.

CAUTION

When shutting down an engine, close throttle prior to turning engine selector valve. If the selector valve is used to shut down an engine, suction from the engine driven fuel pump will collapse the fuel supply lines.

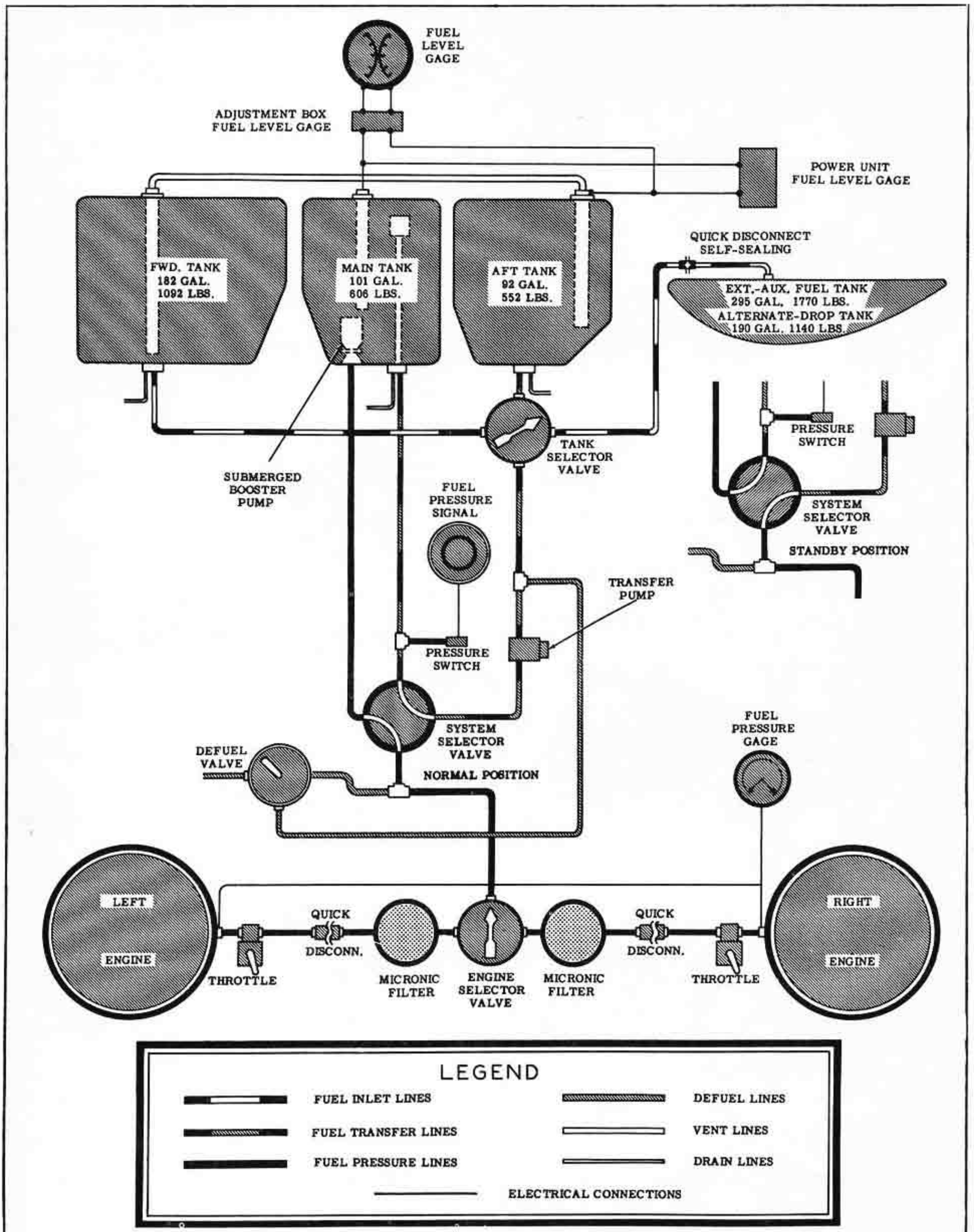


Figure 1-11. Fuel System Diagram

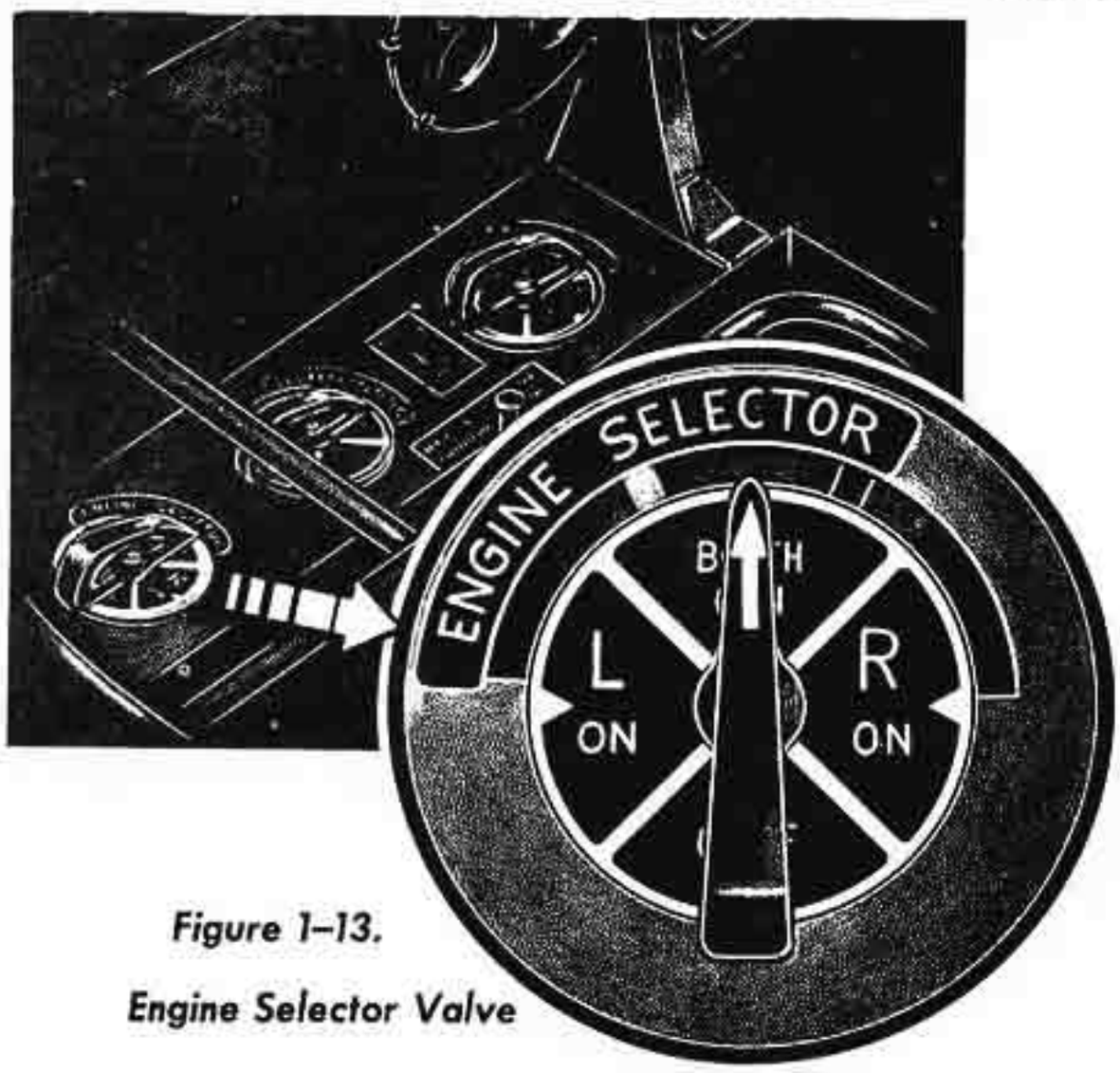


Figure 1–13.

Engine Selector Valve

1-27. SYSTEM SELECTOR VALVE. The system selector valve with "NORMAL" and "STANDBY" positions is located on the left console panel, forward of the engine selector valve and aft of the fuel tank selector valve. Under normal operating conditions this valve directs fuel from the tank selected into the main tank. The pointer must remain in the "NORMAL" position. For emergency operation, in order to by-pass the main tank and direct fuel flow from the tank selected into the engine, move the valve to the "STANDBY" position.

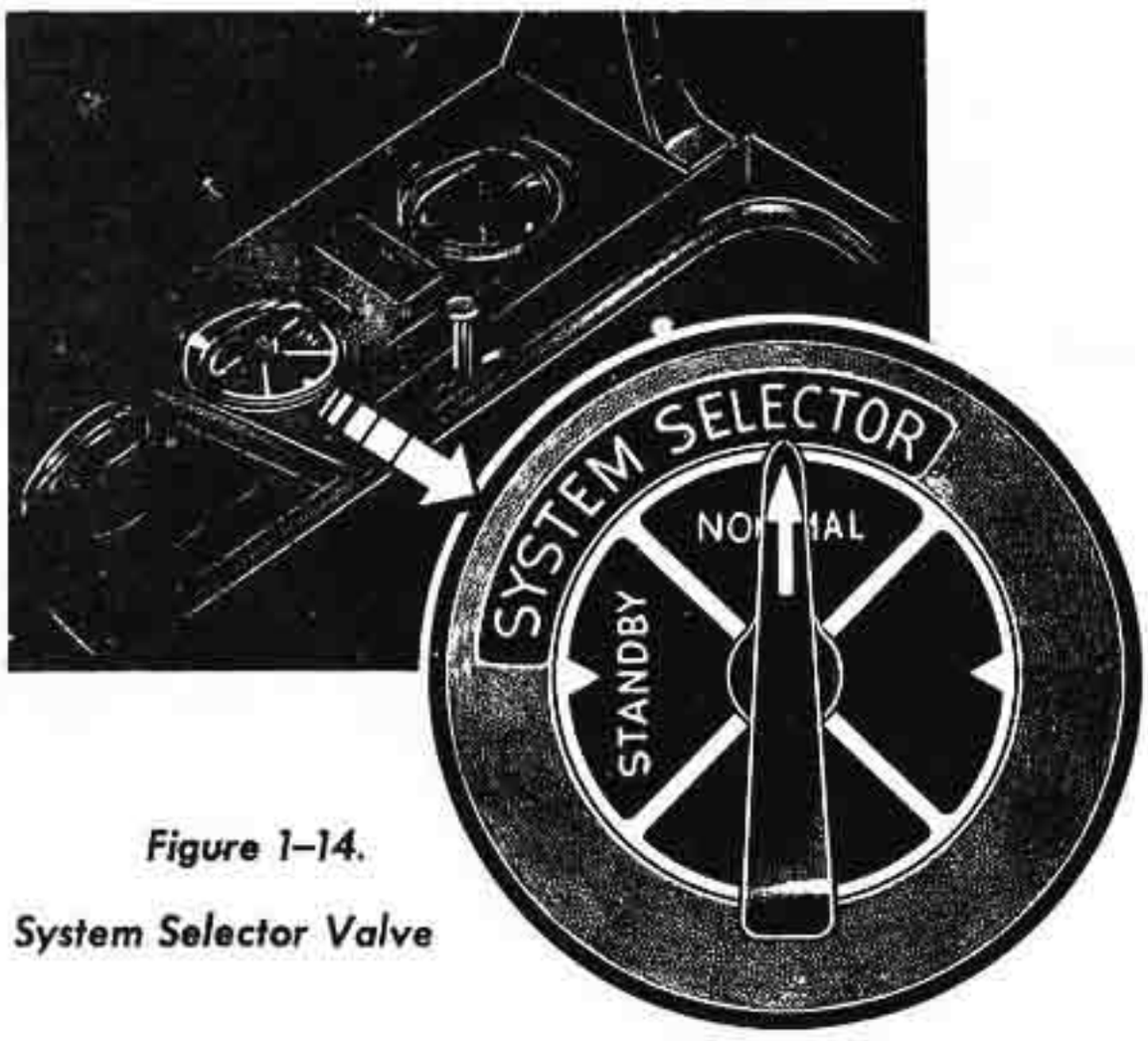


Figure 1–14.

System Selector Valve

1-28. EXTERNAL AUXILIARY FUEL TANK RELEASE. A manual release, for the jettisoning of the external auxiliary fuel tank, is located on the cockpit floor, left side, aft of the JATO unit release. After consuming the supply of fuel for the external auxiliary fuel tank, the empty tank may be jettisoned, if necessary, by pulling the manual "T" release handle, marked "DROP TANK-PULL TO REL."

WARNING

Do not jettison the external auxiliary fuel tank with flaps down or prior to the release of the JATO units.

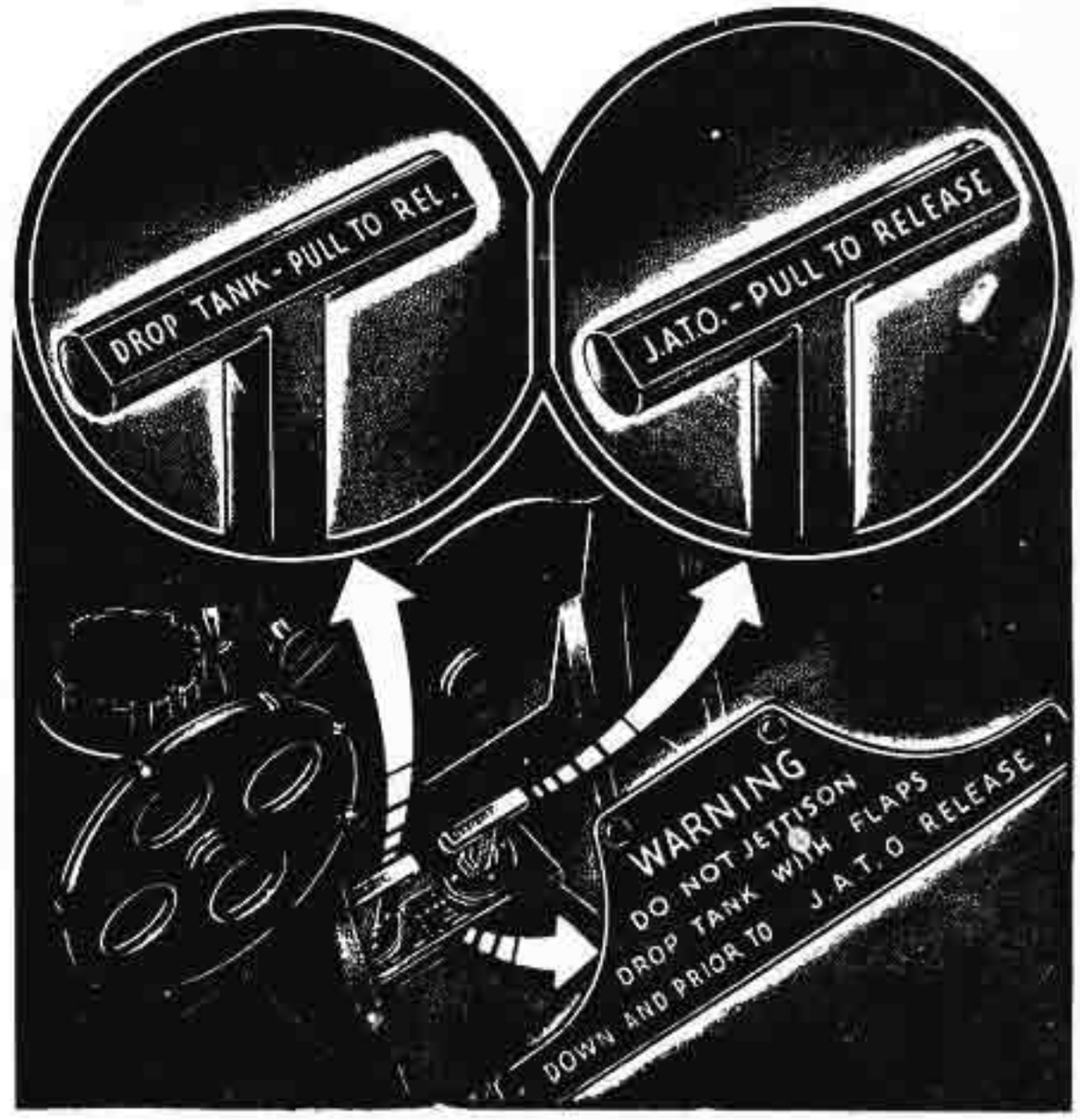


Figure 1–15. JATO and Drop Tank Release Handles

1-29. FUEL QUANTITY GAGE. A two element fuel quantity gage is located on the lower instrument panel, outboard of the landing gear and flap position indicator. The gage, calibrated in fuel pounds, indicates the fuel in the main tank, and total of the aft and forward tanks. No gage is provided for the drop tank.

1-30. FUEL PRESSURE GAGE. A dual type fuel pressure gage is provided and is located on the lower instrument panel, above the landing gear and flap position indicator.

1-31. FLOAT VALVE. A tank float valve is installed in the center fuel cell. This valve functions to maintain a constant fuel level within the center tank as long as fuel flows to the center tank from the tank indicated on the selector valve. When the supply in that tank is exhausted and another tank is not selected immediately, the float valve opens and fuel starts draining from the center tank. When this condition occurs, a pressure switch is actuated, which turns on two signal lights in the cockpit. The nameplates above these lights read "SELECTED

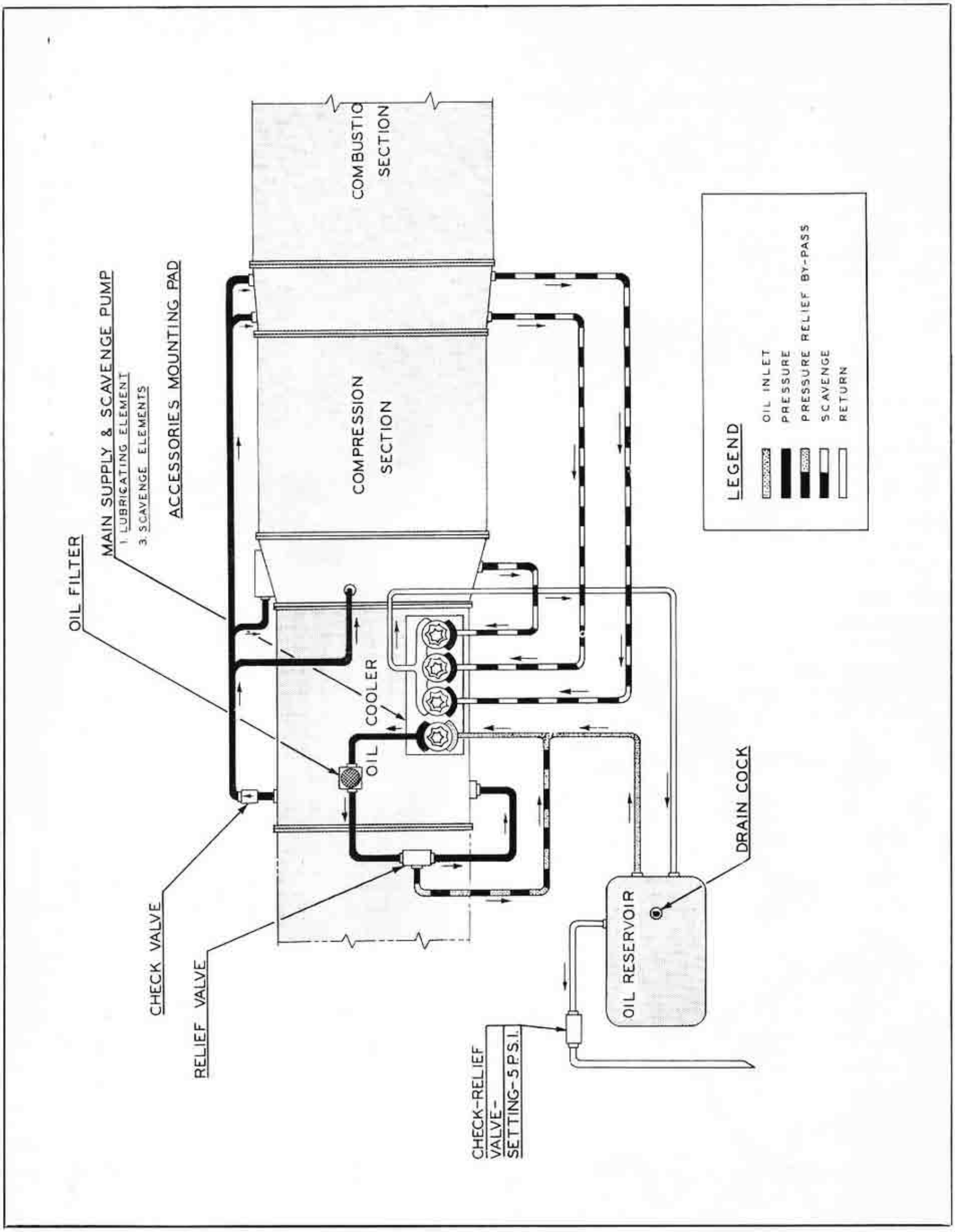


Figure 1–17. Oil System Diagram

TANK EMPTY." Disregard lights when operating on "STANDBY" position.

1-32. OIL SYSTEM.

1-33. GENERAL. Oil conforming to Specification AN-O-9, Grade 1010, is contained in two five-gallon reservoirs. A four element pump which provides both lubricating and scavenging is mounted on the accessory drive of the engine. The lubricating element of the pump draws the oil from the reservoir and, under pressure, circulates it through the oil filter, the oil pressure relief valve, into the oil cooler and from there to the accessory gearbox, and main bearings. The oil filter is set to by-pass oil at 50 psi The oil pressure relief valve at the oil cooler is set to relieve at 12 psi. The other three pump elements scavenge the lubricated regions and return the oil to the reservoir. Maximum allowable bearing temperatures are 108°C. (See Figure 1-17, Oil System Diagram.) Due to the negative "g" feature incorporated into the system, a constant supply of oil is supplied to the engines regardless of the attitude of the airplane, and during negative accelerations.

1-34. HYDRAULIC SYSTEM. The hydraulically operated brakes constitute the entire hydraulic system for this airplane.

1-35. ELECTRICAL SYSTEM.

1-36. GENERAL. The airplane is equipped with a 28 volt D. C., electrical power system. Electrical power is derived from one 24 volt battery and two 28 volt engine driven generators. The generator reverse current relays close at 26.5 volts (approximately 9000 rpm).

1-37. ELECTRICAL SYSTEM CONTROLS.

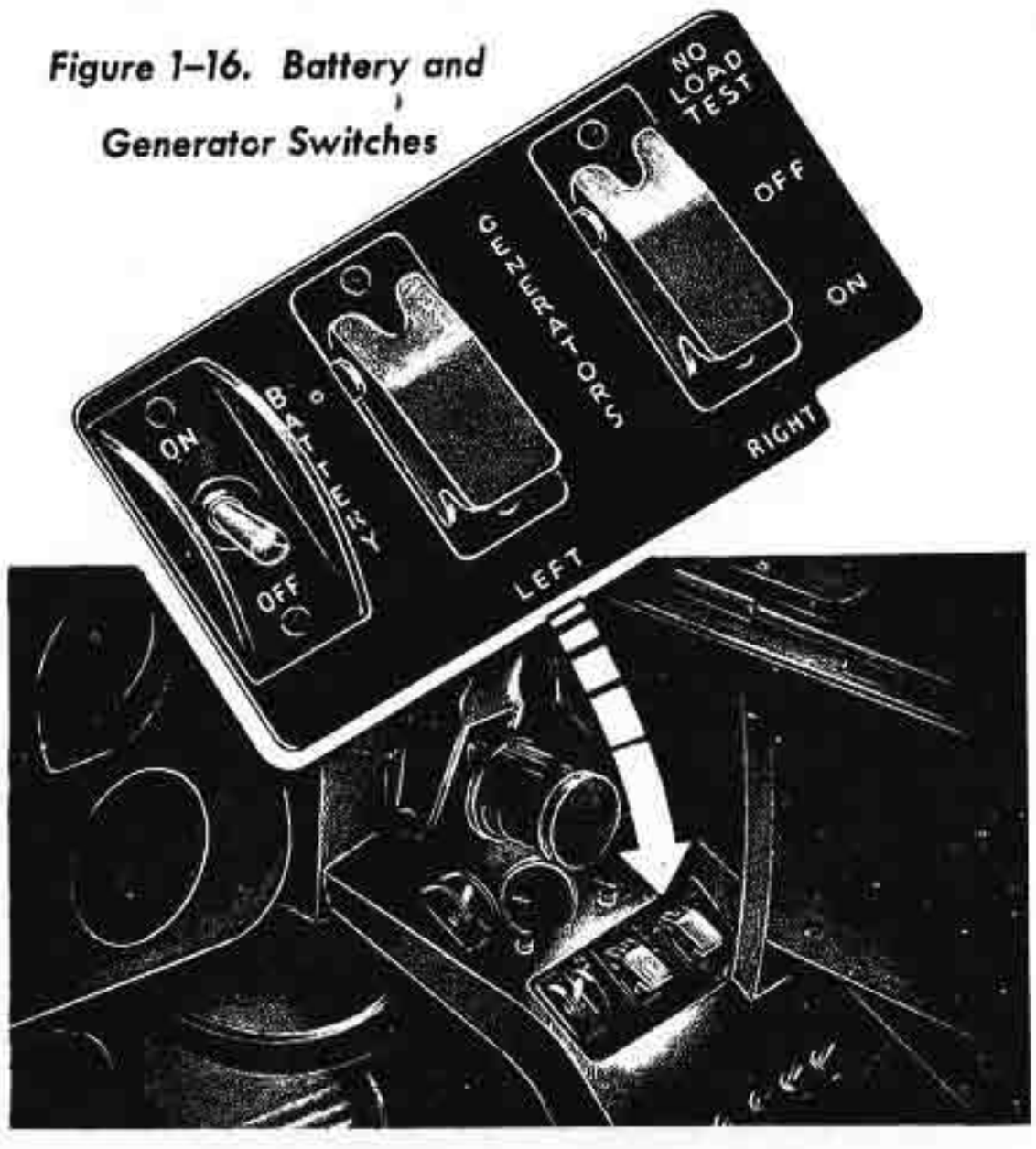


Figure 1-16. Battery and Generator Switches

1-38. BATTERY & GENERATOR SWITCHES. One battery and two generator toggle switches are located on the right hand forward console. Each switch has "ON" and "OFF" positions and the generator switches read "LEFT," "RIGHT," "NO LOAD TEST." (See Figure 1-16.)

1-39. GUN CHARGER CONTROL. See Section V.

1-40. ARMAMENT SWITCHES. See Section V.

1-41. GUN CAMERA SWITCH. See Section V.

1-42. EXTERNAL POWER RECEPTACLE. An external power receptacle is located on the lower surface of the right wing leading edge, directly outboard of the jet engine.

1-43. CIRCUIT BREAKERS. All circuit breakers are located on the main distribution panel below the lower instrument panel. (See Figure 1-18.)

Figure 1-18. Main Distribution Panel

1-44. LANDING GEAR CONTROL. The landing gear is operated by a toggle switch located on the left hand forward console. The switch has "UP" and "DOWN" positions. (See Figure 1-19.) Both the main gear and nose gear are operated by this same toggle switch.

WARNING

Do not extend or retract landing gear at air speeds greater than 152 knots IAS.

Figure 1–19. Landing Gear Control

1-45. LANDING GEAR EMERGENCY RELEASE. In case of failure of the normal landing gear electrical system, the gear can be lowered by flipping the "Landing Gear Emergency" toggle switch down. This switch is located on the left hand forward console panel, outboard of the normal Landing Gear Switch. The gear cannot be retracted with the emergency switch.

CAUTION

The normal landing gear switch must be in the "DOWN" position prior to flipping the "Landing Gear Emergency" switch down.

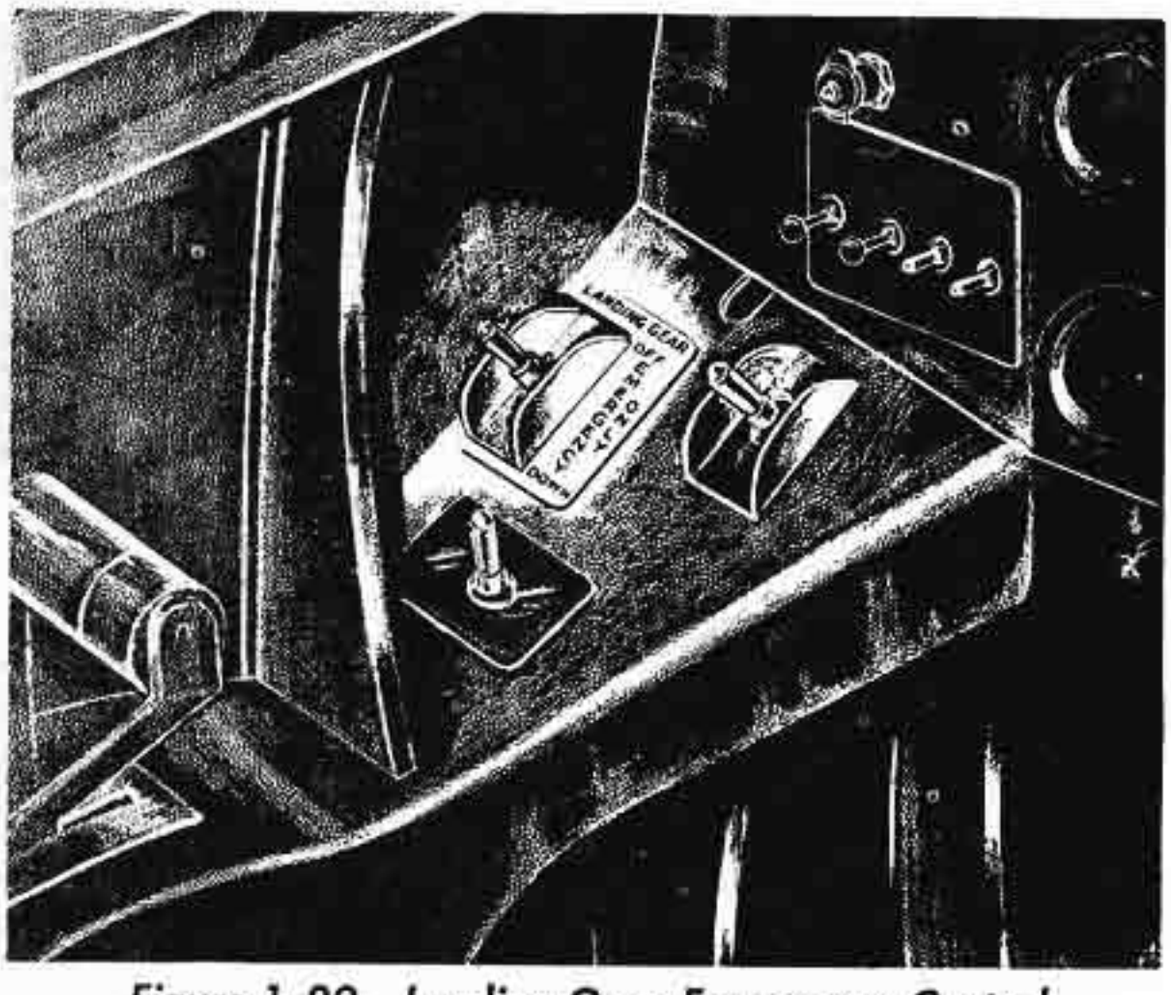


Figure 1–20. Landing Gear Emergency Control

1-46. FLAPS. See Paragraph 1-23.

1-47. CRASH BARRIER AND ARRESTING HOOK CONTROL AND OPERATION. The crash barrier hook and the arresting hook are released simultaneously by a manual control located on the right side of the upper instrument panel, directly above the gun charger handle. The control handle represents a miniature arresting hook. To extend both hooks, pull the handle to the full out position, pointer up. The handle is locked in the out position by means of a ratchet arrangement. To retract the arresting hook, turn the handle 90° and release as indicated on Figure 1-21. Return the handle to the vertical position after release. The crash barrier hook must be manually retracted and locked in the closed position from outside the airplane, "Push Barrier Hook Down to Reset."

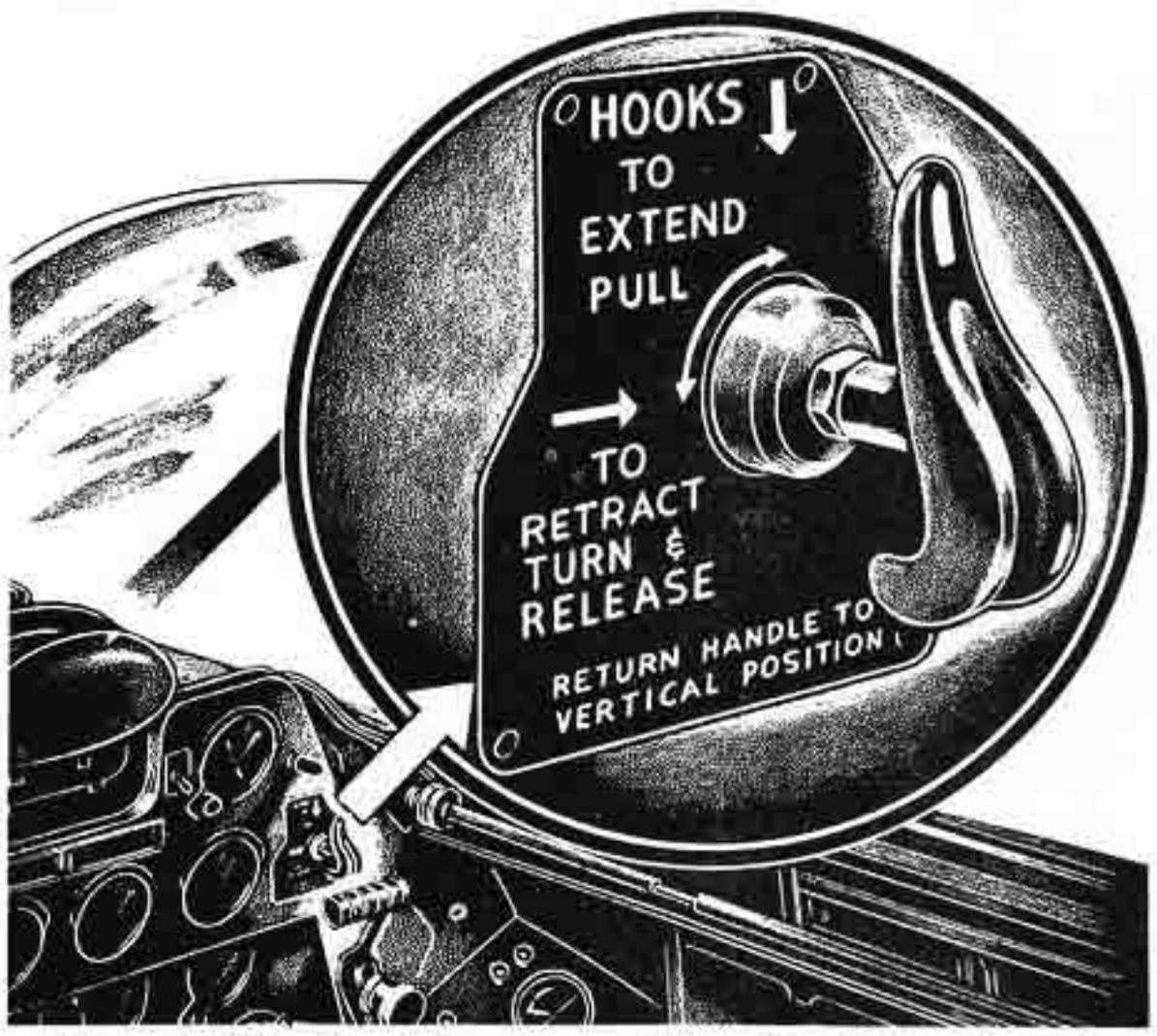


Figure 1-21. Crash Barrier and Arresting Gear Control

1-48. EMERGENCY OPERATION OF ARRESTING HOOK. The arresting hook can be extended manually in case of failure or mal-functioning of the electrical lowering mechanism. This is accomplished by means of a "T" release handle on the right side of the cockpit, inboard of the radio console panel.

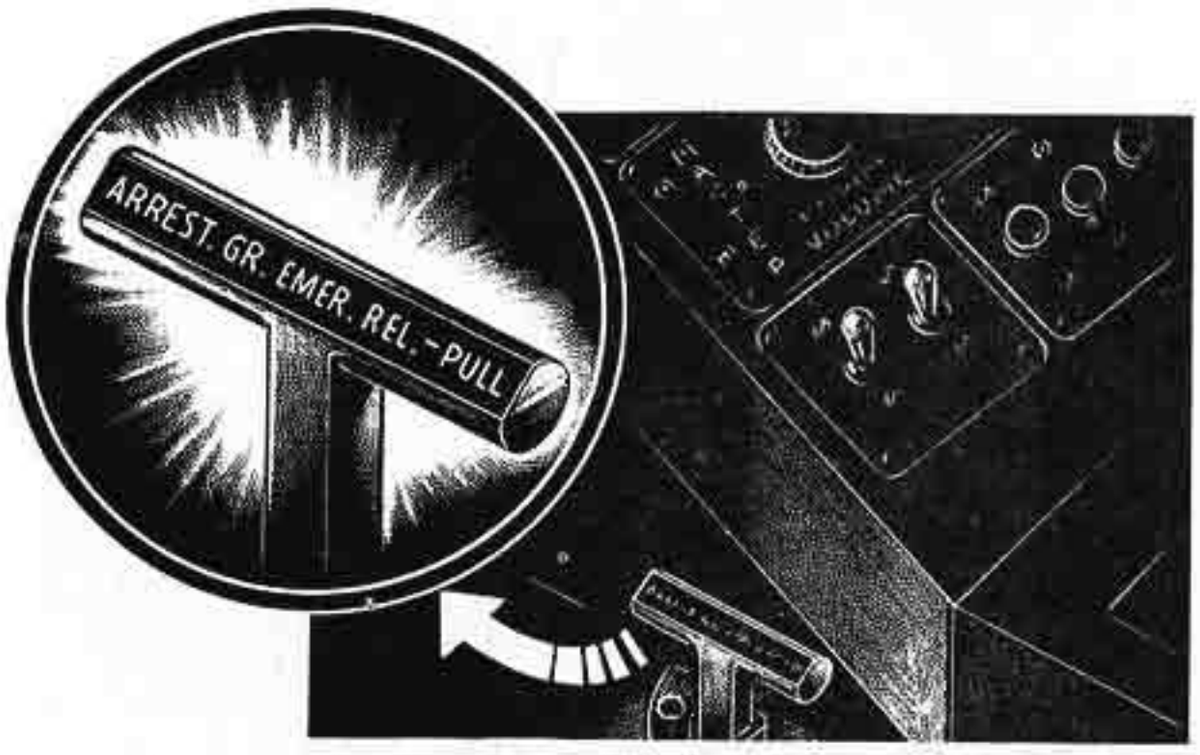


Figure 1–22. Emergency Arresting Gear Release

1-49. WINGFOLD CONTROL. The wingfold electrical mechanism is controlled by a toggle switch located on the right hand center console panel. The switch has "Spread" and "Fold" positions. (See Figure 1-24.) Two red warning flags located at the wing splice are visible to the pilot from the cockpit.

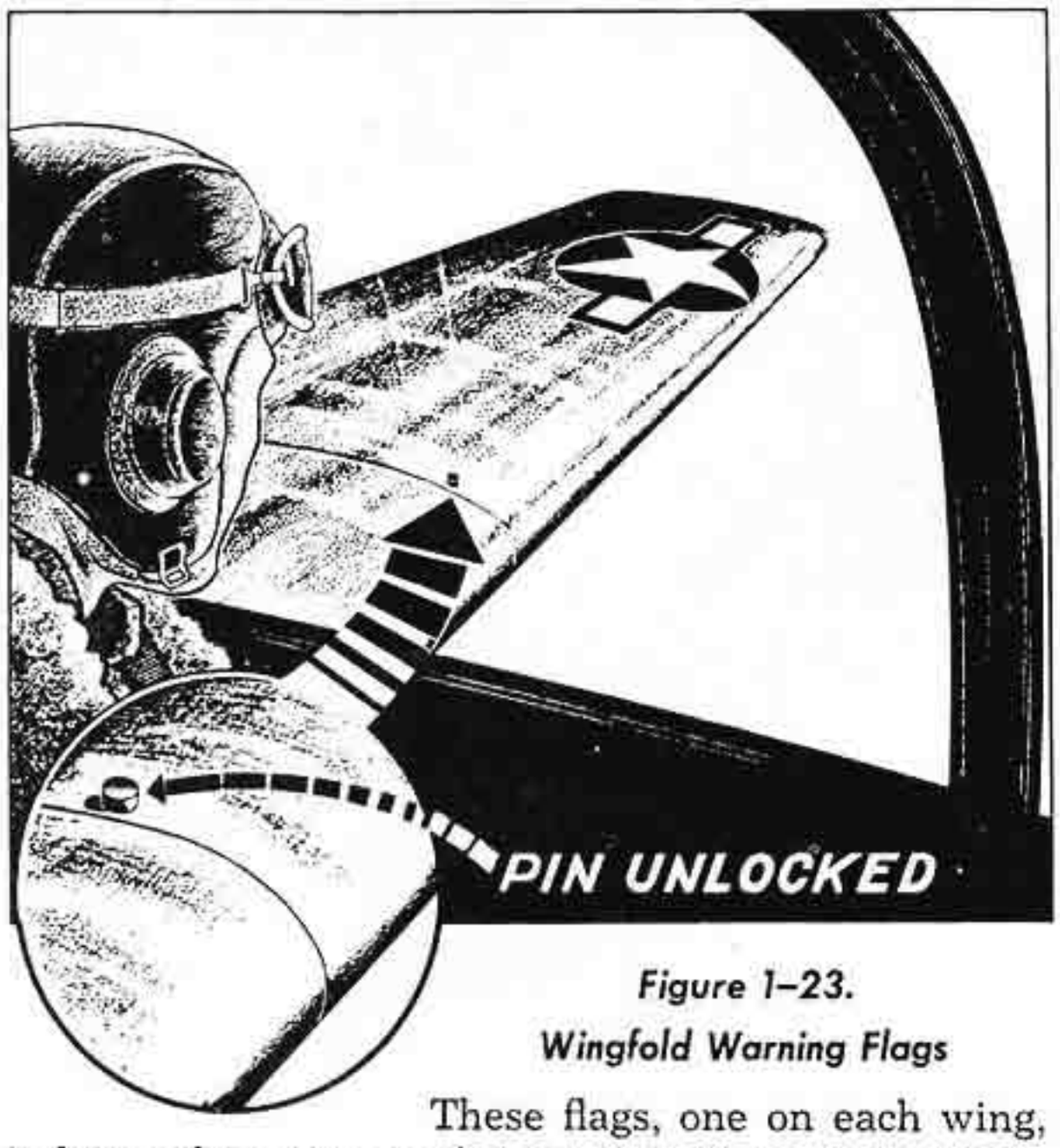


Figure 1–23. Wingfold Warning Flags

These flags, one on each wing, indicate the position of the wingfold pin lock mechanism. When the wingfold switch is in the "Spread" position and the locking pins are in place and locked, the flags retract to the upper contour of the wing. The warning flags are controlled by mechanical linkage from the "Wing Pin Lock" handle. This handle is located on the right hand center console panel, outboard of the wingfold toggle switch. (See Figure 1-24.) To fold or spread the wings, the following operations are observed:

TO FOLD:

a. Pull the wing pin lock handle to unlock the locking pins and raise the warning flags. A safety switch necessitates pulling of the handle prior to folding the wings, by remaining open until the pins are unlocked and the flags raised.

b. Flip the wingfold toggle switch to the "FOLD" position.

TO SPREAD:

a. Pull the wing pin lock handle to unlock the pins and raise the warning flags, if the handle is not already raised.

b. Flip the wingfold toggle switch to the spread position.

c. When the wings are fully down, push the wing pin lock handle to lock the pins and retract the warning flags.

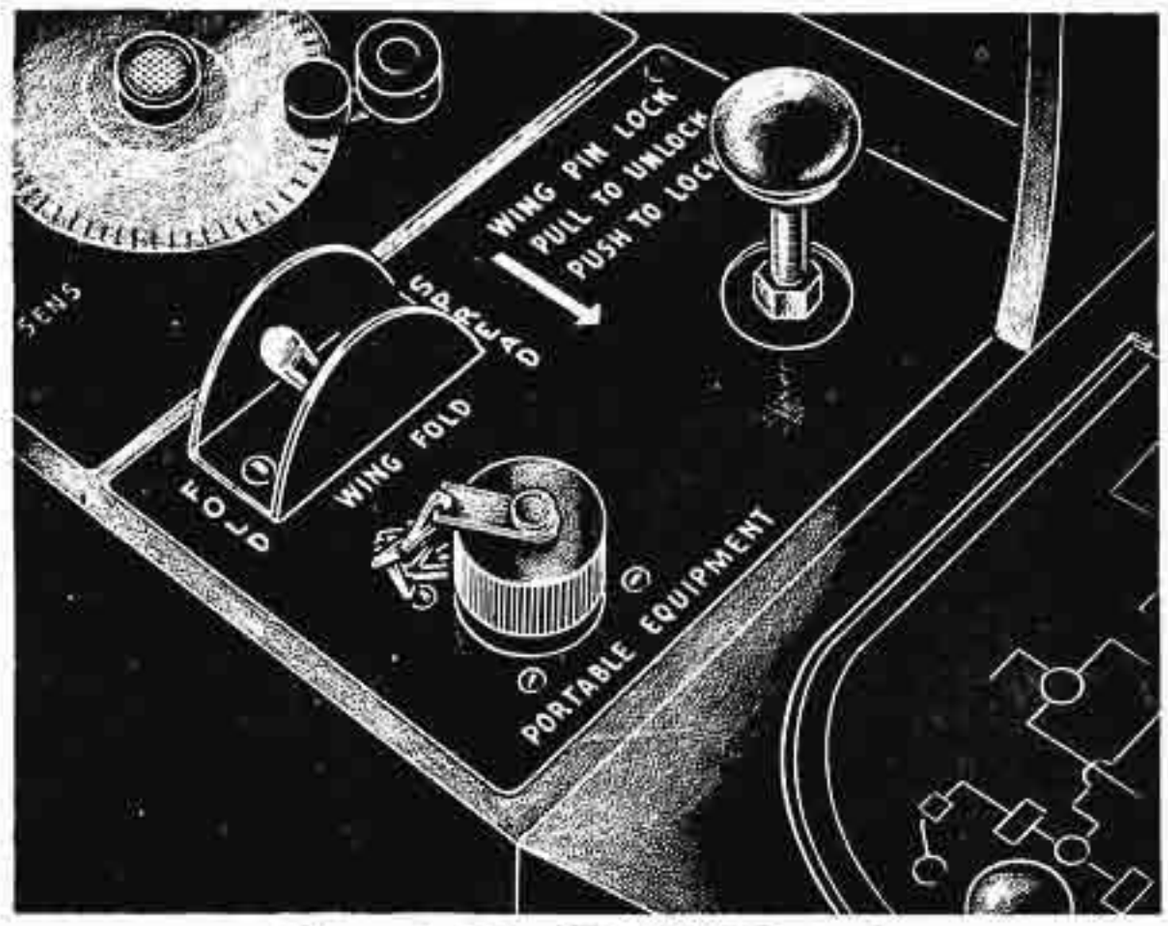


Figure 1–24. Wingfold Controls

1-50. PITOT HEATER SWITCH. A toggle switch for the pitot heater is located on the right hand forward console, inboard of the radio circuit breaker panel. (See Figure 1-25.) The switch has "ON" and "OFF" positions.

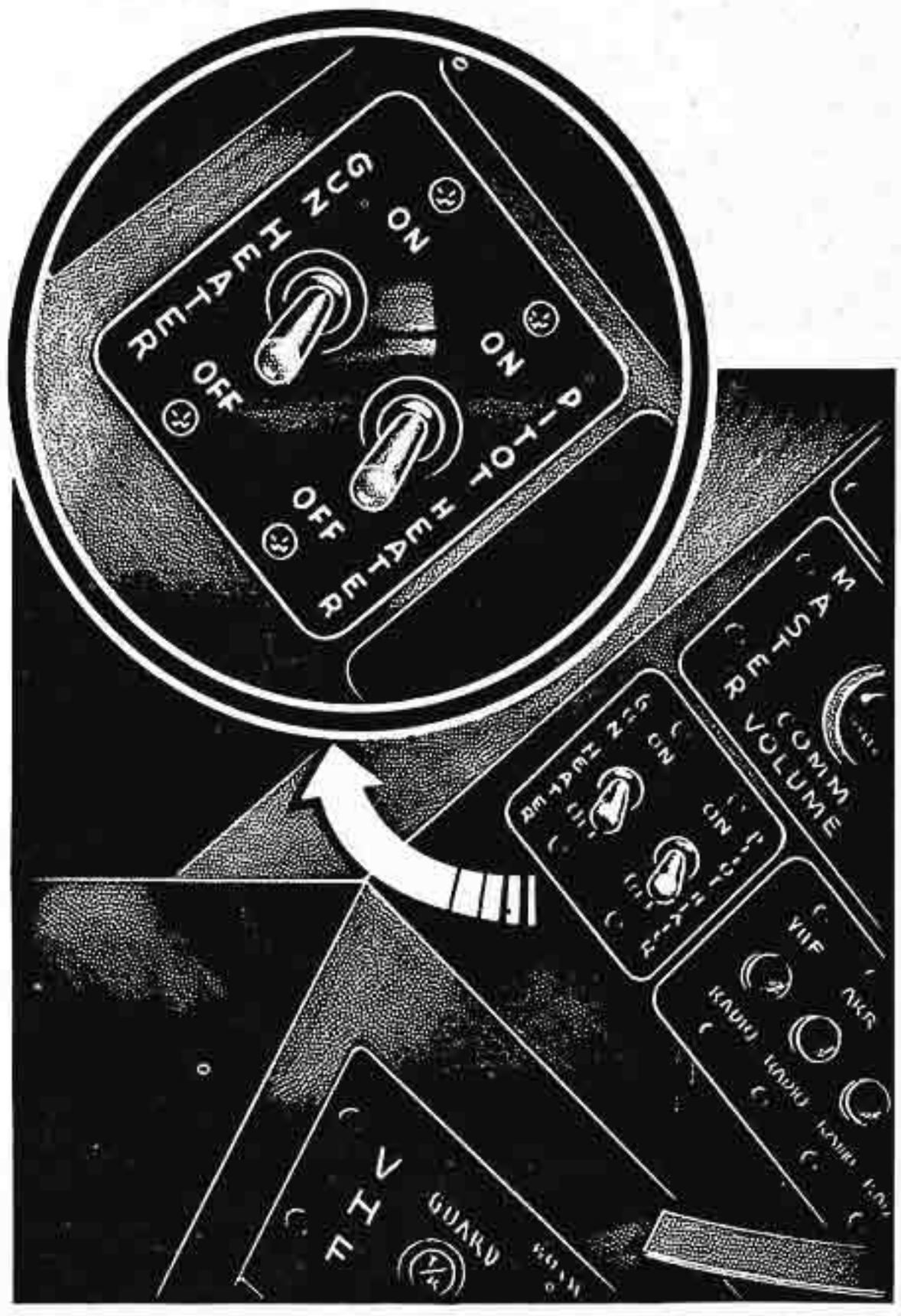


Figure 1–25. Gun and Pitot Heater Switches

1-51. DEFOGGER-HEATER CONTROLS. Cockpit ventilation is controlled by a lever located on a shelf above the cockpit floor, left side, adjacent to the pilot's feet. This lever operates a valve in the cooling air duct leading into the cockpit. A heating element at the pilot's feet controlled by an "ON" and "OFF" toggle switch below the left hand forward console, heats the air admitted through the valve. By manipulation of the control lever, with the heater switch "ON," the warm air may be directed to the windshield for defogging purposes, or may be used for pilot comfort. Cool air is supplied when the valve is open and the toggle switch is "OFF."

CAUTION

Do not turn heating element "ON" while the airplane is on the ground, or if the valve is closed.

Figure 1–26.

Heating — Defogging Controls

1-52. HEATED FLYING SUIT. An "Electrical Receptacle" for the pilot's electrically heated flying suit is provided. This receptacle is located on the right hand aft console panel, adjacent to the pilot's seat and aft of the wingfold switch. See Figure 1-2.

1–53. INTERIOR LIGHTING.

1-54. COCKPIT LIGHTS. Three red cockpit lights are installed. One light is located directly above the instrument panel and one on the left and right side of the cockpit. The lights are controlled by means of a dimming rheostat on the right hand console. The rheostat has "ON," "OFF" and "DIM" positions.

1-55. INSTRUMENT LIGHTS. Red instrument lights are controlled by a toggle switch located on the right hand console. The switch reads "ALL," "OFF" and "FLIGHT INSTR." To obtain only flight instrument lighting, flip the switch to "FLIGHT

Figure 1–27.

Interior Lighting Controls

INSTR." The "ALL" position turns on all the instrument lights and cockpit lights. A dimming rheostat is located outboard of the toggle switch.

1–56. EXTERIOR LIGHTING.

1-57. MASTER EXTERIOR LIGHT SWITCH. This switch is located on the inboard side of the exterior lighting control panel on the right hand forward console. The switch has "ON," "OFF," and "FLASH" positions, and must be "ON" before any exterior lights can be used.

1-58. POSITION LIGHTS. There is a position light on each wing tip and one on the tail of the airplane. The lights are controlled by two toggle switches located directly outboard of the master exterior switch. The switches have "BRIGHT," "DIM," and "OFF" positions.

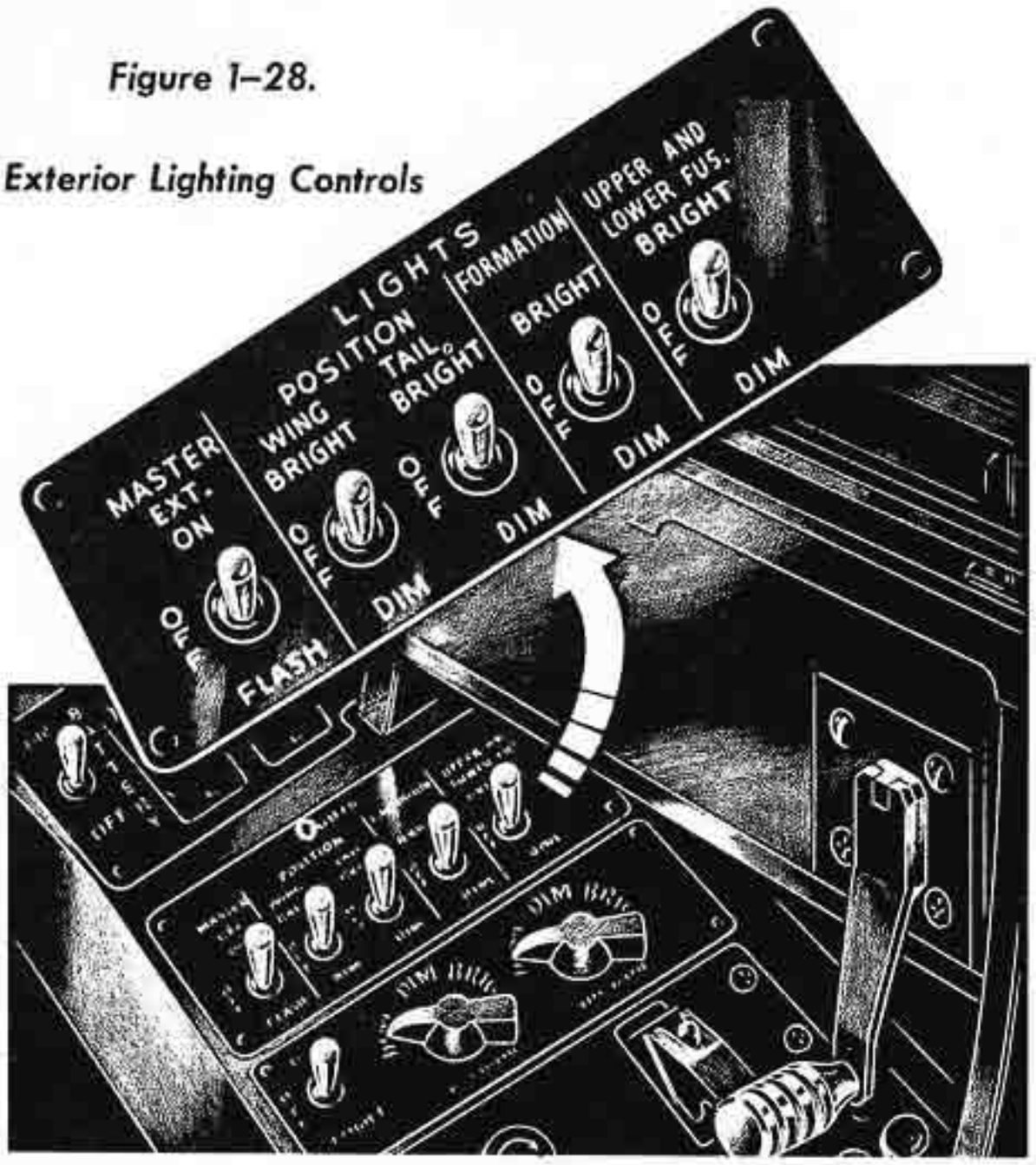
1-59. FORMATION LIGHTS. The formation lights are operated by a toggle switch outboard of the position light switches. The switch has "BRIGHT," "DIM," and "OFF" positions.

1-60. UPPER AND LOWER FUSELAGE LIGHTS. These lights are controlled by a "BRIGHT," "DIM," and "OFF" position toggle switch, located on the outboard side of the exterior lighting panel.

1-61. APPROACH LIGHT. An approach light is installed in the left wing. A manual control for the operation of the light is not provided in the cockpit. The approach light turns on automatically when the arresting hook is "DOWN."

Figure 1–28.

Exterior Lighting Controls



1–62. MISCELLANEOUS CONTROLS AND EQUIPMENT.

1-63. PILOT'S SEAT. An adjustable pilot's seat with provisions for a conventional seat type parachute and pararaft kit is installed. (See Figure 1-29.) The seat is capable of withstanding a 40g acceleration.

Figure 1–29. Pilot's Seat Adjustment

1-64. SAFETY BELT AND SHOULDER HARNESS. Conventional lap and shoulder type safety belts are provided, integral with the pilot's seat. The small lever on the left side of the seat is used for "take-up" on the harness. To unlock the harness, push lever down and aft. To lock, after adjusting to comfortable position, push down and forward.

1-65. RELIEF TUBE. The pilot's relief tube is stowed underneath the forward right hand console panel.

1-66. KNEE PAD BOARD. A conventional pilot's knee pad board is furnished with the airplane.

1-67. HEAD REST. A cushion type head rest is provided and is mounted on the upper forward portion of armor plate in back of the pilot's seat.

1-68. JATO UNITS. Provisions are made for the installation of two JATO units. Each unit is capable of supplying thrust augmentation of 1000 pounds. The units are mounted on the lower surface of the fuselage, aft of the inner wing flaps and inboard of the turbo-jet engines. The Jato units cannot be fired unless both throttles are fully open. The units are energized by a push button type switch, located on the catapult grip cockpit left side. When the switch is pushed, a light above the Jato circuit breaker on the power plant switch panel indicates that the circuit is energized. To release the Jato units after thrust is utilized pull the manual "T" release handle on the cockpit floor, left side, directly forward of the drop tank release handle. See Figure 1-15.

1-69. CANOPY CONTROL. The canopy is opened and closed from the inside of the cockpit by means of a crank handle located at the intersection of windshield and sliding canopy cockpit right side. To open the canopy, pull the handle inboard, in order to offset and clear the locking pin, and rotate clockwise. (See Figure 1-31.) The canopy is capable of withstanding a 40g ditching load when locked in the full aft position. The canopy can be locked open at intermediate positions by pushing the handle outboard and locking the pin in the holes provided. Two spring-loaded retractable handles are provided on the right side of the fuselage at the intersection of windshield and sliding canopy. The handles are used to open the canopy from the outside. The lower handle, in the retracted position, is flush with the fuselage and, when pulled out, offsets the locking pin connected to the control handle on the inside of the cockpit. When this pin is released, unlocking the canopy, the sliding portion can be moved aft by means of the upper handle. A handle is provided on the left side of the airplane at the intersection of windshield and canopy to enable opening the canopy from the left side.

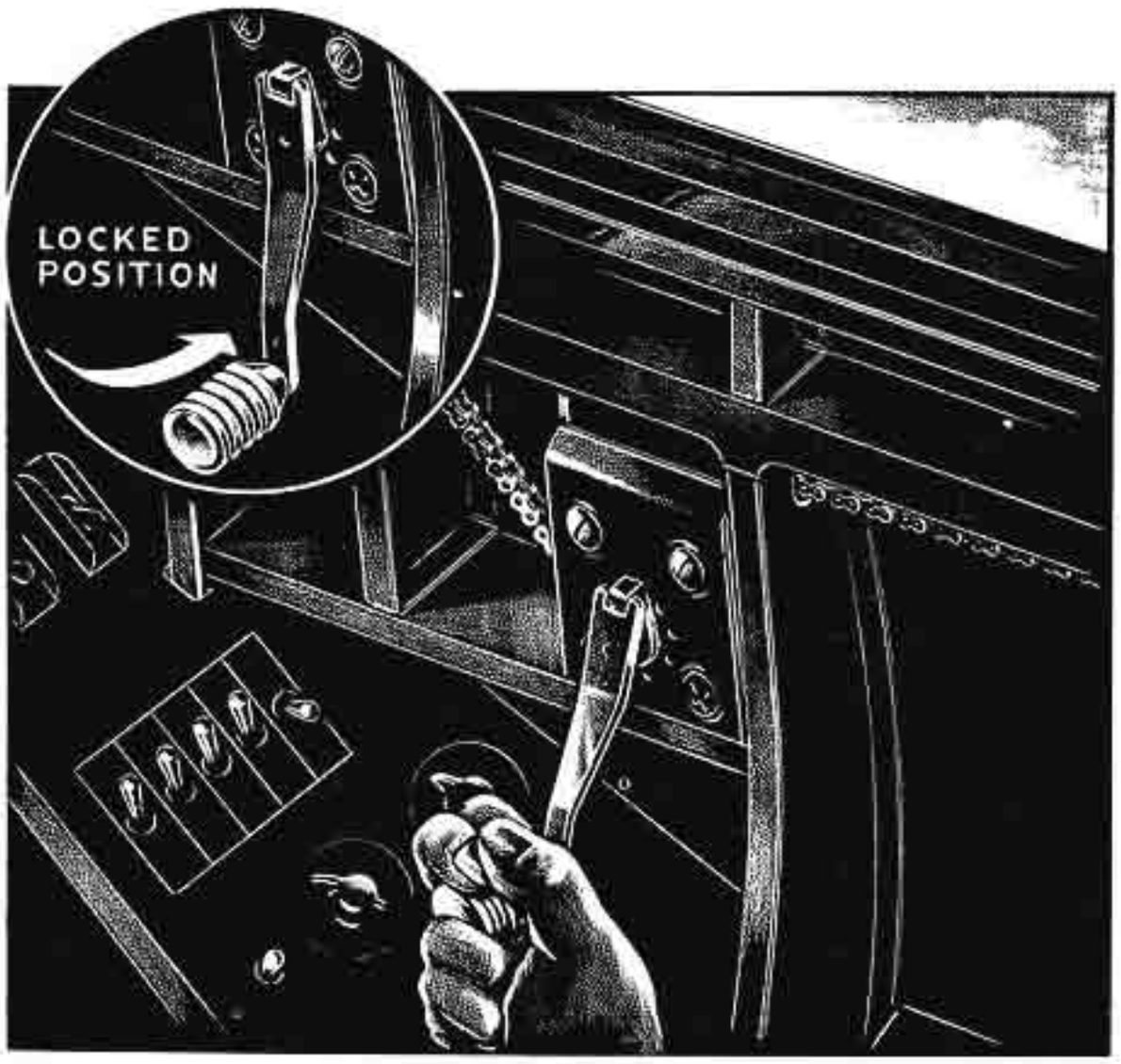


Figure 1–31. Canopy Control

1-70. CONTROLS LOCK. The surface controls lock consists of a tube, marked "CONTROLS LOCK,"

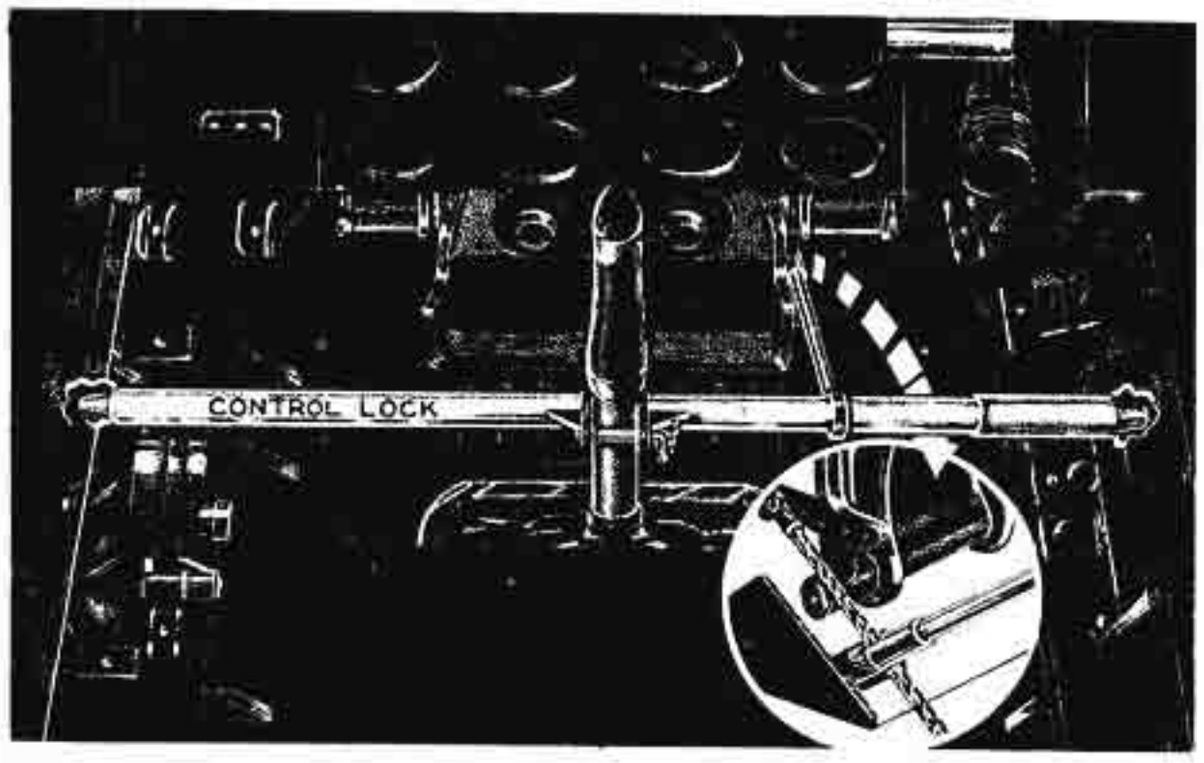


Figure 1–32. Controls Lock

with an attached arm. The left end of this tube is inserted into a socket on the left side of the cockpit, and the other end is screwed outboard onto a fitting on the right side. A pin is inserted through a hole in the upper portion of the control stick and an attached bracket arrangement on this horizontal tube, locking the control stick. The slotted end of the attached arm is fitted into a swaged spherical fitting on the rudder cable to lock the rudder in place. (See Figure 1-32, Controls Lock.)

1-71. ANTI-BLACKOUT SUIT. An Anti-G connection for the pilot's anti-blackout suit is provided. This is located on the left side of the pilot's seat, inboard and above the engine selector valve.

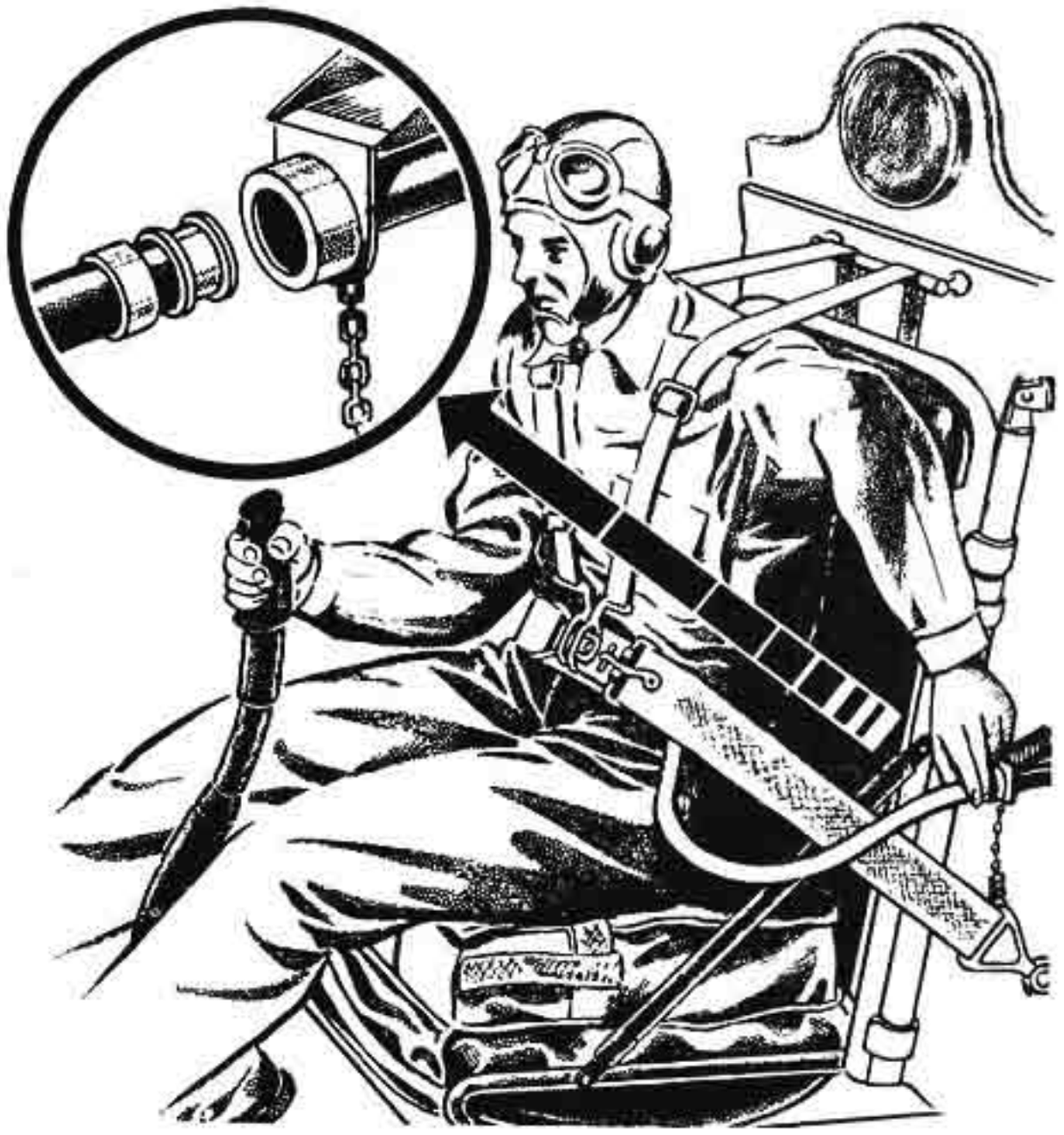


Figure 1–33. Anti-G Connection

1-72. RUDDER PEDAL ADJUSTMENT, The rudder pedals are adjustable fore and aft of pressing the toe release inboard of each pedal, thus releasing the locking pin and allowing the pedal to swing to one of five positions, within an arc of approximately six inches. See Figure 1-34, Rudder Pedal Adjustment.

Figure 1–34. Rudder Pedal Adjustment

SECTION II

NORMAL OPERATING INSTRUCTIONS

2-1. BEFORE ENTERING THE COCKPIT.

THE FOLLOWING RESTRICTIONS ARE TO BE OBSERVED IN THE OPERATION OF MODEL FH-1 AIRPLANES:*

a. The permissible maneuvers are as follows:

Loop	Immelman turn
Aileron roll	Wing over
Chandelle	Vertical turn

CAUTION

When carrying a fuselage external auxiliary fuel tank, observe acceleration limitations given in Paragraph 2-1f.

b. The maximum permissible combinations of airspeed and acceleration at a gross weight of 9,600 pounds or less are shown in Figure 2-1. At other weights above 9,600 pounds the maximum permissible accelerations are such as to maintain a constant product of gross weight and acceleration. These speeds and acceleration limits, which have been determined by flight tests, are due to strength limitations of the airplane, to longitudinal and lateral instability effects at higher speeds, and to general buffeting effects at combinations of higher speed and acceleration. These effects increase in severity as the restricted values are exceeded.

c. The maximum recommended gross weights for various operations are as follows:

Landings on rough runways	10,000 lbs.
Landings on smooth paved runways	12,500 lbs.
Catapulting	12,500 lbs.
Arrested landings	9,400 lbs.

d. The maximum permissible speeds (knots - IAS) for various operations are as follows:

For lowering or retracting landing gear	152
For lowering landing flaps	156
For opening canopy	150
For opening dive brakes	Any airspeed within the operational limits of the clean airplane.
For extending or retracting crash barrier and arresting hooks	152
For emergency release of arresting hook	85

e. The maximum permissible accelerations with dive brakes open are as follows:

Bureau Number	
111749 thru 111751	Do not have dive brakes
111753 thru 111758	6.0g
111759 and subsequent	7.5g

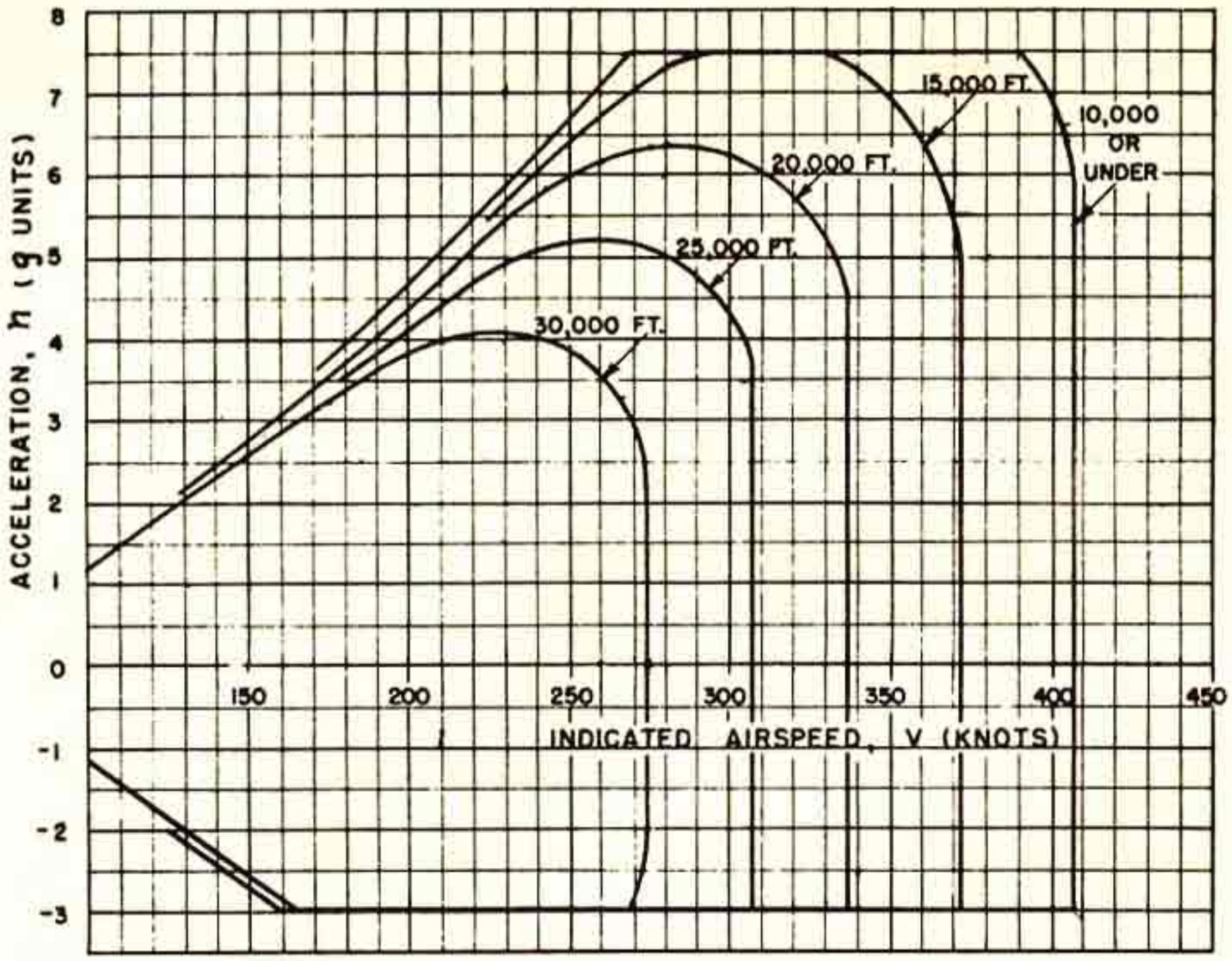
f. The maximum permissible speeds and accelerations for operations involving use of the 295-gallon fuselage external auxiliary fuel tank are shown in Figure 2-1A. When carrying the 190-gallon fuselage external auxiliary fuel tank, if the tank is three-quarters full or less, there are no additional restrictions over those in effect when no external store is carried; if the tank is full, an additional restriction of 6.5g at 350 knots or less, varying linearly to 5.7g at 408 knots, shall be observed. The maximum permissible speeds and accelerations for operations involving unlimited use of the ailerons are shown in Figure 2-1A. Use of the ailerons at speeds outside the boundary line for a given altitude, as shown in Figure 2-1A, shall be limited to the same stick forces as are employed for unlimited use of ailerons at speeds within the boundary line for a given altitude shown in Figure 2-1A. Operation of ailerons at intermediate altitudes shall be controlled proportionately.

g. Catapulting is permissible at any gross weight not exceeding that given in Paragraph 2-1C either with or without a fuselage external auxiliary fuel tank installed. Arrested landings are permissible only after incorporation of Model FH Aircraft Service Change No. 4. Inasmuch as barrier engagements usually dislodge the external auxiliary fuel tank, pilots should carefully observe the instructions that "arrested landings with full or partially filled droppable fuel tanks shall not be made except during emergencies when the fuel cannot be consumed or the tanks cannot be jettisoned."

h. Flight reports indicate that maneuvering control forces are somewhat low with any cg location aft of 20.7 per cent MAC and that the aftermost allowable cg location (for experienced pilots only) is 25.7 per cent MAC. With cg location aft of 20.7 per cent MAC, more than usual caution should be exercised in maneuvers to avoid exceeding the aircraft strength limitations by inadvertently abrupt movement of controls.

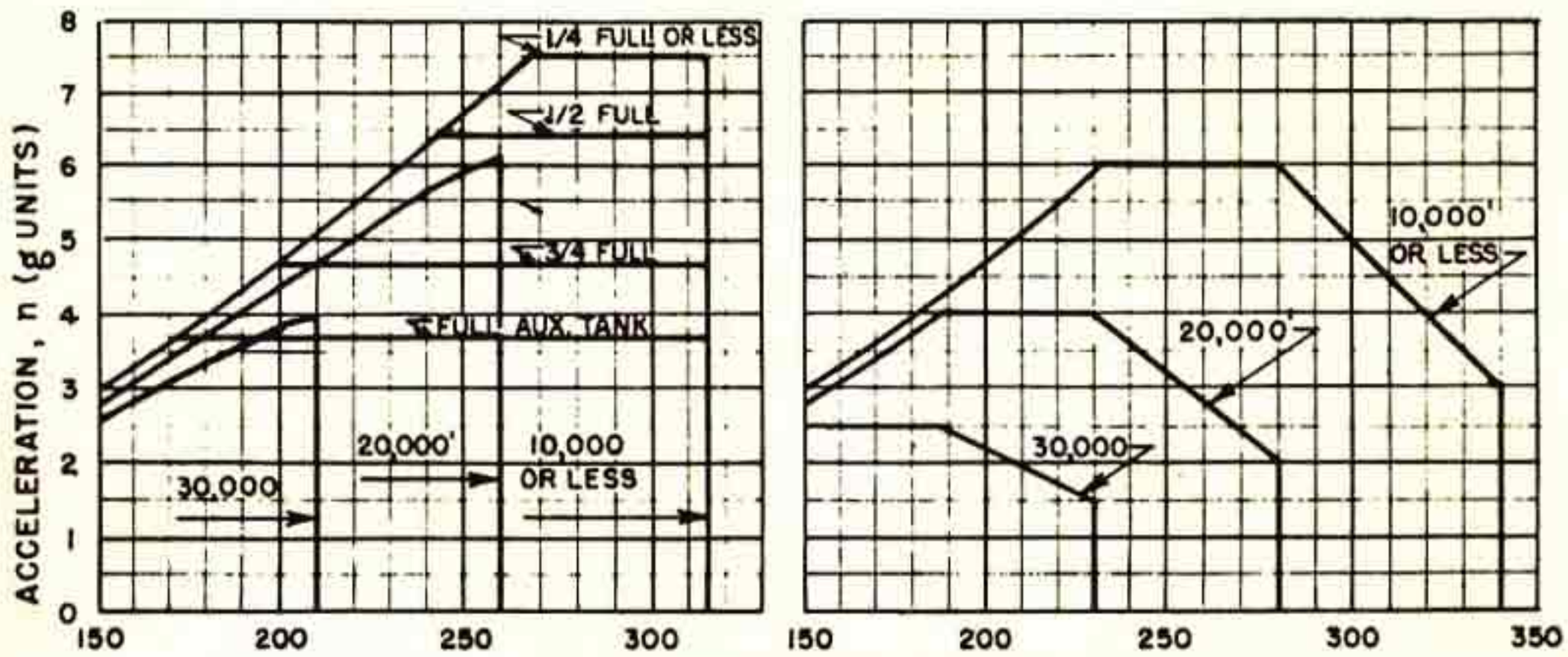
i. The maximum airspeed pointer on the airspeed indicator shall be set at 408 knots IAS and the Mach No. adjustment at 0.73.

*THESE LIMITATIONS AND RESTRICTIONS ARE SUBJECT TO CHANGE AND LATEST SERVICE DIRECTIVES AND ORDERS MUST BE CONSULTED.



OPERATING FLIGHT STRENGTH (V-n) DIAGRAM
MODEL FH-1 AIRPLANE, GROSS WEIGHT 9600 LBS.

Figure 2-1



V-n DIAGRAM FOR OPERATIONS INVOLVING USE OF FUSELAGE EXTERNAL AUXILIARY FUEL TANK.

V-n DIAGRAM FOR OPERATIONS INVOLVING UNLIMITED USE OF AILERONS.

MODEL FH-1 AIRPLANE, GROSS WEIGHT = 9600 LBS.

Figure 2-1A

The following items shall be checked prior to entering the cockpit.

a. Check gross weight and c.g. locations for take-off and anticipated loading for landing. Loading data are furnished in the Handbook of Weight and Balance, Data, AN01-1B-40.

b. Inboard wheel well doors open. Check to see that the doors were not inadvertently closed by the ground crew.

c. Fuel and oil caps secured. Because of the location of the fuel tanks between the engines, it is particularly important that the fuel caps be properly secured so that no fuel leakage into the engine compartment can occur in flight.

d. Inlet air duct guards removed and intake ducts free of loose objects.

e. See that the airplane is parked where the jet blast will do no harm and where no loose objects may be sucked into the inlet air ducts.

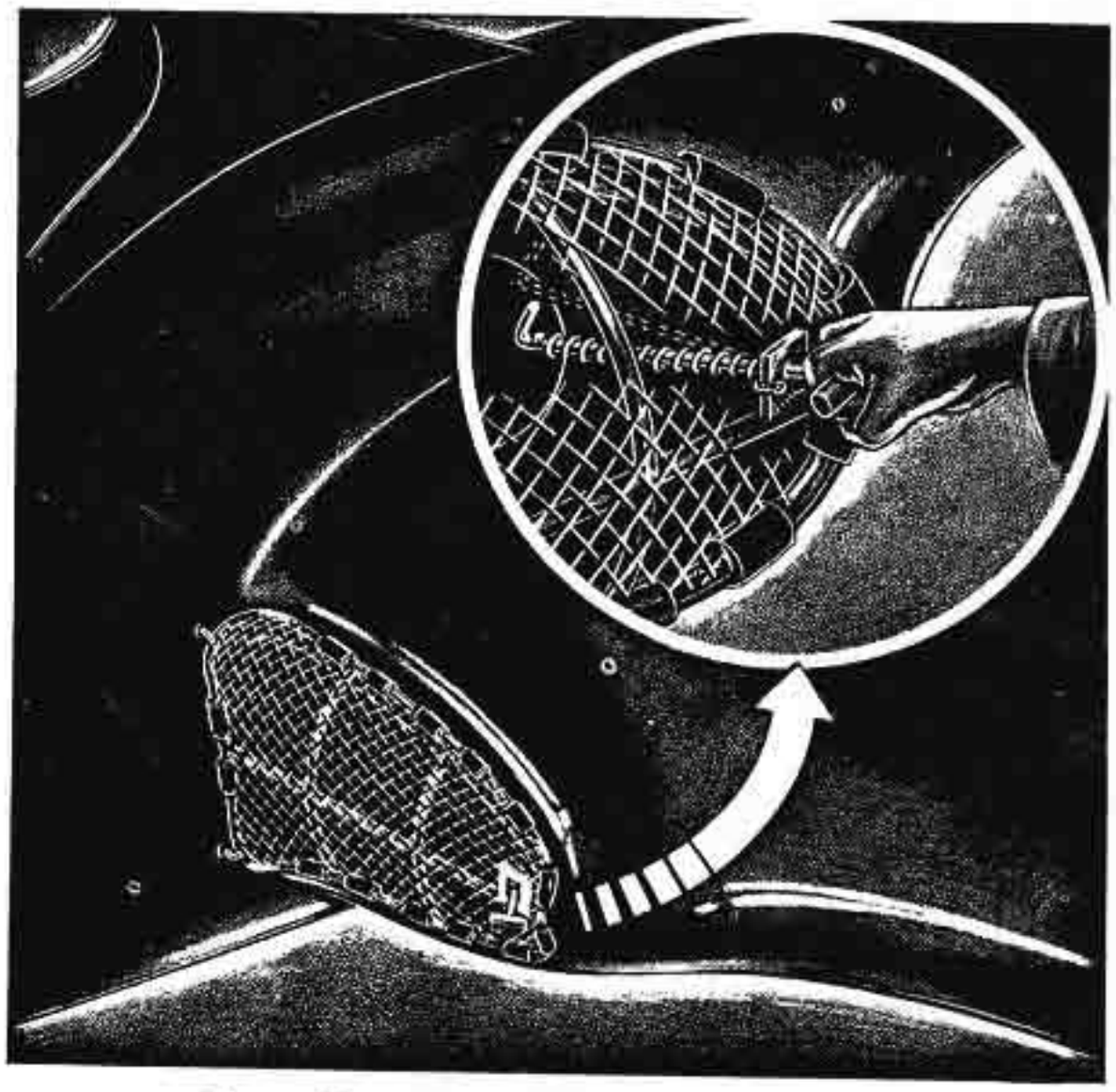
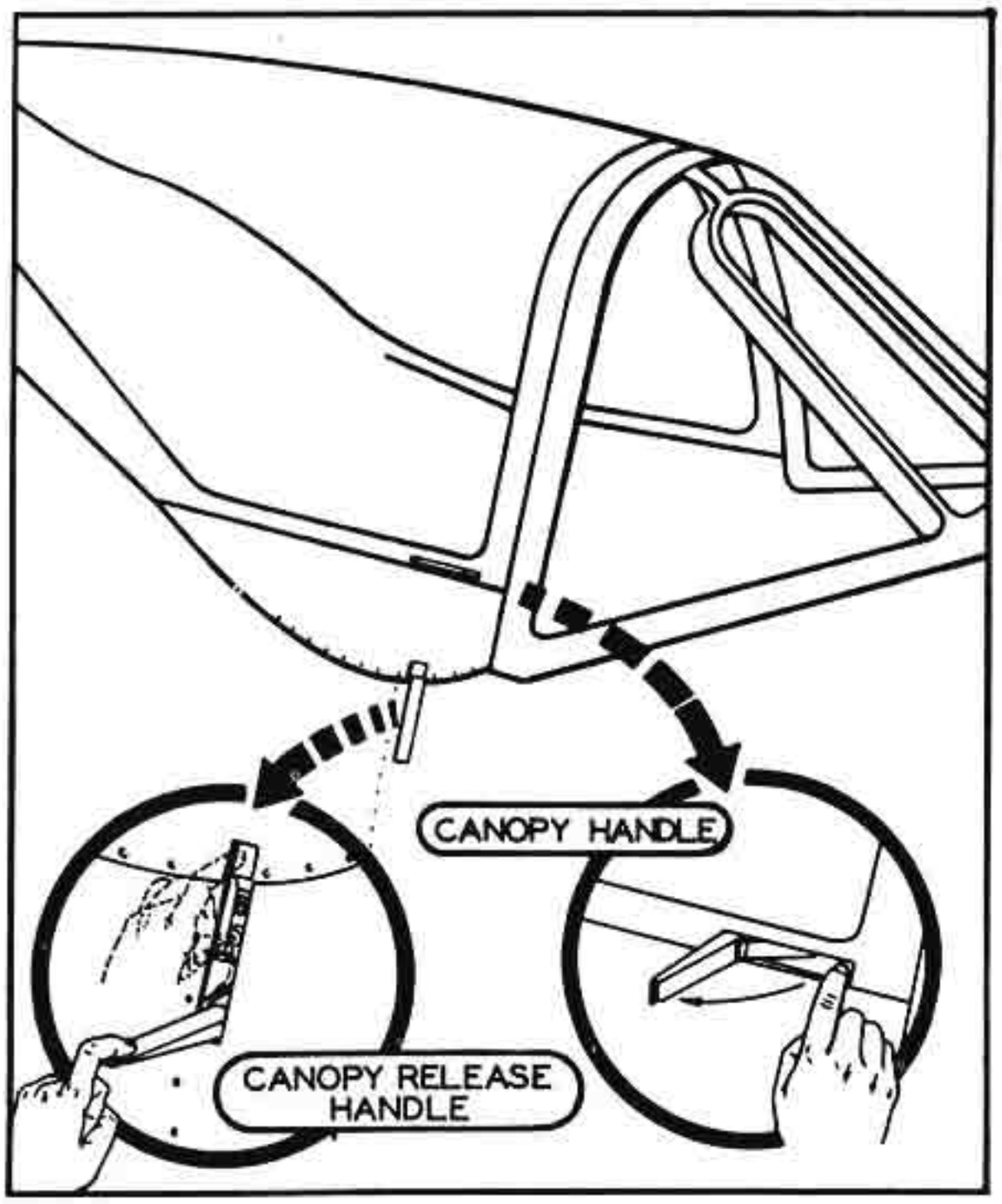


Figure 2–2. Removal of Air Duct Guards

2-2. GAINING ENTRANCE TO COCKPIT. The cockpit is entered from the right side of the airplane as shown below. Guide lines are provided along the right side of the fuselage to indicate location of steps, and the path to be followed when entering or getting out of cockpit.

WARNING

Do not enter or leave cockpit while the right engine is operating.



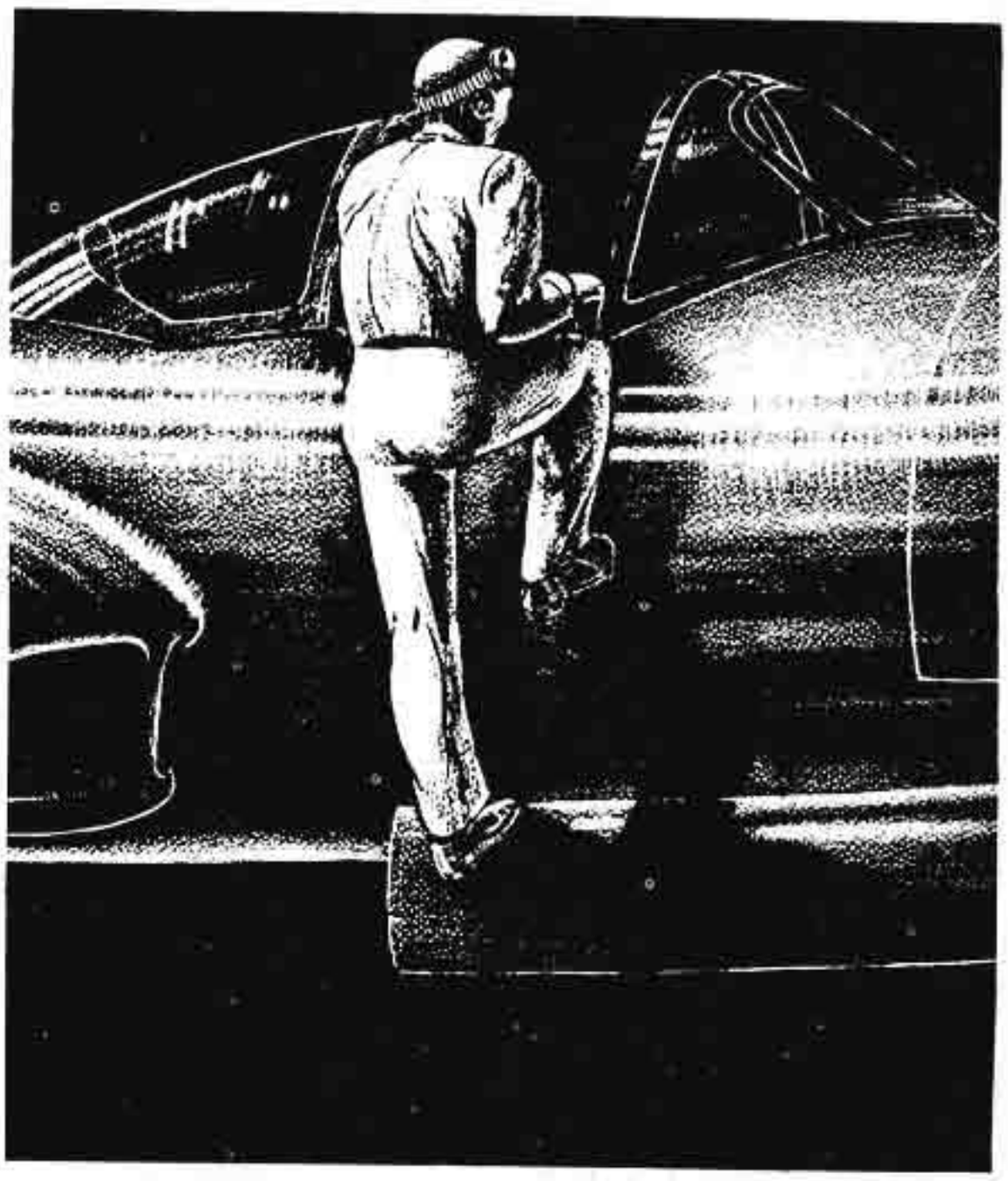


Figure 2-3. Cockpit Access

2-3. ON ENTERING COCKPIT. Jet engines require no warm-up; but fuel consumption is extremely high at all times. Therefore the following preparations for flight should be accomplished before starting the engines.

2–4. BEFORE ALL FLIGHTS.

CHECK LIST

a. ADJUST RUDDER PEDALS.

b. ADJUST SEAT HEIGHT.

c. CHECK FLIGHT CONTROLS THROUGH FULL THROW FOR FREEDOM OF TRAVEL.

d. ADJUST SEAT HARNESS AND RADIO GEAR FOR FLIGHT.

e. SHOULDER HARNESS LOCKED.

f. ASCERTAIN THAT OIL QUANTITY HAS BEEN CHECKED.

g. WINGS "SPREAD" AND LOCKED.

h. CHECK POSITION OF BOTH CANOPY AND JETTISON HANDLES.

i. CHECK FUEL LEVEL GAGE FOR WATER IN TANKS.

2–5. BEFORE NIGHT FLIGHTS.

CHECK LIST

a. CHECK COCKPIT AND INSTRUMENT PANEL LIGHTING.

b. CHECK OPERATION OF DIMMING RHEOSTATS.

c. CHECK EXTERIOR LIGHTING.

2–6. FUEL SYSTEM MANAGEMENT.

CAUTION

Fuel consumption is greater for jet-propelled aircraft than for conventional aircraft. Fuel consumption in flight can be as high as 10 gallons per minute when operating at military power. Therefore, observe the fuel quantities closely.

2-7. SEQUENCE OF TANK SELECTION. A nameplate on the fuel tank selector valve indicates proper sequence of selection. The nameplate reads: EXT. TANK — AFT TANK — FWD. TANK — MAIN TANK.

WARNING

The above sequence must be followed in order for the fuel quantity gages to read correctly.

Note

The main tank side of the fuel quantity gage will usually drop immediately after battery switch is turned "ON," since a small amount of fuel is used from the main tank prior to transfer from selected tank. If an accumulation of water in the bottom of the fuel tank is above the end of the transmitter the indicator will read off scale at the full end.

2-8. SWITCHING TANKS DURING FLIGHT. **Normally fuel is supplied to the engines from the main tank.** Fuel is transferred to the main tank from the tank indicated on the selector valve. Therefore, a fuel tank can be completely empty before it is necessary to switch to another. When a fuel tank does run dry and fuel begins to drain from the main tank supply only, the pilot is warned by the signal lights in the cockpit. He should then select another tank containing fuel.

WARNING

Take-off with System Selector Valve in the "NORMAL" position.

2-9. OIL SYSTEM MANAGEMENT. Check oil pressure and turbine outlet temperatures periodically during flight. Other oil system management is unnecessary as the oil system is self-controlled in each engine.

2-10. STARTING ENGINE. If surface wind velocity is over 10 mph, head airplane into wind for starting. Do not attempt to start engines with flaps up.

Note

An external power supply is required for starting the engines.

It has been determined through field experience that an adequate external power source for starting the engines is either:

(1) Four to six, depending on weather conditions, fully charged 24-volt aircraft batteries connected in parallel using #0 size cables and a standard connector plug.

(2) A 28 to 30 V.D.C. motor generator set having a power rating of 1200 to 1500 amperes with leads and plug as described above.

Note

The positive lead from the batteries or generator should be connected to the center prong and the negative lead to the large outside prong on the connector plug. Do not turn on the generator of one engine after it has started to assist the external power source in starting the other engine unless absolutely necessary to bring the engine being started up to 2000 rpm. The engine that is running must be operating between

14,000 and 15,000 rpm to be sure that the generator is putting out its maximum power before turning it on.

2-11. GENERAL. A cold engine will normally "Light Off" in approximately 15-30 seconds. Do not advance throttle such that turbine outlet temperature limits exceed red line on indicator. The characteristic sound of the engine while starting is a whine which increases in pitch until the combustion point is reached at approximately 2000 rpm. At this point, the sound abruptly changes to a mild, low-pitched rumble. If a heavy rumble and engine vibration accompanied by a rapidly rising turbine outlet temperature occurs, retard the throttle about ¼ to ½ inch beyond the "IDLE" detent. As engine accelerates, advance throttle slowly to "IDLE" position. If a "hot start" is still obtained, as evidenced by turbine outlet temperature above the red line, advance the throttle to obtain 8000 rpm, as this is the speed for coolest engine operation. Maintain this rpm until the temperature has returned to normal. Listen carefully to each engine, as an unusual delay in "Lighting Off" may mean malfunctioning of the engine. During the starting cycle, note the vibration of each engine.

2-12. STARTING PROCEDURE.

a. Battery Switch "OFF."

CAUTION

Battery switch must be "OFF" when starting engines with external power.

b. Generator switch "OFF."
c. External power connected.
d. Flaps "DOWN" — to check dump valve.
e. Engine inlet air ducts "OPEN."
f. Throttles fully "CLOSED."
g. Fuel tank selector valve "EXT. AUX.", if installed, otherwise use "AFT."
h. System selector valve "NORMAL."
i. Engine selector valve, set to engine to be started. Must **not** be set on "BOTH."
j. Momentarily engage normal starter switch of selected engine.
k. Allow engine to reach 2000 rpm, advance throttle slowly to "IDLE," and hold "AIR-START" switch on until engine "lights-off."
l. If engine "lights-off" very late in the cycle, immediately re-engage normal starter switch a second time so that the starter will assist the engine to accelerate. This procedure will prevent hot starts caused by late ignition.
m. To start the other engine, move the engine selector valve to "BOTH," repeating the foregoing starting procedure.
n. With external power disconnected, and battery and generator switches "ON," and engines stabilized, advance throttle to 12000 rpm, check generator output (27.5) volts), and then retard to idling rpm.
o. Increase to 17000 rpm or turbine outlet limiting temperature.

CHECK-OFF LIST AT IDLE RPM (6000 RPM)

Turbine Out. Temp.	391-613°C (736-1135°F)
Fuel Pres.	4-17 psi
Oil Pres.	10-20 psi

CHECK-OFF LIST AT 12000 RPM

Turbine Out. Temp.	344-566°C (651-1051°F)
Fuel Pres.	36-98 psi
Oil Pres.	30-75 psi

2-13. FAILURE OF ENGINE TO START. If the engine fails to start after the foregoing procedure, it is a definite indication of malfunctioning of the engine and the engine should be checked. Unsuccessful starting attempts may result in flooding the combustion chamber and tail pipe with fuel. The presence of this fuel will cause a flaming start, with resultant "hot spots," within the engine, and occasionally a jet of flame will be emitted from the engine's exhaust nozzle. This fuel must be drained prior to attempting a start a second time. This may be done by tilting the airplane upward at the nose. The starter and ignition coils should be allowed to cool for at least 20 minutes after making two unsuccessful starting attempts. Drain dump tank after two false starts. Do not hold starter switch "ON" longer than 10 seconds.

2-14. WARM-UP & GROUND TESTS.

2-15. GENERAL. No extended warm-up is required for jet propulsion engines. The oil system uses low viscosity oil that does not have to be warmed to give proper lubrication. To avoid confusing the "WARM-UP" of conventional engines, the operation is called engine "RUN-UP." The only purpose of the "RUN-UP" is to afford an opportunity for checking the operation of the engine prior to take-off. The second engine may be tested as soon as the test of the first engine has been completed. Using this procedure the complete starting and ground test of the engines can be accomplished in two minutes.

CAUTION

Do not prolong "RUN-UP." Fuel consumption will cut seriously into actual flight time.

2-16. ENGINE RUN-UP. The preferred engine rpm during "RUN-UP" is between 11000—12000, because combustion temperature is lowest in this range. Also,

the generator reverse current cut-outs close when the generator output reaches 27.5 volts (8000 to 9000 rpm), enabling the engines to carry the electrical load in this range.

WARNING

The pilot should warn personnel wearing loose caps, gloves, etc., to beware of the inlet air duct opening. Serious personal injury and damage to the engine can result if sucked against the inlet opening.

2–17. ENGINE & ACCESSORIES GROUND TESTS.

2-18. MILITARY POWER CHECK. Open throttle to obtain Military Power (red lined turbine outlet temperature, or corresponding engine rpm) for 10 to 15 seconds. Check oil and fuel pressures:

Fuel Pres.	180-280 psi
Oil Pres.	40-80 psi

Turbine outlet temperature should not exceed red line on indicator, or limit specified in engine log book. Restrict use to 15 minute duration whenever necessary for take-off or emergency flight conditions. Question any discrepancy between red lined limit and limit specified in engine log book.

CAUTION

Avoid making the above tests on gravel or loose dirt surface, because of possible damage to the engines.

2-19. IDLING CHARACTERISTICS. Engine idling characteristics may vary daily but should be kept above 5000 rpm. Proper idling speed is approximately 6000 rpm at 391-613°C (736-1135°F).

2-20. SCRAMBLE TAKE-OFF. For an emergency take-off, eliminate engine run-up and ground testing, but determine that the engines are up to speed and are operating smoothly. Take-off may be accomplished approximately one and a half minutes after starting the first engine.

2–21. TAXIING INSTRUCTIONS.

2-22. With the bubble canopy, vision from the cockpit is unimpaired, eliminating the necessity for S turns during taxiing.

2-23. It is easier to turn with a tricycle landing gear if the airplane is allowed to roll forward before the turn is started.

2-24. On flat, hard surfaces the airplane will roll forward with both engines idling. Whenever possible, allow the airplane to roll freely, using the brakes only for steering. With a tricycle landing gear it is safe to allow a higher taxi speed than with a conventional gear, and it will relieve part of the load on the brakes.

2-25. The engines should be used to aid turning, particularly sharp turns. However, due to the acceleration characteristics of the engines, any change in power setting should be anticipated beforehand, and the throttle moved before the power is actually needed.

2-26. On hard surfaces the airplane may be taxied satisfactorily using only one engine. When taxiing with one engine it will be difficult to turn toward that engine and easy to turn away from it. The airplane will handle easier if taxied at fairly high speed.

2-27. The airplane may be easily taxied in cross winds. The abuse of the brakes can be reduced by balancing the wind force with unequal engine speed.

2–28. TAKE-OFF.

Use military power.

a. FUEL TANK SELECTOR VALVE "EXT. AUX." if installed, otherwise use "AFT." (See Fig. 1-12.)

b. SYSTEM SELECTOR VALVE "NORMAL."

c. WING FLAPS ONE-QUARTER TO ONE-HALF DOWN FOR FIELD TAKE-OFF.

d. TRIM TABS SET AT ZERO.

e. CONTROLS FREE.

f. CANOPY LOCKED OPEN.

2–29. GENERAL.

2-30. TAB SETTINGS. There is no noticeable torque from jet engines. The trim changes of the airplane, with varying flap and landing gear positions, are slight. Zero setting on all tabs will approximately trim the airplane in climb. The forces necessary for trim control during take-off or initial climb are small. The zero tab setting, therefore, is recommended for take-off.

2-31. FLAP SETTINGS. Flaps should be used on all take-offs. For minimum run (carrier take-off) the setting should be full down; for field operations a setting of one-quarter to one-half down should be used. The latter setting allows a small increase in run over flaps full down, but an improved rate of climb after take-off. Take-off with flaps up will require a longer run, and the initial rate of climb after take-off will be poor.

2–32. TAKE-OFF TECHNIQUE.

2-33. NORMAL TAKE-OFF. After turning into the take-off position, taxi the airplane straight ahead for several feet in order to align the nose wheel, otherwise the airplane will tend to swerve during the early part of the take-off run. Hold the brakes until the engines reach take-off speed. As soon as satis-

factory engine operation is noted, release the brakes and allow the airplane to roll forword. A tricycle landing gear airplane will usually fly itself into the air, but sometimes must be lifted by a movement of the control stick. At approximately 80 knots IAS bring the stick back in order to lift the nose off the ground. Retract the wheels as soon as the airplane is definitely airborne. Do not attempt to climb at low speed. Remain low and pick up forward speed. Retract the flaps at about 100 knots IAS. Remain at low altitude until climbing speed, 180 knots IAS, is attained.

2-34. MINIMUM RUN TAKE-OFF. Take-off with minimum ground run is accomplished with flaps full down. Start the run as for a normal take-off, but lift the airplane off the ground at 80 knots IAS. Retract the landing gear as soon as airborne, but do not raise the flaps until 100 knots airspeed has been attained. In the interval between 80-100 knots, the airplane will be in a very nose high attitude and will climb slowly.

2-35. OBSTACLE TAKE-OFF. Use one-half flap. Retract the landing gear as soon as airborne, and climb the airplane at 85 knots IAS until the obstacle is cleared.

2–36. JATO TAKE-OFF.

a. Throttle "OPEN."
b. Push switch to energize the units.

2–37. ENGINE FAILURE DURING TAKE-OFF.

See Section IV.

2–38. ENGINE FAILURE AFTER TAKE-OFF.

See Section IV.

2–39. CLIMB AND LEVEL FLIGHT.

2-40. MILITARY POWER CLIMB AND LEVEL FLIGHT. Operate according to the Power Plant Chart. In setting the power it should be remembered that the combustion temperature (turbine outlet temperature) does not stabilize immediately after the throttle is moved and, according to the direction of throttle movement, will vary several degrees after the throttle has been set.

2-41. NORMAL POWER CLIMB AND LEVEL FLIGHT. Operate according to the Power Plant Chart. A normal power climb consumes a larger amount of fuel before reaching the desired altitude. If the flight anticipated will require conservation and careful control of fuel, as much of the climb as possible should be made at military power.

2-42. SINGLE ENGINE CLIMB. When climbing with one engine, use military power if possible. This will conserve fuel in reaching the desired altitude.

2–43. GENERAL FLYING CHARACTERISTICS.

Note

Refer to the airplane restrictions listed in Paragraph 2-1 of this section.

Note

P-3 COMPASS — CAUTION

After take-off, cage and uncage compass with airplane in level flight to obtain correct heading. Cage compass 15 seconds prior to exceeding 70° pitch or 110° bank or compass may be damaged.

2-44. STABILITY. The airplane is stable under all conditions; however, light stick forces may be encountered when ammunition is expended and c.g. is aft.

2-45. TRIM CHANGES. The extension of the landing gear and wing flaps results in a mild trim change in the nose heavy direction. The trim change, due to varying power settings in the landing condition, is small.

2-46. CRUISING. The recommended low speed cruise condition is with one engine operating at normal rated power.

2-47. BEST RANGE. Optimum range is obtained by flying on one engine at the highest altitude possible.

2–48. MAXIMUM PERMISSIBLE SPEED AND ACCELERATIONS.

2-49. The maximum permissible combinations of speed and acceleration at a gross weight of 9600 pounds or less are shown in Figure 2-1. As the limiting speed of the airplane is approached a mild buffeting of the elevator and the airframe is encountered. As the speed is increased the buffeting is accompanied by a heavy nose up tendency and a rolling instability which limit the maximum attainable speed of the airplane.

2-50. STEEP DIVES. No difficulty will be encountered in recovering from a steep dive, even when the limiting speed is held, since the airplane has a strong nose up tendency at the limiting speed. However, as much as 4000 ft. should be allowed for recovery, and care should be taken not to exceed the structural limitations of the airplane during the pull-out.

2-51. ATTITUDE GYRO AND INDICATOR. The attitude gyro and indicator is electrically operated and is on when the inverter switch is "ON."

2-52. CAGING SWITCH. The remote indicating compass caging switch is mounted on the upper instrument panel to the left of the rate of climb indicator. When the switch is placed in the CAGED position, the gyro in the remote compass transmitter is locked in a position vertical to the transmitter housing. This should be done to prevent damage to the unit during maneuvers likely to exceed 70 de-

grees in pitch or 110 degrees in bank. The caging switch makes it possible to erect the gyro quickly from positions off the vertical. By caging and then uncaging it, the gyro may immediately be brought to a vertical attitude (approximately), and released in that position. The cage-uncage cycle should be adopted to erect the gyro after starting the system; also, when excessive maneuvers during which the uncaged gyro has been forced from the vertical. To insure accurate compass reading in flight, if the gyro is tumbled, it is necessary to level the airplane, cage the compass, uncage it and wait at least five minutes for the compass to stabilize after flying a constant heading. After a maneuver if the gyro is not tumbled, it is necessary to wait at least two minutes after flying a constant heading prior to reading the compass.

2-53. ENGINE SHUT-DOWN IN FLIGHT.

CHECK LIST

a. THROTTLE "CLOSE."

CAUTION

b. ENGINE SELECTOR VALVE TO OPERATING ENGINE.

c. ALLOW ENGINE TO WINDMILL FOR SEVERAL MINUTES UNTIL THE TURBINE OUTLET TEMPERATURE IS LESS THAN 200°C (392°F).

d. CLOSE INLET AIR DUCT.

e. GENERATOR SWITCH "OFF" ON DEAD ENGINE.

WARNING

If the inlet air duct switch is inadvertently closed on the operating engine, the valve will not close due to the safety feature limit switch incorporated on the throttle. However, if the switch is left in the closed position, the valve will automatically close when the throttle is closed.

The throttle must remain in the closed position, or the inlet air duct valve will open. If the shut-down is an emergency operation, it is not necessary for the engine to cool.

2-54. ENGINE STARTING IN FLIGHT.

CAUTION

Air locks in fuel lines result when fuel tanks run dry and a successful air start cannot be obtained. Remedial action is under development; however, until such time, watch fuel quantity gage carefully to prevent tanks from running dry.

CHECK LIST

a. THROTTLE "CLOSED."

b. INLET AIR DUCT "OPEN."

c. OBTAIN SUITABLE AIRSPEED AS SHOWN IN FIGURE 3-4.

d. ENGINE SELECTOR VALVE "BOTH ON."

e. ALLOW ENGINE TO WINDMILL TO AT LEAST 2000 RPM.

f. ADVANCE THROTTLE TO "IDLE" POSITION.

g. HOLD "AIR START" SWITCH ON UNTIL ENGINE LIGHTS OFF.

h. GENERATOR SWITCH "ON" WHEN ENGINE REACHES 10000 RPM.

2-55. BLOW-OUT AND AIR START DATA. For chart showing blow-out and air start data see Figure 3-3. If an attempt to start the engine in flight is unsuccessful, close throttle, turn engine selector valve "OFF," and allow engine to windmill for several minutes in order to dissipate excess fuel in the system. Turn engine selector valve to "BOTH ON," and attempt another start.

2-56. MANEUVERS. All permissible maneuvers are listed in Paragraph 2-1A. However, the airplane will not perform a satisfactory snap roll because autorotation ceases after one-quarter turn. Aileron rolls should be performed at speeds above 220 knots, I.A.S. Minimum speeds for full rudder yaws are 100 knots, I.A.S. for the clean configuration and 90 knots, I.A.S. in the landing configuration. Minimum speed recommended for entering Immelman turns is 260 knots, I.A.S.

2-57. SPINS.

2-57(1). DESCRIPTION. Normal spins are very oscillatory to either left or right. The nose of the airplane oscillates from 80° below the horizon to a slightly nose high attitude. During the steep portion of the spin, rotation is rapid and control forces required to maintain the spin are large; during the flat, nose high portion of the cycle, rotation is very slow and control forces light. The spin oscillations are increased somewhat if the ailerons are held with the spin. With landing flaps and gear down, the oscillations are milder. The use of two-engine power has practically no effect on the spinning characteristics. Application of single-engine power against the spin increases the severity of the oscillations while single-engine power with the spin has the opposite effect.

Inverted spins are difficult to enter due to the lack of sufficient elevator control to obtain a complete inverted stall. Once started, an inverted spin is smooth and very steep after the initial gyration.

2-57(2). RECOVERY. Recovery can be effected from any phase of the normal spin in less than one-half turn by neutralizing the controls. Recovery may

also be made quickly by use of rudder alone, with full back elevator, or by elevator alone with rudder full into the spin. Use of both rudder and elevator against the spin frequently results in over-controlling with an ensuing change in direction and rotation. Aileron position, landing flap and gear position, and engine power settings have little effect on recovery characteristics.

Recovery from an inverted spin may be effected in less than one-half turn by using opposite rudder and neutralizing the elevator. Comparatively high rudder forces are encountered.

Normal spins in the clean configuration require about 1,500 ft. per turn with another 1,000 ft. for recovery. With flaps and gear down the spin is steeper and 2,000 ft. per turn plus 1,000 ft. for recovery are required. Considerably more altitude is required for recovery from an inverted spin, and it is recommended that, in order to save altitude, a roll be made in preference to a split "S" following recovery.

Note

The above maneuvers are permissible only with the airplane in the normal gross weight condition.

2-58. DIVES. Maximum permissible speeds and accelerations in dives for a gross weight of 9600 pounds are shown in Figure 2-1.

DIVE CHECK LIST

a. COCKPIT LOCKED CLOSED.

b. LANDING GEAR AND FLAPS "UP."

c. FUEL TANK SELECTOR VALVE ON AN INTERNAL TANK.

2-59. A warming up period is not required after completing the dive prior to opening the engines to military power. The engine speed does **NOT** increase appreciably in dives since the governor maintains constant engine speed. Engine speed will actually decrease if appreciable altitude is lost.

2-60. EXTERNAL AUXILIARY FUEL TANK. When the external auxiliary fuel tank is installed, the limitation shown in Figure 2-1A should not be exceeded.

2-61. RECOMMENDED APPROACH. With the high idling thrust present in the axial flow engine, it is difficult to lose altitude with the airplane clean without excessive speed. It is recommended that the landing gear and flaps be fully extended at altitude and the airplane be glided down at 120 to 140 knots IAS.

2-62. APPROACH AND LANDING. The airplane has a relatively flat approach angle in the landing configuration, throttles "IDLE." If a very low approach is made, only a moderate amount of power is required to maintain a safe approach speed.

CHECK LIST

a. SHOULDER HARNESS LOCKED.

b. WING FLAPS "DOWN" AT LESS THAN 156 KNOTS.

c. LANDING GEAR "DOWN" AT LESS THAN 152 KNOTS.

d. ARRESTING HOOK "UP" FOR FIELD, "DOWN" FOR CARRIER.

e. GUN SWITCHES "OFF."

f. DEFOGGER-HEATER "OFF."

g. CANOPY OPEN.

WARNING

Start approach with at least 60 gallons of fuel in order to have sufficient fuel for a "WAVE-OFF," if necessary.

2-63. NORMAL APPROACH. Normal approach is accomplished with wheels and flaps fully down at approximately 95 knots, IAS (See Take-off, Climb, and Landing Chart) with a little power on (9000 rpm). With this approach there will be an appreciable float after retarding throttles to "IDLE," but a smooth landing can be made with the tail well down. For landing in a restricted space, an approach similar to a carrier approach should be made. In landing, fly the airplane to the ground with the tail down and hold the nose in the air as long as possible. If the stick is held fully back, the nose will rock over gently to the three-point altitude at about 55 knots IAS.

2-64. CARRIER APPROACH. Approach the carrier with landing gear and flaps fully down, at about 85 knots IAS. (See Take-off, Climb, and Landing Chart.) Land with tail down. Arresting hook switch in "DOWN" position.

2-65. CROSS-WIND LANDING. Normal landing technique can be used in cross-wind landings. The tricycle landing gear will guarantee a straight roll after landing. Use rudder or brake if necessary.

2-66. SINGLE ENGINE LANDING. See Section IV.

2-67. WAVE-OFF. In the event of a wave-off, or an incomplete landing attempt, advance the throttles smoothly to military power, and climb at 155 knots IAS until a safe altitude is reached. Immediately after opening the throttles, retract the landing gear. When a safe altitude is reached and the speed increased, retract the flaps and fly in the clean condition until ready to attempt another landing.

WARNING

About 40 gallons of fuel is required to go around.

2-68. STOPPING ENGINES.

CHECK LIST

a. "CLOSE" THROTTLES.
b. ALLOW ENGINE TO COAST TO A STOP.
c. ENGINE SELECTOR VALVE "OFF" TO DISCONTINUE FUEL SUPPLY.
d. BATTERY SWITCH "OFF."
e. LIGHTING SWITCHES "OFF."
f. RADIO SWITCHES "OFF."
g. SYSTEM SELECTOR VALVE "NORMAL."

2-69. It is recommended, when time permits, to shut down the engines individually, and the vibration of each engine be carefully noted below 5,000 rpm. The most marked indication of engine bearing failure occurs at about 2,000 rpm.

2-70. If residual burning occurs, (burning in the combustion chamber after stopping the engines), extinguish by pumping carbon dioxide into the inlet and outlet of the engine. If carbon dioxide extinguishers are not available immediately or engines have stopped, run the engine through a starting cycle with the fuel supply off at the engine selector valve.

2-71. BEFORE LEAVING THE COCKPIT.

a. Install the surface controls lock if wind and parking conditions require it.
b. Battery "ON."
c. Inlet air ducts "SHUT."
d. Battery "OFF."

During land operations, if hangar space is not available, secure the airplane by means of lines attached at the main and nose gear strut yokes and, if necessary, at the tail bumper. Place chocks fore and aft of the main and nose wheels.

2-72. AFTER LEAVING COCKPIT. Ascertain that inlet air duct guards are properly inserted into the air duct openings.

SECTION III
OPERATING DATA

POWER PLANT CHART

AIRPLANE MODEL
FH-1

ENGINE MODEL
J30-WE-20

OPERATING CONDITIONS	ALTITUDE (Feet)	MAX. TURBINE OUTLET TEMP.		TWO ENGINE FUEL CONSUMPTION			
				* OVERLOAD GROSS WEIGHT		NORMAL GROSS WEIGHT	
		°C.	°F	GAL/HR	LB/HR	GAL/HR	LB/HR
MILITARY POWER 17000 R.P.M. 15 Min. Max.	SEA LEVEL	655°	1210°	833	4998	853	5118
	5000	655°	[illegible]	734	4404	750	4500
	10000	655°	[illegible]	637	3822	649	3894
	15000	[illegible]	[illegible]	553	3318	562	3372
	20000	[illegible]	[illegible]	477	2862	485	2910
	25000	[illegible]	1210°	405	2430	453	2718
	30000	655°	1210°	337	2022	345	2070
NORMAL POWER 15700 R.P.M.	SEA LEVEL	600°	1110°	597	3582	604	3624
	5000	600°	1110°	522	3132	528	3168
	10000	600°	1110°	455	2730	464	2784
	15000	600°	1110°	396	2376	413	2478
	20000	600°	1110°	341	2046	353	2118
	25000	600°	1110°	302	1812	307	1842
	30000	600°	1110°	245	1470	256	1536

SEE RED LINE ON INDICATOR AND ENGINE LOG BOOK

During **rapid accelerations**, the maximum permissible Turbine Outlet Temperature is 816°C (1500°F). **Rate** of acceleration should be reduced if temperature exceeds this limit.

Question any discrepancy between red line limit on instrument, and limit specified in engine log book.

*Due to reduced airspeed, fuel consumption is less at constant rpm, with external auxiliary tank installed.

Figure 3-1. Power Plant Chart

AIRSPEED INSTALLATION CORRECTION TABLE		
	I.A.S.	CORRECTION
FLAPS RETRACTED	100 KNOTS	ADD 1/2 KNOT
	200 KNOTS	ADD 1 KNOT
	300 KNOTS	ADD 1 KNOT
	400 KNOTS	ADD 1-1/2 KNOTS
	500 KNOTS	ADD 2 KNOTS
FLAPS EXTENDED	70 KNOTS	ADD 2 KNOTS
	100 KNOTS	ADD 1/2 KNOT

Figure 3-2. Airspeed Installation Correction Chart

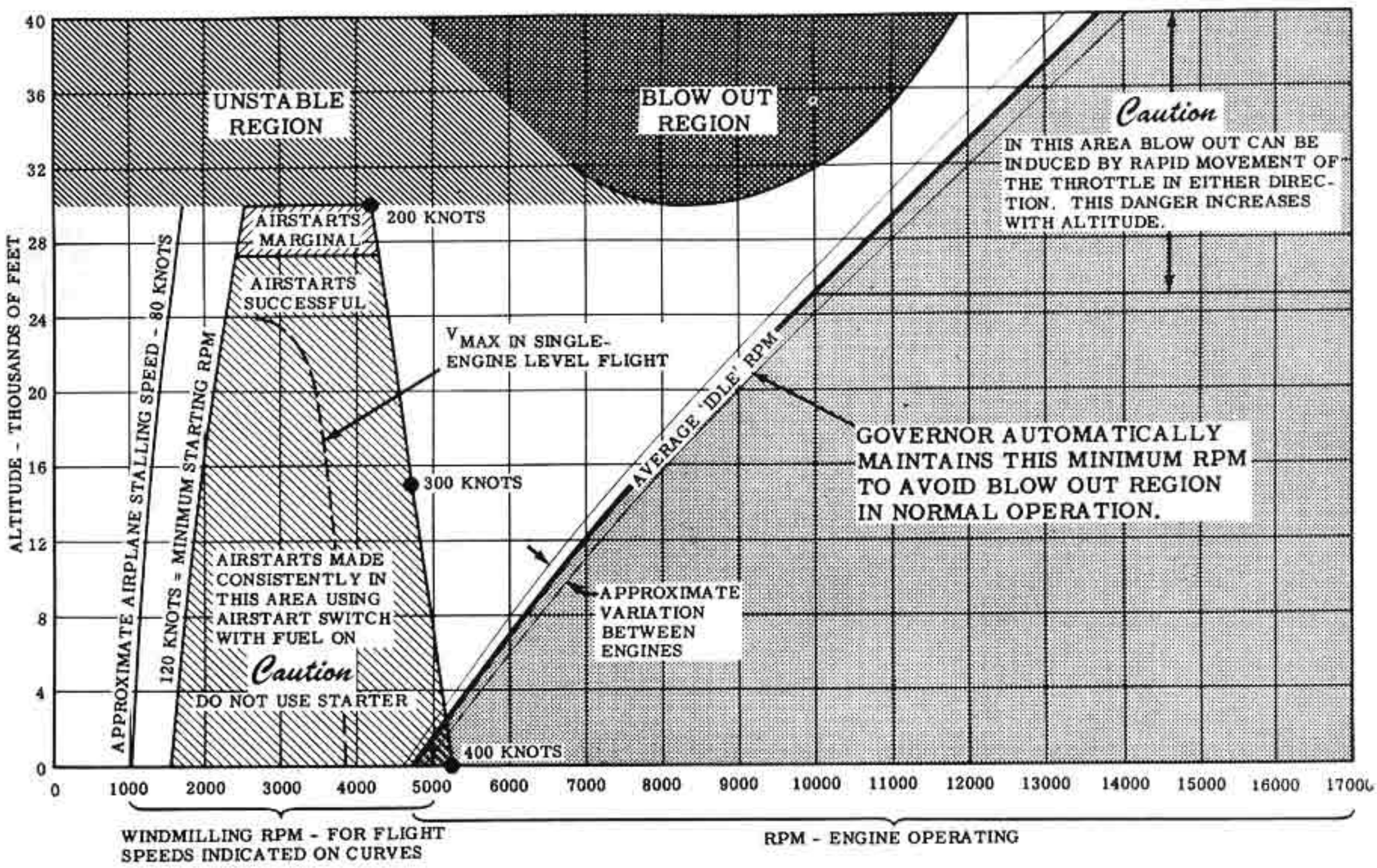


Figure 3-3. Blow-Out and Air Start Data Chart

SECTION IV

EMERGENCY OPERATION INSTRUCTIONS

4-1. EMERGENCY EXIT.

To jettison the canopy:

a. Crank safety pin pull handle 90°.
b. Release shoulder harness.
c. Pull up sharply on canopy jettison handle.

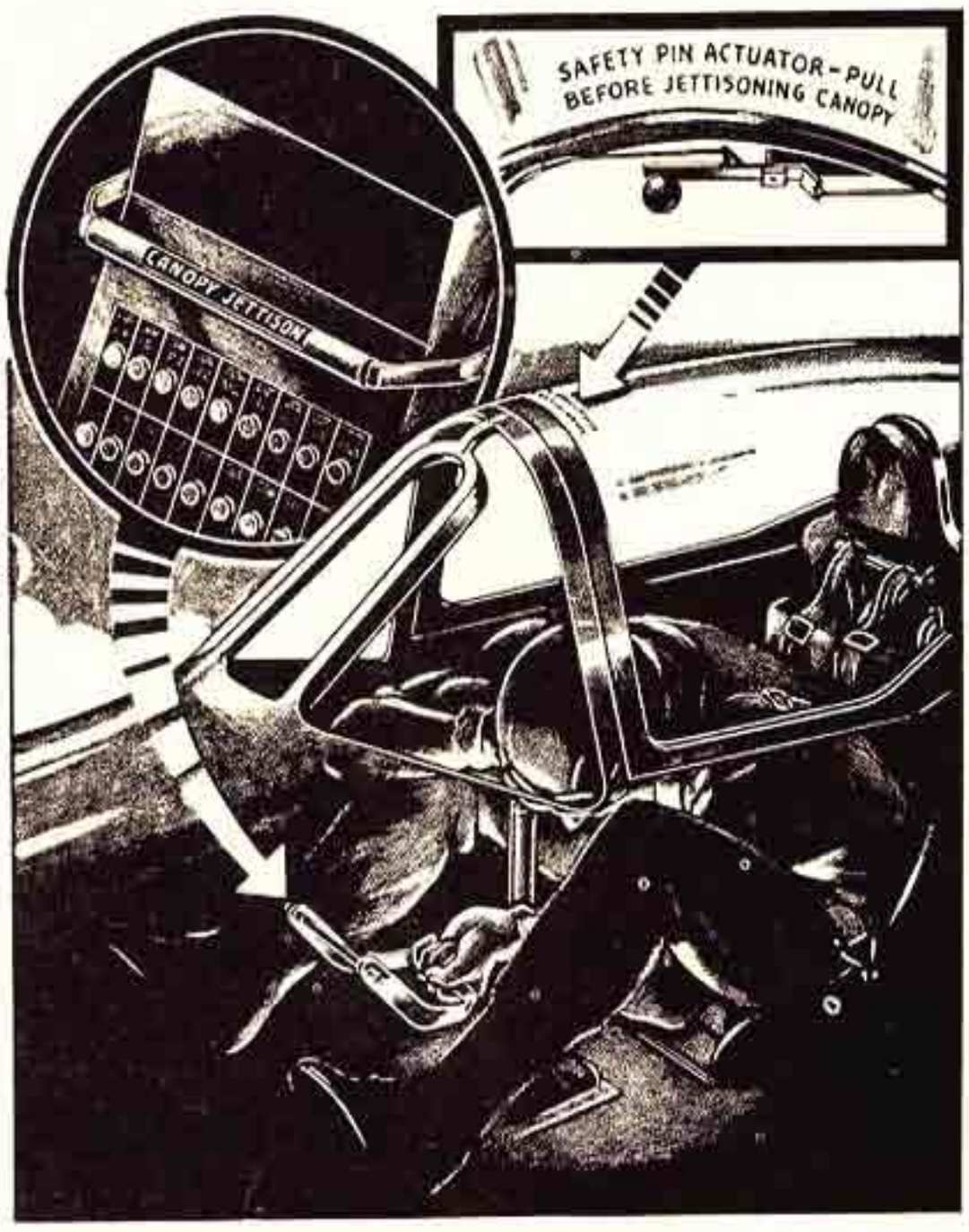


Figure 4–1. Emergency Canopy Jettison

4-2. EMERGENCY LANDING GEAR OPERATION. To lower the landing gear, in case of failure of the normal landing gear electrical circuit, flip the "LANDING GEAR EMERGENCY" toggle switch down.

WARNING

If the nose gear fails to extend following this emergency procedure, and a prepared runway is available, landing should be made with main gear extended. Elevator action will hold nose off for first half of landing run. After nose has made contact with runway, the airplane may be braked to a stop.

CAUTION

Normal landing gear switch must be "DOWN" before moving the "LANDING GEAR EMERGENCY" switch.

WARNING

In case of failure of the emergency lowering circuit as well as the normal circuit, prepare for a belly landing, after jettisoning the droppable fuel tank. Do not jettison external fuel tank unless airborne. If jettison is attempted during roll on take-off or landing the tank will skid along the ground surface with the airplane, such as to impose a very great fire hazard.

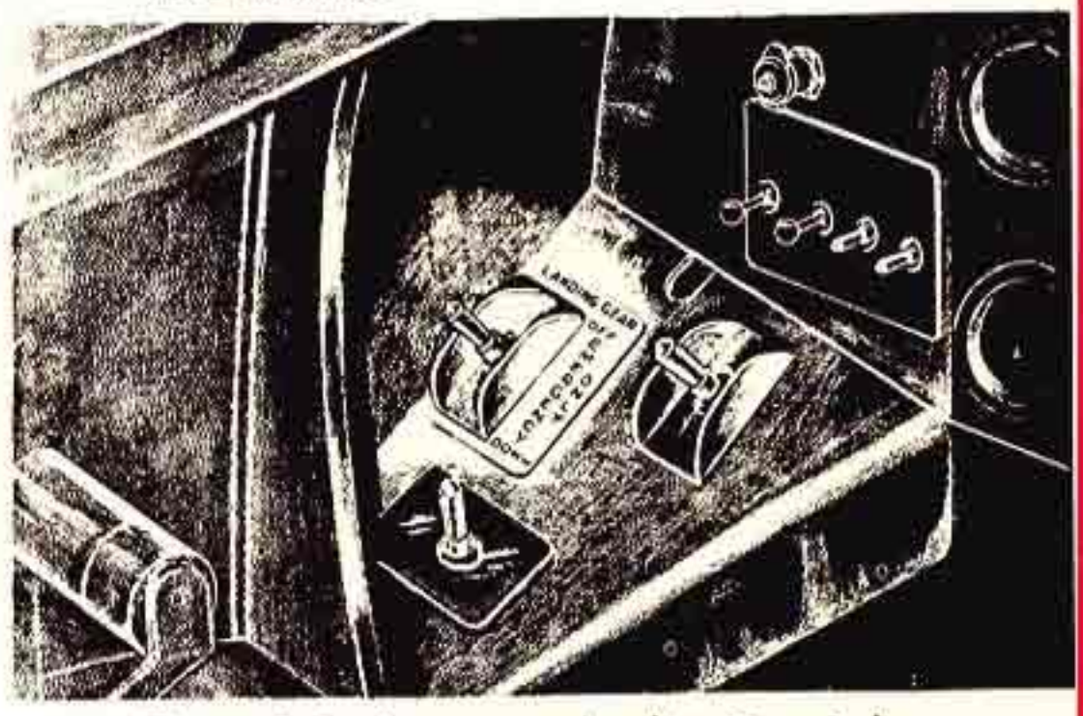


Figure 4–2. Emergency Landing Gear Release

Note

In case either or both of the main landing gear cannot be lowered by normal or emergency systems and landing is to be made on a prepared runway, the nose gear if possible should be extended and flaps deflected three quarters. The nose wheel can be lowered independent of the main gear by proper circuit breaker selections. The nose wheel, flaps, catapult holdback and tail bumper provide skid points for a good landing.

4-3. EMERGENCY ARRESTING HOOK OPERATION. Pull up the red "EMERGENCY ARRESTING HOOK" T handle.

4-4. ENGINE FAILURE DURING TAKE-OFF BEFORE BECOMING AIRBORNE.

a. Engine selector valve "OFF."
b. Stop straight ahead.

CAUTION

The landing gear cannot be retracted unless the nose wheel is lifted off the ground. This can be done at speeds above 50 knots IAS by pulling control stick back.

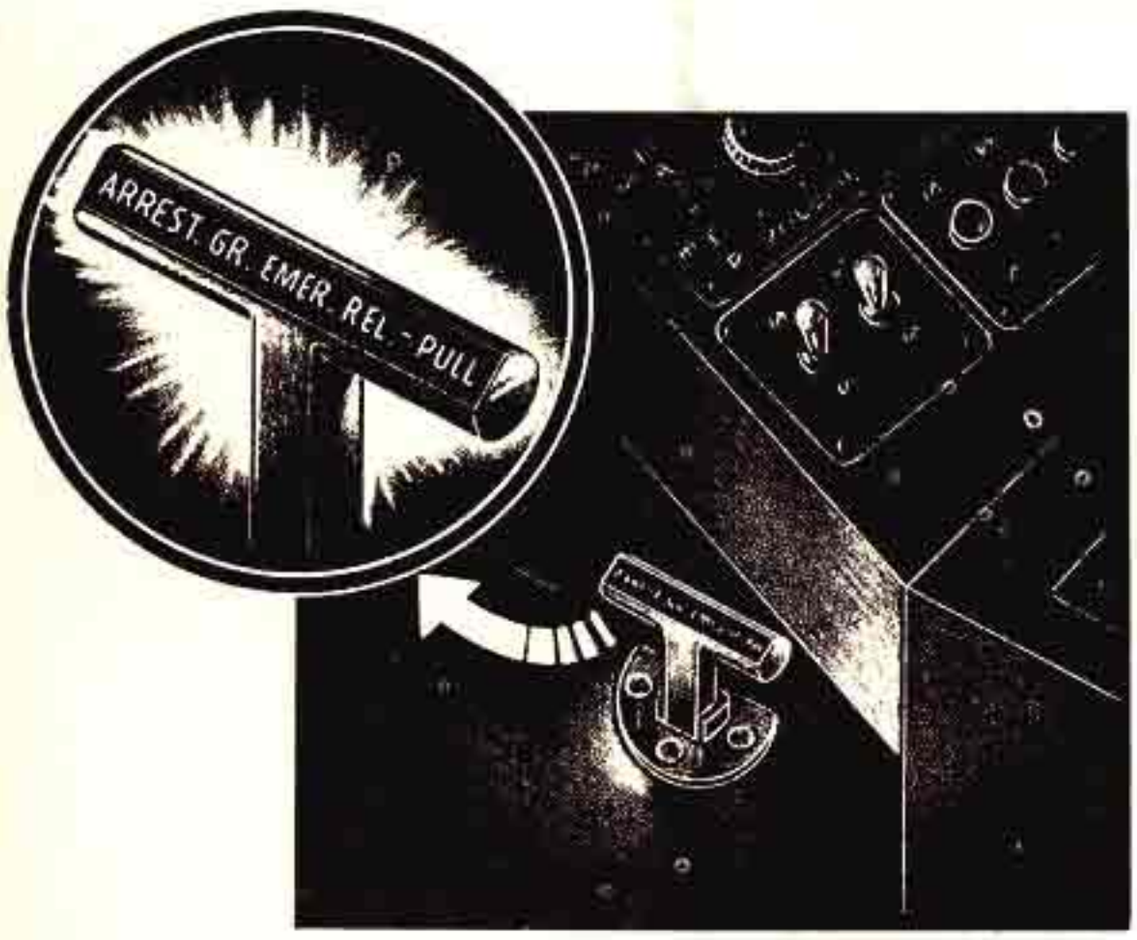


Figure 4–3. Emergency Arresting Gear Release

4–5. ENGINE FAILURE AFTER TAKE-OFF.

a. Retract landing gear and continue straight ahead at minimum altitude necessary to clear obstacles, until sufficient speed is attained to raise flaps. If the take-off has been made with flaps full down, raise half-way at 105 knots IAS and fully up at 120 knots IAS.

b. Jettison External Auxiliary Fuel Tank if sufficient altitude is attained.

c. Throttle of malfunctioning engine "CLOSED."

d. Engine selector valve to operating engine.

e. Generator "ON" operating engine only.

f. After climbing speed, 180 knots IAS has been attained, a climb may be started. The airplane may be climbed at normal rated power on one engine; however, it is preferable to use military power.

4-6. SINGLE ENGINE LANDING. A normal landing on one engine can be made as described for two engine operation except that the approach should be planned carefully to avoid the necessity of going around again. If space permits, a landing with one-quarter flaps should be made. This will result in about four knots higher approach and landing speed, but the performance of the airplane in the event of going around again will be improved. A single engine carrier landing should be made as an emergency landing with landing gear and arresting hook down, and flaps one-half down. In the event of a wave-off, if possible, increase the speed and retract the landing gear before attempting to climb.

4-7. GENERATOR FAILURE DURING FLIGHT. In case of generator failure during flight one generator will sustain operation. To test the generator output with no load, flip the switch that reads "NO LOAD TEST" and watch the voltmeter.

4-8. EMERGENCY FUEL TANK SELECTION. In order for fuel to by-pass the main tank and flow directly to the engine from the tank selected, move the system selector valve to the "STANDBY" position.

4–9. ELECTRICAL FIRE.

a. Battery and generator switches "OFF."

b. All electrical circuits off.

c. If the fire does not continue, it is an indication of an electrical fire. Hit circuit breakers one at a time, and determine the circuit causing the fire.

4-10. ENGINE FIRE IN FLIGHT.

a. Close throttle of affected engine.

b. Engine selector valve to operating engine.

c. Jettison external auxiliary fuel tank if possible.

d. Turn generator switch "OFF", affected engine.

e. Inlet air duct "OPEN."

Note

An increase in airplane speed will assist in extinguishing the flames.

4-11. OXYGEN SYSTEM EMERGENCY OPERATION. Should symptoms occur suggestive of the onset of anoxia or the regulator becomes inoperative, immediately turn on the emergency valve and descend below 10,000 feet. Wherever excessive carbon monoxide or other noxious or irritating gas is present or suspected, then, regardless of the altitude, the air valve should be set at "100% OXYGEN" and undiluted oxygen used until danger is passed or flight completed. Should brief removal of the mask from the face be necessary at high altitude, use the following procedure:

a. Take three or four deep breaths of undiluted oxygen. (Air valve set at "100% OXYGEN.")

b. Hold breath and remove mask from face.

c. As soon as practicable, replace mask to face and take three or four deep breaths of undiluted oxygen.

d. Reset air valve to "NORMAL OXYGEN."

SECTION V
OPERATIONAL EQUIPMENT

5–1. ARMAMENT.

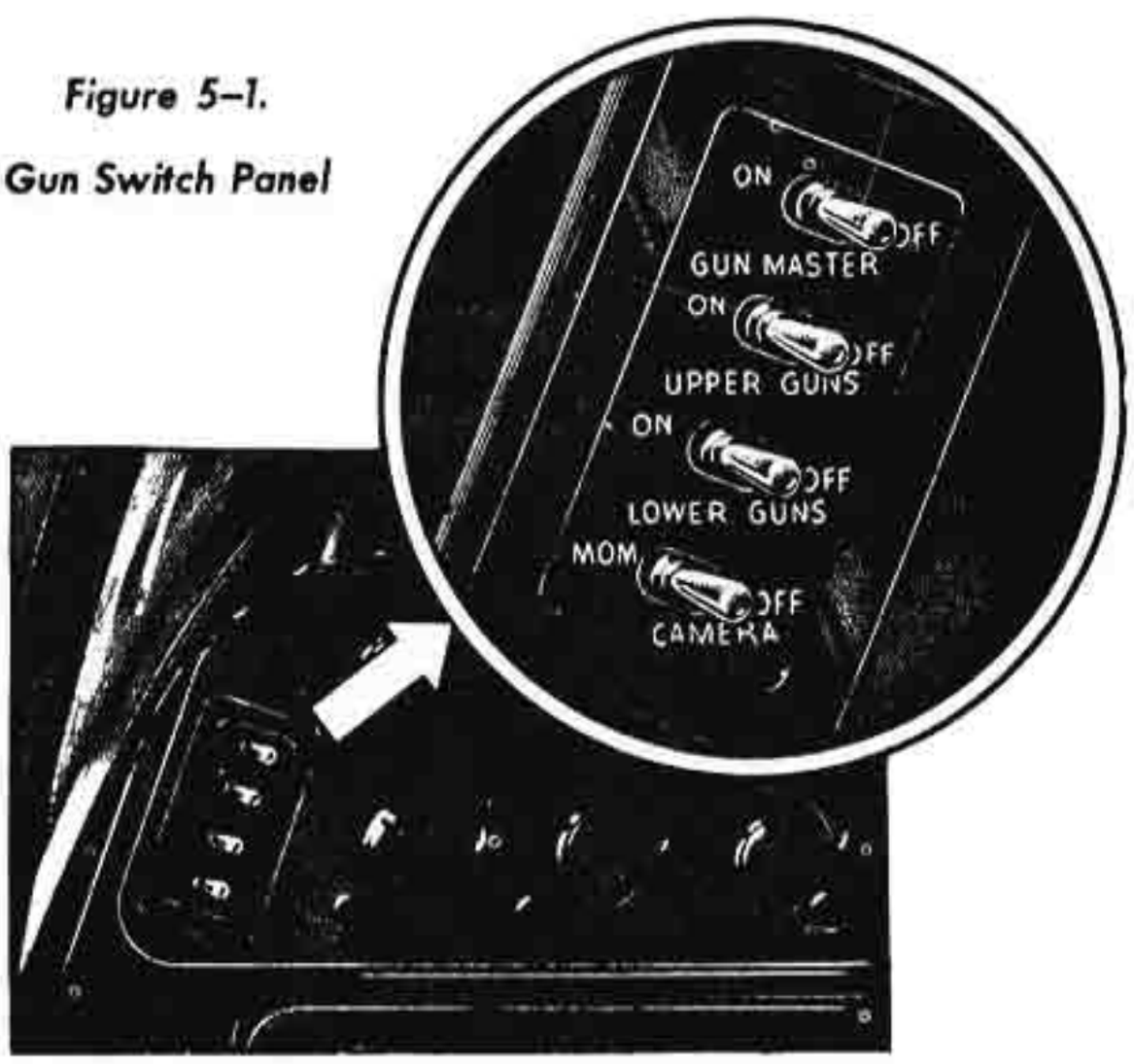
5-2. GUNS. The FH-1 airplane is armed with four .50 caliber machine guns located in the nose of the fuselage. Provisions are made for 325 rounds of ammunition for each gun. The guns are electrically controlled by the "Gun Master" switch. This is a toggle switch with "ON" and "OFF" positions, located on the gun switch panel. A manual gun charger is located on the right side of the cockpit. To fire the guns, first turn the gun master switch "ON." The gun trigger is located on the control stick. The guns fire in salvo, and will continue firing until the trigger is released. The upper and lower guns can be fired separately by switching desired guns "ON," with master switch "ON."

WARNING

The guns cannot be fired unless the arresting hook switch is in the "UP" position.

Figure 5–1.

Gun Switch Panel



5-3. GUN CAMERA. The gun camera will operate whenever the guns are fired by pressing the trigger switch, or the gun camera may be operated by means of the trigger switch without firing the guns, if the Gun Master switch is "ON" and the gun switches are "OFF." The gun camera may also be operated for testing without firing the guns by holding the gun camera switch on the "TEST" position with the GUN MASTER switch "ON."

5-4. GUN CAMERA HEATER. The gun camera is furnished with an integral heater, thermostatically controlled, requiring no operation from the cockpit.

5-5. GUN HEATERS. The gun heaters are operated by an "ON" and "OFF" toggle switch located outboard of radio circuit breakers. Generator switches must be "ON" in order to activate the gun heaters, with heater switch "ON."

5-6. GUN SIGHT. The Mark 23 gun sight is located above the instrument panel, and is turned "ON" and "OFF" by means of a toggle switch on the panel directly below the lower instrument panel. (See Figure 1-1.) A rheostat control knob to the right of the toggle switch adjusts the intensity of illumination of the gun sight. The rheostat has "DIM" and "BRITE" positions. The toggle switch controls the type of reticle presentation. When on "FIXED" position, the fixed reticle is illuminated. On "FIXED" and "GYRO" position the fixed reticle is illuminated and also the gyro motor and gyro are running to provide the pilot with a fixed and movable reticle presentation. On "GYRO" position the gyro and gyro motor are operating to present a movable reticle but the fixed reticle is not illuminated. To use the gun sight as a computing gun sight:

a. Move the toggle switch to "FIXED" and "GYRO" or "GYRO" position.

b. Set the target span into sight with the span setting knob.

c. Adjust dimmer to provide desired reticle brilliance.

d. Track and encircle target with the six diamonds of the reticle pattern by rotating the throttle handle.

5-7. GUN CHARGER. The gun charger controls consist of a Gun Selector Knob, gun charging handle, and a charging bolt safety lock. The manual gun charger is located on the right side of the cockpit, directly outboard of the lower instrument panel. The "Gun Selector" knob is marked "Gun No. 1, 2, 3, 4 and Neutral." The charging handle is locked in the forward position when the knob is "Neutral."

WARNING

Take off with "Gun Selector" in "Neutral," and charging bolt safety lock in "LOCK" position.

The guns must be charged separately as follows:

TO CHARGE:

a. Turn "Gun Selector" knob to gun to be charged.
b. Charging bolt safety lock in "OPEN" position.
c. Pull handle back to cock gun, then release, allowing handle to swing forward.

WARNING

This operation must be repeated twice.

TO SAFETY:

a. Charging bolt safety lock in "LOCK" position.
b. Repeat charging operations once.

TO FIRE:

a. Charging bolt safety lock "OPEN."
b. Squeeze gun trigger with Armament switches "ON."

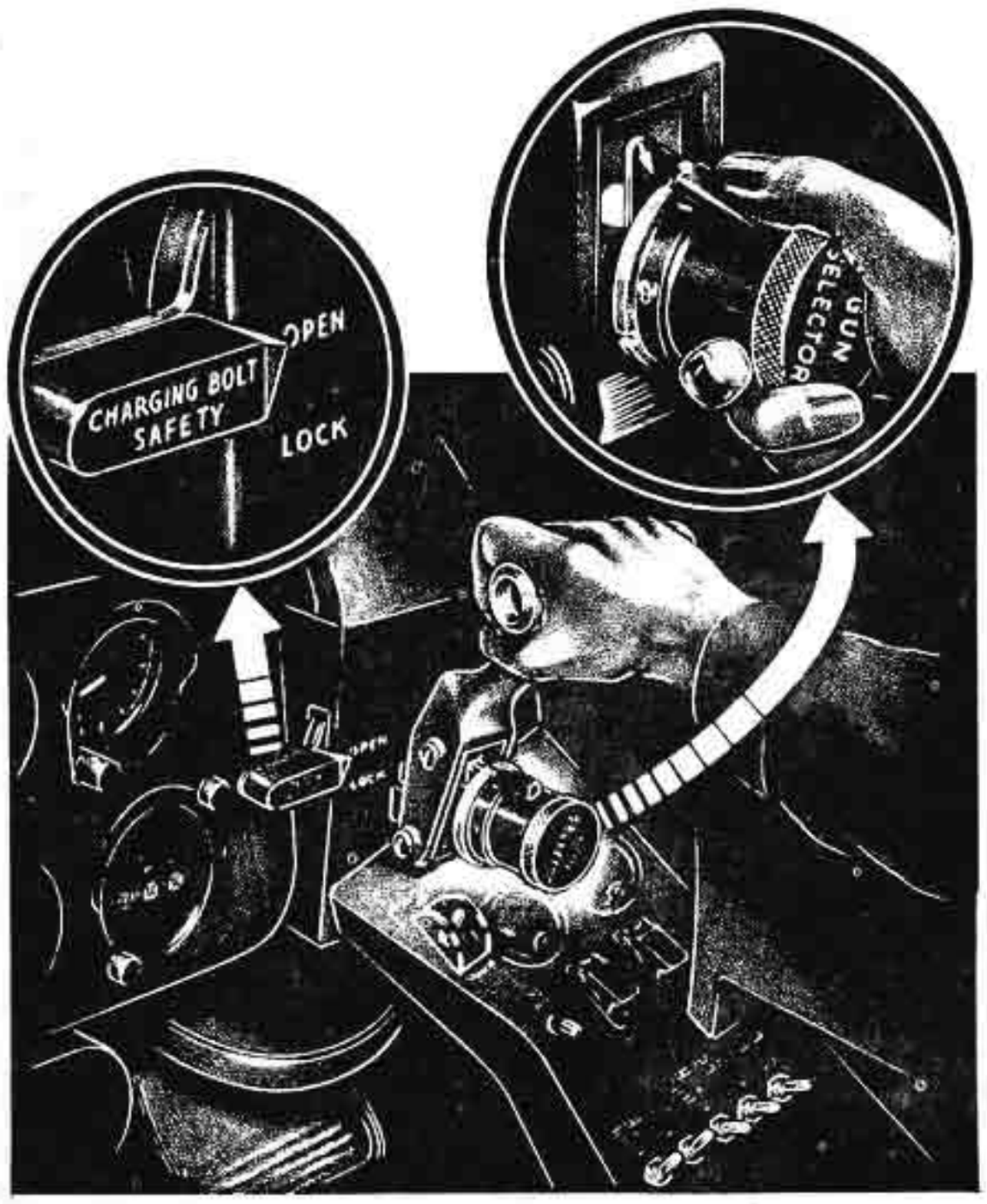


Figure 5–2. Gun Charger Controls

5–8. OPERATION OF RADIO, COMMUNICATION AND NAVIGATIONAL EQUIPMENT.

5-9. GENERAL. This airplane is furnished with AN/ARC-1 communcation, AN/ARR-2A navigation, AN/ARC-5 radio range, AN/APX-1 identification radio and radar equipment, and an AN/ARN-6 radio compass receiver.

5–10. RADIO RECEPTION

5-11 EQUIPMENT.

Receiver	Frequency
RT-18/ARC-1	100-156 Megacycles
R-4A/ARR-2	234-258 Megacycles
R-101/ARN-6	100-1750 Kilocycles (with 4 bands)

5-12. OPERATION.

a. Plug headphone and microphone into special jack (U-56/AR) located aft of the pilot's seat.
b. Battery switch "ON."
c. Master radio switch "On." This switch is located on the "MASTER" panel, right-hand forward console. (It will take about one minute to warm up at which time the R-101/ARN 6 radio compass receiver, the R-4A/ARR-2 navigation receiver, and the AN/ARC-1 equipment are operative.)

5-13. IF VHF RECEPTION IS DESIRED:

a. Turn the SENS controls fully counterclockwise on both the NAVIG and RECVR control panels of the radio console panel.
b. On VHF panel of the radio console turn CHAN SEL switch to the desired main channel. (Allow at least 20 seconds for warm up.)
c. Turn GUARD-BOTH-MAIN T/R switch on the same panel to "BOTH" position. (This is the position for normal operation.)

Note

Reception may be prevented by interfering signals or noise passed by the other channel. Suppress this by turning to "MAIN T/R" or "GUARD" as required.

d. Turn GUARD-BOTH-MAIN T/R switch to "GUARD" or "MAIN T/R" depending on which of the desired signals are recognized.
e. Adjust COMM VOLUME control on the MASTER control panel to the desired volume intensity. This control regulates only the volume of the VHF receiver.

5-14. TO TURN OFF EQUIPMENT:

a. On "MASTER" panel turn master radio switch "OFF."

5-15. AN/ARN-6 RADIO COMPASS RECEIVER.

FREQUENCY
(4 Bands)
100-1750 kilocycles

5-16. GENERAL. The equipment will perform the following three major functions:

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

5-17. HOMING COMPASS OPERATION - AN/ARN-6. To use as a homing compass perform the following operations:

a. Battery switch "ON."
b. Function switch to "COMP" position.

c. Rotate the band switch to the frequency band in which operation is desired.

d. Turn the "TUNING" crank to the desired station frequency and tune for maximum swing of the tuning meter. Greater accuracy in tuning may be obtained by placing the "C.W." - "VOICE" switch in the "C.W." position. A 900 cycle tone will be heard along with the station modulation. This will aid in accurate tuning. After tuning, return the "C.W." - "VOICE" switch to "VOICE" to eliminate the 900 cycle tone.

e. Adjust "AUDIO" control for desired headset level.

f. Listen for station identification to be sure that the correct station is being received.

g. Turn the "VAR" knob on the indicator until the azimuth zero is at the index.

h. The indicator pointer will now show the bearing of the station relative to aircraft heading. For example, if the pointer is to the left of zero the station is on your left. Turn your aircraft to the left until the pointer is at zero. If the aircraft heading is held at zero degrees on the radio compass indicator, you will ultimately fly over the radio station antenna. Cross winds, however, will cause the flight path to be a curved line. Direction of wind may be determined by noting any change in magnetic bearing while homing with the radio compass. An increasing magnetic bearing indicates a wind from the right while a decreasing magnetic bearing indicates a wind from the left. Compensate for wind drift by off-setting the aircraft heading until there is a minimum rate of change of the magnetic compass reading. The radio compass indicator now shows directly in degrees the relative aircraft to station heading necessary to correct for wind drift.

5-18. POSITION FINDING.

5-19. GENERAL. There are two methods of position finding, automatic and aural-null. Prior to the use of either method, the following steps should be taken in order to shorten the time required for a complete set of readings:

a. Select three stations whose geographical locations are spaced at approximately equal intervals about the aircraft.

b. Tune in the stations, identify them and log their dial readings.

5-20. AUTOMATIC METHOD. For operation as an automatic indicating position finder, perform the following operations:

a. Adjust "VAR" knob on the indicator until its bearing scale at the index is the same as the **true** magnetic heading of the aircraft.

b. Function switch to "COMP" position.

c. Tune in one of the selected stations, and record the bearing as indicated by the **tail** of the indicator pointer.

d. Repeat (c) for the other stations, in rapid succession, while flying with a steady level heading.

Note

Because of the airplane's motion, the less time taken for observations, the greater the accuracy of the fix.

e. The recorded bearings will be the station to aircraft bearings from north. Project lines from the stations at the recorded bearings. The aircraft position will be within the vicinity of the small triangle made by the intersection of the projected lines.

5-21. AURAL-NULL METHOD. For operation as an aural-null position finder, perform the following operations:

a. Adjust the "VAR" knob on the indicator until the bearing scale at the index is the same as the true magnetic heading of the aircraft.

b. Function switch to "LOOP" position.

c. Tune in the desired station. To obtain good signal strength for station identification, it may be necessary to rotate the loop by means of the "LOOP L-R" switch knob for maximum signal. Direction and speed of loop rotation are controlled by direction and amount of "LOOP L-R" switch rotation, respectively.

d. Use the "LOOP L-R" switch knob as in (c), and rotate loop for minimum headset volume. Record the bearing shown by the indicator pointer. Better definition of the null may be obtained by turning the "AUDIO" control fully clockwise and locating the null by either listening for minimum audio signals or noting a counter-clockwise dip of the tuning meter pointer. The use of "C.W." operation also improves the definition of the null. To obtain "C.W." operation flip the "C.W." - "VOICE" switch to "C.W." position.

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

5-22. RECEIVER OPERATION.

5-23. ANTENNA RECEPTION.

a. Function switch to "ANT" position.

b. Band switch to desired frequency band.

c. Flip "C.W. - VOICE" switch to "C.W." position for aural reception of unmodulated signals.

d. Use the "TUNING" crank and tune in the desired station.

e. Adjust "AUDIO" control for desired headset volume.

Note

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

5-24. LOOP RECEPTION. If reception on "ANT" is noisy due to precipitation static, commonly known as rain or snow static, better results may be obtained by operating in "LOOP" position as follows:

a. Function switch to "LOOP" position.
b. Band switch to desired frequency band.
c. If station is unmodulated, flip "C.W. - VOICE" switch to "C.W." position.
d. Tune in desired station.
e. Rotate loop with the "LOOP L-R" switch until maximum signal is obtained. If flight course is not straight, re-adjustments may be necessary.
f. Adjust "AUDIO" control for desired headset volume.
g. For best definition of radio range A-N signals on "LOOP," it is necessary to maintain the loop near the 90 or 270 degree position and adjust the "AUDIO" control for lowest usable headset volume.

Note

Cone of silence indications are not always reliable while receiving on "LOOP." In some cases, an increase instead of a decrease in signal may be noted. This is the result of certain types of radio range transmitting antennas and the loop location on the aircraft.

5-25. SUMMARY OF PRECAUTIONS DURING OPERATION.

a. Select radio stations that provide stable bearings. Do not use a station for bearing unless it can be identified by headset signal on "COMP" operation. High powered clear channel stations should be used when possible. Any interference from other stations will cause an error in bearing. Tune equipment accurately. Station identification must be checked, especially stations broadcasting network programs. Avoid taking bearings on synchronized stations except when near desired station. If station stops transmitting or fades, bearings may change to other stations of the same frequency, thus causing errors. This is especially true of code stations operating in a network.

b. Night effect or reflection of radio waves from the sky may be recognized by fluctuations in bearings. Night effect is worse at sunrise and sunset. The higher the frequency of operation, the greater the night effect. It may be present at distance over 20 miles when receiving 850 to 1750 kilocycle stations, however, with 100 to 450 kilocycle stations, reliable bearings above 100 miles can be taken even when night effect is present. The remedies for night effect are:

(1) Increase altitude, thereby increasing the signal strength of direct waves.
(2) Use stations operating at lower frequency.
(3) Take an average of the fluctuations.

c. Mountain effect is considered to be the reflection of radio waves from mountain surfaces. It is known to exist around Salt Lake City and Pittsburgh. Do not rely fully on bearings taken in such areas.

d. For aural reception of A-N signals, operate equipment on "ANT" or "LOOP" instead of "COMP", since the action of AVC in "COMP" position will cause broad course indications. Always operate the equipment with "AUDIO" control set at lowest usable headset volume and reduce it as the A-N signal strength increases. Cone of silence indications are not always reliable when operating the equipment on "LOOP." Use equipment on "ANT" for cone of silence indication.

e. This equipment should provide compass bearings during conditions of moderate precipitation static which interrupt normal reception. When static becomes too severe, it will be necessary to operate on "LOOP" position. In this position, satisfactory aural rception and aural-null direction finding will be possible most of the time.

f. Do not depend on two stations for afix of locations, use at least three stations with bearings spaced at approximately equal intervals throughout 360 degrees for greatest accuracy.

g. While taking bearings, always keep aircraft on a steady level heading.

h. When homing or direction finding on "LOOP" operation, there is a 180 degree ambiguity and station bearings may be 180 degrees from the null obtained. Use stations with good signal strength for sharply defined nulls. Width of null may be controlled by position of "AUDIO" control. The tuning meter may be used as a visual-null indicator.

5-26. TO OPERATE R-4A/ARR-2 NAVIGATION RECEIVER:

a. On NAVIG panel: See that VOICE-NAV indicator is in NAV position.

b. Set CHAN SEL indicator to the particular channel desired of the six channels available.

c. Turn SENS knob clockwise to obtain a comfortable volume intensity. Keep signal level at lowest usable level to avoid incorrect course indication.

d. Vary pitch (or beat note) by turning PITCH knob to a desirable tone. If signals from other receivers interfere turn down the COMM VOLUME control on the MASTER panel or the SENS control on the RECVR panel as required.

e. To turn the radio level completely down, turn SENS knob on NAVIG panel fully counter-clockwise.

5–27. RADIO TRANSMISSION.

5-28. EQUIPMENT.

Transmitter	Frequency
RT-18/ARC-1	100-156 Megacycles

5–29. OPERATION:

a. Plug headphone and microphone into special jack (U-56/AR).

b. Battery switch "ON."

c. Master radio switch "ON." (It will take about one minute to warm up at which time the R-101/ARN-6 radio compass receiver and the R-4A/ARR-2 navigation receiver are also operative.)

d. On VHF panel turn CHAN SEL switch to the desired main channel. (Allow at least 20 seconds for warm up.)

e. Turn GUARD-BOTH-MAIN T/R switch to "BOTH" or "MAIN T/R" position depending upon the type of operation desired.

f. Depress throttle switch button and talk. Speak clearly and distinctly. It is not necessary to shout.

g. Release microphone switch to cease transmission.

5-30. To turn off equipment, flip master radio switch to "OFF" position.

5–31. IDENTIFICATION:

5-32. EQUIPMENT.

a. AN/APX-1.

5–33. OPERATION.

Note

Before take-off check that a complete destructor circuit test has been made.

a. Plug headphone and microphone into special jack (U-56/AR).

b. Battery switch "ON."

c. On IFF Panel of control console set CODE selector switch to the desired position of the six positions available. (Set to position No. 1 if no other has been previously specified.)

d. Operate G BAND switch as required.

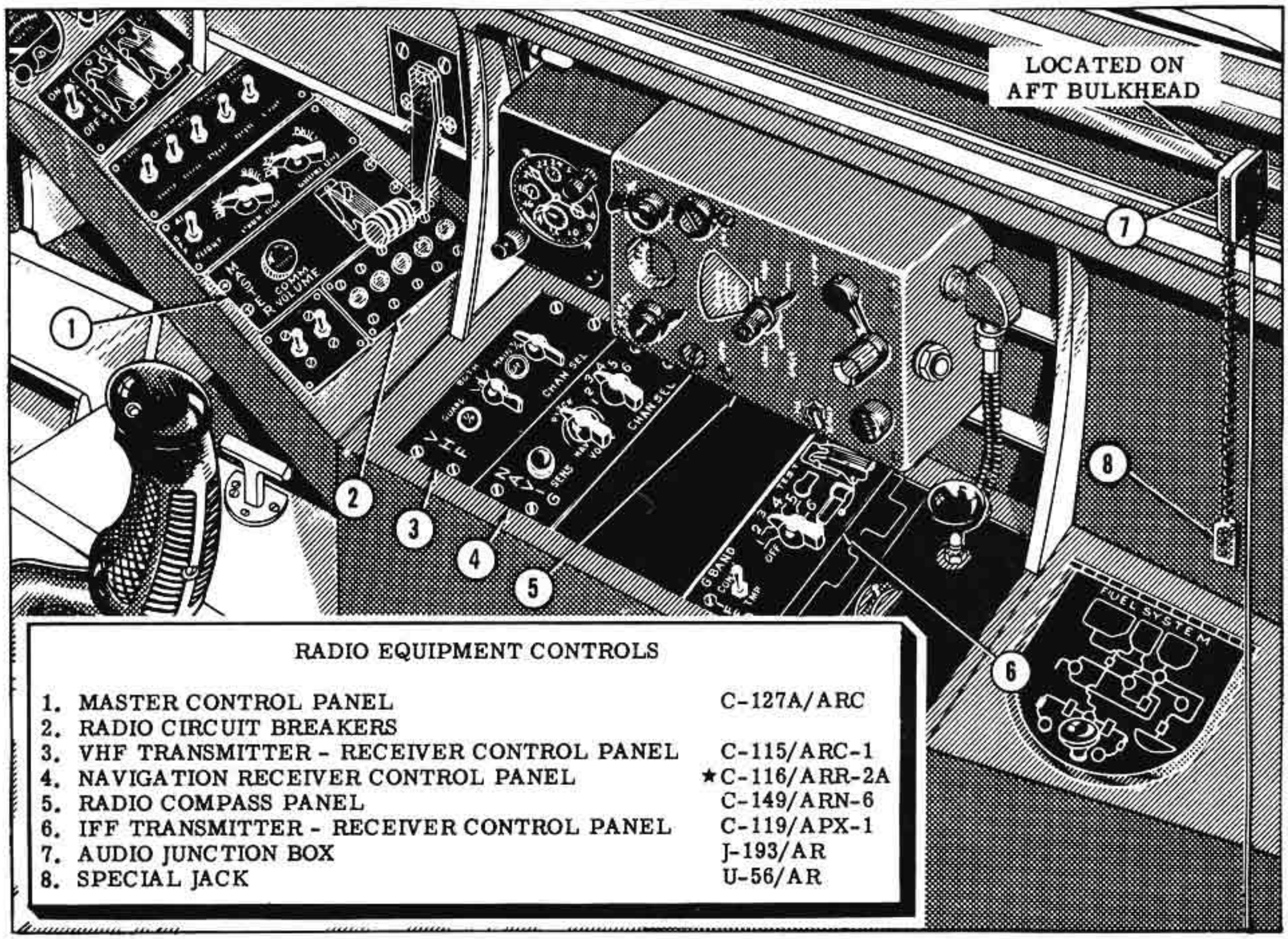
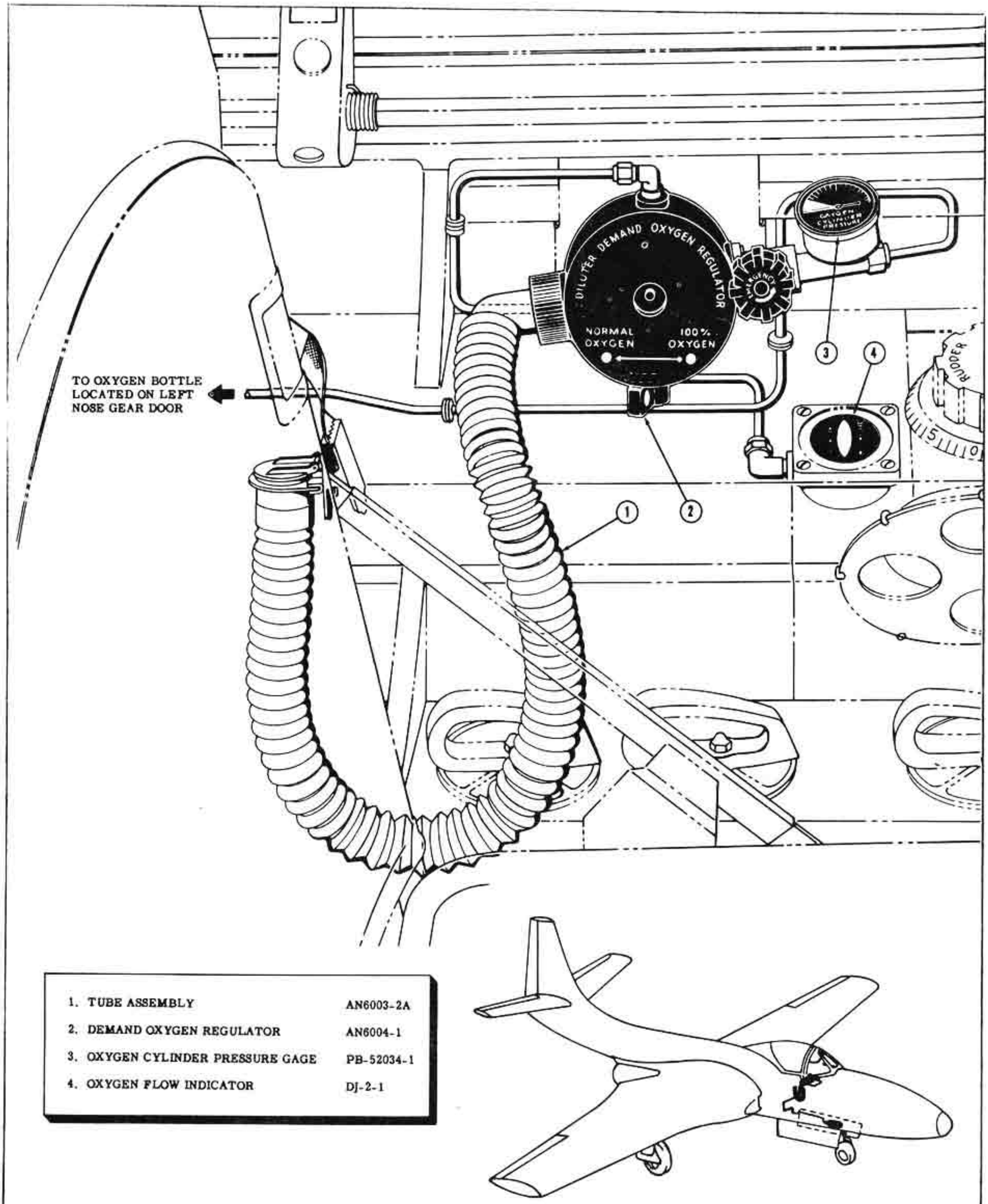


Figure 5–3. Radio Equipment Controls



1.	TUBE ASSEMBLY	AN6003-2A
2.	DEMAND OXYGEN REGULATOR	AN6004-1
3.	OXYGEN CYLINDER PRESSURE GAGE	PB-52034-1
4.	OXYGEN FLOW INDICATOR	DJ-2-1

Figure 5–4. Oxygen System

e. To turn off equipment be sure that G BAND switch is in "OUT" position and CODE selector switch is in "OFF" position.

Note

Additional information concerning operation of identification equipment should be obtained from the communications officer in charge.

5-34. OXYGEN EQUIPMENT.

5-35. GENERAL. The diluter-demand regulator is designed to meet the demands of the inhalation phase of the breathing cycle and deliver either a properly proportioned mixture of air and oxygen or 100% oxygen dependent upon the setting of the adjustable air-valve lever. With the air-valve set to the "ON" or "NORMAL OXYGEN" position, air is drawn into the breathing system and is automatically mixed with oxygen from the supply cylinder to give the total oxygen required up to approximately 30,000 feet. Above 30,000 feet, 100% cylinder oxygen is delivered. With the air-valve set to the "OFF" or "100% OXYGEN" position, 100% oxygen is delivered at all altitudes. With the air-valve of the diluter-demand regulator set to the "ON" or "NORMAL OXYGEN" position, a relatively small inhalation suction (one inch of water) is sufficient to deliver a flow of 150 liters of oxygen per minute. This characteristic assures the user an adequate oxygen flow and ease of breathing.

5-36. CONTROLS.

a. The shut-off valve is located at the mouth of the oxygen cylinder. To close the valve, screw the knob fully in with clockwise rotation; to open it unscrew the knob with counterclockwise rotation.

b. The air valve controlling the mixture of oxygen and air, is located on the diluter-demand oxygen regulator. The valve has two positions, "NORMAL OXYGEN" and "100% OXYGEN."

CAUTION

Care should be taken to prevent inadvertently moving air valve.

c. The emergency valve is located immediately to the right of the oxygen regulator. The valve has a red-colored knob which is turned counterclockwise to open the valve and clockwise to close.

5-37. OPERATION.

a. Oxygen shall be used constantly during day flights when above 10,000 feet. Oxygen shall be used constantly during night flights when above 5,000 feet, when on combat mission and training mission simulating combat.

b. Fit the oxygen mask tube to the breathing tube leading from the regulator.

WARNING

Make sure that mating parts of oxygen mask tube and breathing tube are properly engaged while oxygen equipment is being used.

c. Open the shut-off valve completely before each flight and close completely after each flight to prevent possible leakage.

d. During normal operations, set the air valve at "NORMAL OXYGEN," so as to obtain the maximum economy and endurance from the oxygen supply aboard.

e. Set the air valve at "100% OXYGEN" position only when the presence of excessive carbon monoxide is suspected.

f. It is intended that the emergency valve should be used only if anoxia is suspected or if diluter-demand regulator becomes inoperative. When used, open emergency valve slowly and obtain minimum flow required.

g. Upon completion of the oxygen flight, close the cylinder shut-off valve.

5-38. PREFLIGHT INSPECTION. The following items should be checked while the airplane is on the ground, prior to flight in which oxygen is to be used (or is likely to be used), to assure proper functioning of the oxygen system.

a. Emergency valve "CLOSED."

b. Open cylinder shut-off valve, allowing at least 10 seconds for pressure in line to equalize. Pressure gage should read 1800 to 1850 psi, if the cylinder is fully charged.

c. Close cylinder shut-off valve. After a few minutes observe pressure gage and again open cylinder shut-off valve. If gagepointer jumps, leakage is indicated.

Note

If leakage is found, test further. Open cylinder shut-off valve, carefully noting pressure gage reading; then close cylinder shut-off valve. If gage pointer drops more than 100 psi in five minutes, there is excessive leakage, and the system must be repaired prior to use.

d. Check mask fit by placing thumb over end of mask tube and inhaling lightly. If there is no leakage, mask will adhere tightly to the face due to suction created. If mask leaks, tighten mask suspension straps and/or adjust nose wire. Do not use mask that leaks.

CAUTION

Never check mask fit by squeezing mask tube.

e. Couple mask tube securely to breathing tube by means of quick-disconnect coupling.

WARNING

Mating parts of couplings must not be "cocked" but must be fully engaged.

f. Open cylinder shut-off valve. Depress diaphragm knob through hole in center of regular case, and feel flow of oxygen into the mask; then release diaphragm knob. Breathe several times, observing oxygen flow indicator for "blinker" verifying the position flow of oxygen.

Note

Since the amount of added oxygen is very small at sea level, the oxygen flow indicator may not operate while airplane is on the ground. In this case turn air valve to "OFF."

MAN HOUR CONSUMPTION CHART

ONE OXYGEN CYLINDER
514 CU. IN. CAPACITY

ALTITUDE (Feet)	AIR VALVE "ON" NORMAL OXYGEN (Endurance Hours)	AIR VALVE "OFF" 100% OXYGEN (Endurance Hours)
5000	8.00	.95
10000	9.37	1.20
15000	8.75	1.45
20000	7.00	1.84
25000	4.09	2.30
30000	3.09	3.07

WITH FULLY CHARGED CYLINDER
(1800 DOWN TO 300 PSI)

APPENDIX I

OPERATING CHARTS, TABLES & DIAGRAMS

OPERATING CHARTS PREFACE

A-1. GENERAL. This appendix contains a tabulation of information necessary for flight planning. The performance data given is calculated and therefore subject to revision as flight test information becomes available.

A-2. TAKE-OFF, CLIMB AND LANDING CHART. Take-off, climb and landing data has been calculated for various weights and configurations as noted on the charts. Take-off and landing distances are based on a full flap setting (57°). Climb data is based on zero flap setting and normal power (15700 rpm). Two types of landings are considered; they are, normal approach and carrier approach and the respective approach speeds are noted on the proper charts.

A-3. FLIGHT OPERATION INSTRUCTION CHARTS. These charts include information concerning range attainable and recommended power plant control settings for various combinations of gross weight, fuel load, altitude and airspeed. To avoid misuse or misinterpretation of the chart, cognizance should be taken of the following items:

a. The charted ranges make no allowance for run-up, take-off and climb. Fuel consumed during these operations should be obtained from take-off, climb and landing chart. Similarly, no account is taken of the improved miles per gallon realizable during descent. Neglect of this latter factor is recommended to balance the fuel required for the landing operation.

b. The operating data included on any one chart should be used only when the gross weight is within the limits specified in the title block. When diminishing fuel load causes the gross weight to decrease to a value included in the weight limits of the next chart, the operating data included in the corresponding column of that chart should be used. This is ESSENTIAL, AS RANGES HAVE BEEN COMPUTED ON THIS BASIS. Ranges shown on charts listing external load items are based on the conservative assumption that these items are carried on the entire distance.

c. All data have been based on the maximum weight for which the chart is applicable. When gross weight is within the chart weight limits and less than the maximum (due to lighter initial weight or diminished fuel load), the airspeed should be slightly greater than that listed on the chart. To be conservative, no account has been taken of this faction.

d. The fuel quantity indicated in the chart is calculated to be the fuel available.

CAUTION

No allowance has been made for wind, navigational error or other contingencies. No allowance has been made for combat or formation flight. Appropriate allowances for these items should be dictated by local doctrine.

AAFMC-527
4-1-44

AIRCRAFT MODEL (S)
FH-1
WITHOUT DROPPABLE FUEL TANK
CARRIER BASED

TAKE-OFF, CLIMB & LANDING CHART

ENGINE MODEL (S)
WESTINGHOUSE J30-WE-20 OR J30-P-20

TAKE-OFF DISTANCE FEET

GROSS WEIGHT LB.	HEAD WIND M.P.H.	HEAD WIND KTS.	HARD SURFACE RUNWAY AT SEA LEVEL GROUND RUN	HARD SURFACE RUNWAY AT SEA LEVEL TO CLEAR 50' OBJ.	HARD SURFACE RUNWAY AT 3000 FEET GROUND RUN	HARD SURFACE RUNWAY AT 3000 FEET TO CLEAR 50' OBJ.	HARD SURFACE RUNWAY AT 6000 FEET GROUND RUN	HARD SURFACE RUNWAY AT 6000 FEET TO CLEAR 50' OBJ.	SOD-TURF RUNWAY AT SEA LEVEL GROUND RUN	SOD-TURF RUNWAY AT SEA LEVEL TO CLEAR 50' OBJ	SOD-TURF RUNWAY AT 3000 FEET GROUND RUN	SOD-TURF RUNWAY AT 3000 FEET TO CLEAR 50' OBJ.	SOD-TURF RUNWAY AT 6000 FEET GROUND RUN	SOD-TURF RUNWAY AT 6000 FEET TO CLEAR 50' OBJ.	SOFT SURFACE RUNWAY AT SEA LEVEL GROUND RUN	SOFT SURFACE RUNWAY AT SEA LEVEL TO CLEAR 50' OBJ.	SOFT SURFACE RUNWAY AT 3000 FEET GROUND RUN	SOFT SURFACE RUNWAY AT 3000 FEET TO CLEAR 50' OBJ.	SOFT SURFACE RUNWAY AT 6000 FEET GROUND RUN	SOFT SURFACE RUNWAY AT 6000 FEET TO CLEAR 50' OBJ.
10,035	0	0	1250	2000	1550	2350	1900	2850														
	17.3	15	850	1450	1050	1750	1350	2150														
	34.5	30	500	1000	700	1200	850	1500														
	51.8	45	300	600	400	750	500	1000														
10,035	0	0	650		775		900															

NOTE: INCREASE CHART DISTANCES AS FOLLOWS: 75°F. +10%; 100°F. +20%; 125°F. +30%; 150°F. +40%.
DATA AS OF 3-28-47. BASED ON: ADDENDUM No. 2 OF M. A. C. REP. No. 341.

TAKE-OFF WITH 17,000 R.P.M. & 57 DEG. FLAP.

CLIMB DATA

GROSS WEIGHT LB.	AT SEA LEVEL BEST I. A. S. KTS.	AT SEA LEVEL RATE OF CLIMB F. P. M.	AT SEA LEVEL GAL. OF FUEL USED	AT 5000 FEET BEST I. A. S. KTS.	AT 5000 FEET DIST. NAUT. MI.	AT 5000 FEET RATE OF CLIMB F. P. M.	AT 5000 FEET FROM SEA LEVEL TIME MIN.	AT 5000 FEET FROM SEA LEVEL FUEL USED	AT 10,000 FEET BEST I. A. S. KTS.	AT 10,000 FEET DIST. NAUT. MI.	AT 10,000 FEET RATE OF CLIMB F. P. M.	AT 10,000 FEET FROM SEA LEVEL TIME MIN.	AT 10,000 FEET FROM SEA LEVEL FUEL USED	AT 15,000 FEET BEST I. A. S. KTS.	AT 15,000 FEET DIST. NAUT. MI.	AT 15,000 FEET RATE OF CLIMB F. P. M.	AT 15,000 FEET FROM SEA LEVEL TIME MIN.	AT 15,000 FEET FROM SEA LEVEL FUEL USED	AT 20,000 FEET BEST I. A. S. KTS.	AT 20,000 FEET DIST. NAUT. MI.	AT 20,000 FEET RATE OF CLIMB F. P. M.	AT 20,000 FEET FROM SEA LEVEL TIME MIN.	AT 20,000 FEET FROM SEA LEVEL FUEL USED	AT 30,000 FEET BEST I. A. S. KTS.	AT 30,000 FEET DIST. NAUT. MI.	AT 30,000 FEET RATE OF CLIMB F. P. M.	AT 30,000 FEET FROM SEA LEVEL TIME MIN.	AT 30,000 FEET FROM SEA LEVEL FUEL USED
10,035	224	3150	41	216	6	2800	1.5	54	208	14	2400	3.5	67	201	23	2000	6.0	81	188	36	1625	8.5	94	167	72	825	17.0	127

FOR CLIMB AT 15,700 R.P.M.
DATA AS OF 3-28-47. BASED ON: ADDENDUM No. 2 OF M. A. C. REP. No. 341.

FUEL USED (U. S. GAL.) INCLUDES WARM-UP & TAKE-OFF ALLOWANCE EQUIVALENT TO 5 MIN. AT NORMAL POWER (15700 RPM)

LANDING DISTANCE FEET

GROSS WEIGHT LB.	BEST I.A.S. APPROACH POWER OFF M.P.H.	POWER OFF KTS.	POWER ON M.P.H.	POWER ON KTS.	HARD DRY SURFACE AT SEA LEVEL GROUND ROLL	HARD DRY SURFACE AT SEA LEVEL TO CLEAR 50' OBJ.	HARD DRY SURFACE AT 3000 FEET GROUND ROLL	HARD DRY SURFACE AT 3000 FEET TO CLEAR 50' OBJ.	HARD DRY SURFACE AT 6000 FEET GROUND ROLL	HARD DRY SURFACE AT 6000 FEET TO CLEAR 50' OBJ.	FIRM DRY SOD AT SEA LEVEL GROUND ROLL	FIRM DRY SOD AT SEA LEVEL TO CLEAR 50' OBJ.	FIRM DRY SOD AT 3000 FEET GROUND ROLL	FIRM DRY SOD AT 3000 FEET TO CLEAR 50' OBJ	FIRM DRY SOD AT 6000 FEET GROUND ROLL	FIRM DRY SOD AT 6000 FEET TO CLEAR 50' OBJ.	WET OR SLIPPERY AT SEA LEVEL GROUND ROLL	WET OR SLIPPERY AT SEA LEVEL TO CLEAR 50' OBJ	WET OR SLIPPERY AT 3000 FEET GROUND ROLL	WET OR SLIPPERY AT 3000 FEET TO CLEAR 50' OBJ.	WET OR SLIPPERY AT 6000 FEET GROUND ROLL	WET OR SLIPPERY AT 6000 FEET TO CLEAR 50' OBJ.
8,145					750		850		950													
10,035					950		1050		1150													

DATA AS OF 3-28-47. BASED ON: ADDENDUM No. 2 OF M. A. C. REP. No. 341.

REMARKS:

NOTE: TO DETERMINE FUEL CONSUMPTION IN BRITISH IMPERIAL GALLONS, MULTIPLY BY 10, THEN DIVIDE BY 12.

DATA IS FOR OPERATION WITH TWO ENGINES.

†WITH TWO JATO UNITS (1,000 LB. THRUST EACH).

LEGEND
I. A. S.: INDICATED AIRSPEED
M. P. H.: MILES PER HOUR
KTS.: KNOTS
F. P. M.: FEET PER MINUTE

AAFMC 527
4-44

AIRCRAFT MODEL (S)
FH-1
WITH DROPPABLE FUEL TANK
CARRIER BASED

TAKE-OFF, CLIMB & LANDING CHART

ENGINE MODEL (S)
WESTINGHOUSE J30-WE-20 OR J30-P-20

TAKE-OFF DISTANCE FEET

GROSS WEIGHT LB.	HEAD WIND		HARD SURFACE RUNWAY						SOD-TURF RUNWAY						SOFT SURFACE RUNWAY					
			AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET	
	M.P.H.	KTS.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.
12,030	0	0	1900	2900	2400	3650	3000	5050												
	17.3	15	1350	2200	1700	2800	2200	3950												
	34.5	30	900	1550	1150	2000	1500	2950												
	51.8	45	500	1000	700	1350	950	2050												
†12,030	0	0	1000		1150		1350													

NOTE: INCREASE CHART DISTANCES AS FOLLOWS: 75°F. +10', ; 100°F. +20', , 125°F. +30', ; 150°F. +40', TAKE-OFF WITH 17,000 R.P.M. & 57 DEG. FLAP.
DATA AS OF 3 28 47. BASED ON ADDENDUM No. 2 OF M. A. C. REP. No. 341.

CLIMB DATA

GROSS WEIGHT LB.	AT SEA LEVEL			AT 5000 FEET					AT 10,000 FEET					AT 15,000 FEET					AT 20,000 FEET					AT 30,000 FEET				
	BEST I. A. S. KTS.	RATE OF CLIMB F. P. M.	GAL. OF FUEL USED	BEST I. A. S. KTS.	DIST. NAUT. MI.	RATE OF CLIMB F. P. M.	FROM SEA LEVEL TIME MIN.	FROM SEA LEVEL FUEL USED	BEST I. A. S. KTS.	DIST. NAUT. MI.	RATE OF CLIMB F. P. M.	FROM SEA LEVEL TIME MIN	FROM SEA LEVEL FUEL USED	BEST I. A. S. KTS.	DIST NAUT MI.	RATE OF CLIMB F. P. M.	FROM SEA LEVEL TIME MIN.	FROM SEA LEVEL FUEL USED	BEST I. A. S. KTS.	DIST. NAUT MI.	RATE OF CLIMB F. P. M.	FROM SEA LEVEL TIME MIN.	FROM SEA LEVEL FUEL USED	BEST I. A. S. KTS.	DIST NAUT MI	RATE OF CLIMB F. P. M.	FROM SEA LEVEL TIME MIN	FROM SEA LEVEL FUEL USED
12,030	208	2275	41	201	9	1975	2.5	59	194	18	1625	5.0	78	186	31	1300	8.5	98	180	48	975	13.0	120	162	115	300	29.0	182
10,260	206	2800	41	198	7	2450	2.0	56	191	15	2050	4.0	71	183	25	1700	7.0	86	175	38	1325	10.0	103	158	81	600	20.5	141

FOR CLIMB AT 15,700 R.P.M.
DATA AS OF 3 28 47. BASED ON: ADDENDUM No. 2 OF M. A. C. REP. No. 341.
FUEL USED (U. S. GAL.) INCLUDES WARM-UP & TAKE-OFF ALLOWANCE EQUIVALENT TO 5 MIN. AT NORMAL POWER (15700 RPM)

LANDING DISTANCE FEET

GROSS WEIGHT LB.	BEST I.A.S. APPROACH				HARD DRY SURFACE						FIRM DRY SOD						WET OR SLIPPERY					
	POWER OFF		POWER ON		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET	
	H.P.M.	KTS.	M.P.H.	KTS.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.
8,370			115	100	750		850		950													
10,260			125	109	950		1050		1150													

DATA AS OF 3-28-47. BASED ON: ADDENDUM No. 2 OF M. A. C. REP. No. 341.

REMARKS:

NOTE: TO DETERMINE FUEL CONSUMPTION IN BRITISH IMPERIAL GALLONS, MULTIPLY BY 10, THEN DIVIDE BY 12.

DATA IS FOR OPERATION WITH TWO ENGINES.

†WITH TWO JATO UNITS (1,000 LB. THRUST EACH).

LEGEND
I. A. S.: INDICATED AIRSPEED
M. P. H.: MILES-PER HOUR
KTS.: KNOTS
F. P. M.: FEET PER MINUTE

AIRCRAFT MODEL (S)
FD-1
ENGINES WESTINGHOUSE
J30-WE-20 OR J30-P-20

FLIGHT OPERATION INSTRUCTION CHART

SHEET 1 OF 2 SHEETS
CHART WEIGHT LIMITS: 10035 TO 8910 POUNDS

EXTERNAL LOAD ITEMS
NONE

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING AND MOVE TO THE RIGHT OR LEFT AND READ AVAILABLE RANGE IN COLUMN FOR PROPOSED CRUISING ALTITUDE. ADD THE DISTANCE WHICH WILL BE COVERED DURING CLIMB AS DETERMINED FROM CORRESPONDING CLIMB DATA CHART.

EXAMPLE

TO DETERMINE SINGLE ENGINE MAXIMUM RANGE AT 20,000 FEET WITH 75 GALS. RESERVE. TAKE-OFF GROSS WEIGHT IS 10,035 LBS. WITH 375 GALS. FUEL.

(1) FROM CLIMB DATA, FUEL REQUIRED FOR TAKE-OFF AND CLIMB IS 94 GALS., AND DISTANCE IS 41 STATUTE MILES OR 36 NAUTICAL MILES; (2) AFTER DEDUCTING RESERVE AND FUEL FOR CLIMB, FUEL AVAILABLE FOR CRUISE IS 206 GALS.; (3) RANGE IS 365 + 41 = 406 STATUTE MILES OR 317 + 36 = 353 NAUTICAL MILES; (4) CRUISE I. A. S. IS 176 KTS.*

MAXIMUM CONTINUOUS POWER

TWO ENGINE CRUISE

ALTITUDE (FEET)	S. L.		5000		10,000		15,000		20,000		30,000	
FUEL AVAILABLE FOR CRUISE U. S. GAL.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.
375 (2250 lbs)												
350 (2100 lbs)												
300 (1800 lbs)	210	182	240	208	280	243						
250 (1500 lbs)	175	152	200	174	235	204	275	239	320	278		
200 (1200 lbs)	140	122	160	139	185	161	220	191	255	222	350	304
150 (900 lbs)	105	91	125	109	145	126	170	148	195	169	265	230
100 (600 lbs)	70	61	80	69	95	83	110	96	130	113	175	152
R.P.M.	15700		15700		15700		15700		15700		15700	
INDICATED AIRSPEED (KTS.)	373**		351**		331**		311**		291**		239**	
FUEL CONSUMPTION (U. S. GAL. HR.)	604		528		464		403		353		256	
FUEL CONSUMPTION (LBS. HR.)	3621		3170		2786		2419		2116		1537	

SINGLE ENGINE CRUISE

ALTITUDE (FEET)												
FUEL AVAILABLE FOR CRUISE U. S. GAL.												
375 (2250 lbs)												
350 (2100 lbs)												
300 (1800 lbs)	310	269	365	317	415	360						
250 (1500 lbs)	260	226	305	265	345	300	405	352	450	391		
200 (1200 lbs)	205	178	245	213	275	239	325	282	365	317		
150 (900 lbs)	160	139	185	161	210	182	245	213	270	235		
100 (600 lbs)	105	91	125	109	140	122	160	139	180	156		
R.P.M.	15700		15700		15700		15700		15700			
INDICATED AIRSPEED (KTS.)	267**		250**		229**		218**		177**			
FUEL CONSUMPTION (U. S. GAL. HR.)	292		253		219		186		158			
FUEL CONSUMPTION (LBS. HR.)	1752		1516		1314		1118		948			

MAXIMUM RANGE

TWO ENGINE CRUISE

ALTITUDE (FEET)	S. L.		5000		10,000		15,000		20,000		30,000	
FUEL AVAILABLE FOR CRUISE U. S. GAL.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.
375 (2250 lbs)												
350 (2100 lbs)												
300 (1800 lbs)	245	213	285	248	340	295						
250 (1500 lbs)	205	178	240	208	285	248	330	287	390	339		
200 (1200 lbs)	165	143	190	165	230	200	265	230	315	274	425	369
150 (900 lbs)	125	109	145	126	165	143	200	174	235	204	320	278
100 (600 lbs)	85	74	100	87	115	100	135	117	155	135	210	182
R.P.M.	USE R.P.M. REQUIRED TO MAINTAIN I.A.S. SPECIFIED											
INDICATED AIRSPEED (KTS.)	242		242		223		212		202		181	
FUEL CONSUMPTION (U. S. GAL. HR.)	333		308		263		231		203		163	
FUEL CONSUMPTION (LBS. HR.)	1997		1845		1580		1387		1219		978	

SINGLE ENGINE CRUISE

ALTITUDE (FEET)												
FUEL AVAILABLE FOR CRUISE U. S. GAL.												
375 (2250 lbs)												
350 (2100 lbs)												
300 (1800 lbs)	320	278	370	322	425	369						
250 (1500 lbs)	265	230	310	269	355	308	410	356	455	395		
200 (1200 lbs)	215	187	250	217	285	248	330	287	365	317		
150 (900 lbs)	160	139	185	161	215	187	245	213	265	230		
100 (600 lbs)	110	96	125	109	145	126	160	139	170	148		
R.P.M.	USE R.P.M. REQUIRED TO MAINTAIN I.A.S. SPECIFIED											
INDICATED AIRSPEED (KTS.)	223		217		206		195		177			
FUEL CONSUMPTION (U. S. GAL. HR.)	239		216		193		174		158			
FUEL CONSUMPTION (LBS. HR.)	1432		1298		1160		1043		948			

* USE OPERATING CONDITIONS OF NEXT CHART IF WEIGHT DIMINISHES BELOW LIMITS OF THIS CHART.
** INDICATED AIRSPEED VARIES WITH AIRPLANE WEIGHT.

AIRCRAFT MODEL (S)
FH-1
ENGINES WESTINGHOUSE
J30-WE-20 OR J30-P-20

FLIGHT OPERATION INSTRUCTION CHART

SHEET 2 OF 2 SHEETS
CHART WEIGHT LIMITS: 8910 TO 7785 POUNDS

EXTERNAL LOAD ITEMS
NONE

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING AND MOVE TO THE RIGHT OR LEFT AND READ AVAILABLE RANGE IN COLUMN FOR PROPOSED CRUISING ALTITUDE. ADD THE DISTANCE WHICH WILL BE COVERED DURING CLIMB AS DETERMINED FROM CORRESPONDING CLIMB DATA CHART.

EXAMPLE

TO DETERMINE TWO-ENGINE MAXIMUM RANGE AT 30,000 FEET WITH 75 GALS. RESERVE; INITIAL FUEL IS 310 GALS.

(1) FROM CLIMB DATA (G. W. = 10,035 LBS.), FUEL REQUIRED FOR TAKE-OFF AND CLIMB IS 127 GALS., AND DISTANCE IS 83 STATUTE MILES OR 72 NAUTICAL MILES; (2) AFTER DEDUCTING RESERVE AND FUEL FOR CLIMB, FUEL AVAILABLE FOR CRUISE IS 108 GALS.; (3) RANGE IS 210+83=293 STATUTE MILES OR 182+72=254 NAUTICAL MILES; (4) CRUISE I. A. S. IS 180 KTS.

	MAXIMUM CONTINUOUS POWER												ALTITUDE (FEET)		MAXIMUM RANGE											
	S. L.		5000		10,000		15,000		20,000		30,000		FUEL AVAILABLE FOR CRUISE		S. L.		5000		10,000		15,000		20,000		30,000	
	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	U. S. GAL.	POUNDS	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.
TWO ENGINE CRUISE	130	113	150	130	175	152	205	178	240	208	325	282	188	1128	155	135	180	156	215	187	250	217	295	256	400	347
	105	91	120	104	140	122	165	143	190	165	260	226	150	900	125	109	145	126	170	148	200	174	235	204	320	278
	70	61	80	69	95	83	110	96	125	109	175	152	100	600	85	74	95	83	115	100	135	117	160	139	210	182
	35	30	40	35	45	39	55	48	65	56	85	74	50	300	40	35	50	43	55	48	65	56	80	69	105	91
	15700		15700		15700		15700		15700		15700		R.P.M.		USE R.P.M. REQUIRED TO MAINTAIN I.A.S. SPECIFIED											
	373**		351**		332**		312**		290**		241**		INDICATED AIRSPEED (KTS.)		245		232		219		205		195		180	
	604		528		465		403		352		257		FUEL CONSUMPTION (U. S. GAL./HR.)		333		290		253		218		191		156	
	3625		3170		2789		2420		2111		1541		FUEL CONSUMPTION (LBS./HR.)		1998		1741		1519		1307		1143		935	
SINGLE ENGINE CRUISE	195	169	230	200	260	226	305	265	345	300			188	1128	200	174	235	204	270	235	310	269	350	304		
	155	135	180	156	210	182	240	208	275	239			150	900	160	139	185	161	215	187	245	213	280	243		
	105	91	120	104	140	122	160	139	185	161			100	600	105	91	125	109	145	126	165	143	185	161		
	50	43	60	52	70	61	80	69	90	78			50	300	55	48	60	52	70	61	80	69	95	83		
	15700		15700		15700		15700		15700				R.P.M.		USE R.P.M. REQUIRED TO MAINTAIN I.A.S. SPECIFIED											
	269**		254**		234**		213**		186**				INDICATED AIRSPEED (KTS.)		238		221		204		191		176			
	292		253		219		187		159				FUEL CONSUMPTION (U. S. GAL./HR.)		251		216		187		163		145			
	1754		1518		1316		1123		956				FUEL CONSUMPTION (LBS./HR.)		1506		1293		1122		979		870			

** INDICATED AIRSPEED VARIES WITH AIRPLANE WEIGHT.

AIRCRAFT MODEL (S)	FLIGHT OPERATION INSTRUCTION CHART	EXTERNAL LOAD ITEMS
FH-1 ENGINES WESTINGHOUSE J30-WE-20 OR J30-P-20	SHEET 1 OF 3 SHEETS CHART WEIGHT LIMITS: 12030 TO 10260 POUNDS	DROPPABLE FUEL TANK ENTIRE FLIGHT

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING AND MOVE TO THE RIGHT OR LEFT AND READ AVAILABLE RANGE IN COLUMN FOR PROPOSED CRUISING ALTITUDE. ADD THE DISTANCE WHICH WILL BE COVERED DURING CLIMB AS DETERMINED FROM CORRESPONDING CLIMB DATA CHART.

EXAMPLE

TO DETERMINE SINGLE ENGINE MAXIMUM RANGE AT 10,000 FEET WITH 75 GALS. RESERVE; TAKE-OFF GROSS WEIGHT IS 12,030 LBS. WITH 670 GALS. FUEL:

(1) FROM CLIMB DATA, FUEL REQUIRED FOR TAKE-OFF AND CLIMB IS 78 GALS., AND DISTANCE IS 21 STATUTE MILES OR 18 NAUTICAL MILES. (2) AFTER DEDUCTING RESERVE AND FUEL FOR CLIMB, FUEL AVAILABLE IS 517 GALS. (3) RANGE IS 615+21=636 STATUTE MILES OR 534+18=552 NAUTICAL MILES; (4) CRUISE I. A. S. IS 204 KTS.*

MAXIMUM CONTINUOUS POWER

	S. L.		5000		10,000		15,000		20,000		30,000	
	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.
TWO ENGINE CRUISE	390	339	455	395								
	360	313	415	360	485	421	575	500	655	569		
	325	282	380	330	440	382	520	452	600	521		
	295	256	340	295	395	343	470	408	540	469	740	643
	265	230	310	269	360	313	415	360	480	417	655	569
	235	204	270	235	315	274	370	322	425	369	575	500
	200	174	230	200	270	235	320	278	365	317	495	430
	15700		15700		15700		15700		15700		15700	
	346 **		325 **		304 **		291 **		261 **		208 **	
	597		521		455		396		341		245	
	3581		3129		2730		2374		2047		1468	
SINGLE ENGINE CRUISE	560	486	650	565								
	515	447	595	517	675	586						
	470	408	545	473	615	534						
	425	369	495	430	555	482						
	380	330	440	382	490	426						
	330	287	380	330	425	369						
	285	248	325	282	365	317						
	15700		15700		15700							
	236 ..		217 ..		192 ..							
	290		250		216							
	1740		1500		1295							

ALTITUDE (FEET)	FUEL AVAILABLE FOR CRUISE	
	U. S. GAL.	POUNDS
	670	4020
	650	3900
	600	3600
	550	3300
	500	3000
	450	2700
	400	2400
	350	2100
	300	1800
R.P.M.		
INDICATED AIRSPEED (KTS.)		
FUEL CONSUMPTION (U. S. GAL. HR.)		
FUEL CONSUMPTION (LBS. HR.)		
	670	4020
	650	3900
	600	3600
	550	3300
	500	3000
	450	2700
	400	2400
	350	2100
	300	1800
R.P.M.		
INDICATED AIRSPEED (KTS.)		
FUEL CONSUMPTION (U. S. GAL. HR.)		
FUEL CONSUMPTION (LBS. HR.)		

MAXIMUM RANGE

S. L.		5000		10,000		15,000		20,000		30,000	
STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.
440	382	515	447								
405	352	470	408	560	486	645	560	760	660		
370	322	430	374	510	443	590	512	695	604		
335	291	390	339	450	391	535	465	630	547		
300	261	345	300	400	347	470	408	550	478	730	634
260	226	305	265	355	308	410	356	480	417	635	552
220	191	260	226	305	265	350	304	410	356	540	469
USE R.P.M. REQUIRED TO MAINTAIN I.A.S. SPECIFIED											
257		247		234		222		210		182	
404		357		315		281		247		203	
2420		2140		1887		1684		1479		1219	

FOR SINGLE ENGINE CRUISE WITH DROPPABLE FUEL TANK, FLY MAXIMUM CONTINUOUS POWER (15,700 R.P.M.).

* USE OPERATING CONDITIONS OF NEXT CHART IF WEIGHT DIMINISHES BELOW LIMITS OF THIS CHART.
** INDICATED AIRSPEED VARIES WITH AIRPLANE WEIGHT.

AIRCRAFT MODEL (S)
FH-1
ENGINES WESTINGHOUSE
J30-WE-20 OR J30-P-20

FLIGHT OPERATION INSTRUCTION CHART

SHEET 2 OF 3 SHEETS
CHART WEIGHT LIMITS: 10260 TO 9135 POUNDS

EXTERNAL LOAD ITEMS
DROPPABLE FUEL TANK
ENTIRE FLIGHT

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING AND MOVE TO THE RIGHT OR LEFT AND READ AVAILABLE RANGE IN COLUMN FOR PROPOSED CRUISING ALTITUDE. ADD THE DISTANCE WHICH WILL BE COVERED DURING CLIMB AS DETERMINED FROM CORRESPONDING CLIMB DATA CHART.

EXAMPLE
TO DETERMINE TWO-ENGINE MAXIMUM RANGE AT 30,000 FEET WITH 75 GALS. RESERVE, TAKE-OFF GROSS WEIGHT IS 10,260 LBS. WITH 375 GALS. FUEL:

(1) FROM CLIMB DATA, FUEL REQUIRED FOR TAKE-OFF AND CLIMB IS 141 GALS., DISTANCE IS 93 STATUTE MILES OR 81 NAUTICAL MILES. (2) AFTER DEDUCTING RESERVE AND FUEL FOR CLIMB, FUEL AVAILABLE FOR CRUISE IS 159 GALS. (3) RANGE IS 280+93=373 STATUTE MILES OR 243+81=324 NAUTICAL MILES. (4) CRUISE I. A. S. IS 174 KTS.*

TWO ENGINE CRUISE

MAXIMUM CONTINOUS POWER

S. L.		5000		10,000		15,000		20,000		30,000	
STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.
245	213	285	248	330	287	390	339	450	391	625	543
230	200	270	235	310	269	360	313	420	365	580	504
200	174	230	200	265	230	310	269	360	313	485	421
165	143	195	169	220	191	260	226	300	261	405	352
135	117	155	135	175	152	205	178	240	208	325	282
100	87	115	100	135	117	160	139	185	161	250	217
65	56	80	69	90	78	105	91	120	104	165	143
15700		15700		15700		15700		15700		15700	
347**		327**		307**		287**		266**		218**	
598		522		456		395		343		248	
3588		3131		2737		2369		2059		1488	

ALTITUDE (FEET)	
FUEL AVAILABLE FOR CRUISE	
U. S. GAL.	POUNDS
375	2250
350	2100
300	1800
250	1500
200	1200
150	900
100	600
R.P.M.	
INDICATED AIRSPEED (KTS.)	
FUEL CONSUMPTION (U. S. GAL. HR.)	
FUEL CONSUMPTION (LBS. HR.)	

MAXIMUM RANGE

S. L.		5000		10.000		15.000		20,000		30.000	
STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.
280	243	325	282	390	339	450	391	535	465	710	616
260	226	305	265	365	317	420	365	500	434	665	578
220	191	260	226	315	274	365	317	430	374	570	495
185	161	220	191	255	222	305	265	355	308	480	417
150	130	175	152	205	178	245	213	285	248	375	326
115	100	130	113	155	135	180	156	215	187	280	243
75	65	90	78	105	91	120	104	145	126	190	165
USE R.P.M. REQUIRED TO MAINTAIN I.A.S. SPECIFIED											
236		230		222		215		204		182	
361		322		288		256		223		182	
2168		1932		1725		1537		1339		1092	

SINGLE ENGINE CRUISE

355	308	415	361	470	408	535	465
330	287	385	334	440	382	500	434
285	248	330	287	380	330	430	374
240	208	280	243	315	274	360	313
190	165	220	191	255	222	290	252
145	126	165	143	190	165	215	187
95	83	110	96	125	109	140	122
15700		15700		15700		15700	
242**		224**		204**		180**	
290		251		217		184	
1742		1503		1300		1105	

375	2250
350	2100
300	1800
250	1500
200	1200
150	900
100	600
R.P.M.	
INDICATED AIRSPEED (KTS.)	
FUEL CONSUMPTION (U. S. GAL. HR.)	
FUEL CONSUMPTION (LBS. HR.)	

FOR SINGLE ENGINE CRUISE WITH DROPPABLE FUEL TANK, FLY MAXIMUM CONTINUOUS POWER (15,700 R.P.M.).

* USE OPERATING CONDITIONS OF NEXT CHART IF WEIGHT DIMINISHES BELOW LIMITS OF THIS CHART.
** INDICATED AIRSPEED VARIES WITH AIRPLANE WEIGHT.

AIRCRAFT MODEL (S)
FH-1
ENGINES WESTINGHOUSE
J30-WE-20 OR J30-P-20

FLIGHT OPERATION INSTRUCTION CHART

SHEET 3 OF 3 SHEETS
CHART WEIGHT LIMITS: 9135 TO 8010 POUNDS

EXTERNAL LOAD ITEMS
DROPPABLE FUEL TANK
ENTIRE FLIGHT

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING AND MOVE TO THE RIGHT OR LEFT AND READ AVAILABLE RANGE IN COLUMN FOR PROPOSED CRUISING ALTITUDE. ADD THE DISTANCE WHICH WILL BE COVERED DURING CLIMB AS DETERMINED FROM CORRESPONDING CLIMB DATA CHART.

EXAMPLE

TO DETERMINE RANGE AT 20,000 FEET FOR TWO-ENGINE MAXIMUM CONTINUOUS POWER OPERATION WITH 75 GALS. RESERVE; INITIAL FUEL IS 290 GALS.:

(1) FROM CLIMB DATA (G. W. = 10,260 LBS.), FUEL REQUIRED FOR TAKE-OFF AND CLIMB IS 103 GALS., DISTANCE IS 44 STATUTE MILES OR 38 NAUTICAL MILES; (2) AFTER DEDUCTING RESERVE AND FUEL REQUIRED FOR CLIMB, FUEL AVAILABLE FOR CRUISE IS 112 GALS.; (3) RANGE IS 120 + 44 = 164 STATUTE MILES OR 104 + 38 = 142 NAUTICAL MILES; (4) CRUISE I. A. S. IS 267 KTS.**

MAXIMUM CONTINUOUS POWER

	S. L.		5000		10,000		15,000		20,000		30,000		ALTITUDE (FEET)	
	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	FUEL AVAILABLE FOR CRUISE U. S. GAL.	FUEL AVAILABLE FOR CRUISE POUNDS
TWO ENGINE CRUISE	125	109	145	126	165	143	195	170	225	196	305	265	188	1128
	100	87	115	100	135	117	155	135	180	156	245	213	150	900
	65	56	75	65	90	78	105	91	120	104	165	143	100	600
	35	30	40	35	45	39	50	43	60	52	80	69	50	300
	15700		15700		15700		15700		15700		15700		R.P.M.	
	348**		328**		308**		289**		267**		222**		INDICATED AIRSPEED (KTS.)	
	598		522		456		396		344		250		FUEL CONSUMPTION (U. S. GAL. HR.)	
	3589		3132		2738		2371		2062		1498		FUEL CONSUMPTION (LBS. HR.)	
SINGLE ENGINE CRUISE	180	156	210	182	240	208	275	239	300	261			188	1128
	140	122	165	143	190	165	220	191	240	208			150	900
	95	83	110	96	125	109	145	126	160	139			100	600
	45	39	55	48	65	56	75	65	80	69			50	300
	15700		15700		15700		15700		15700				R.P.M.	
	245**		229**		211**		190**		162**				INDICATED AIRSPEED (KTS.)	
	289		251		217		185		156				FUEL CONSUMPTION (U. S. GAL. HR.)	
	1732		1506		1303		1110		937				FUEL CONSUMPTION (LBS. HR.)	

MAXIMUM RANGE

S. L.		5000		10,000		15,000		20,000		30,000	
STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.	STAT.	NAUT.
140	122	165	143	195	170	230	200	270	235	365	317
110	96	130	113	155	135	180	156	215	187	290	252
75	65	85	74	105	91	120	104	140	122	195	169
35	30	45	39	50	43	60	52	70	61	95	83
USE R.P.M. REQUIRED TO MAINTAIN I.A.S. SPECIFIED											
228		221		214		205		195		174	
344		308		272		240		212		166	
2066		1846		1632		1442		1270		994	

FOR SINGLE ENGINE CRUISE WITH DROPPABLE FUEL TANK, FLY MAXIMUM CONTINUOUS POWER (15,700 R.P.M.).

** INDICATED AIRSPEED VARIES WITH AIRPLANE WEIGHT.

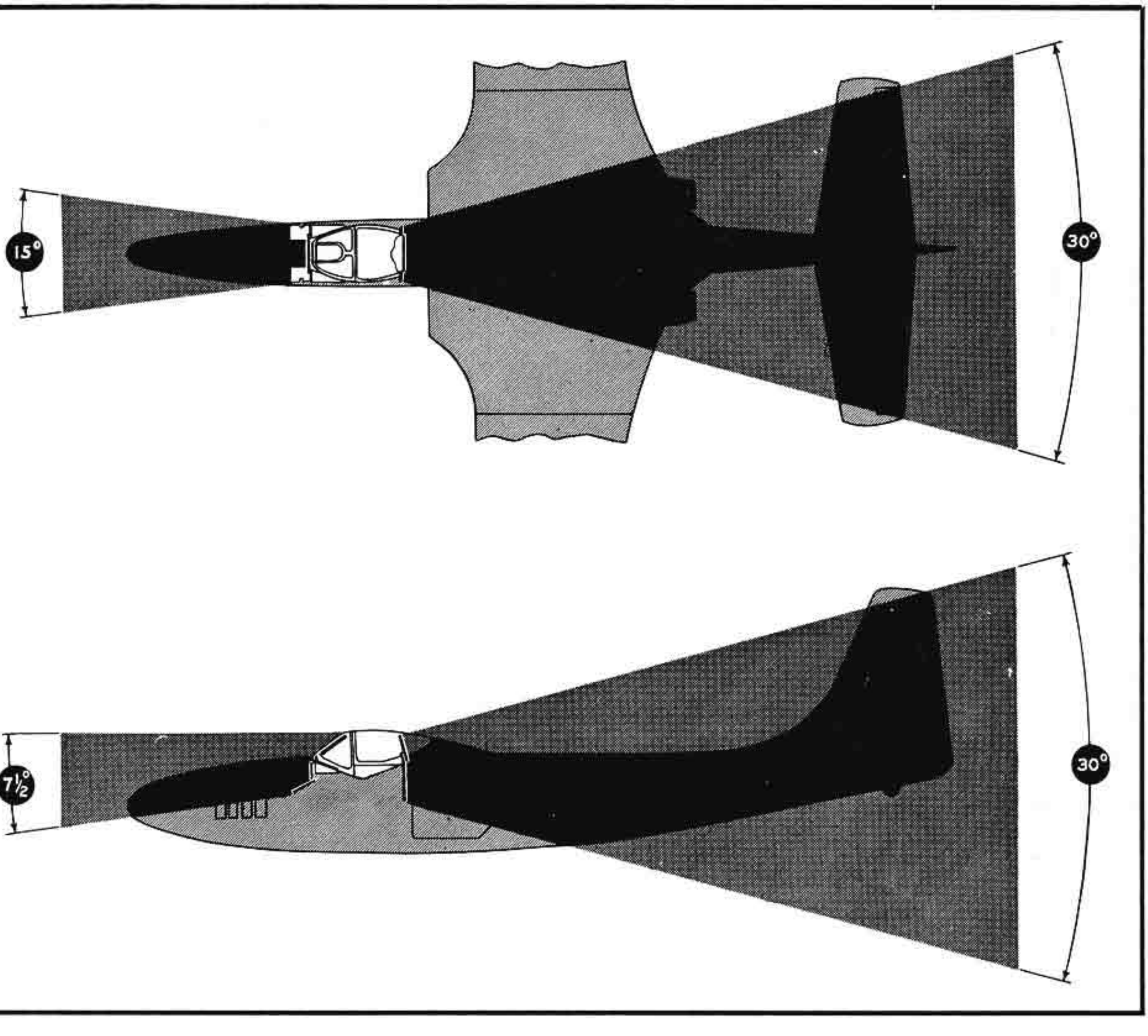


Figure A–3. Angles of Armor Protection