Pilot's Handbook of Flight Operating Instructions

NAVY MODELS

F4U-1 F3A-1 FG-1
F4U-1C F3A-1D FG-1D
F4U-1D Airplanes

BRITISH MODELS

CORSAIR I • II • III • IV

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THIS HANDBOOK SUPERSEDES AN 01-45HA-1 DATED 1 JUNE 1944

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Index
OF PRINCIPAL SECTIONS
PILOTS HANDBOOK
of
FLIGHT OPERATING INSTRUCTIONS
FOR

U.S. Navy Models

F4U-1 • F4U-1C • F4U-1D
F3A-1
FG-1 • FG-1D

British Models

CORSAIR I • II • III

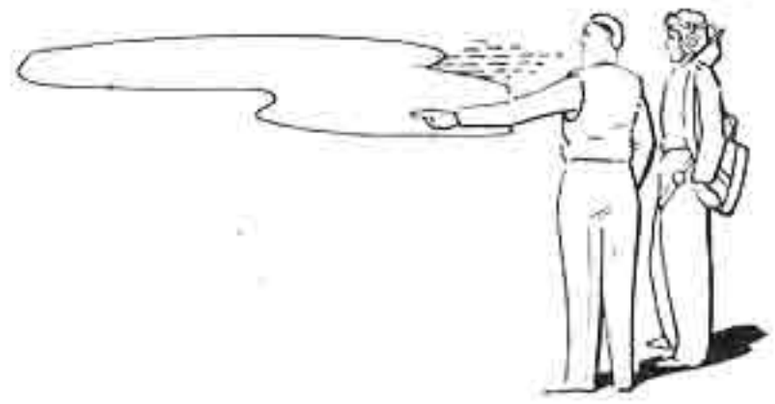
Section

TABLE OF CONTENTS

INDEX OF ILLUSTRATIONS

INDEX OF CHARTS, TABLES AND CURVES

Section I
DESCRIPTION



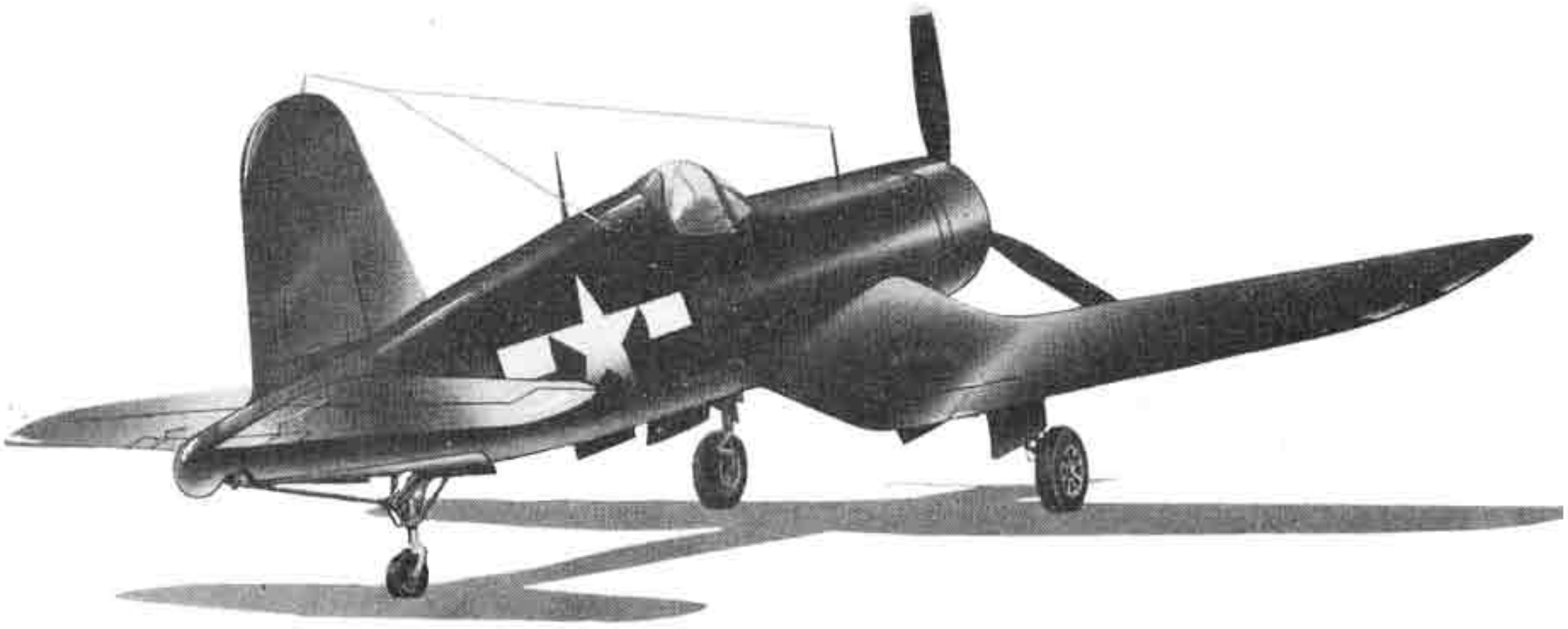


Figure 1—The Corsair

1. AIRPLANE.

a. GENERAL.—The Model F4U-1, F3A-1, FG-1 airplanes, F4U-1C airplanes and British Corsair I, II, III airplanes are single-engine, single-seat, folding low-wing monoplanes designed as carrier and land based fighters.

In the Model F4U-1C airplane (cannon wing design), the .50 caliber machine guns are replaced by M2 cannons.

The Model F4U-1D and FG-1D airplanes (center section twin pylons design) are equipped for operation as long range fighter-bombers when carrying either one or two 1000 pound bombs.

The approximate gross weights for these airplanes with full ammunition loading and full internal fuel, but with no external loading, are as follows:

F4U-1, F3A-1, FG-1 ..... 12,820 pounds

F4U-1C ..... 12,063 pounds

F4U-1D and FG-1D ..... 12,028 pounds

The approximate overall dimensions for these airplanes in the three-point attitude are as follows:

Length ..... 33 ft.

Height ..... 12 ft.

Span ..... 41 ft.

BRITISH

Span ..... 40 ft.

b. ENGINE.—Pratt and Whitney Double Wasp; R-2800-8W; two stage supercharged; two speed auxiliary stage; geared 2:1.

c. PROPELLER.—Production airplanes are normally equipped with Hamilton Standard Hydromatic three blade 6501A-0 or 6541A-0 propellers having a diameter of thirteen feet, one inch. If this propeller is not available, those Hamilton Standard propellers with blade designations of 6443A-21 or 6525A-21 with a diameter of thirteen feet, four inches may be substituted.

d. STARTER AND PRIMER.

(1) CARTRIDGE STARTER—ECLIPSE, TYPE III.

(a) Breech access door—upper right hand accessory compartment.

(b) Starter switch—electrical panel (right side of cockpit).

(c) Use Type "D" cartridges for starting under normal conditions. Type "E" may be used in cold weather, or under other conditions when Type "D" cartridges are inadequate.

(2) ELECTRIC STARTER—JACK AND HEINTZ, MODEL JH4NER.

(a) Starter switch—electrical panel (right side of cockpit).

Note

The ignition booster is operated by the starter switch. Hold starter switch "ON" until engine is running smoothly. Model F4U-1 airplanes with serial numbers below 02443 (except 02264 and 02391) are equipped with booster coils; subsequent Model F4U-1 airplanes (except 02468, 02469, 02470, 02485, 02516, 02576, 02715, 02716 and 02722) are equipped with induction vibrators in lieu of booster coils. Model FG-1, F3A-1, and Britsh Corsair I, II, III airplanes all are equipped with induction vibrators.

(3) PRIMER SWITCH.—The primer switch is located adjacent to the starter switch. The electric auxiliary fuel pump must be used to supply pressure for priming before starting the engine.

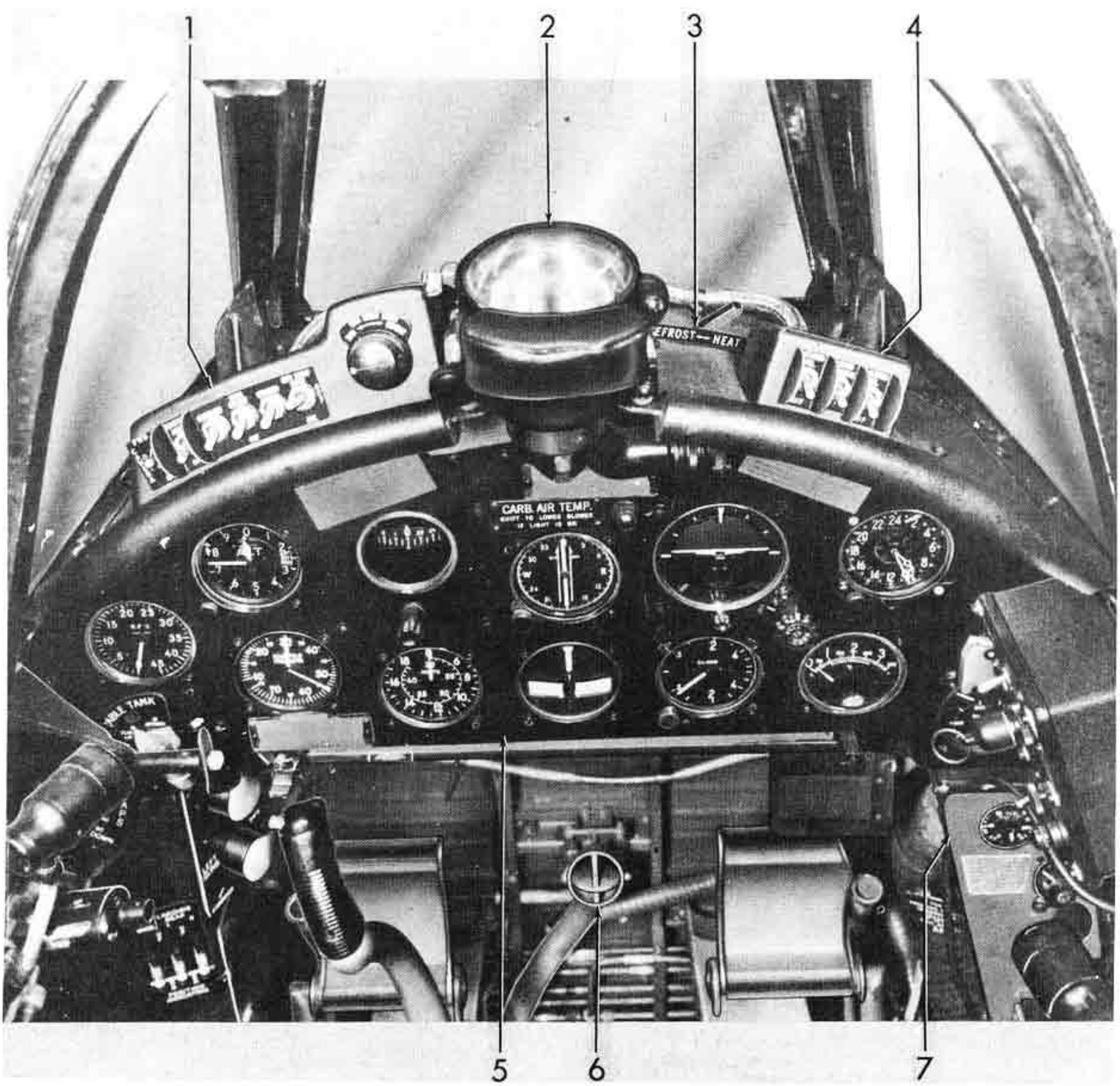


Figure 2—Cockpit—Forward

1. Gun Switch Box
2. Gun Sight
3. Defroster Control
4. Bomb Switch Box
5. Main Instrument Panel
6. Cockpit Ventilator
7. Right Hand Sub-Instrument Panel

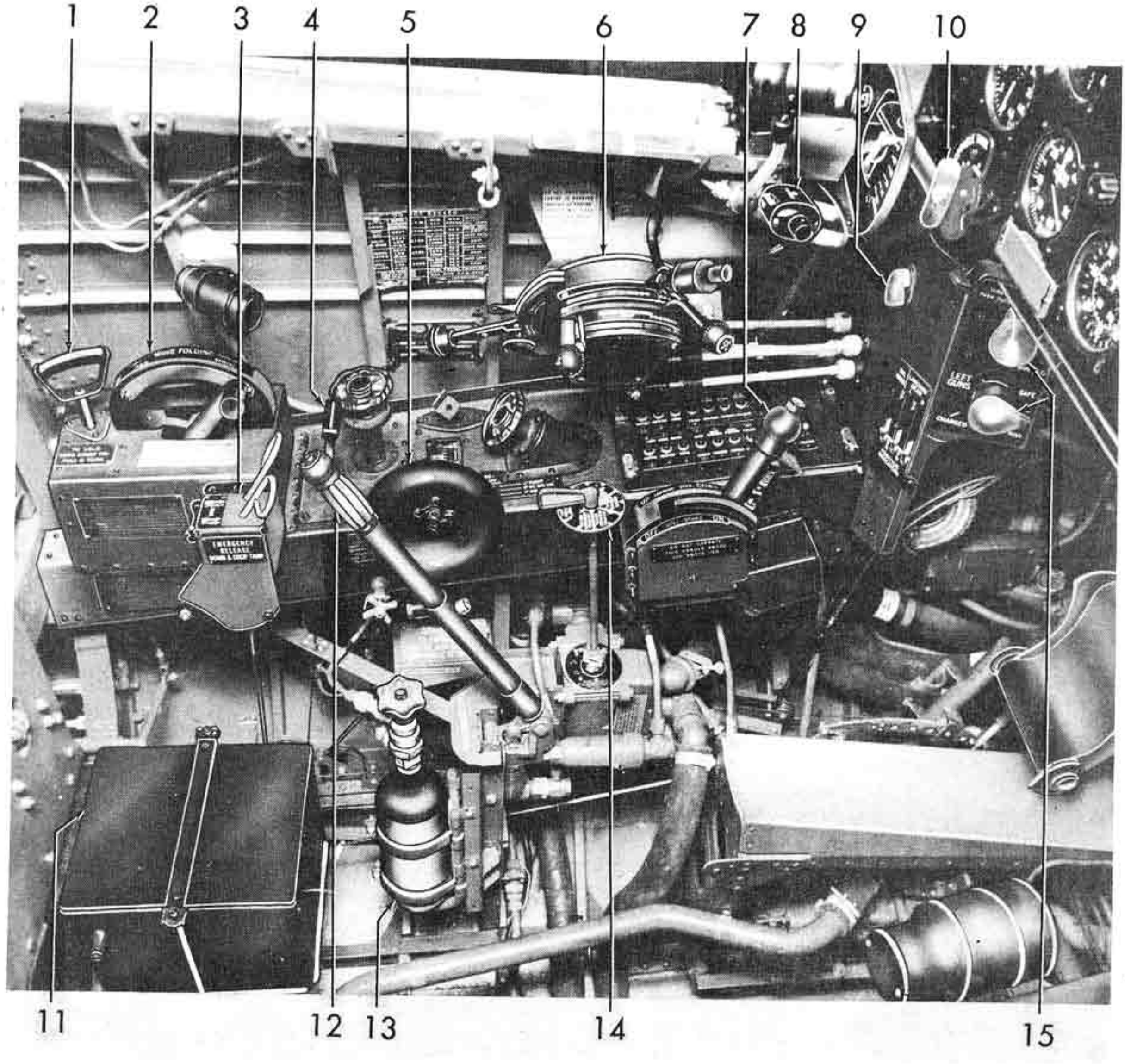


Figure 3—Cockpit—Left Side

1. Wing Hinge Pin Lock Control
2. Wing Folding Control
3. Manual Drop Tank and Bomb Release
4. Tail Wheel Lock Control
5. Trim Tab Controls
6. Engine Control Unit
7. Landing Gear and Dive Brake Control
8. Rocket Launching Switch
9. Ignition Switch
10. Wing Flaps Control
11. Battery
12. Hydraulic System Hand Pump
13. CO_2 Bottle—Emergency Landing Gear
14. Fuel Selector
15. Gun Charging Controls

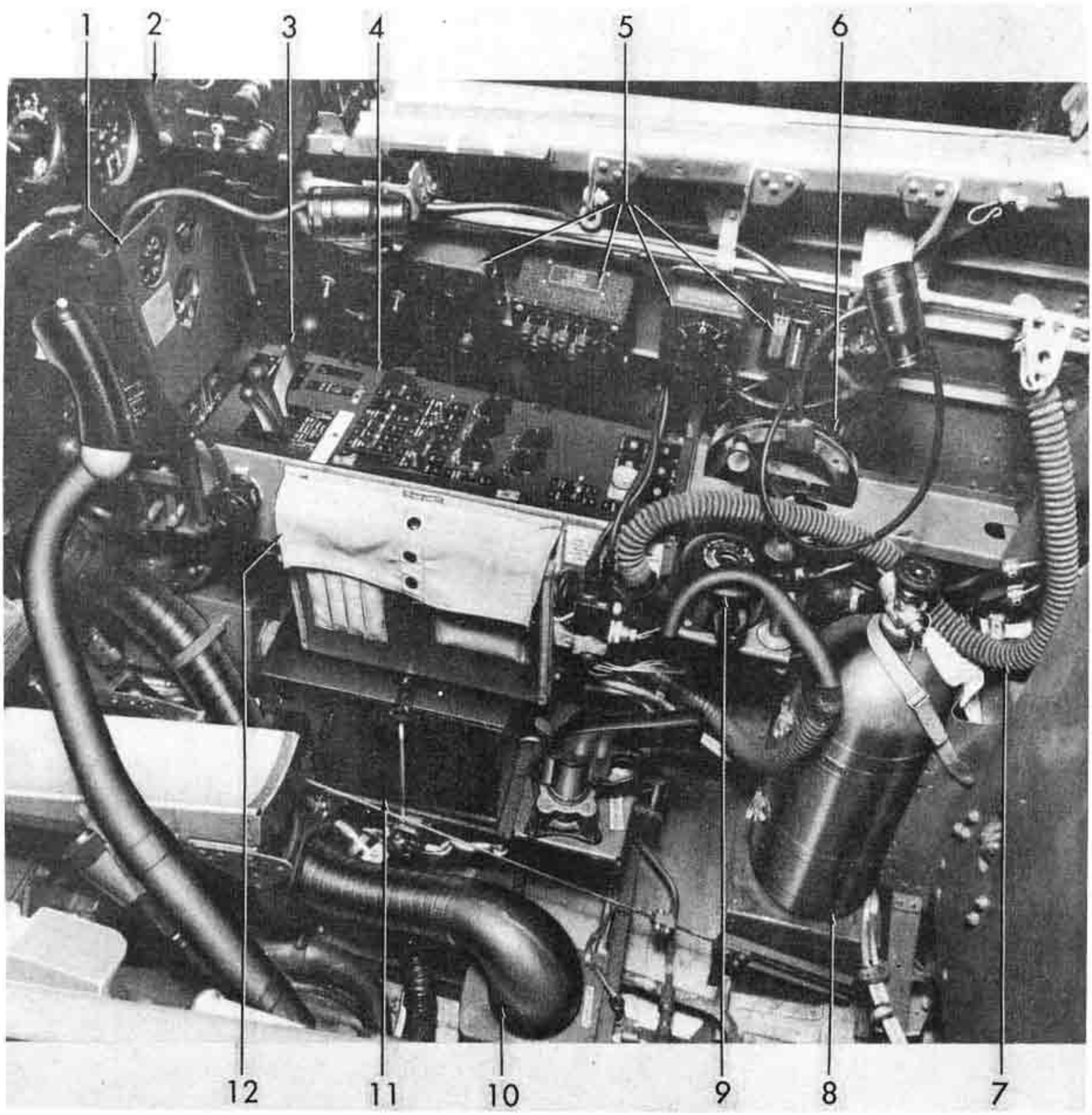
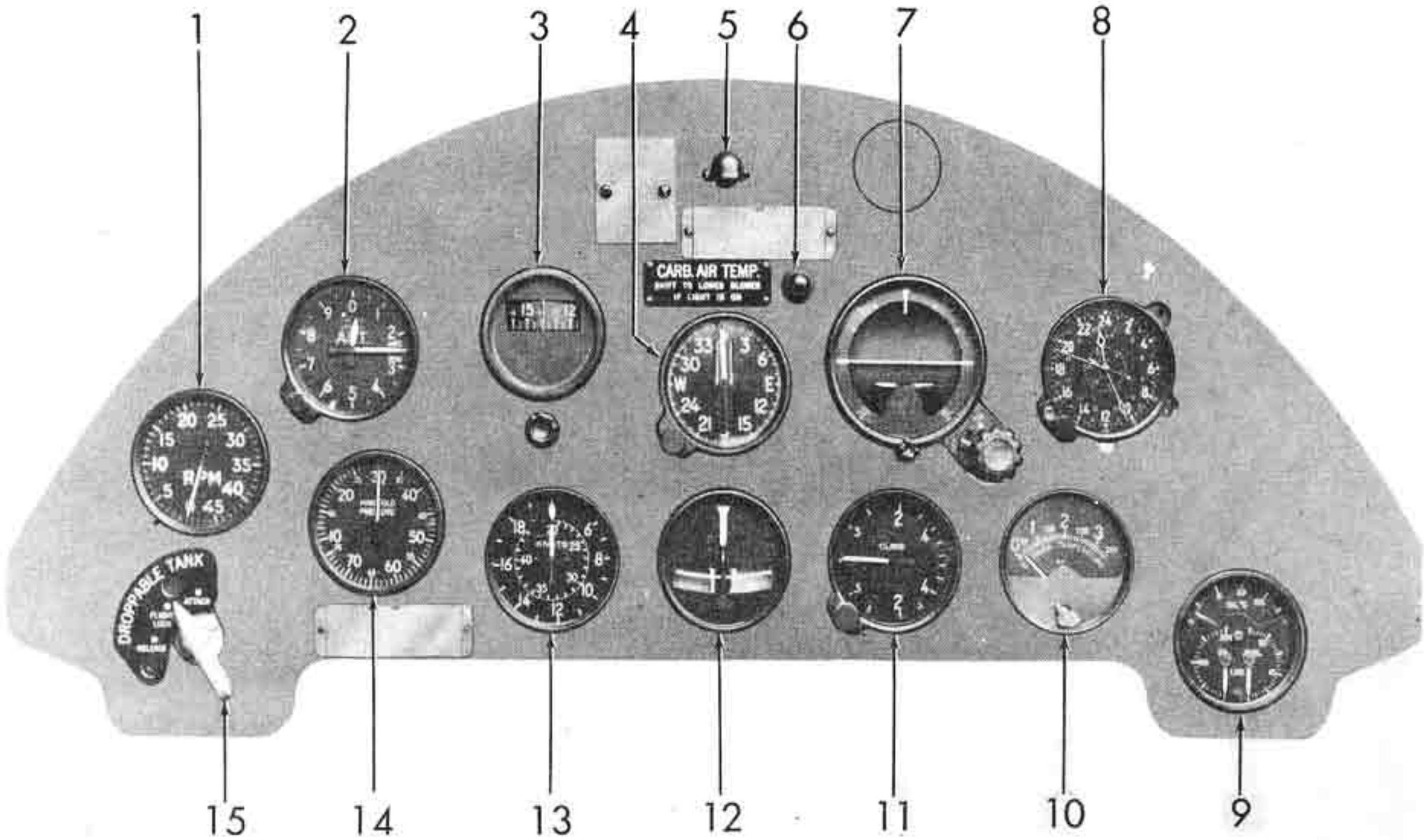
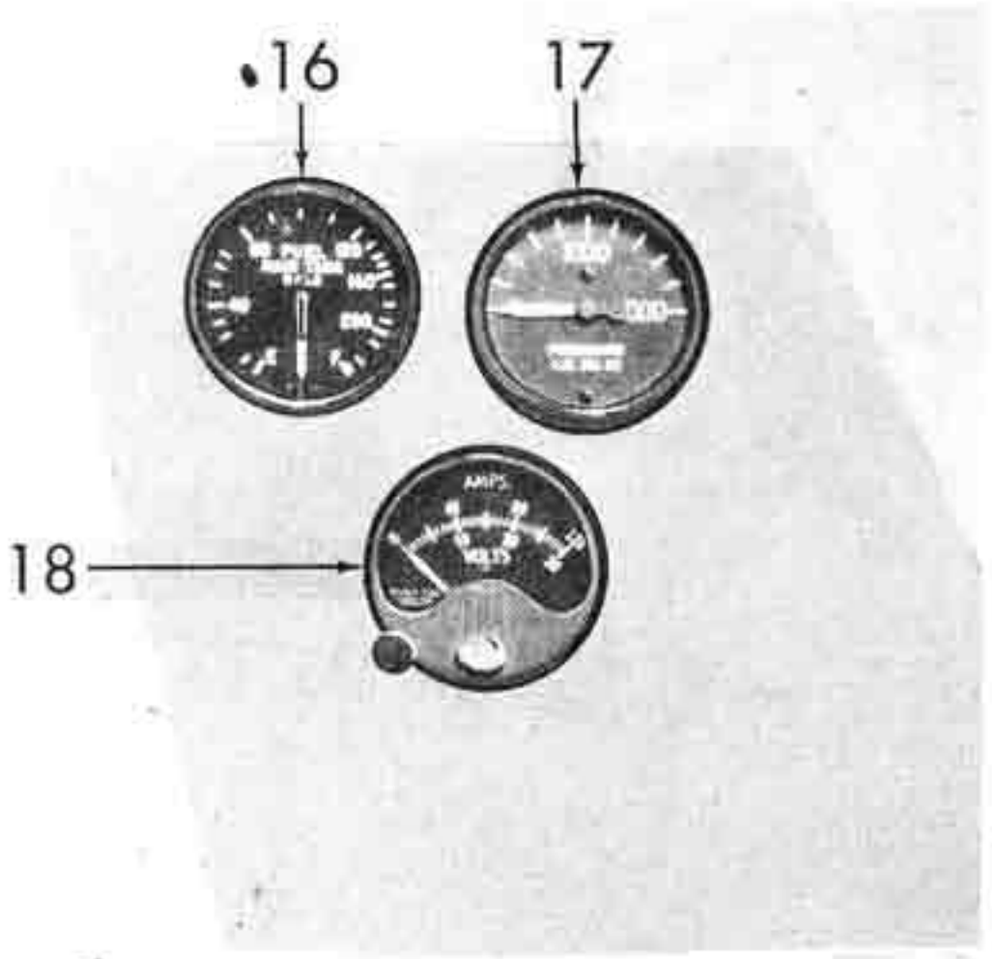


Figure 4—Cockpit—Right Side

1. Right Hand Sub-Instrument Panel
2. Rocket Station Distributor Box
3. Cooling Flaps Controls
4. Pilot's Distribution Box
5. Radio and Communications Controls
6. Arresting Hook Control
7. Oxygen Tube
8. Oxygen Bottle
9. Diluter-Demand Regulator
10. Defroster
11. Battery
12. Map Case



MAIN INSTRUMENT PANE



RIGHT HAND SUB-INSTRUMENT PANEL

Figure 5—Instrument Panels

1. Tachometer
2. Altimeter
3. Directional Gyro
4. Compass
5. Chartboard Light
6. Carburetor Air Temperature Warning Light
7. Gyro Horizon
8. Clock
9. Engine Gage Unit
10. Cylinder Temperature Indicator
11. Climb Indicator
12. Turn and Bank Indicator
13. Airspeed Indicator
14. Manifold Pressure Gage
15. Centerline Droppable Fuel Tank Switch
16. Fuel Quantity Gage
17. Hydraulic Pressure Gage
18. Voltammeter

2. CONTROLS DESCRIPTION.

a. GENERAL.—In addition to the conventional surface controls, the cockpit contains the power plant, fuel system, oil system, and hydraulic system controls, and other miscellaneous controls. The location and operation of each control is described in the following paragraphs.

b. POWER PLANT CONTROLS.—The throttle, mixture, propeller governor, and supercharger controls are mounted in a control unit and installed on the left side of the cockpit as shown in figure 3. Each control moves through a quadrant in operation. For ease of handling, the engine control unit is plainly marked with the name and correct positioning of the controls mounted thereon.

(1) THROTTLE CONTROL.—The throttle control is located on the engine control unit on the left hand side of the cockpit.

(2) WATER INJECTION MICRO SWITCH.—In addition to its normal function, the throttle control operates the water injection micro switch. Moving the throttle control full forward (breaking the safety-wire stop) closes the micro switch and turns the water injection equipment on. When the throttle control is in any other position, the water injection equipment is off. Refer to Section II, paragraphs 4.*b.*(8) and 14.*d.* for information concerning the water injection system and its operation.

(3) MIXTURE CONTROL. — This engine is equipped with a PT-13D4 (PT-13D6 on airplanes with water injection system) Bendix-Stromberg injection carburetor with automatic mixture control.

(a) The mixture control has three effective positions:

IDLE CUT-OFF
AUTO LEAN
AUTO RICH

The fourth position, "FULL RICH", has been or should be rendered inoperative, and therefore no attempt should be made to use it. Fuel will be discharged into the supercharger at any fuel pressure above four p.s.i. when the mixture control is in any position except IDLE CUT-OFF. The mixture control should be kept in the IDLE CUT-OFF position whenever the engine is not running to insure against flooding of the supercharger in case the auxiliary fuel pump is inadvertently turned ON.

Note

Upon stopping the engine, particularly in hot weather, fuel trapped in the carburetor (with the mixture control in IDLE CUT-OFF) may boil from the residual heat of the engine. The abnormally high vapor pressure can jam rubber-tipped vapor vent needles in their seats so that faulty vapor elimination may occur during subsequent operation of the engine. Therefore, until such time as the present rubber-tipped needles can be replaced by all-steel needles, operating activities have been advised to place the mixture control in AUTO LEAN (after shutting down with IDLE CUT-OFF) until the engine and accessory compartment have cooled.

This procedure requires that adequate precautions be taken to insure that:

1. The auxiliary fuel pump is turned OFF before stopping engine.
2. The mixture control is placed in IDLE CUT-OFF as soon as practicable after the engine has cooled.
3. Neither the main battery switch nor the auxiliary fuel pump switch is turned ON until the mixture control has been checked to see that it is in IDLE CUT-OFF.

CAUTION

Failure to observe these precautions may result in hydraulic lock and rod failure, as well as an obvious fire hazard.

(b) For all flight operations, except take-off and landing approach, the control shall be set in "AUTO LEAN." If it is impossible to maintain cylinder head temperatures below 260° C. (500° F.) for 30 minutes at military power, and 232° C. (450° F.) continuous at any lower power without opening the cowl flaps, enrich enough to restore proper cooling. "AUTO RICH" position shall be used for take-off, landing approach and all ground operations.

(c) If there is any slack in the linkage between the mixture control handle and the carburetor lever, moving the handle from one automatic position notch to another will not necessarily mean that the carburetor lever has moved accordingly. Therefore, when adjusting the mixture control, make sure the control is set properly by feeling for the "notch" which indicates proper positioning of the carburetor lever.

(d) Manual leaning is not recommended except when there is conclusive evidence that erratic carburetor metering is causing an over-rich mixture. Tests have shown that, when properly adjusted, present carburetor settings meter very close to best economy at 60 per cent power and below.

For mixture control test procedure, see Section II, paragraph 24.

(4) PROPELLER GOVERNOR CONTROL.—The constant speed propeller control is located on the after end of the engine control quadrant. Move the control down to increase rpm; move the control up to decrease rpm. Full down position gives take-off rpm; full up position gives approximately 1200 rpm. Vernier adjustment is obtained by rotating the knob on the control lever.

(a) The control sets the constant speed unit and has no direct control over propeller blade angle. The blade angle is such that 2700 rpm can be obtained at somewhat less than full power, and 3060 rpm will not be exceeded in dives up to maximum allowable diving speed. Rapid changes in throttle or propeller control setting will tend to cause the rpm to "overshoot the mark" momentarily before settling down.

(b) A hydraulic accumulator is connected to the propeller oil system to provide a reserve supply of oil to the governor at sufficient pressure to change propeller blade angle when the normal supply is interrupted for any reason. Accumulator pressure should be checked each day prior to flight. The pressure should be 300 pounds per square inch with engine not running.

(5) SUPERCHARGER CONTROL. — The two stage supercharger induction system installation is shown diagrammatically on figure 7. The main stage impeller is geared directly to the crankshaft, and the auxiliary stage impeller is driven through oil-operated clutches by means of which it can be engaged in either of two fixed gear ratios ("LOW" or "HIGH").

(a) The purpose of the auxiliary stage impeller is to supply air to the carburetor at approximately sea level pressure when operating at altitude. The auxiliary stage supercharger regulator maintains this condition by gradually opening the auxiliary stage gate valves, at the entrance to the auxiliary supercharger, as the altitude increases.

(b) The heat produced by compressing the intake air in the auxiliary supercharger is partially dissipated in the intercoolers, reducing the temperature of the intake air before it enters the carburetor. (See paragraph 3.*b.* (8)). Do not use "LOW" blower when the desired power can be obtained in "NEUTRAL" (or "HIGH" when the desired power can be obtained in "LOW"). High carburetor air temperature and uneconomical fuel consumption will result.

(c) Do not shift the supercharger control more often than at five-minute intervals during flight, except in an emergency, to allow the dissipation of heat from the clutches. The supercharger control must be properly positioned to prevent clutch slippage and to insure the availability of rated power at all times. If practicable, the engine should be operated for at least five minutes in each of the supercharger control settings during each five-hour period of operation.

(d) FLIGHT OPERATION.—The use of the procedure outlined below will result in a minimum of manifold pressure surge, RPM surge, and cutting out during blower shifts from a *lower* to a *higher* ratio:

1. Shift the blower selector lever to the desired new blower ratio position without reducing RPM.
2. Wait for the first indication of the manifold pressure to pick up.
3. Quickly retard the throttle to about 2/3 open. (This 2/3 open position will hereafter be referred to as the "Surge Control Position"). After the blower has become fully engaged (about 15 to 20 seconds after repositioning the blower selector lever), the throttle may be opened to maintain the desired manifold pressure.

Notes

(i) If the engine is already operating with the throttle at or near the surge control position when the shift is made, it will not be necessary to retard the throttle further. If the engine is operating with a throttle which is less than the surge control position, it is best to open the throttle to the surge control position before shifting.

(ii) When operating at powers below 1900 RPM and 30 in. Hg. it is not necessary to retard the throttle after repositioning the blower selector lever.

(iii) When climbing at War Emergency Power in neutral or low blower, it is not necessary to retard the throttle after shifting to a higher blower ratio. The whole auxiliary blower system is working at such a high percentage of its capacity at War Emergency Power that the manifold pressure does not surge beyond 60 in. Hg. Shifts at War Emergency Power shall be made only during an emergency.

(iv) When the auxiliary stage is operating and it is desired to shift to a *lower* blower ratio, move the blower selector lever to the desired lower blower ratio position. It is not necessary to change either the throttle position or the engine speed during this process. Blowers may be shifted down from high to low, high to neutral, or low to neutral. Usually, there is a smooth surgeless transition of power as the blower ratio decreases. However, it is possible that the engine may cut out momentarily if the blower ratio is shifted from high to neutral at altitudes above 20,000 ft. after considerable high power operation in high blower.

(6) CARBURETOR AIR TEMPERATURE. — A warning light is provided on the main instrument panel to indicate (red light on) if the carburetor air temperature exceeds the maximum limit of 43°C. (110°F.). Operating the engine at high power with excessively high carburetor air temperature (red light on) will probably cause detonation and serious damage to the engine except when operating at War Emergency Power. Detonation may be indicated by a slight undue roughness increasing somewhat in severity in a few seconds, and by an appreciable and sudden rise in cylinder head temperature, if the offending cylinder happens to be the one connected to the temperature gage (No. 4 cylinder head).

Note

When operating at War Emergency Power, an anti-detonant is used. Because of this, the carburetor air temperature warning light may be on without fear of detonation and possible damage to the engine.

(a) Control of the carburetor air temperature when operating in low or high blower is provided by means of the intercooler flap. The following flap setting should be used:

1. Normal climb or maneuvers—½ open.
2. Severe operating conditions and maneuvers—wide open.
3. Level flight—closed.

Note

If the warning light comes on when operating in low or high blower at low speeds, immediately open the intercooler flap wide.

(b) Excessively high carburetor air temperature is most likely to occur during high power, high rpm, low air speed operation (as in steep climb or in tight turns) with the intercooler flap "CLOSED." The warning light is especially likely to come on if the supercharger control is shifted to a higher blower ratio at too low an altitude. In this case, immediately shift back to the next lower blower ratio.

(c) In view of the above, the warning light is placarded as follows: "SHIFT TO LOWER BLOWER

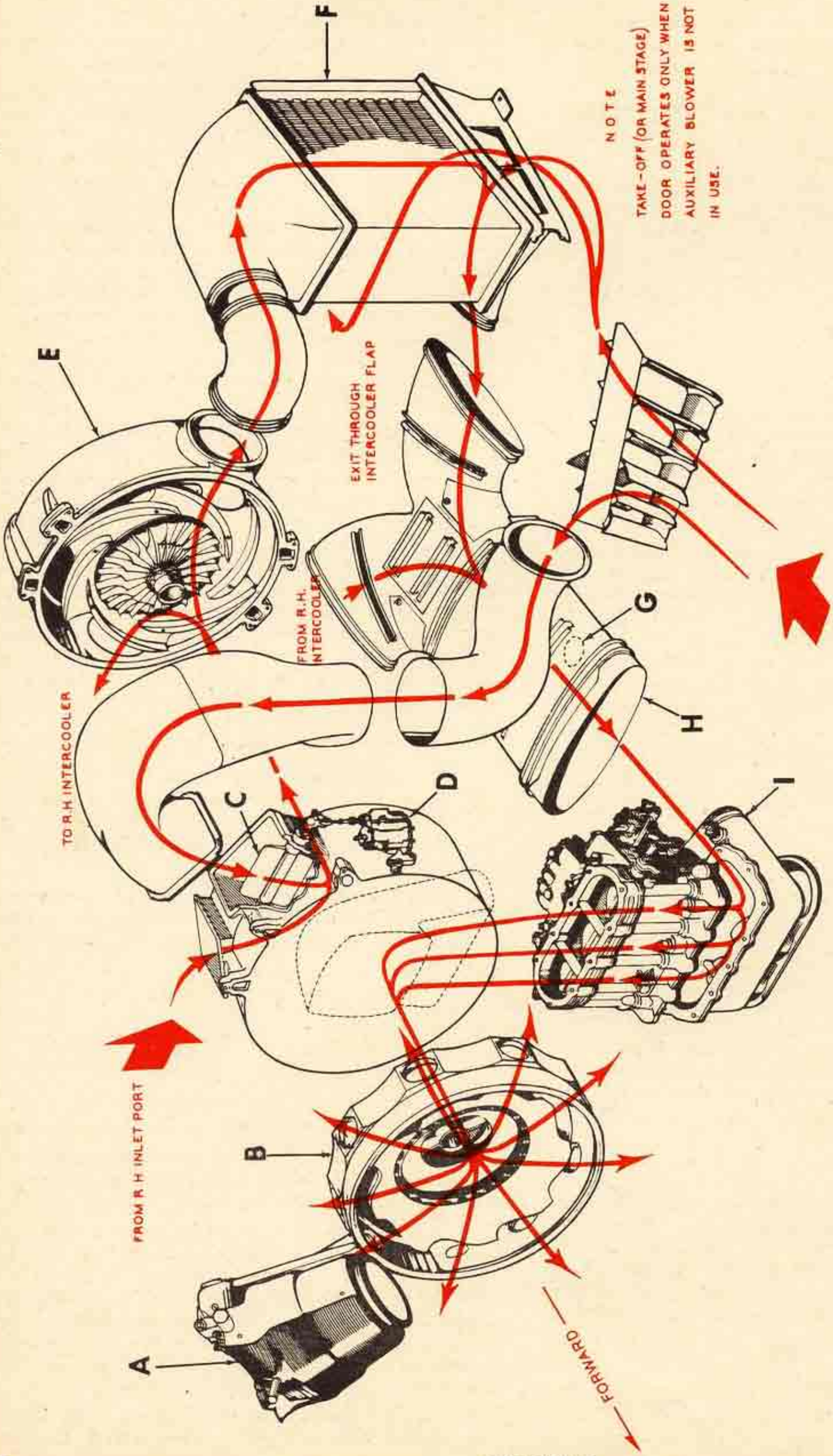


Figure 7—Induction System

IF LIGHT IS ON" since this is the best and most positive means of reducing the carburetor air temperature to normal.

(7) COWL FLAP CONTROL AND CYLINDER TEMPERATURES.—The cowl flap control is located on the right side of the cockpit, forward of the electrical panel (see figures 4 and 15).

Note

Hold either "OPEN" or "CLOSED" until desired setting is obtained, then release.

(a) The cowl flaps should be adjusted so as not to exceed the following cylinder head temperatures:

1. Take-off, military, and war emergency power, 260°C. (500°F.).

2. High speed and climb at normal rated power, 260°C. (500°F.).

3. Continuous operation at any power except as above, 232°C. (450°F.).

(b) The full open setting of cowl flaps is provided primarily for ground cooling. If this setting is used in flight, buffeting of the tail surfaces will result. Open about 2/3 for take-off and climb, and close (or open slightly, if required) for high speed and cruising level flight. Cylinder head temperatures can be reduced by:

1. Enriching mixture.
2. Opening cowl flaps.
3. Reducing power.
4. Increasing air speed.

(c) Climbing at speed slightly greater than best climbing speed will have very little effect on the rate of climb. Better all around cooling will result.

(8) INTERCOOLER FLAP CONTROL.—Control of the carburetor air temperature when operating in low or high blower is provided by means of the intercooler flap control, located on the right side of the cockpit forward of the electrical panel (see figures 4 and 15). Refer to paragraph 3. *b.*(6) for further information concerning the intercooler flap control.

(9) OIL COOLER FLAP CONTROL.—The quantity of cooling air to be admitted to the oil coolers is regulated by two flaps controlled from the right side of the cockpit (see figures 4 and 15). The two flaps may be placed in any position between "OPEN" and "CLOSED," as required to effect the flow of the necessary quantity of cooling air through the airduct openings to the coolers.

c. FUEL SYSTEM CONTROLS.

(1) GENERAL.—The fuel system controls are shown on figures 8 and 9.

(a) FUEL.—Grade: 100 130.

Specification: AN-F-28.

(2) TANKS.

(a) Model F4U-1, F3A-1, FG-1 airplanes and British airplanes, serial numbers JT-100 to JT-554:

The self-sealing main tank, located in the fuselage, forward of the cockpit, has a total capacity of 237 U.S. gallons (197 Imp. gallons) of fuel, including a standpipe reserve of 50 U.S. gallons (42 Imp. gallons). The two wing tanks, built integrally with the outer panels, have a capacity of 63 U.S. gallons (53 Imp. gallons) each. The wing tanks are provided with a CO_2 vapor dilution system. Provision is made, under the fuselage, for the installation of a droppable auxiliary tank having a capacity of 170 U.S. gallons (142 Imp. gallons) of fuel. The main fuel tank maintains a standpipe reserve of 50 U.S. gallons of fuel (42 Imp. gallons) after the fuel supply through the main line is exhausted. Bear in mind that the reserve fuel is made available as the quantity necessary for final operation before landing, when the main fuel supply is exhausted, and as noted in Section II, paragraph 4.*b.*(3).

(b) Model F4U-1D, FG-1D and British airplanes, serial number JT-555 and subsequent:

Provision is made in the fuel system of these models for installing two Navy standard-type droppable tanks, each with a capacity of 154 U.S. gallons (129 Imp. gallons) of fuel, on the center section twin pylons. P-38 steel droppable tanks which have a capacity of 171 U.S. gallons (142 Imp. gallons) may be installed in place of the Navy standard-type tanks when the latter are not available. The original main tank and the provisions for installing a droppable tank under the fuselage are retained on these airplanes. However, the two wing tanks and their vapor dilution system are eliminated.

(3) FUEL SELECTOR.—The fuel selector is located on the left hand shelf in the cockpit. For fuel selector positions see figures 8 and 9.

(4) FUEL QUANTITY GAGE.—An electrical fuel quantity gage is provided for the main tank only; it shows the total quantity of fuel in the tank, including the standpipe reserve. The gage dial is calibrated to indicate correctly with the airplane in level flight at approximately 175 knots indicated air speed, normal fighter load.

(5) ELECTRIC AUXILIARY FUEL PUMP SWITCH.—This switch is located on the left hand shelf (see Section II, paragraph 4.*b.*(4), for operation).

(6) PRESSURE REGULATOR CONTROL.—The manual control for the main tank pressure regulator is located on the forward right hand side of the cockpit

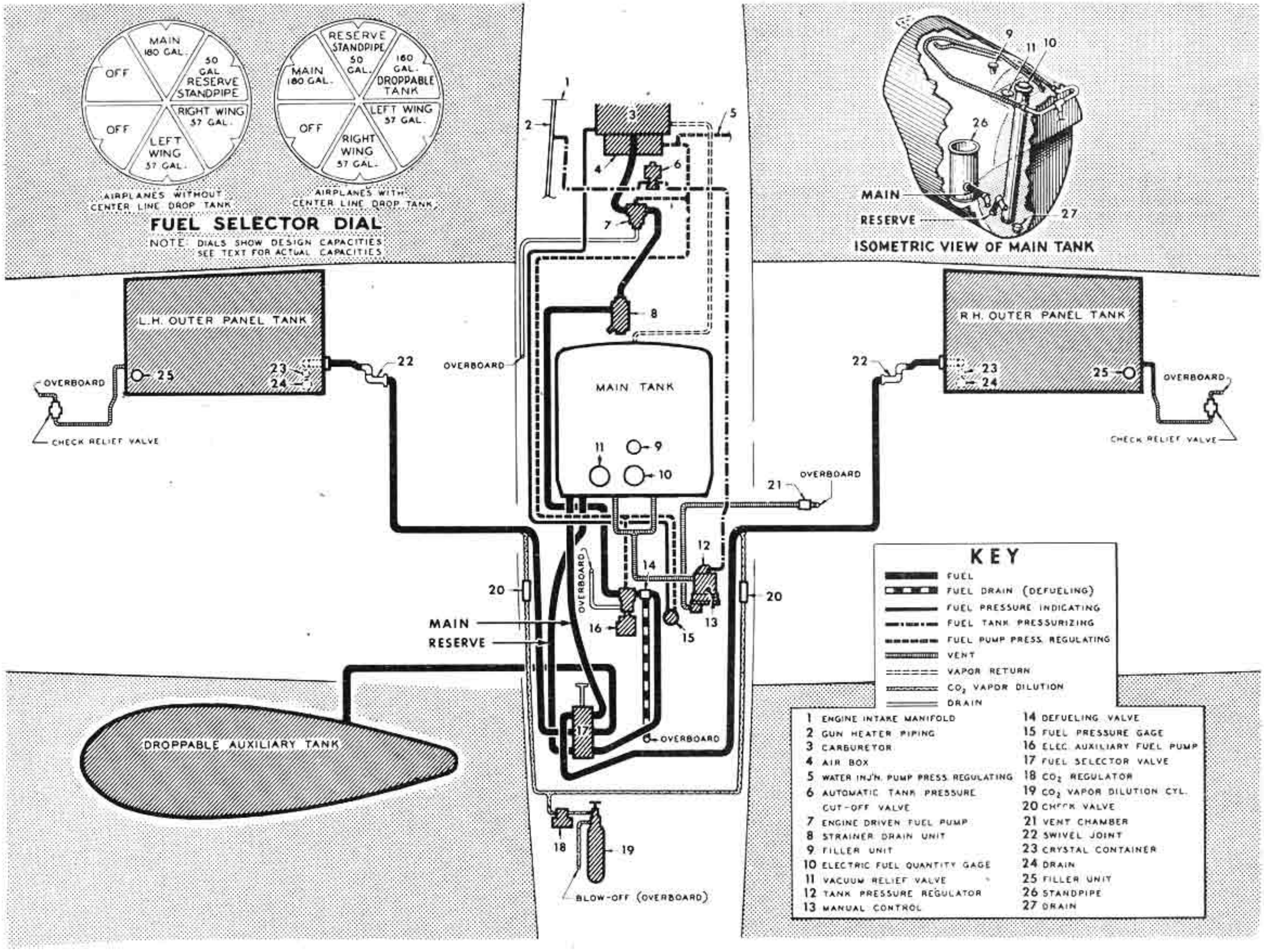
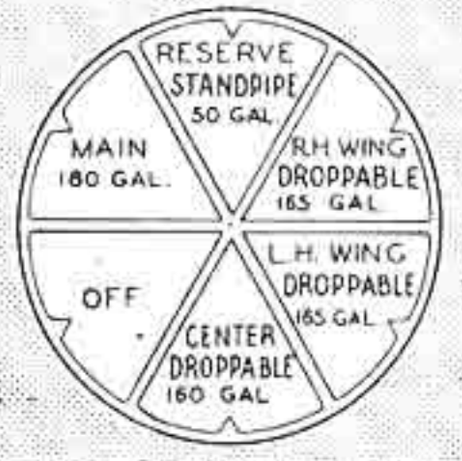
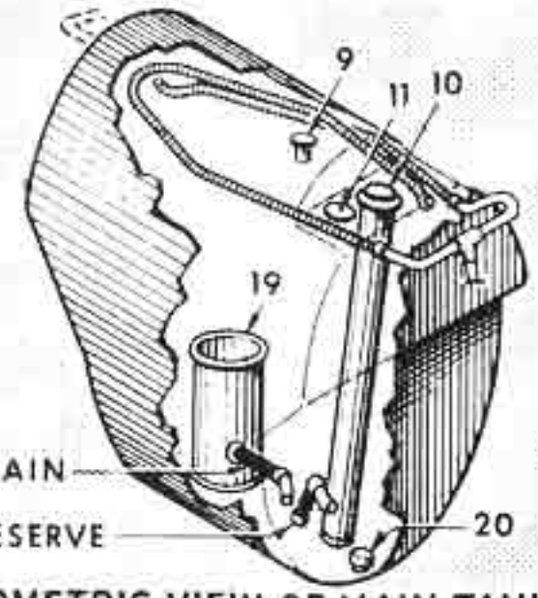


Figure 8—Fuel System Control Diagram on Airplanes Prior to Installation of Twin Pylon Droppable Tanks

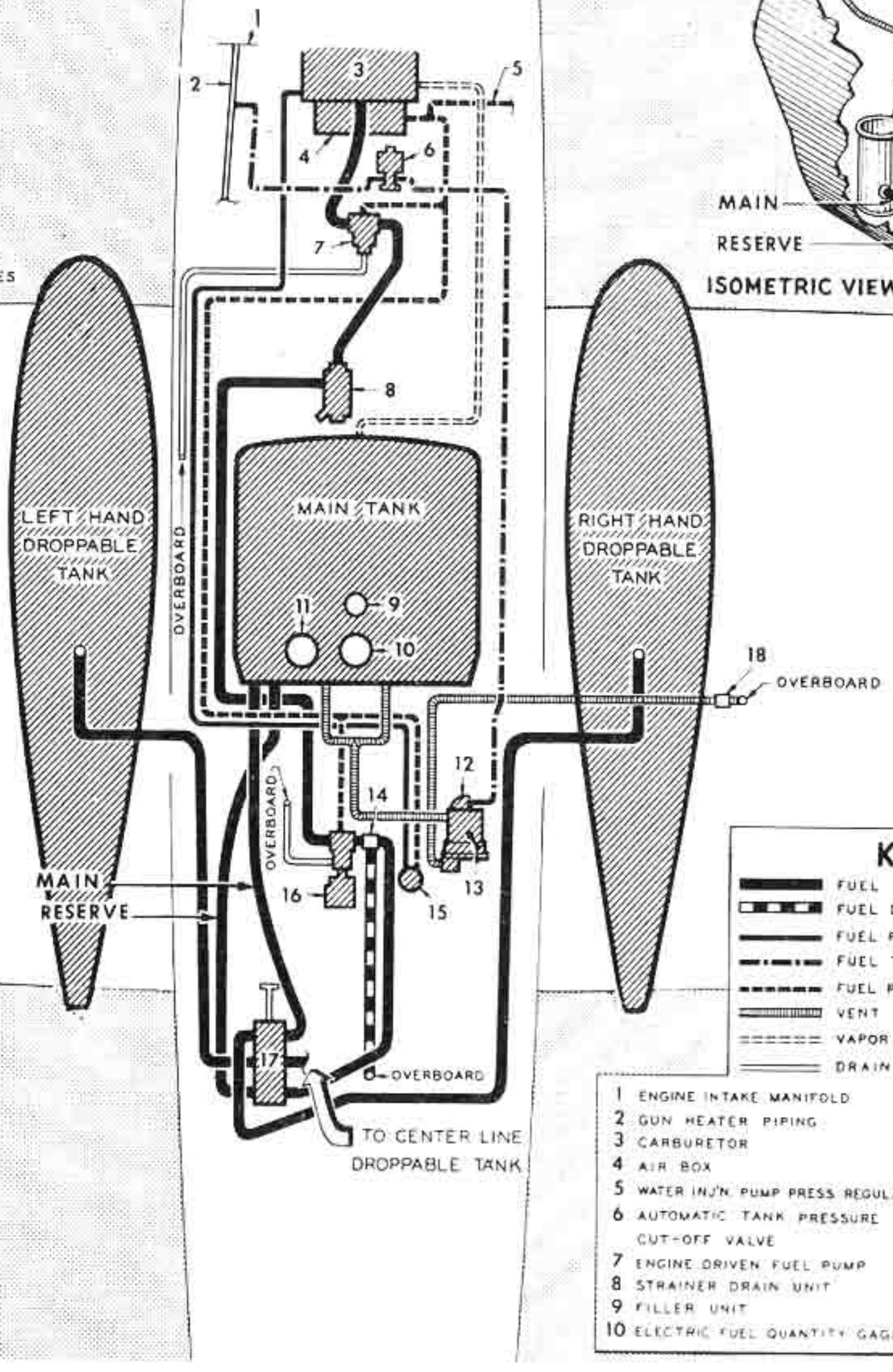


FUEL SELECTOR DIAL

NOTE: DIAL SHOWS DESIGN CAPACITIES SEE TEXT FOR ACTUAL CAPACITIES



ISOMETRIC VIEW OF MAIN TANK



KEY

- FUEL
- FUEL DRAIN (DEFUELING)
- FUEL PRESSURE INDICATING
- FUEL TANK PRESSURIZING
- FUEL PUMP PRESS. REGULATING
- VENT
- VAPOR RETURN
- DRAIN

1 ENGINE INTAKE MANIFOLD
2 GUN HEATER PIPING
3 CARBURETOR
4 AIR BOX
5 WATER INJ'N. PUMP PRESS. REGULATING
6 AUTOMATIC TANK PRESSURE CUT-OFF VALVE
7 ENGINE DRIVEN FUEL PUMP
8 STRAINER DRAIN UNIT
9 FILLER UNIT
10 ELECTRIC FUEL QUANTITY GAGE
11 VACUUM RELIEF VALVE
12 TANK PRESSURE REGULATOR
13 MANUAL CONTROL
14 DEFUELING VALVE
15 FUEL PRESSURE GAGE
16 ELEC. AUXILIARY FUEL PUMP
17 FUEL SELECTOR VALVE
18 VENT CHAMBER
19 STANDPIPE
20 DRAIN

Figure 9—Fuel System Control Diagram on Airplanes with Twin Pylon Droppable Tanks

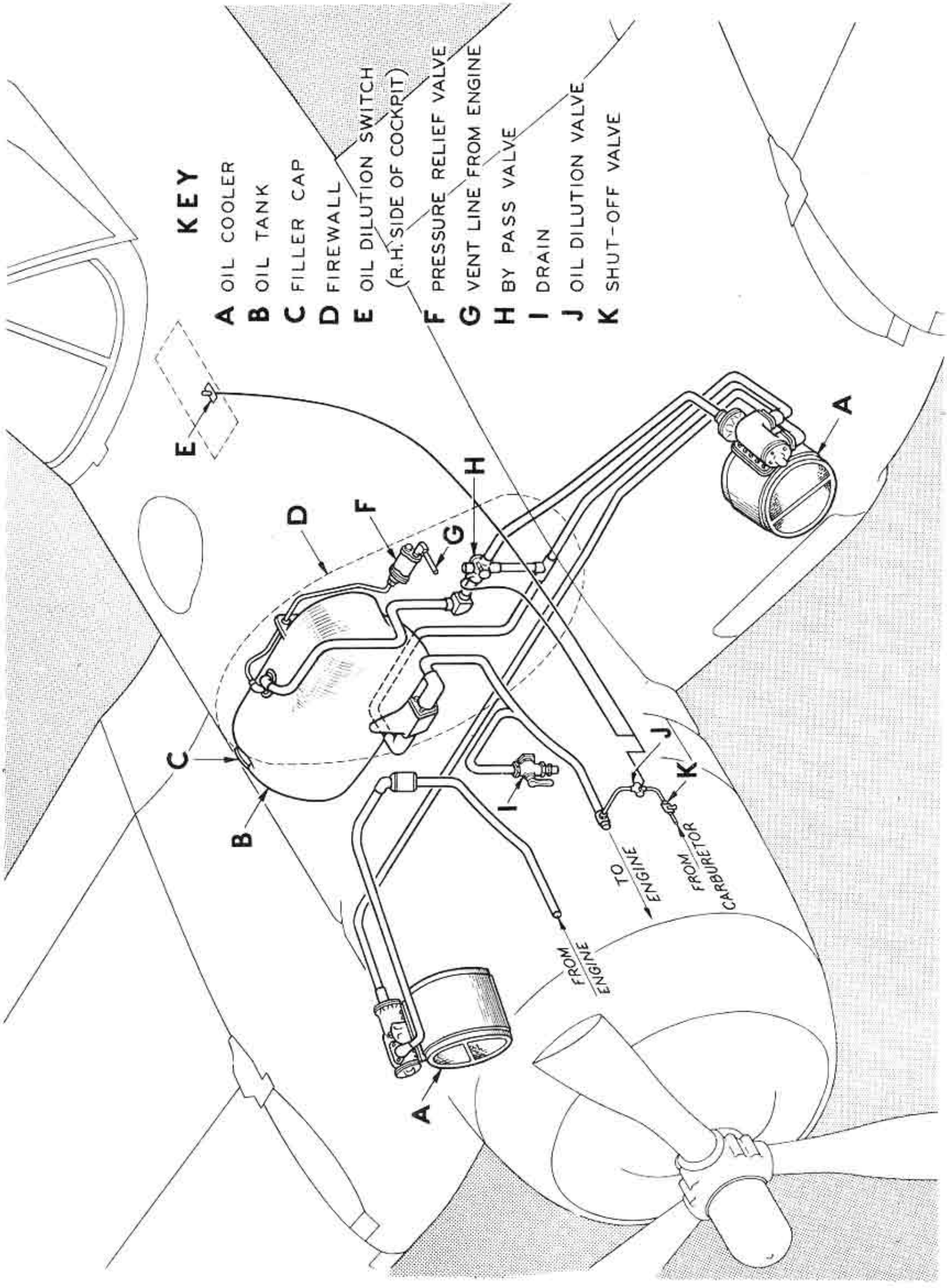


Figure 10—Oil System Control Diagram

below the main instrument panel. (Refer to Section II, paragraph 4.*b*.(6) for operation of the regulator.)

d. OIL SYSTEM CONTROLS.

(1) GENERAL.—The oil system is shown on figure 10.

(a) OIL.—Grade: 1100

Specification: AN-VV-O-446.

(2) OIL TANK.—The oil tank, located just forward of the firewall, has a capacity of 20 U.S. gallons (17 Imp. gallons).

(3) OIL COOLERS.—The oil coolers, mounted just aft of the airduct openings in the wings, are provided with thermostatic regulator valves set to maintain the oil temperature at 60 to 80°C. (140 to 176°F.).

(4) OIL DILUTION SYSTEM (if installed)

(a) The oil dilution switch is located on the right hand panel in the cockpit. The purpose of oil dilution is to reduce the cranking torque of the engine and to provide a sufficient amount of low viscosity oil for lubrication when starting an engine at temperatures near or below the pour point of the oil. This is accomplished by diluting the oil in the engine and quick warm-up circuit of the oil system with gasoline in the manner described in Section II, paragraph 22.*c*. prior to stopping the engine. Oil dilution can be effected only when the engine is running. Never dilute subsequent to starting a cold engine having undiluted oil as it will not be of any aid in starting and may cause trouble.

e. HYDRAULIC SYSTEM CONTROLS *(See Figures 17 to 23)*.

(1) HYDRAULIC OIL: Specification: AN-VV-O-366 (red fluid).

(2) GENERAL. — An engine-driven hydraulic pump, pressure regulator and accumulator combine to maintain a constant pressure of 900 to 1150 pounds per square inch, indicated by the gage located on the right hand sub-instrument panel in the cockpit. After a hydraulic control is moved, the pressure will drop and vary while the items are moving, and then become steady after the movement is completed. A hand pump is provided for use when the engine is not running or in event of failure of the engine-driven pump.

(3) LANDING GEAR CONTROL.

CAUTION

The landing gear control must be at "DOWN" at all times when the airplane is on the ground.

(a) To operate the landing gear retraction and extension, the control is moved to and locked in the desired position. The gear and the closure doors are automatically operated in proper sequence. The positions of each side of the landing gear and of the tail wheel are shown by the respective indicators.

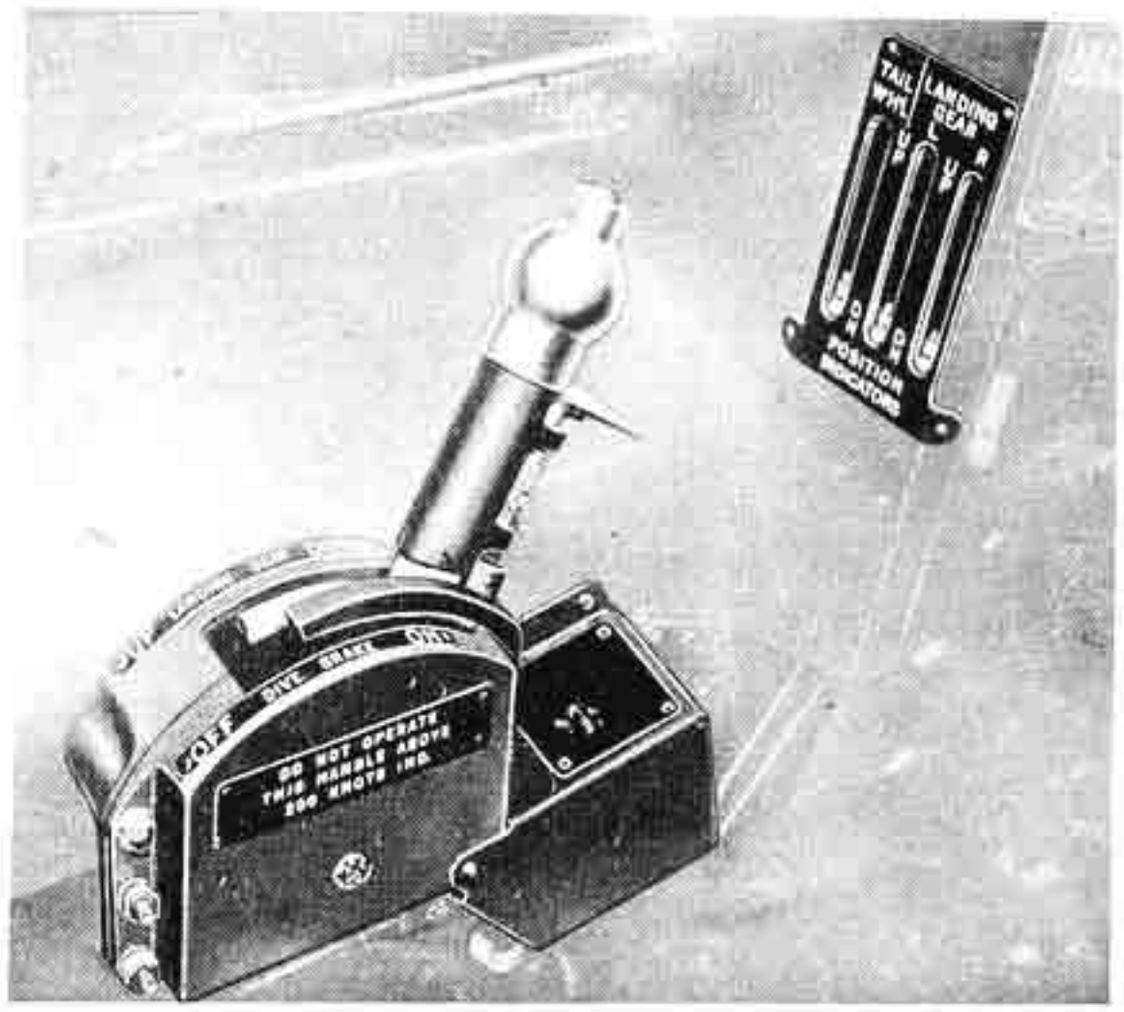


Figure 11—Landing Gear and Dive Brake Control

CAUTION

The landing gear must not be extended in excess of 200 knots because serious damage to the tail wheel doors may result from the high air loads at higher speeds, if the doors are open.

(4) DIVE BRAKE CONTROL.—The shift-type dive brake control is located on the left side of the cockpit (see figure 11). Moving the control to "ON" extends the main landing gear only, the tail wheel remaining retracted. Moving the dive brake control to "OFF" retracts the main landing gear. For dive brake flight restrictions see Section II, paragraphs 1.*a*. and 19.*c*.

Figure 12—Arresting Hook Control

(5) ARRESTING HOOK CONTROL.—Three settings for the arresting hook control, located on the right hand panel, are provided; "UP," "DOWN," and "PARKING." To lower the hook (tail wheel extended) move the handle to "DOWN," and vice versa. At all times, except on arrested landings and when the airplane is on the ground, the hook control should be at "UP."

(a) During combat, the arresting hook control can be placed in the "PARKING" position, thus isolating the hydraulic line to the arresting hook from the rest of the hydraulic system and thereby preventing loss of fluid in the event of damage by gunfire.

(6) WING FLAP CONTROL.—The flap control mechanism located above the pilot's left hand shelf, is designed so that any desired flap angle in 10° steps to "FULL DOWN" (50°) can be obtained by a corresponding setting of the wing flap control.

(a) Due to the mechanical nature of the slide in the flap valve, the desired flap setting may not be obtained exactly when retracting the flaps from a greater to a lesser intermediate setting unless the flap control is moved slightly past the desired setting and then back to the position desired. The flaps on the right and left sides of the airplane are maintained "in step" by means of a hydraulic flow equalizer which functions only in the extension process. The flow equalizer does not operate when the flaps are moving up, that is, on retraction, or when the flaps are "blowing" up.

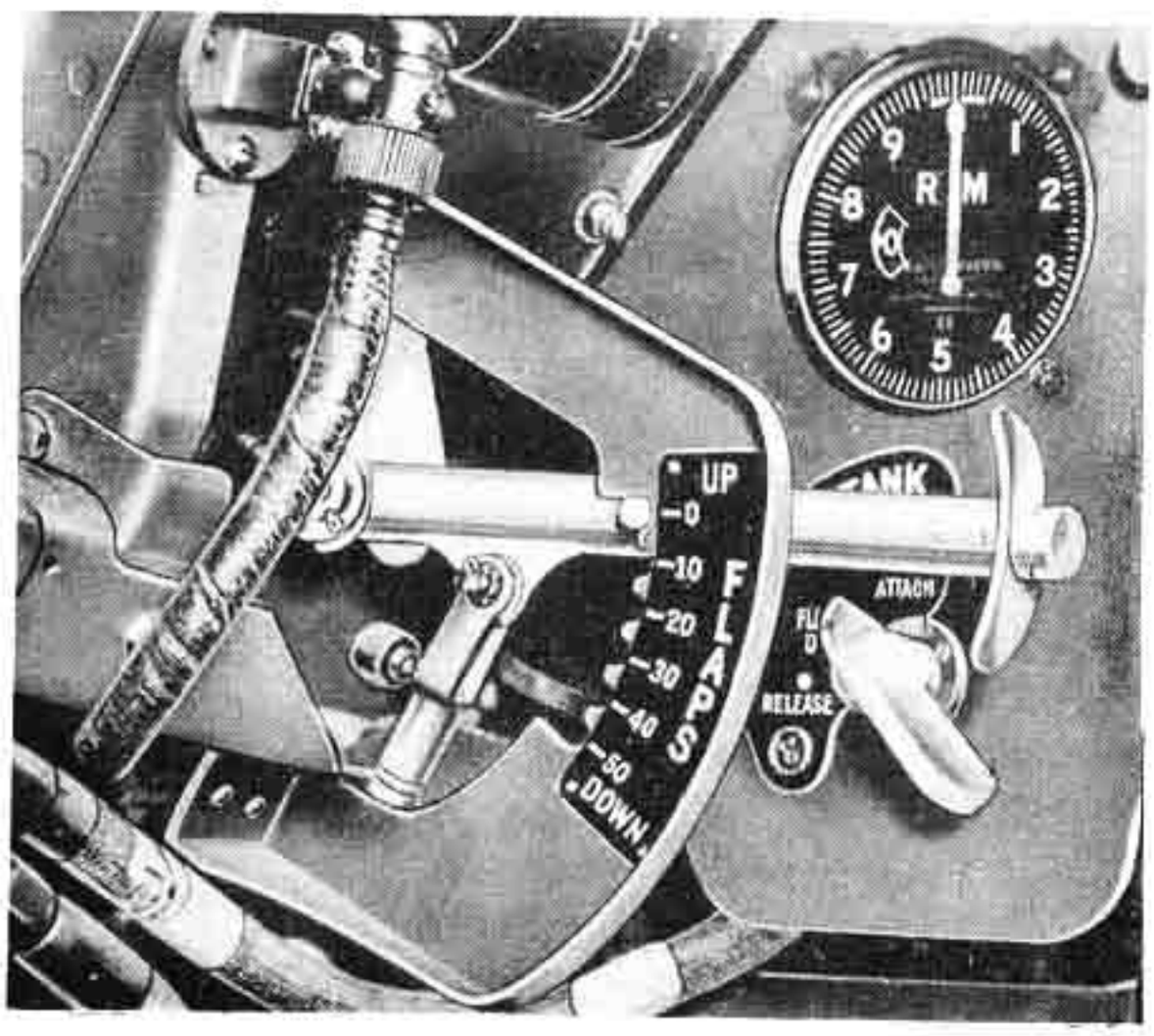


Figure 13—Wing Flap Control

Note

The flow equalizer has been removed from F4U-1 airplanes number 50559 and subsequent and FG-1 airplanes number 76140 and subsequent. As a result, while the airplane is on the ground, one flap may extend before the other upon movement of the flap control. However, this is not cause for alarm because, during all airborne operation, the flaps will operate together by reason of the equal air loads imposed on them.

(b) The wing flap system includes a mechanism which causes the flaps to "blow up" (back off) from the angle set by the control under excessive air loads caused by air speeds greater than normal. The flaps will return to the angle corresponding to the control setting when the air speed is reduced. The mechanism is set so that with flaps set full down (50°) and power on for level flight in the landing condition, they begin to "blow up" at between 90 to 110 knots, indicated. At lesser flap settings, the "blow-up" speeds will be greater than with flaps full down.

Note

The wing flap control shall not be placed in position for lowering flaps at speeds in excess of 200 knots even though the flaps are protected by an overload relief mechanism. If the flap relief mechanism is not in operation, the restricted speed with flaps down varies from 130 knots with flaps deflected 50° to 200 knots with flaps deflected 20°.

(c) The flaps are also designed for use in maneuvering the airplane in combat. With typical maneuvering flap deflections of 20° or less (see Section II, paragraph 15.*a*.) the airplane may be maneuvered at equivalent limiting "flaps up" accelerations up to 200 knots.

(7) WING FOLDING AND LOCKING CONTROLS.—To fold the wings, release the manual wing hinge pin lock handle adjacent to the wing folding control. Then move the wing fold control (located to the left of the pilot) to "FOLD." This operation extracts the wing hinge pins and folds the wings in the proper sequence. With the engine running, the wings will fold automatically; otherwise, the hand pump must be used. To spread the wings, set the wing fold control to "SPREAD." This operation spreads the wings and inserts the hinge pins in proper sequence. When the wings are spread, lock the pins mechanically by pulling and engaging the manual wing hinge pin locking handle in the "LOCK" position.

(a) A visual check that the wings are fully spread and that the wing hinge pins are "home" is provided by the closing doors (painted red inside) at the wing joints. These doors will not close nor the mechanism lock engage until the outer panels are fully spread and the wing hinge pins "home." When the wings are in the full spread position, the manual control for wing hinge pin lock must

Figure 14—Wing Folding and Locking Controls

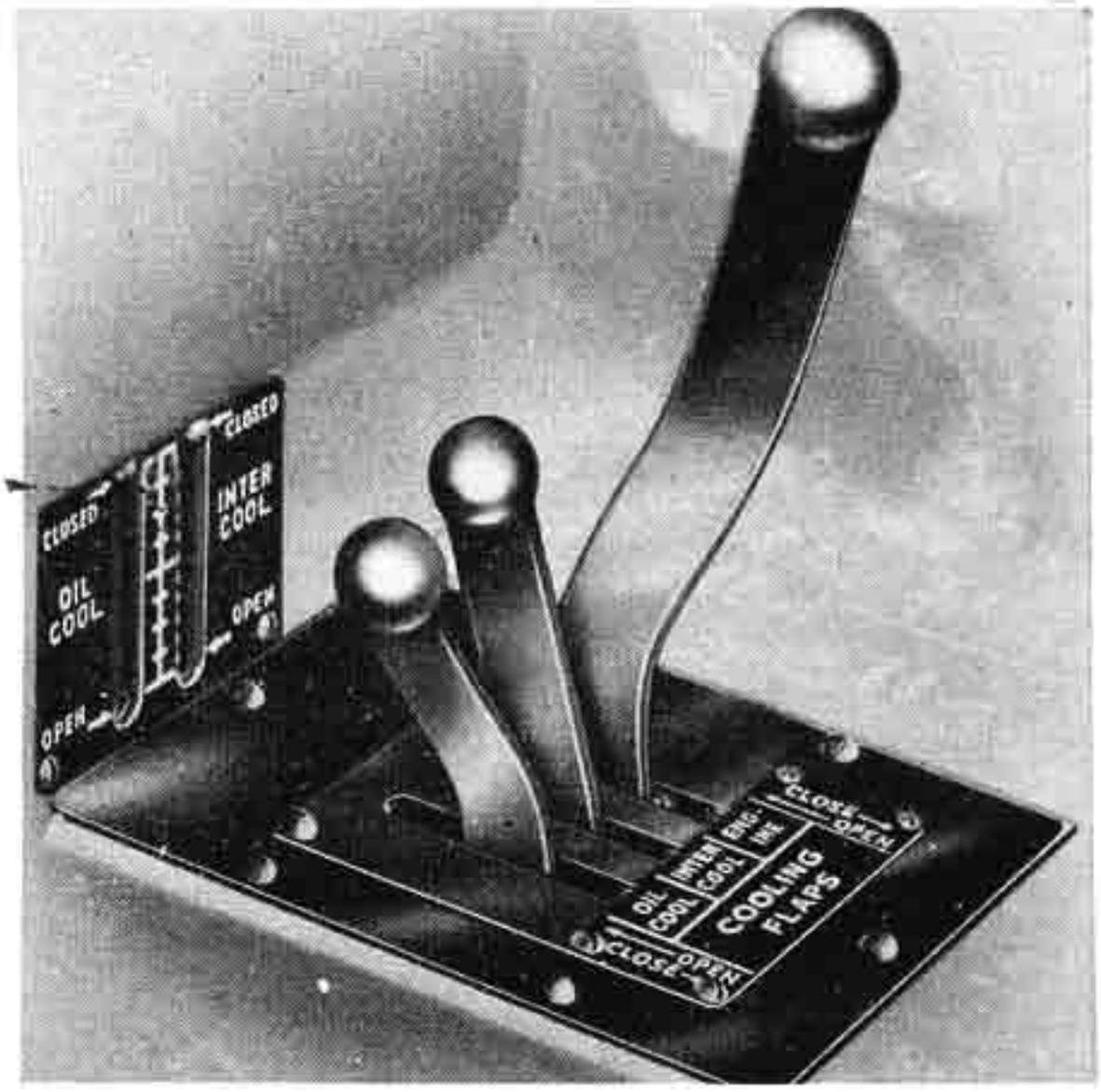


Figure 15—Cooling Flaps Controls and Indicators

be pulled and turned into position moving the lock into place.

WARNING

WING FOLD HANDLE MUST ALWAYS BE IN "SPREAD" POSITION DURING FLIGHT.

(b) No provision is made in the wing folding part of the hydraulic system for keeping the outer panels "in step" while being folded or unfolded; viz., no flow equalizer is installed. The wings must not be left free in any intermediate position between fully spread and fully folded as air loads will cause the wings to shift position, blowing one down and the other up. When fully folded, the wings should be locked by means of the jury struts provided. When the wings are fully folded and the jury struts installed, they may, by temporarily unlocking the jury struts, be moved to vertical for refueling and gun servicing by the action of the accumulator, if the pressure is up, or by the hand pump. The jury struts are telescopic, with a limit stop at the vertical position.

Note

If the wing fold control is moved to "FOLD" before the manual wing hinge pin lock is released, damage to wing fold mechanism will result. Thus, when starting to fold the wings, be sure that the manual wing hinge pin lock is released before the wing fold control is moved to "FOLD."

(8) COOLING FLAPS CONTROLS.—The control levers for the cowl, oil cooler, and intercooler flaps are spring-loaded and must be held at either "OPEN" or "CLOSED" until the desired setting is obtained, then released. The positions of the oil cooler and intercooler flaps are shown by the respective indicators located just above the controls on the right side of the cockpit. A pressure relief valve is incorporated in the cowl flaps to blow toward "OPEN," while they are able to blow toward "CLOSED" against a spring load when under excessive air load. After having blown open they will not automatically return to the original setting when the speed decreases. A relief valve is incorporated on the "down" line to the oil cooler strut and on both "up" and "down" lines to the intercooler strut.

(9) GUN CHARGING CONTROLS.

(a) The fixed guns are hydraulically charged. The top gun charging knob, located on the left hand side of the cockpit, just below the main instrument panel, operates the charging and safetying of the three right guns while the lower knob controls the three left guns.

(b) To charge the guns, rotate the knob to "CHARGE," then push in. The knob will spring back out, indicating completion of the cycle of operation. The breeches are now closed, with live shells in the firing chambers. If the gun has been charged previously, one shell will be lost in this operation.

(c) To safety the guns, turn the charging knob to "SAFE" and push in. The knob will spring out when the guns are safe. The gun chargers will then hold the bolts back in the "SAFE" position To allow the bolts to go forward from "SAFE" to "CHARGE," simply turn the knobs to "CHARGE."

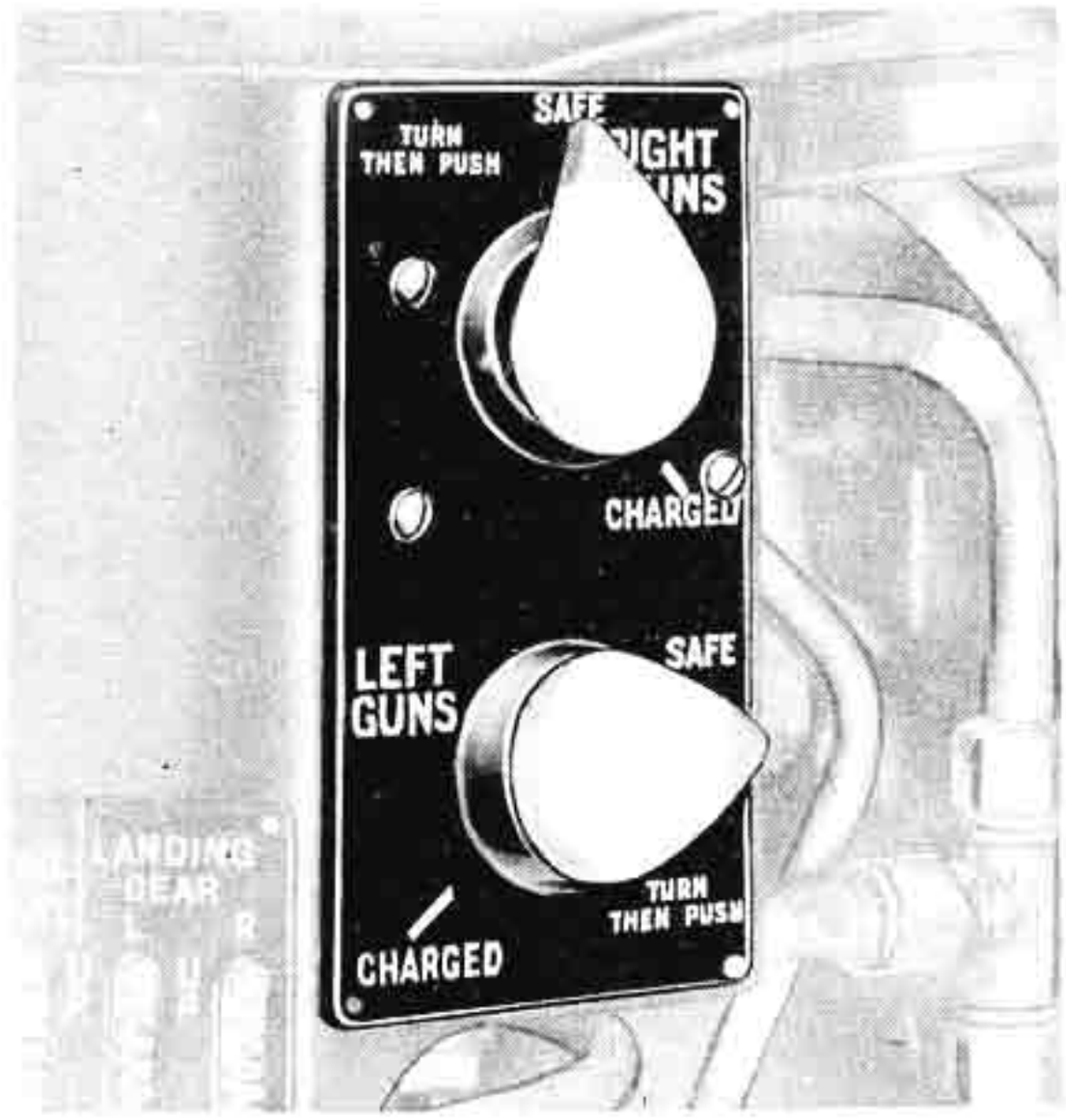


Figure 16—Gun Charging Controls

(d) It should be noted that simply rotating the knob to "SAFE" does not safety the guns unless the knob is subsequently pushed in. No ammunition is lost in pushing the knob in while in the "SAFE" position and hence, if in any doubt, no harm is done by pushing the knob in again for the pilot's own reassurance.

CAUTION

Always safety the guns before landing.

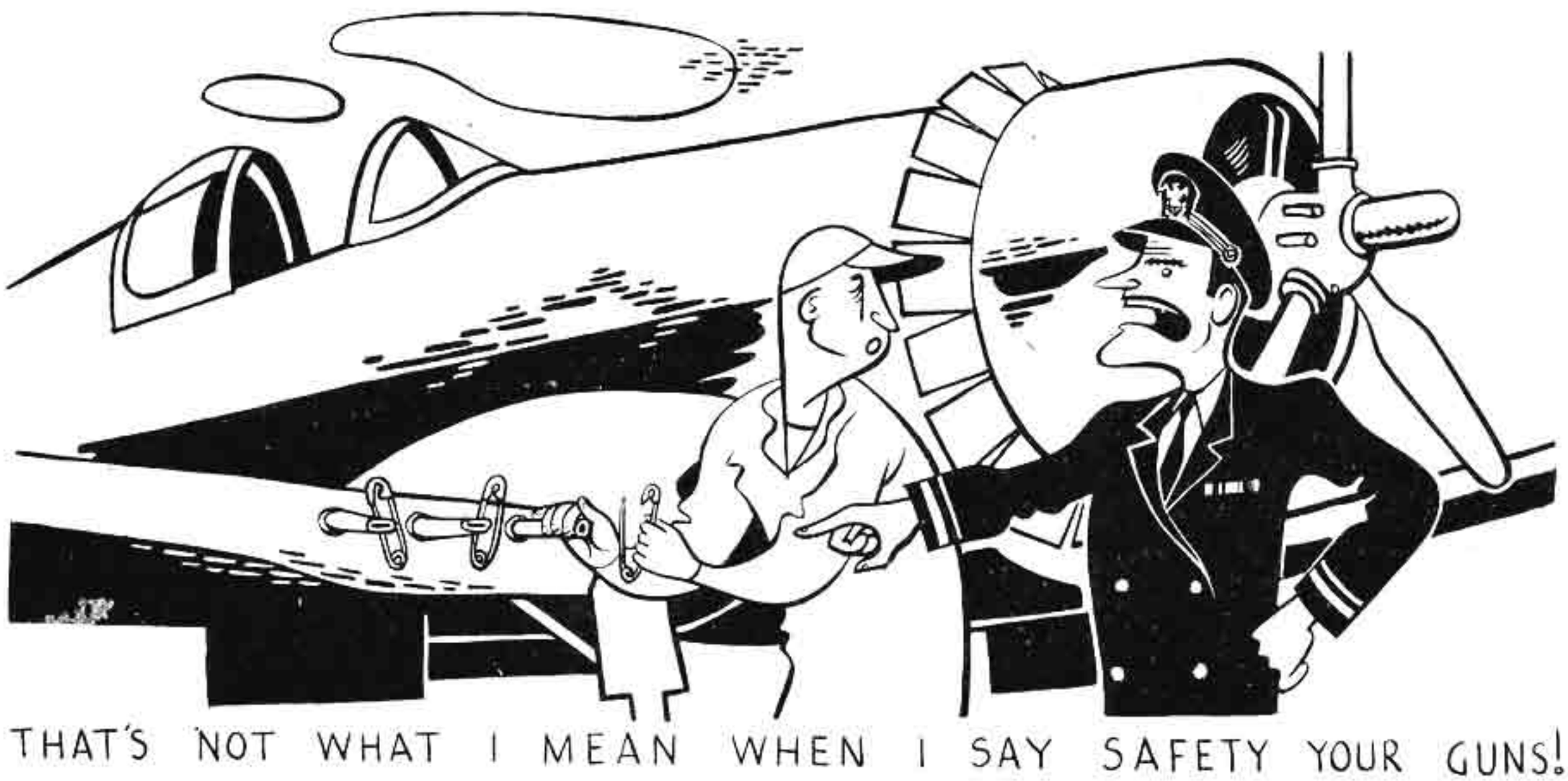
(e) To clear jams during flight, charge the guns a few times. The ejected cartridges can be seen passing the trailing edge of the outer panel flap.

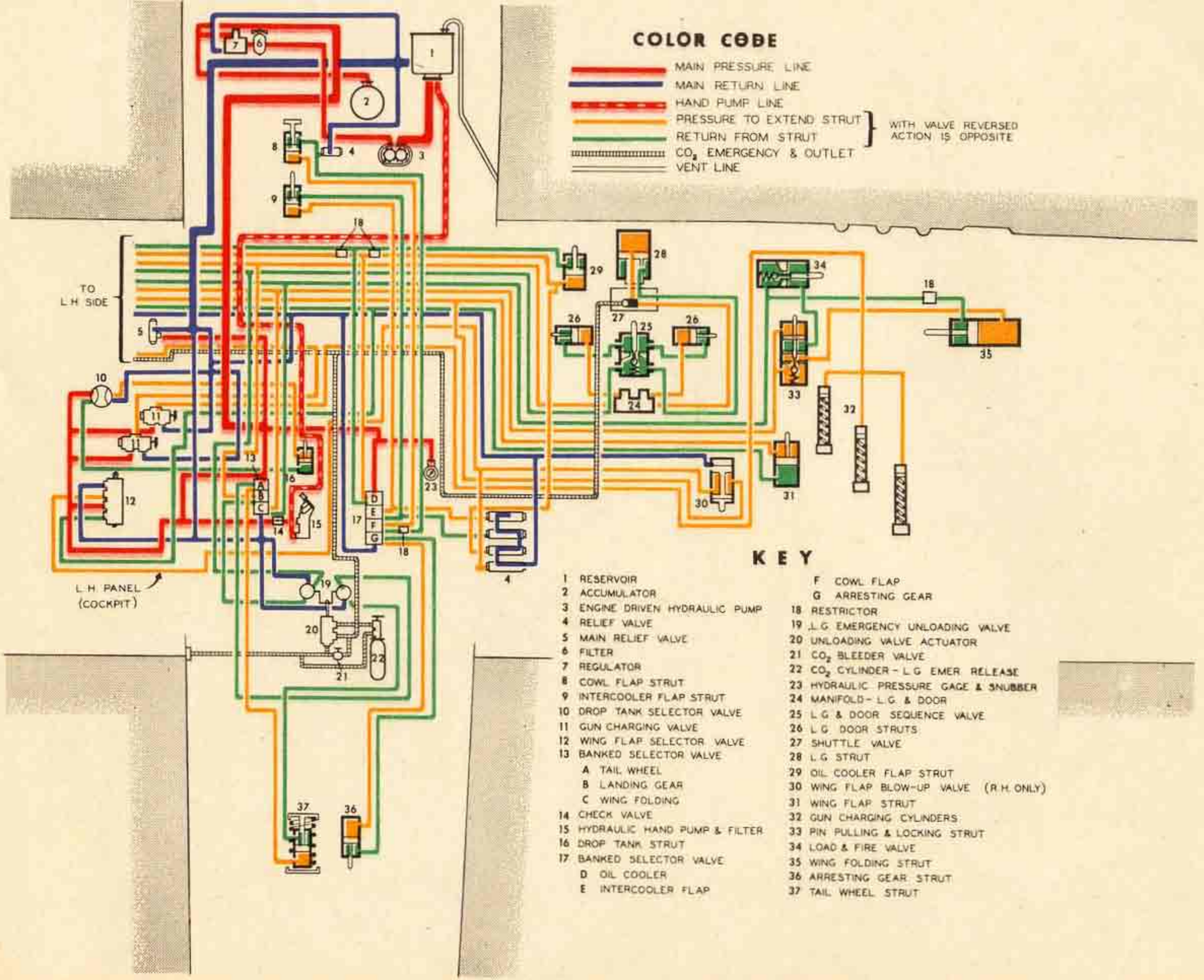
(10) HYDRAULIC SYSTEM HAND PUMP.—The feed for the hand pump is drawn from the bottom of the hydraulic reservoir, while that for the engine-driven pump is drawn from the ½ gallon level. In the event that failure of a hydraulic pressure line allows the engine-driven pump to pump overboard all of its available fluid, the ½ gallon of hydraulic oil remaining in the tank is sufficient for one operation each, by use of the hand pump, of the following: wing flaps, cooling flaps, and gun charging. The arresting hook does not require hydraulic pressure for extension. Emergency landing gear extension is provided for by CO_2 extension system. See Section IV, paragraph 2, and refer to figure 3.

Note

If it is known that the hydraulic system has lost fluid, the landing gear should be lowered by means of the emergency extension system, conserving the remaining fluid for lowering the wing flaps, etc.

(11) HAND PUMP CHECK VALVE.—Prior to F4U-1 airplane number 50559 and FG-1 airplane number 76140, a hand pump check valve is installed in the hydraulic system. When this valve is turned to "GROUND" it is possible to maintain accumulator pressure with the hand pump when the airplane is on the ground and the engine is not running; it is normally in the "FLIGHT" position for all airborne operations.





KEY

1 RESERVOIR
2 ACCUMULATOR
3 ENGINE DRIVEN HYDRAULIC PUMP
4 RELIEF VALVE
5 MAIN RELIEF VALVE
6 FILTER
7 REGULATOR
8 COWL FLAP STRUT
9 INTERCOOLER FLAP STRUT
10 DROP TANK SELECTOR VALVE
11 GUN CHARGING VALVE
12 WING FLAP SELECTOR VALVE
13 BANKED SELECTOR VALVE
- A TAIL WHEEL
- B LANDING GEAR
- C WING FOLDING

14 CHECK VALVE
15 HYDRAULIC HAND PUMP & FILTER
16 DROP TANK STRUT
17 BANKED SELECTOR VALVE
- D OIL COOLER
- E INTERCOOLER FLAP
- F COWL FLAP
- G ARRESTING GEAR

18 RESTRICTOR
19 L.G. EMERGENCY UNLOADING VALVE
20 UNLOADING VALVE ACTUATOR
21 CO_2 BLEEDER VALVE
22 CO_2 CYLINDER - L.G. EMER. RELEASE
23 HYDRAULIC PRESSURE GAGE & SNUBBER
24 MANIFOLD - L.G. & DOOR
25 L.G. & DOOR SEQUENCE VALVE
26 L.G. DOOR STRUTS
27 SHUTTLE VALVE
28 L.G. STRUT
29 OIL COOLER FLAP STRUT
30 WING FLAP BLOW-UP VALVE (R.H. ONLY)
31 WING FLAP STRUT
32 GUN CHARGING CYLINDERS
33 PIN PULLING & LOCKING STRUT
34 LOAD & FIRE VALVE
35 WING FOLDING STRUT
36 ARRESTING GEAR STRUT
37 TAIL WHEEL STRUT

Figure 17—Hydraulic System Overall Diagram

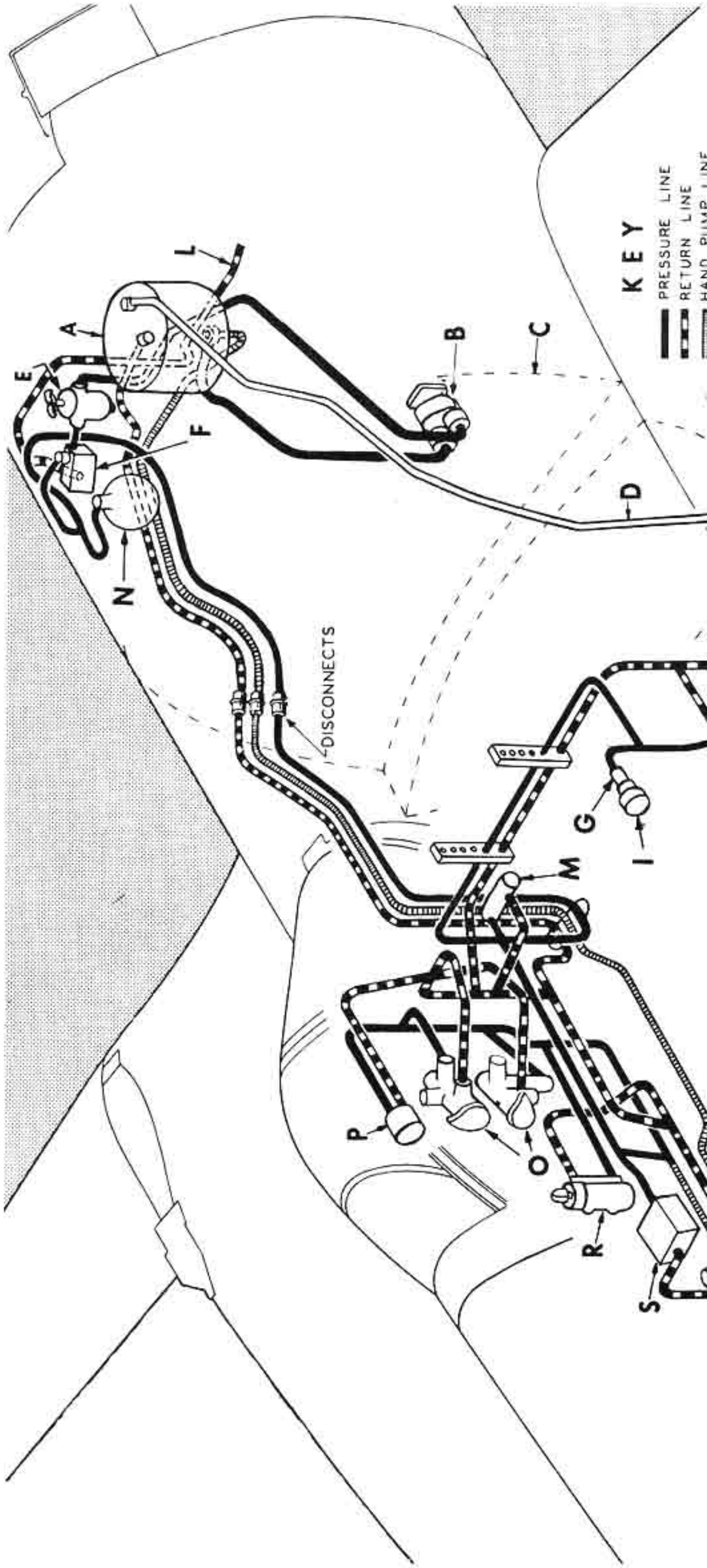


Figure 18—Hydraulic System Power Supply

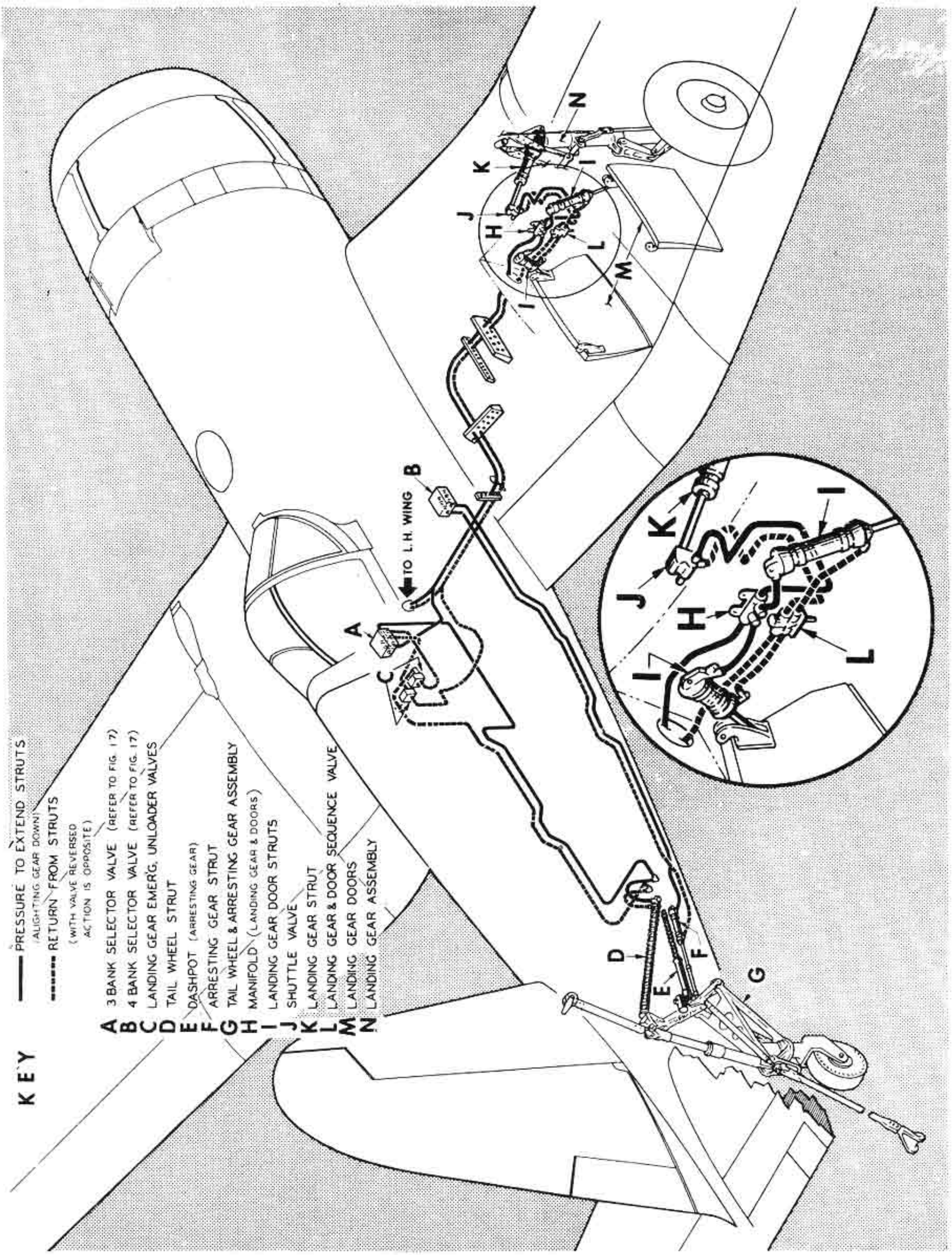


Figure 19—Alighting Gear Hydraulic System

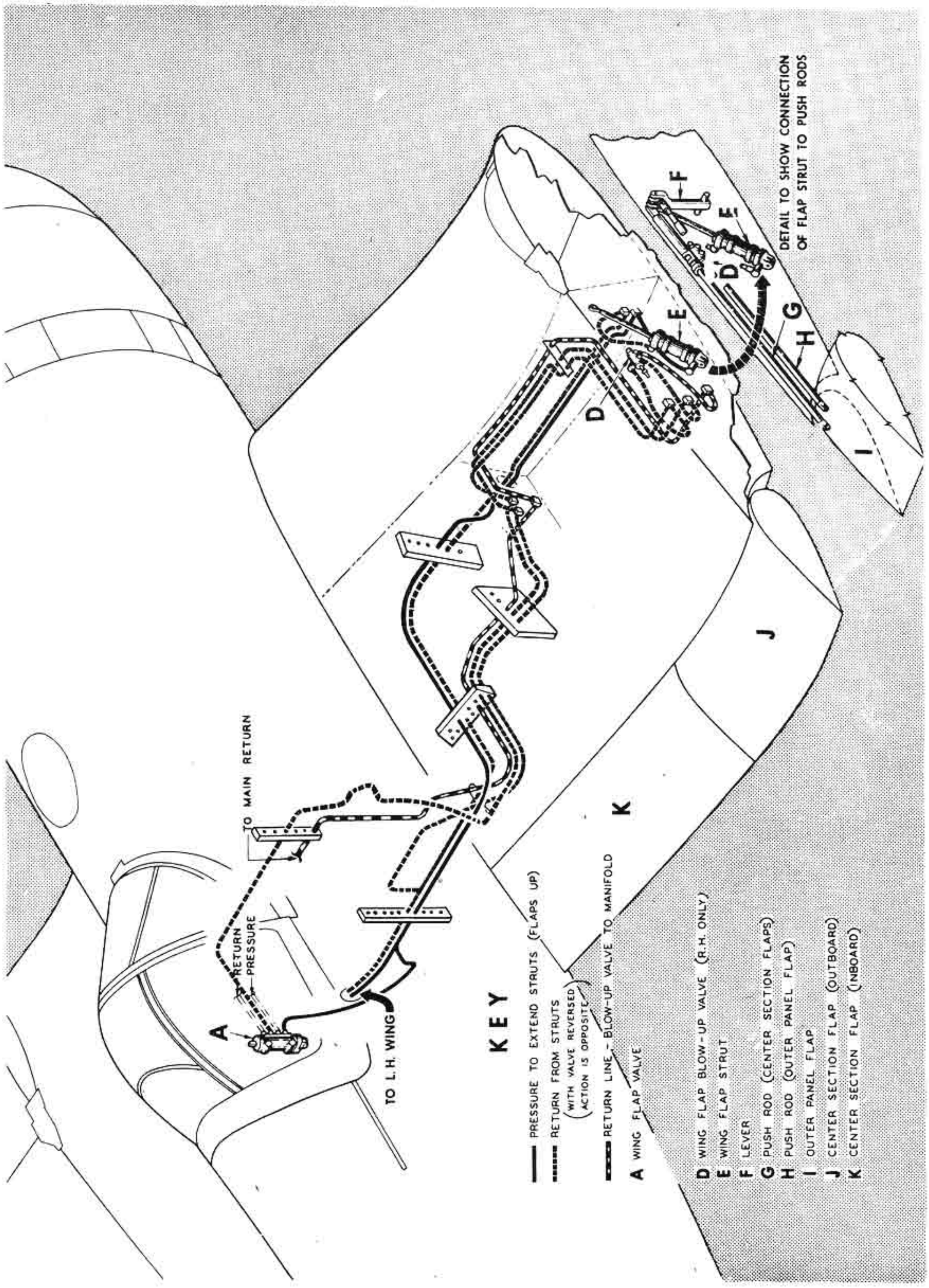


Figure 20—Wing Flaps Hydraulic System

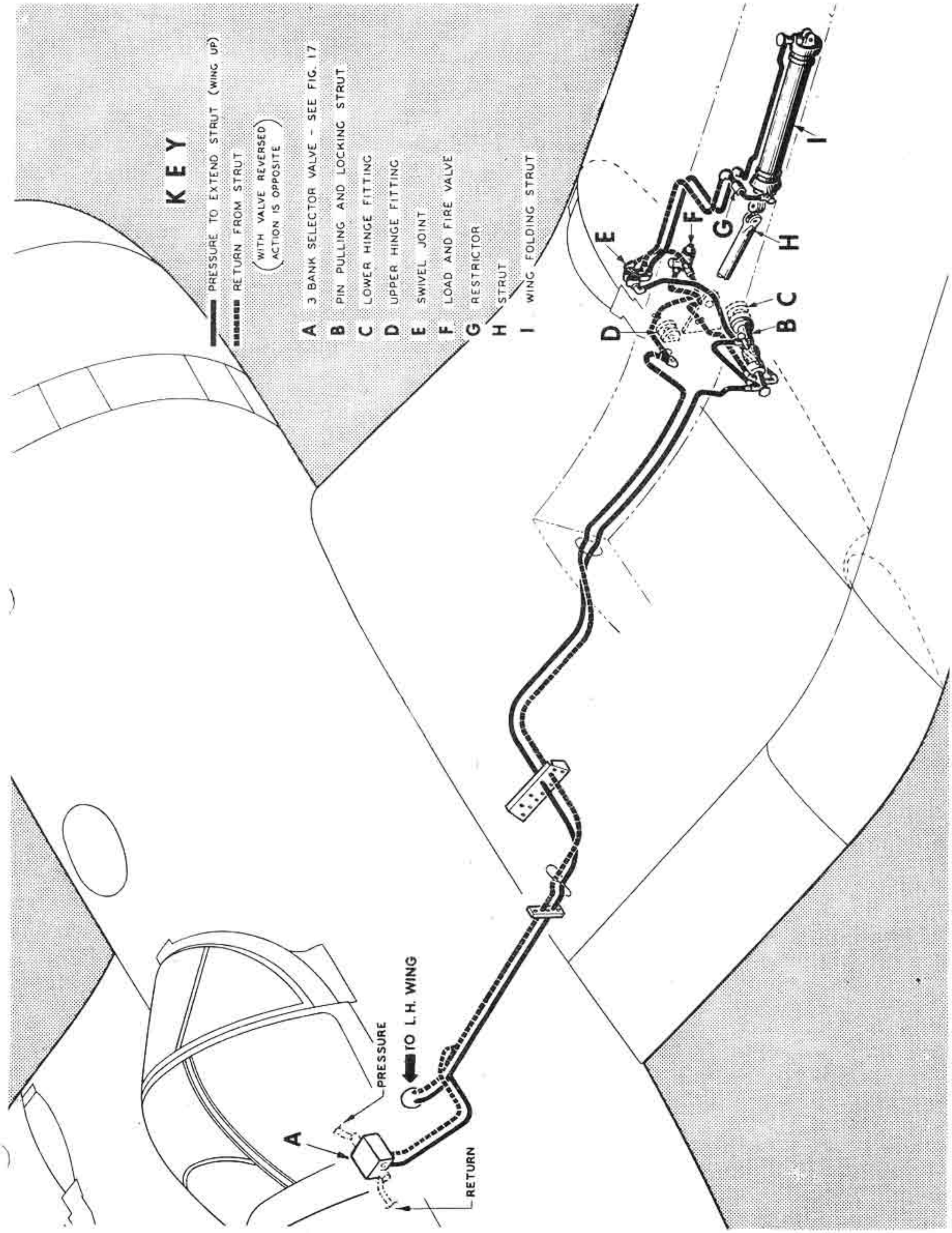


Figure 21—Wing Folding Hydraulic System

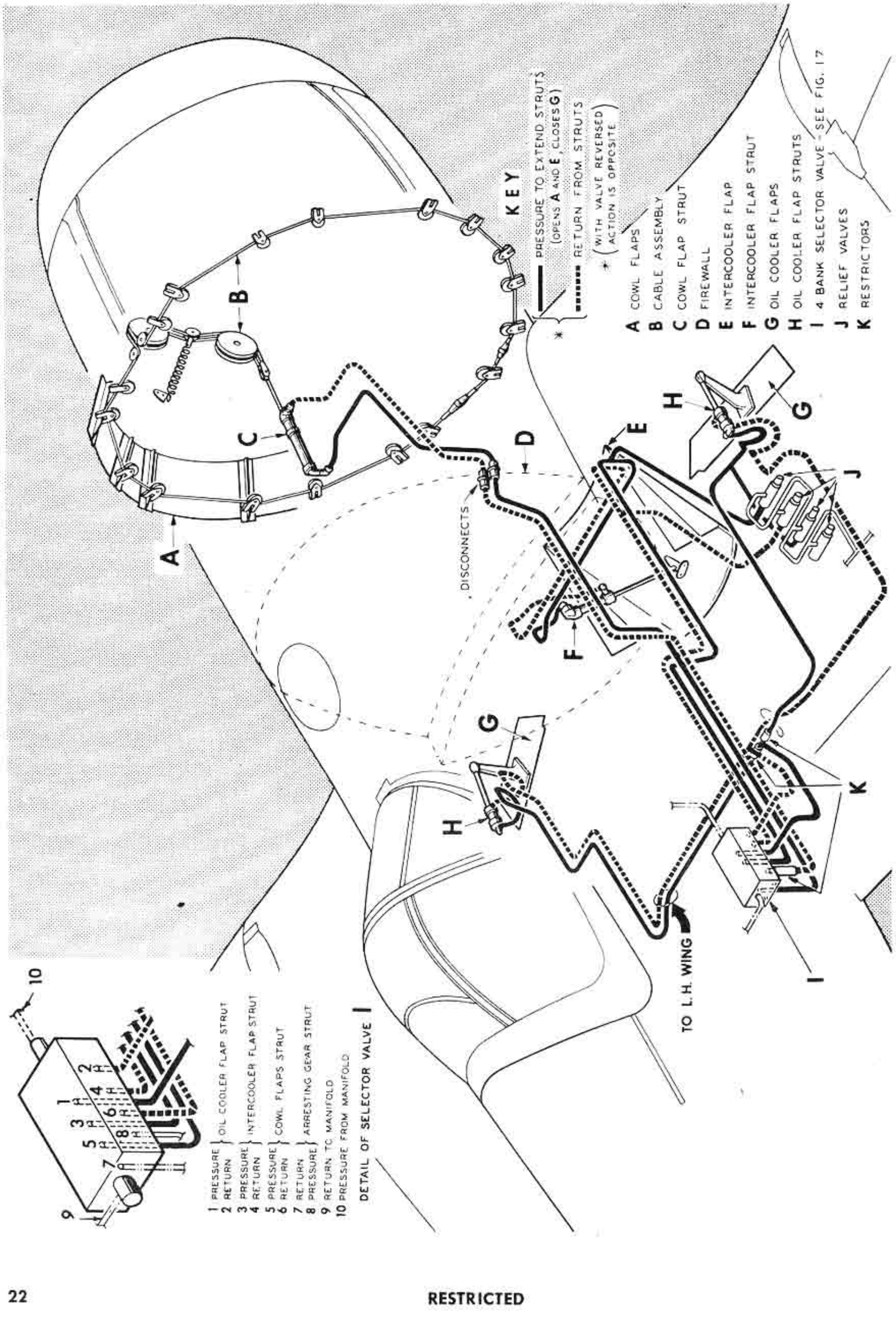


Figure 22—Cooling Flaps Hydraulic System

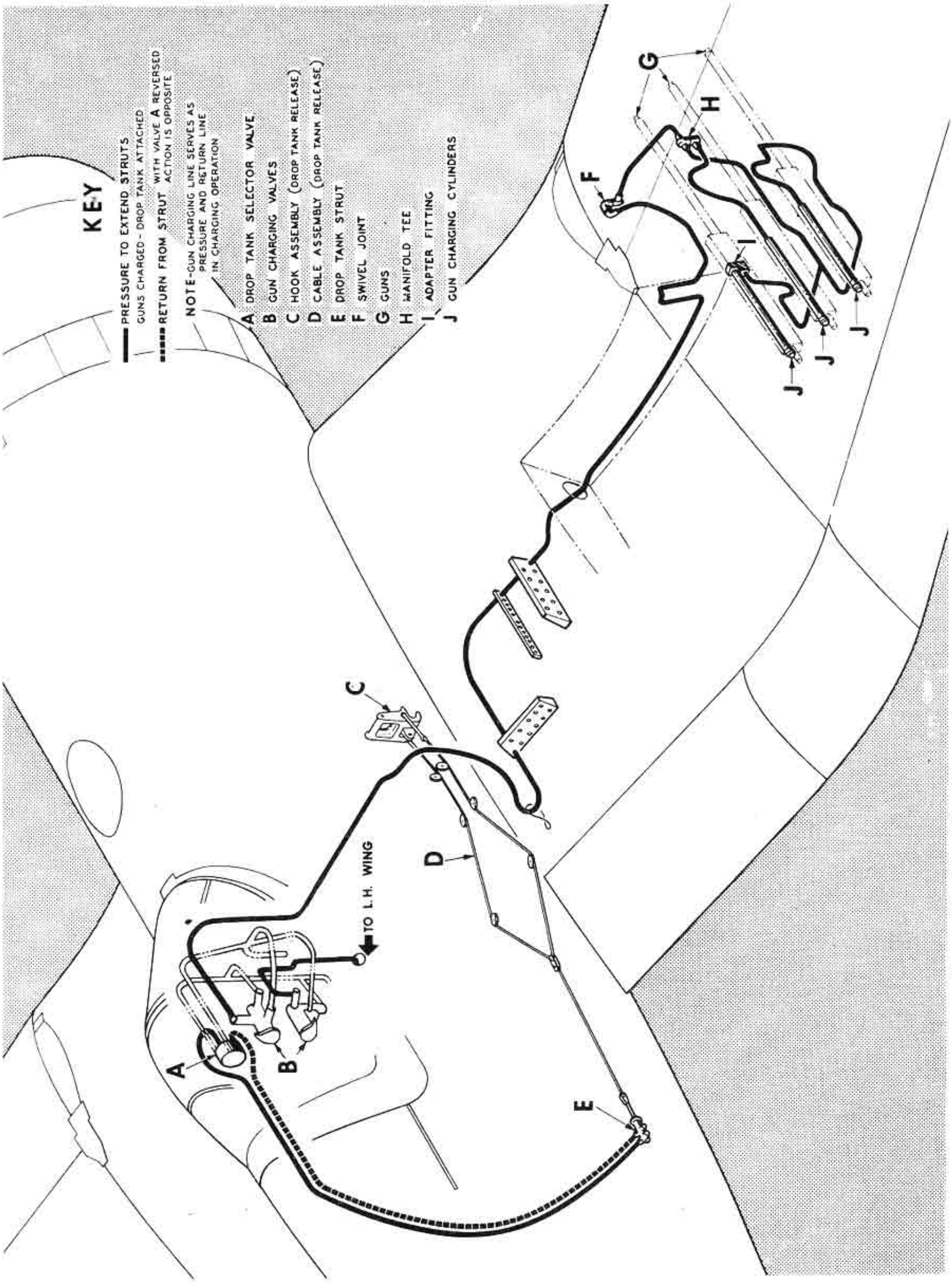


Figure 23—Gun Charging and Center Line Drop Tank Hydraulic Systems

f. TRIM TAB CONTROLS.—Trim tabs are provided on the left wing aileron, on the elevators, and on the rudder to permit control forces to be trimmed to comfortable values under all normal operating conditions. Refer to figure 24.

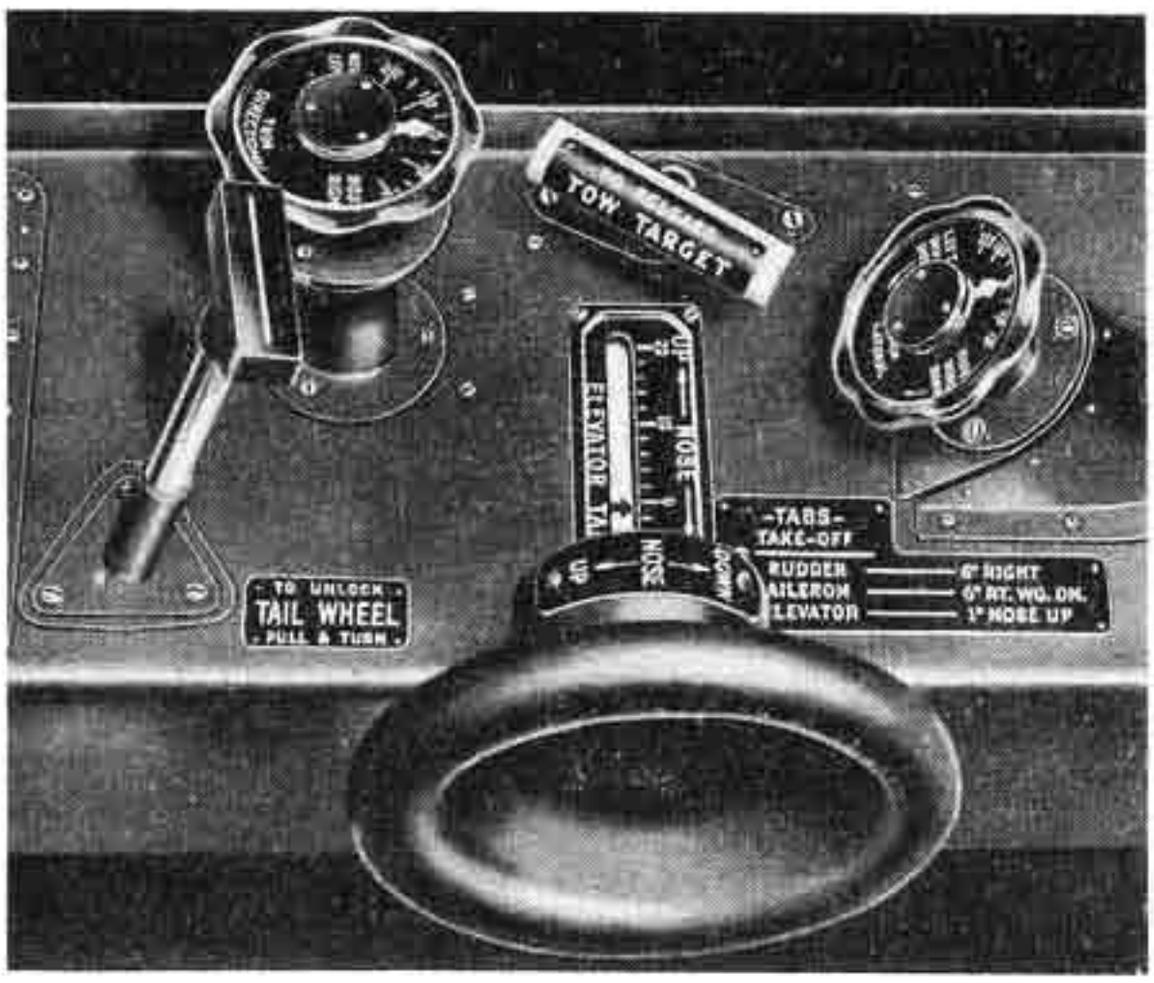


Figure 24—Trim Tab Controls and Tail Wheel Lock

(1) AILERON TAB CONTROL.—Rotating the aileron tab control (inclined wheel on left hand shelf) to the right results in a downward movement of the right wing in flight. Rotating the hand wheel to the left results in upward movement of the right wing.

(2) ELEVATOR TAB CONTROL.—Rotating the elevator trim tab control (large vertical wheel on the side of the left hand shelf) forward lowers the nose of the airplane in flight. Aft rotation raises the nose.

CAUTION

In order to improve stick forces in the landing condition, some of these airplanes are equipped with a heavy bungee spring, connected to the elevator control and the tail wheel door mechanism, which becomes effective when the landing gear control is moved to the "DOWN" position. Because of this it is necessary to watch for a change of trim when raising or lowering the landing gear on airplanes equipped with the bungee spring.

(3) RUDDER TAB CONTROL.—Rotating the rudder tab control (horizontal hand wheel on left hand shelf) to the right moves the nose of the airplane to the right in flight. Rotating the hand wheel to the left moves the nose of the airplane to the left.

g. BALANCE TABS.—Balance tabs are provided on the ailerons and elevators in order to reduce the stick forces. These tabs require no control, since they are linked directly to the control surfaces. Down movement of the ailerons and elevators causes up movement of the tabs, and vice versa.

b. MISCELLANEOUS CONTROLS AND EQUIPMENT.

(1) GENERAL.—Other controls and equipment, not discussed below, are located in Sections IV and V, as follows:

(a) Emergency Egress—Section IV, paragraph 1.

(b) Emergency Landing Gear Operation—Section IV, paragraph 2.

(c) Life Raft—Section IV, paragraph 3.

(d) Operation of Oxygen Equipment—Section V, paragraph 1.

(e) Operation of Radio Equipment—Section V, paragraph 2.

(f) Operation of Electrical Equipment—Section V, paragraph 3.

(g) Operation of Armament—Section V, paragraph 4.

(2) RUDDER PEDAL ADJUSTMENT.—The position of the rudder pedals is adjustable to suit the comfort of the pilot. By pressing forward and inboard with the heel on the lever located on the after side of the pedal arm while the toe rests on the pedal, the pedals can be shifted fore or aft as desired. A total adjustment of six inches is provided.

(3) TAIL WHEEL LOCK CONTROL.—This control is located on the left hand shelf (see figures 3 and 24). To unlock the tail wheel, pull upward on the control handle and turn.

(4) WINDSHIELD DEFROSTER AND COCKPIT HEATER.—A combustion heater, located in the cockpit, supplies heat for defrosting the windshield and heating the cockpit. The defroster switch, located on the pilot's distribution box, must be moved to the "ON" position before heat can be supplied. The regulator control (refer to figure 2) located on the cowl deck just below the windshield bullet-proof glass, operates a butterfly valve for directing the necessary amount of heat flow to the windshield when turned to "DEFROST." When the regulator control is not set for maximum heating flow for defrosting, the remaining heat is by-passed into the cockpit. For heating:

(a) Defroster switch—"ON."

(b) Regulate required amount of heat to windshield or cockpit.

(5) FRESH AIR CONTROL.—The ventilator for supplying fresh air to the cockpit is located forward of and between the foot troughs. Adjustment, to vary the amount of fresh air, can be made by rotating the butterfly valve by foot. See figure 2.

(6) SHOULDER HARNESS.—The locking handle for the shoulder harness is located on the left side of the seat. The length of the traps should be so adjusted as to provide a snug fit with the handle locked (forward). Relea ing the handle will permit the pilot to lean forward and reach the desired controls.

WARNING

Under no circumstances should the shoulder harness be omitted, using the seat belt only, since, without the shoulder straps connected, the belt release may bind on attempting to open it.

(7) FLYING SUIT RECEPTACLE.—The flying suit receptacle is located on the pilot's distribution box. The switch for the receptacle is adjacent. See figure 31.

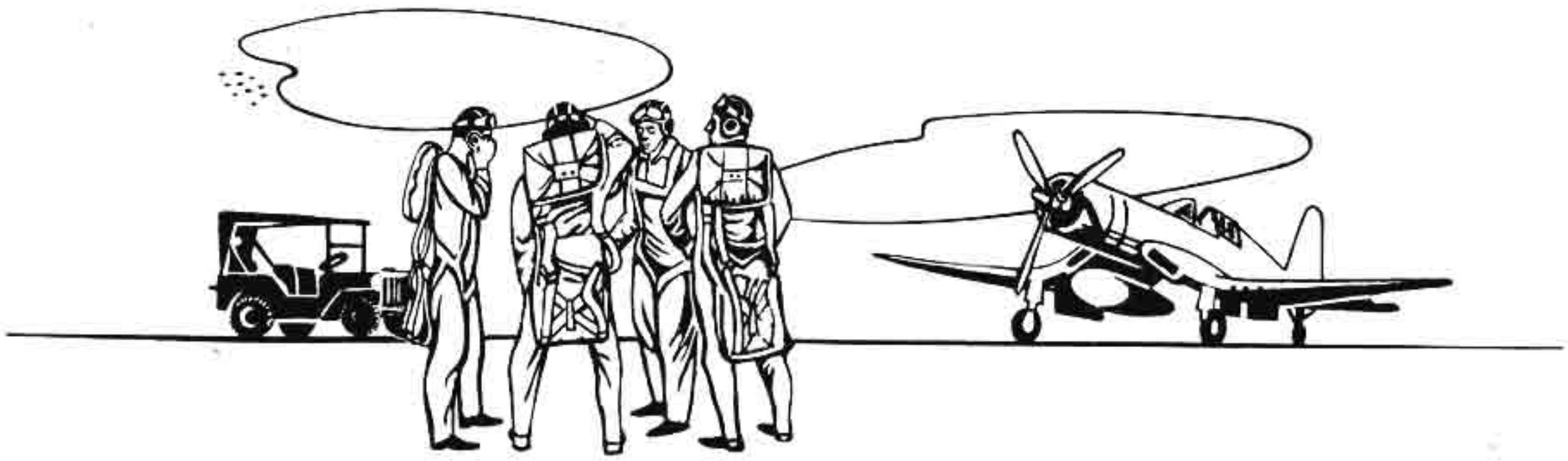
(8) SEAT ADJUSTMENT.—The pilot's seat has a vertical adjustment of nine inches in one-inch increments and is controlled by a handle on the right side of the seat.

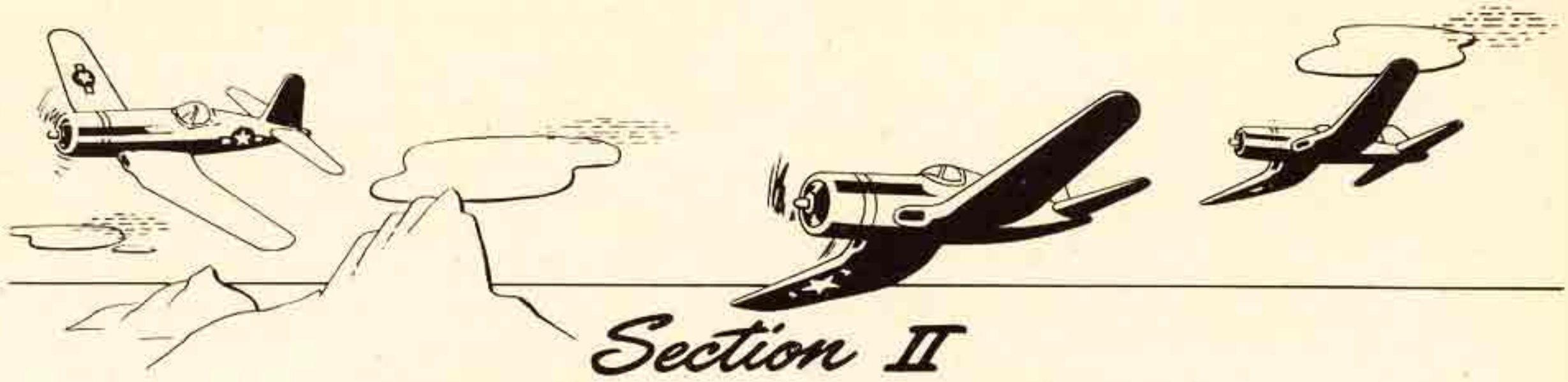
(9) MAP CASE.—The map case is located on the inboard side of the pilot's distribution box. See figure 4.

(10) CHART BOARD.—The chart board is stowed on rails underneath the main instrument board. When used it is pulled out until a pin engages the last hole in the rail. Disengage the lock on the left-hand rail and slide the chart board aft.

(11) REAR-VISION MIRRORS.—The three rear-vision mirrors are located on the after side of the front sliding section frame.

(12) NAVIGATION ANTENNA *(See figure 30)*. —The control for extending and retracting this antenna is located on the right side of the cockpit, just below the cabin track. The antenna is extended by unlatching, pulling the handle aft and latching. The antenna should be extended only when actually being used, since it causes a certain definite, though small, loss in maximum speed (one mph).





Section II

NORMAL OPERATING INSTRUCTIONS

1. BEFORE ENTERING THE COCKPIT:

a. NOTE THE FOLLOWING AIR SPEED LIMITATIONS.

ITEM	OPERATION	RESTRICTION
Airplane	Max. Diving Speed	Dependent on Altitude (See Section II, paragraph 14.*b.*)
Landing Gear	Lowering	200 knots
Dive Brake	Extending or Retracting	395 knots (See Section II, paragraph 19.*c.*)
Wing Flaps		
Blow-up Operating (0° to 50°)	Max. Speed	200 knots
Blow-up Inoperative (0° to 20°)	Max. Speed	200 knots
(20° to 30°)	Max. Speed	170 knots
(30° to 40°)	Max. Speed	145 knots
(40° to 50°)	Max. Speed	130 knots
Cabin	Open	300 knots
Ailerons	Full Throw	300 knots
Cooling Flaps (cowl, intercooler, oil cooler)	Open	No restriction (protected by relief system)
Center Drop Tank	Diving	375 knots
Twin Pylon Drop Tank	Diving	375 knots

THESE LIMITATIONS MAY BE SUPPLEMENTED OR SUPERSEDED BY INSTRUCTIONS INCLUDED IN SERVICE PUBLICATIONS

b. OBTAIN INITIAL GROSS WEIGHT AND LOADING DATA.

(1) GROSS WEIGHT AND LOADING.—It is not necessary to carry ballast to keep the center of gravity from being too far forward even though useful load items such as radio and armament are not installed. On the contrary, extra equipment of appreciable weight should not be carried, as the longitudinal stability, particularly in climb, will be adversely affected.

2. ENTRANCE TO CLOSED AIRPLANE.

a. Entrance to the cockpit is gained from the right side of the airplane. Steps, handgrips, and walkways are provided. The sliding section is controlled internally by a pull handle and externally by a push button (black button on upper forward end of sliding section), either of which unlocks it from the cabin track, permitting it to be slid forward or aft.

3. ON ENTERING THE COCKPIT.

a. BEFORE ALL FLIGHTS:

(1) Adjust the rudder pedals and seat height, if necessary.

(2) Check the controls for freedom of motion and security.

(3) Make sure that the mixture control is in "IDLE CUT-OFF," then turn on the battery switch.

(4) Check the fuel and oil quantity aboard.

(5) Make certain that the wings are spread and locked.

(6) Test operate the gun sight illumination. Spare bulbs are located above instrument panel, right hand side.

(7) See that the gyro-horizon and directional gyro are uncaged.

(8) Check to see that the cabin emergency release pins are secure.

(9) Set the altimeter to the correct barometric pressure.

(10) Test operate the oxygen system as outlined in Section V, paragraph 1 if the flight planned is an oxygen flight.

(11) Check to ascertain that the desired armament load is carried.

(12) See that all armament switches are in the "OFF" position and that the gun charging valves are in the "SAFE" position.

(13) If rockets are carried, remove the rocket safety plug located on the Mark 3 station distributor.

b. BEFORE NIGHT FLIGHTS.

(1) In addition to the standard check for all flights, for night flights turn on the battery switch and check the following items:

(a) INTERIOR LIGHTS.

1. COCKPIT LIGHTS.—Check the cockpit lights by turning on the switch on each light and the rheostat located on the pilot's distribution box.

2. INSTRUMENT BOARD LIGHTS.—Check the instrument board lights by turning on the rheostat located on the pilot's distribution box.

(b) EXTERIOR LIGHTS.

1. Check the formation, section, recognition wing and tail lights by turning on the respective switches and the exterior light master switch. These switches are located on the pilot's distribution box.

4. FUEL SYSTEM MANAGEMENT.

a. GENERAL.—For high power operation at high altitude use fuel from the main tank, which is pressurized to maintain adequate fuel flow. It is possible, on airplanes equipped with wing tanks in the outer panels (prior to installation of center section twin pylons), to operate under the above conditions while using fuel from the wing tanks if the auxiliary fuel pump is switched "ON"; under such conditions, keep a close watch on fuel pressure and cylinder head temperature. Some attention should be paid to the fuel quantities in the wing tanks to keep the fuel consumption in the tanks approximately equal in order to maintain the airplane in approximate lateral balance, keeping the quantity in the right tank somewhat greater than that in the left tank, since the airplane has a tendency toward left wing heaviness in the landing condition with power on. Since no quantity gages are provided for the wing tanks, the quantities of fuel consumed must be determined from the time of operation on each tank.

b. MANAGEMENT.

(1) The fuel system is managed with two controls, viz., the fuel tank selector and the electric auxiliary fuel pump switch. The normal flow of gasoline in the system is as follows: the fuel flows from the tank outlet for which the fuel selector valve is set, through the valve, the electric auxiliary fuel pump, the strainer drain unit and the engine driven fuel pump, to the inlet on the carburetor.

(2) DROP TANK RELEASE.—The drop tanks may be released either manually or electrically.

(a) The centerline drop tank can only be released manually; the release is located on the left side of the main instrument panel. To drop the tank, turn the switch to "RELEASE."

(b) The pylon tanks and bombs can be released either manually or electrically.

1. The manual drop tank release controls are on the left hand shelf. To release a drop tank, pull the desired release control to the limit of its extension. A force of three to four positive g's will aid in dropping the tanks.

2. To release a drop tank electrically, proceed as follows:

a. Turn the master armament switch to "ON."

b. Select the tank to be dropped, turning the desired bomb release switch to "RELEASE."

c. Press the thumb button on the control stick.

Note

Selection of the manner of release (manual or electrical) will depend on the type of adapter installed on the particular airplane.

(3) FUEL TANK SELECTION.

(a) Use droppable tank and wing tank fuel before using the main tank fuel, except as noted immediately below.

Note

Set fuel tank selector on "RESERVE" for take-off, landing, diving and maneuvers. Do not cruise on "RESERVE."

(4) ELECTRIC AUXILIARY FUEL PUMP.—The electric auxiliary fuel pump is used for:

(a) Starting.

(b) Take-off and landing.

(c) Changing from one tank to another.

(d) If fuel pressure drops below 16 pounds per square inch.

(e) After failure of engine-driven fuel pump.

(f) To maintain fuel pressure during high-power, high-altitude operation. This condition is most likely to occur in summer operation and is caused by vapor formation in the fuel lines.

Note

It is possible, on airplanes equipped with center section twin pylons, to operate at very high altitudes while using fuel from the drop tank if the auxiliary fuel pump is switched on; under such conditions, keep a close watch on fuel pressure and cylinder head temperature. Shifts to drop tanks should be made below 19,000 ft., since it may be impossible to start fuel flow from the drop tank above this altitude.

(5) VAPOR ELIMINATION.—The vapor elimination line, running from the carburetor to the top of the main fuel tank, returns approximately two quarts of fuel to the main tank in an hour of normal engine operation.

(6) MAIN TANK PRESSURIZING.—Provision is made for pressurizing the main tank to prevent the loss of fuel pressure and consequent unsatisfactory engine operation at high altitudes due to vaporization of fuel. An automatic cut-off valve set to operate at approximately 12,000 feet, turns the pressure "ON" above this altitude and "OFF" below this altitude. A manual shut-off control is also provided for turning the tank pressure "OFF." This control should be left "ON" (forward) at all times, except when the main tank is punctured in combat, when tank pressure is not required to maintain satisfactory engine operation at combat altitude, or as an additional safeguard in the event of a forced landing under adverse conditions.

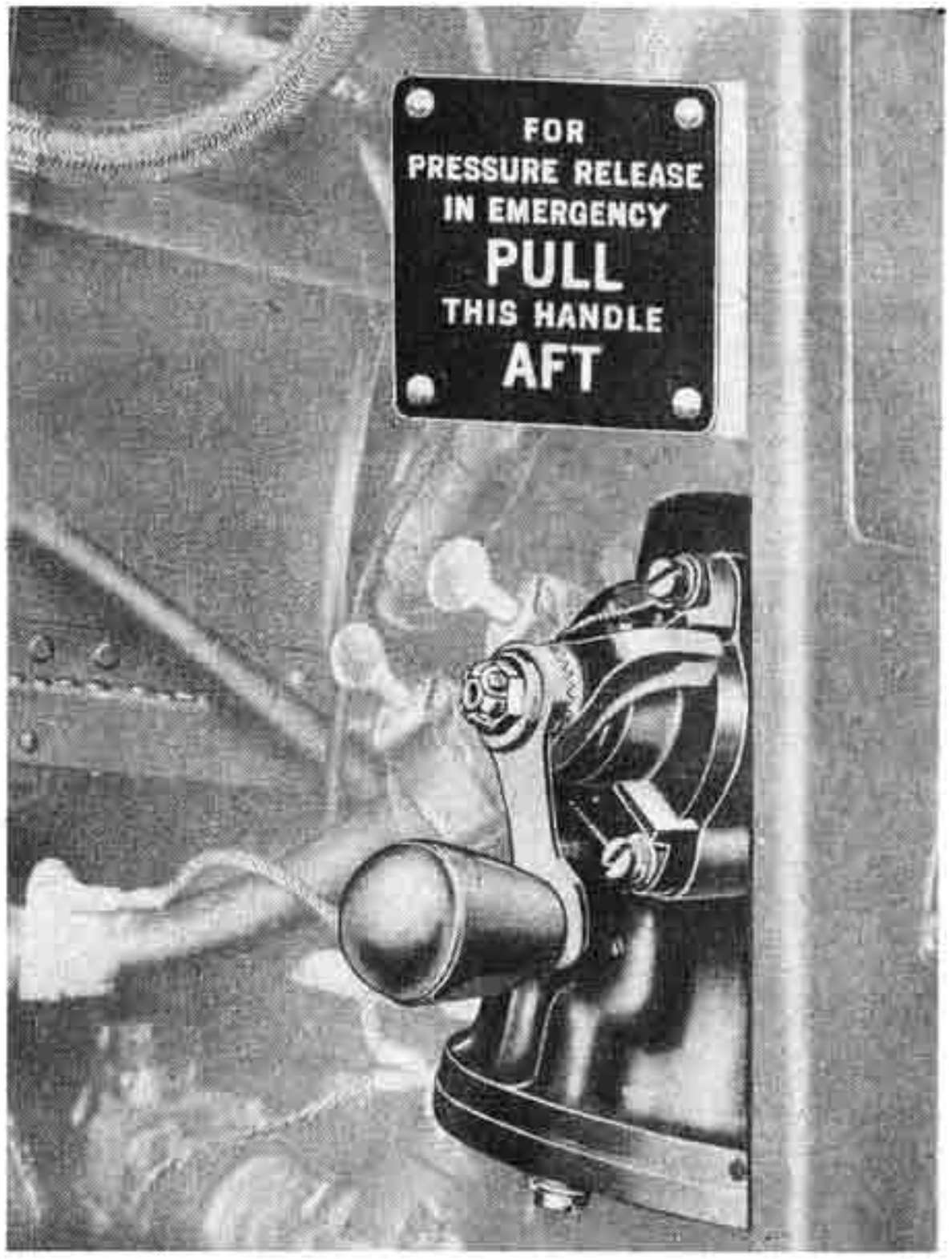


Figure 25—Main Fuel Tank Pressure Regulator

(7) WING TANK VAPOR DILUTION SYSTEM OPERATION.—Provision is made, on airplanes having outer panel integral wing tanks, for making the atmosphere above the fuel inert by admitting CO_2 to the wing tanks, for protection from gunfire during combat. This system does not force fuel out of the tanks. To operate, turn the knob located below the elevator tab control approximately one full turn to the left.

WARNING

The vapor dilution system must not be used when operating on fuel from the outer panel tanks. Injection of CO_2 would result in an interruption of fuel flow through the lines. However, use of the vapor dilution system does not render the gasoline in the outer panel tanks unfit for further use.

(8) WATER INJECTION SYSTEM.—A water injection system for war emergency power operation is provided on airplanes bearing serial numbers 55910 F4U-1 (which includes British JT-331), 13992 FG-1, 11208 F3A-1 and subsequent. For details concerning the use of the water injection system in obtaining war emergency power, refer to paragraph 14.*d.* and Section I, paragraph 2.*b.*(2).

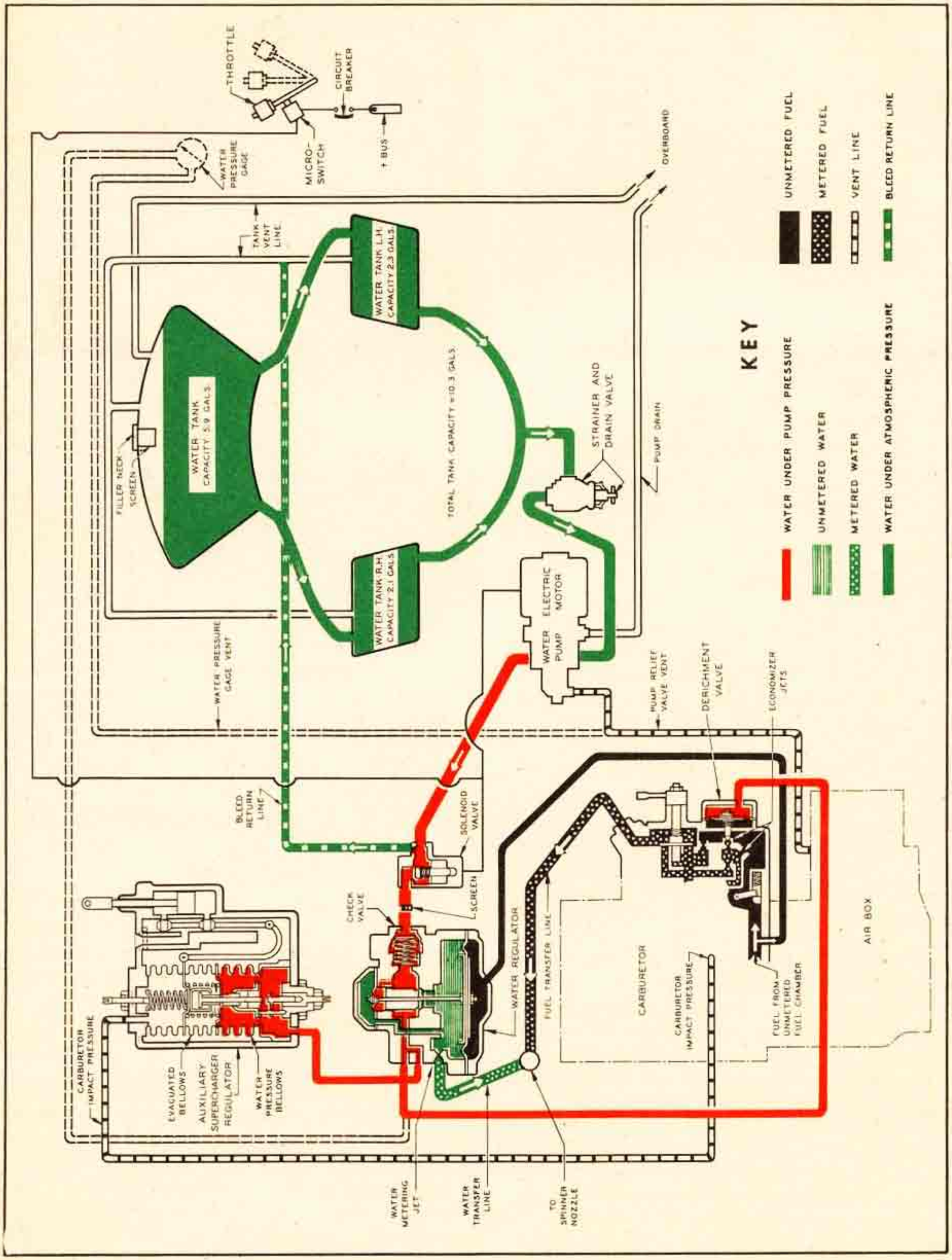


Figure 26—Water Injection System

(a) OPERATION.—The throttle operates the switch which controls the water injection equipment. Moving the throttle control full forward (breaking the safetywire stop) turns the water injection equipment "ON." When the throttle control is in any other position, the water injection equipment is "OFF." The throttle operated switch opens the solenoid shut-off valve in the water lines and starts the electric water pump. Water pressure acts on diaphragms to shut off a jet in the carburetor ("deriching" the mixture) and to reset the auxiliary stage supercharger regulator, permitting high carburetor inlet pressure. Water is metered by a water regulator, which operates in the same manner as the metering unit in the carburetor, and is mixed with metered fuel just ahead of the fuel spinner discharge nozzle which is located in the face of the main stage supercharger impeller. Refer to figure 26.

(b) WATER SUPPLY.—The water supply is carried in three tanks, one of 5.9 U.S. gallon (4.9 Imp. gallon) capacity, one of 2.3 U.S. gallon (1.9 Imp. gallon) capacity, and one of 2.1 U.S. gallon (1.7 Imp. gallon) capacity; these are connected to a common supply line without individual shut-offs. The filler cap can be reached through a door at the top front of the accessory compartment.

(c) FOR COMBAT FLIGHTS.—After engine warm-up, fill the water injection system as follows:

1. With the engine operating at 1200 to 1400 rpm, engage the auxiliary supercharger in the low blower and wait approximately 30 seconds in order to permit the supercharger to become fully engaged.

2. Open the throttle to obtain approximately 2000 rpm (all water checks should be made at a minimum of 2000 rpm).

3. As soon as the engine speed and manifold pressure become stabilized, turn on the water injection micro switch. This is readily accessible behind the engine control unit and can be operated with a screwdriver.

4. The engine will hesitate for approximately one second before the power increases. In addition, proper action of the supercharger reset mechanism will be indicated by a sudden increase in manifold pressure (two to three inches Hg.).

CAUTION

Do not hold the micro switch on any longer than necessary. As soon as a power increase is indicated, turn the switch off.

5. OIL SYSTEM MANAGEMENT.

a. OIL PRESSURES AND TEMPERATURES.—The proper oil pressures and temperatures for the various operating conditions are given on the Specific Engine Flight Chart, Section III.

b. The oil temperature can best be kept from exceeding the limit by:

(1) Opening the oil cooler flaps.

(2) Reducing engine rpm.

(3) Increasing the climbing air speed.

Note

It will be observed that the oil pressure decreases slightly with altitude and takes an additional drop when shifting from "NEUTRAL" to "LOW" or "HIGH." This drop is normal and is to be expected. Oil pressure may drop as low as 70 pounds per square inch at 25,000 feet altitude at rated rpm. full throttle. Check operation of the pressurizing valve in the oil vent line before next flight if oil pressure is lower.

6. STARTING ENGINE.

a. PROCEDURE.

(1) Ignition switch—"OFF."

(2) Mixture control—"IDLE CUT-OFF."

(3) Clean engine of fuel by pulling propeller by hand through four or five revolutions in the direction of operation.

(4) Fuel selector—"RESERVE."

(5) Engine cowl flaps—full open.

(6) Supercharger control—"NEUTRAL."

(7) Throttle—Set to red quadrant mark (approximately one inch open).

(8) Battery switch—"ON."

(9) Electric auxiliary fuel pump switch—"ON."

(10) Electric primer switch—"ON"—five to fifteen seconds (depending upon temperature and condition of the engine) immediately prior to operating the starter.

(11) Ignition switch—on "BOTH."

(12) Starter switch—"ON" until engine runs smoothly.

(13) Mixture control—Move slowly from "IDLE CUT-OFF" to "AUTO RICH" as soon as engine fires. If moved too rapidly, engine will go dead.

(14) Primer switch—"ON" intermittently until engine runs smoothly.

(15)Electric auxiliary fuel pump—"OFF" when changing mixture control setting.

CAUTION

Do not pump or move the throttle abruptly until the engine is running smoothly.

(16) Idle at 800 to 900 rpm until oil pressure moves up, then idle at 1000 rpm. If oil pressure is not indicated in 30 seconds, stop engine and investigate.

Note

Normally, it should be necessary to operate the starter no more than 30 seconds in order to start the engine. If the starter switch is held "ON" for one minute and the engine does not start, allow the starter to cool before making another attempt.

b. FAILURE OF ENGINE TO START ON FIRST ATTEMPT.—If the engine does not start, wait a few minutes to allow any spilled fuel to drain out of the intake ducts. Inspection of the exhaust pipe outlets, especially those from the upper cylinders, should indicate whether the engine has been over or under-primed. No trace of smoke indicates under-priming; excessive black smoke shows over-priming. The use of the electric primer switch should be governed accordingly. If the engine is over-primed, clean the cylinders and induction system of the excess fuel as follows:

(1) Ignition switch—"OFF."

(2) Mixture control—"IDLE CUT-OFF."

(3) Throttle—full open or full closed.

(4) Electric auxiliary fuel pump switch—"OFF."

(5) Clean engine by pulling propeller by hand through four or five revolutions in the direction of normal operation.

c. GENERAL.—Consistent starts will result from practice and experience. It is important, if backfires are to be prevented, that the procedure outlined above be used. It is strongly reocmmended that starting be practiced on an airplane from which the bottom accessory compartment cowl panel and carburetor air duct have been removed, to minimize the fire hazard and damage resulting from backfire. Do not attempt to adjust the idling of the engine when the carburetor air duct has been removed, since it will be affected by the changed air flow and temperature conditions.

CAUTION

This airplane does not have a built-in CO_2 fire extinguisher. If the engine fails to start, leave the battery switch on for about 15 seconds so that indication of fire may be given by the carburetor air temperature warning light and extinguishing action can be taken before the rubber gasket on the carburetor air duct is damaged. If a fire is detected in the duct system, press the nozzle of the CO_2 fire extinguisher firmly against the air duct valve hole in the bottom accessory compartment cowl panel.

7. WARM-UP AND GROUND TEST.

a. GENERAL.—For warm-up and ground testing, the following should be observed:

(1) Propeller control — maximum rpm ("INCREASE").

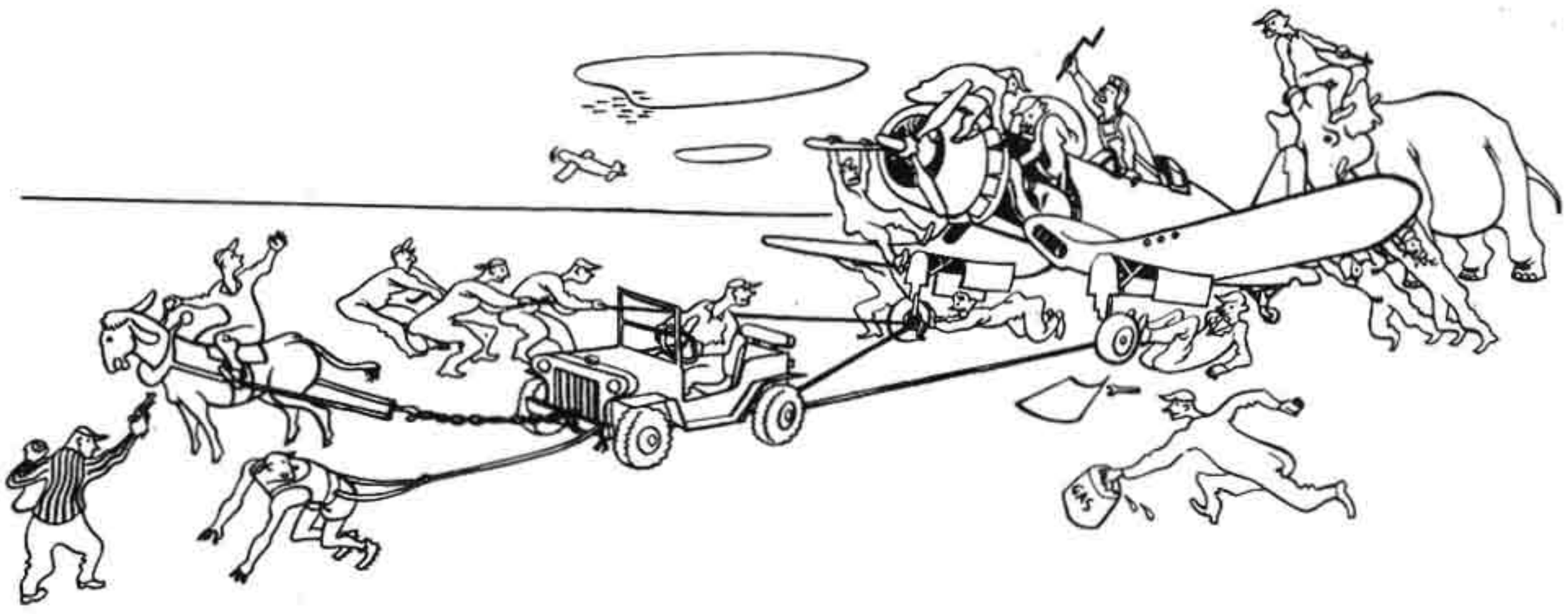
(2) Cowl flaps—full open.

(3) Oil cooler flaps—"CLOSED."

(4) Intercooler flaps—"OPEN."

(5) Mixture control—"AUTO RICH."

(6) Cylinder head temperature—232°C. (450°F.) maximum. If cylinder head temperatures approach 232°C.



(450° F.), the engine should be cooled at 1000 rpm before continuing with the ground test.

b. ENGINE WARM-UP.

(1) Check oil pressure. With cold oil, oil pressure may be above 200 pounds per square inch until the oil-in temperature is approximately 40°C. (104°F.).

(2) Idle at 1000 rpm until oil temperature is 40°C. (104°F.) and cylinder head temperature is 120°C. (228°F.).

c. ENGINE AND ACCESSORIES GROUND TEST.

(1) Open throttle briefly to at least 2200 rpm and 30 inches Hg. and check the following:

CAUTION

Backfiring may result from opening the throttle too suddenly from the idling position (in flight or on the ground).

(a) Oil pressure 85 to 90 pounds per square inch.

(b) Fuel pressure 16 to 18 pounds per square inch.

(c) Magnetos—rpm drop-off should be no more than 100 when shifting from "BOTH" to "RIGHT" or "LEFT." Permit engine run to stabilize after operating on one set of plugs before checking the other set.

(2) IDLE MIXTURE CHECK.

(a) Set throttle for 600 rpm.

(b) Electric auxiliary fuel pump—"ON."

(c) Move the mixture control lever smoothly and steadily into "IDLE CUT-OFF" and observe the tachometer for any change in rpm.

(d) Return the mixture control to "AUTO RICH" before the engine cuts out. A rise of more than 10 rpm indicates too rich an idle mixture, and no change or drop in rpm indicates that the mixture is too lean. A rise of 5 to 10 rpm is recommended in order to permit idling at low speeds without danger of fouling plugs and at the same time to afford good acceleration characteristics.

(3) SUPERCHARGER CHECK.—The supercharger check run should be made when the oil temperature has reached 60°C. (140°F.) minimum and the oil pressure is 50 pounds per square inch.

(a) Shift the supercharger control to "HIGH" (a momentary drop in oil pressure and fluctuation of manifold pressure and rpm should accompany the shift).

(b) Open throttle to approximately 30 inches Hg.

(c) Observe manifold pressure and oil pressure when rpm is stabilized.

(d) Shift to "LOW" (fluctuation of manifold and oil pressures should accompany the shift).

CAUTION

Do not idle below 800 rpm any longer than is necessary, to avoid fouling plugs. Be sure to clear out engine and check both magnetos before take-off after protracted idling.

(e) To loosen any small accumulation of sludge and dirt, supercharger clutches shall be shifted to each position for two 30-second periods during warm-up, prior to each day's flight. These shifts shall be with the engine turning up about 1000 rpm (between idle and 1200 rpm allowed).

(f) To more completely desludge supercharger clutches, engines shall be operated in each blower position at about 1000 rpm for 30 seconds or more after each flight. The procedure of doing part of the taxiing in high blower and part in low blower satisfies this requirement. Carrier based aircraft need not desludge after flight.

(g) Indications of supercharger selector valve and clutch operation will appear as very slight changes in oil pressure and in engine speed when the propeller is not governing.

(4) GENERATOR CHECK.—Run the engine up above 1300 rpm and check the generator output. It should read from 27.5 to 28.5 volts.

(5) HYDRAULIC PRESSURE CHECK.—Check the hydraulic pressure gage. It should indicate 900 to 1150 pounds per square inch.

(6) RADIO CHECK.—Test the radio operation (refer to Section V, paragraph 2).

(7) PROPELLER GOVERNOR CHECK.

(a) Adjust the throttle to give an engine speed of 2000 rpm.

(b) Move the propeller control from full "INCREASE" to full "DECREASE." The engine speed should drop to about 1200 rpm.

(c) Return the propeller control to "INCREASE."

(8) Check operation of the wing flaps.

(9) Check operation of wing folding.

8. SCRAMBLE TAKE-OFF.

It is possible to make an emergency take-off providing the oil temperature is above 40°C. (104°F.) In cases of extreme emergency, where the above temperatures cannot be met, run the engine up; if it does not operate roughly, or cut altogther, take off.

9. TAXIING INSTRUCTIONS.

a. Use the S-turn procedure for adequate forward vision on taxi strips. However, let the airplane roll freely where possible, using the brakes as an aid in steering stopping, and holding, only.

b. Use the tail wheel lock in extended cross-wind taxiing to relieve excessive braking action.

c. Use low power when taxiing. Don't rev up the engine and then ride the brakes. Bear in mind that badly overheated brakes are not fully effective and can fuse the brake discs to the extent of leaving them frozen for landing.

10. TAKE-OFF.

a. Refer to the Take-off, Climb and Landing Chart in Appendix I.

b. CHECK LIST.

(1) Shoulder harness—locked.

(2) Wings—spread and locked.

Note

Check to see that wing fold control is in "SPREAD" position, that closure doors at wing joints are closed, that mechanical wing hinge pin locking handle is in the "LOCK" position and that pin locking indicator is down.

(3) Arresting hook control—"UP."

(4) Fuel tank selector—"RESERVE."

(5) Mixture—"AUTO RICH."

(6) Supercharger control—"NEUTRAL."

(7) Propeller control — maximum rpm ("INCREASE").

(8) Cowl flaps—2/3 open.

(9) Intercooler flap—"CLOSED."

(10) Oil cooler flap—open as required.

(11) Rudder tab—six degrees "NOSE RIGHT."

(12) Aileron tab—six degrees "RIGHT WING DOWN."

(13) Elevator tab—one degree "NOSE UP."

(14) Wing flaps—set as required. See paragraph *c.*, below.

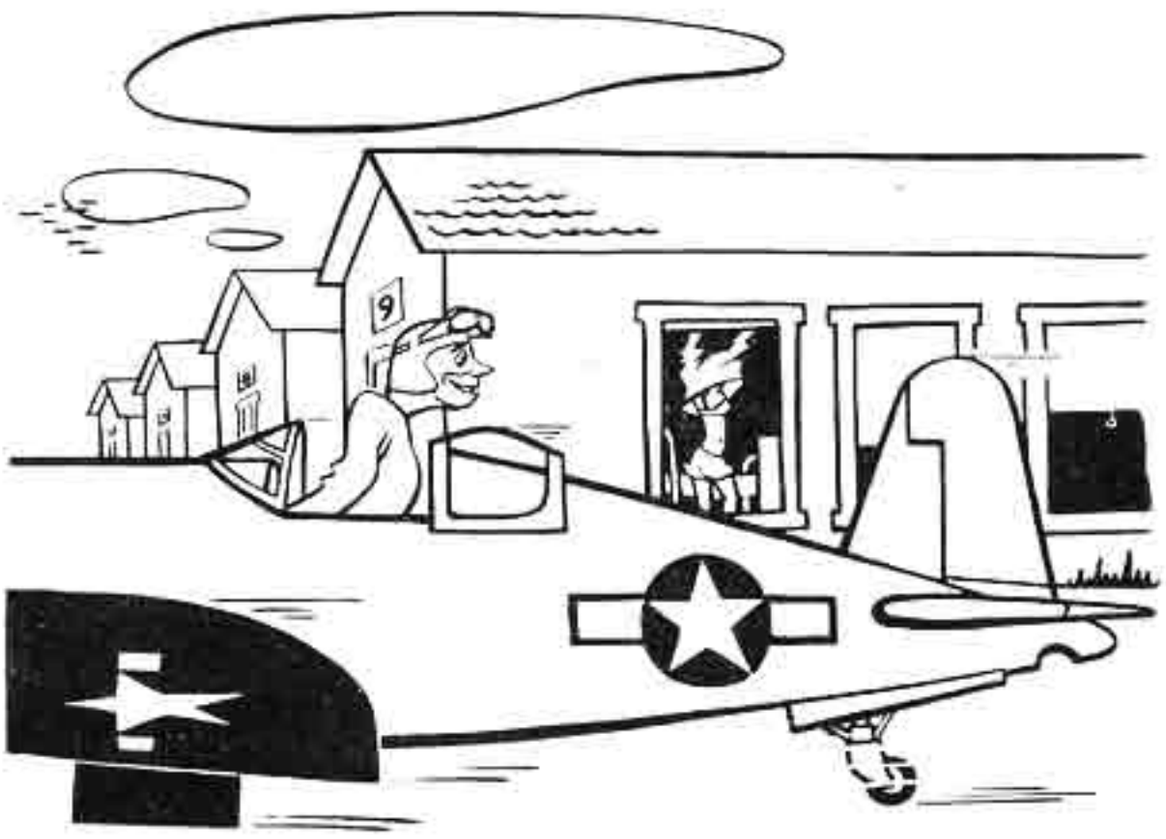
(15) Tail wheel—locked.

(16) Manifold pressure limit—54.0 inches Hg.

(17) Check to see that cylinder head and oil temperatures are above the minimum and not near the limits.

c. GENERAL.

(1) FLAP SETTINGS.—For normal operation it is recommended that a setting of 20 degrees be used for take-off. Actually, any flap setting from 0 degrees to 50 degrees may be used, the higher settings giving shorter ground distance. Take-offs with flaps up are easily accomplished with a small increase in run, dispensing with the inconvenience of retracting the flaps after take-off. In addition, the rate of climb immediately after take-off with flaps deflected is inferior to that with flaps up. Take-



offs at high flap setting and at full flap should be made only when it is necessary to obtain the shortest possible ground run, and after more experience with settings increased gradually from the recommended setting of 20 degrees. When a high flap setting is used, the elevator tab should be set slightly more tail heavy (about 1°).

Note

It has been found that with the flaps down the tail cannot be held on the ground, with the stick full back, at manifold pressures greater than 44 inches Hg. Also, when operating from a wooden platform, the wheels will start slipping on the deck at approximately the same manifold pressure. As a result, when making a carrier take-off it is necessary to advance the throttle through the final portion of its travel as the airplane starts to roll. No difficulty should be encountered in this operation.

(2) TAB SETTINGS.—Due to the high engine power and low propeller gear ratio, the proper tab settings must be used for take-off; otherwise, needless difficulty will be encountered. The rudder force required to maintain a straight run will be high unless the rudder tab has been set at approximately six degrees "NOSE RIGHT" prior to the start. Also, the left wing tends to be slightly heavy just as the airplane becomes airborne, due to high torque reaction. If the aileron tab is set approximately six degrees "RIGHT WING DOWN" before the start and if the airplane is not lifted off prematurely, this effect can be avoided. Use of the proper tab settings is particularly important when high flap settings and maximum power are used. Individual airplanes will require slightly different tab settings from those given above. It may be noticed that the tab control knobs rotate slightly when the stick and rudder controls are moved. However, the actual tab setting does not change.

d. MINIMUM RUN TAKE-OFF.

(1) Wing flaps—full "DOWN" (50 degrees).

(2) Propeller governor — maximum rpm "INCREASE."

(3) Manifold pressure—54 inches Hg. (60 inches Hg. at war emergency power).

(4) Elevator tabs—three to four degrees "NOSE UP."

(5) Hold brakes slightly until tail starts to rise.

(6) Release brakes and allow tail to rise to near level flight attitude (tail high).

(7) Take off when minimum flying speed is attained (approximately 70 knots indicated). The nose will be slightly heavy. If the take-off is made from an unpaved or muddy runway, take off with the tail slightly lower than directed above.

Note

If an obstacle is to be cleared during take-off, the wing flap setting should be reduced to approximately 30 degrees.

e. CATAPULT TAKE-OFF.

(1) Shoulder harness and safety belt—tight.

(2) Place back and head firmly against seat and head rest.

(3) Place feet against rudder pedals with legs stiff.

(4) Brace right arm.

(5) Push throttle full forward and grasp catapult throttle hold.

11. ENGINE FAILURE DURING TAKE-OFF.

a. In the event of engine failure during take-off, LAND STRAIGHT AHEAD.

(1) Jettison drop tank or bombs.

(2) Landing gear—"UP" unless sufficient runway is available STRAIGHT AHEAD for a landing in the normal (wheels down) landing condition.

(3) Wing flaps—full down.

(4) Lower the seat several notches.

(5) Switches (battery and ignition)—"OFF."

(6) Fuel selector—"OFF."

The battery switch turns off the electric auxiliary fuel pump.

12. AFTER TAKE-OFF.

a. FOR MOST EFFICIENT OPERATION:

(1) Reduce manifold pressure to not over 44.0 inches Hg.

(2) Reduce rpm to not over 2550.

(3) Retract landing gear.

(4) Retract wing flaps.

(5) Trim airplane for 125 knots indicated air speed for best climb.

(6) Adjust cowl flaps, if necessary.

(7) Adjust oil cooler flaps, if necessary.

(8) Set fuel tank selector to desired setting.

(9) Set mixture control to "AUTO LEAN."

b. Unless a rapid rate of climb is desired, it is recommended that the manifold pressure and rpm be further reduced to 34 inches Hg. and 2300 rpm, and the air

speed increased to 10 knots above the normal air speed for climb.

CAUTION

Do not retract the flaps too soon or too rapidly after take-off if the speed is very low; otherwise, the airplane may settle due to the loss in lift. It should be remembered that the higher the take-off speed, the better the control.

13. CLIMB AND LEVEL FLIGHT.

a. MILITARY POWER CLIMB AND LEVEL FLIGHT—2700 RPM.—Operate according to the Specific Engine Flight Chart in Section III. Table I gives the throttle and supercharger control settings for this condition. Above 25,000 feet use normal rated power (2550 rpm) because of loss in efficiency at 2700 rpm.

CAUTION

Do not exceed 260°C. (500°F.) cylinder head temperature.

TABLE I

ALTITUDE	MAN. PRESS. IN. HG.	BLOWER
S.L.-1700 1700-5500	52.5* F.T. (SHIFT TO "LOW" WHEN MAN. PRESS. DROPS TO 45.0 IN.)	"NEUTRAL"
5500-16000 16000-18000	53.0 (F.T.) F.T. (SHIFT TO "HIGH" WHEN MAN. PRESS. DROPS TO 50.0 IN.)	"LOW"
18000-21000	53.0*	"HIGH"

*The altitudes at which these manifold pressures can be obtained vary considerably with carburetor entrance conditions. The above values are for standard air and no ram. At high speed the above manifold pressures will be reached at higher altitudes.

CAUTION

Reduce manifold pressure three to four inches Hg. to avoid power surge when shifting.

b. RATED POWER CLIMB AND LEVEL FLIGHT—2550 RPM.—Operate according to the Specific Engine Flight Chart in Section III. Table II gives the throttle and supercharger control settings for this condition.

CAUTION

Do not exceed 260°C. (500°F.) cylinder head temperature.

TABLE II

ALTITUDE	MAN. PRESS. IN. HG.	BLOWER
S.L.-5500 5500-7000	44.0* F.T. (SHIFT TO "LOW" WHEN MAN. PRESS. DROPS TO 41.5 in.)	"NEUTRAL"
7000-16500 16500-18000	49.5* F.T. (SHIFT TO "HIGH" WHEN MAN. PRESS. DROPS TO 47.0 IN.)	"LOW"
18000-22000	49.5*	"HIGH"

*The altitudes at which these manifold pressures can be obtained may vary considerably with carburetor entrance conditions. The above values are for standard air and no ram.

14. GENERAL FLYING CHARACTERISTICS.

a. Refer to the Specific Engine Flight Chart in Section III, the discussion on Gross Weight and Balance, this section, paragraph 1.*b.*, and the discussion on Supercharger Control in Section I, paragraph 2.*b.*(5).

b. STABILITY.—The airplane is stable in all permissible loading conditions. However, the longitudinal stability becomes quite low when the center of gravity approaches the aftermost limit of the permissible center of gravity range in low-speed, high-power flight conditions such as climb and carrier approach. In the cruising condition the airplane has a high degree of stability at all permissible center of gravity positions.

c. TRIM CHANGES.

(1) Extension of the landing gear and the wing and cooling flaps changes the trim of the airplane only slightly. However, for the convenience of the pilot, the direction of the trim changes is listed as follows:

(a) Extend landing gear:—tail-heavy as gear begins to extend, but nose-heavy when the gear is fully down.

(b) Extend wing flaps:—tail heavy at small flap angles, and nose-heavy at large flap angles.

(c) Open cowl flaps:—nose-heavy.

(d) Open oil cooler flaps:—tail-heavy.

(e) Open intercooler flap:—tail-heavy.

(2) The airplane exhibits no unusual flying characteristics at low speeds. There is some change of both lateral and directional trim due to the application of power at low air speeds. However, the effectiveness of the aileron and rudder trim tabs is sufficient to offset these changes of trim easily. All of the trim tabs on this airplane are effective and sensitive.

d. WAR EMERGENCY POWER—2700 RPM (FIVE MINUTES).

(1) To obtain war emergency pow

(a) Mixture control—"AUTO LEAN."

(b) Propeller control — maximum rpm ("INCREASE").

(c) Throttle—"FULL OPEN."

(2) War emergency ratings are based upon engine structural limitations, water being used to suppress detonation.

CAUTION

Because war emergency power places a strain on the engine, it is to be used with discretion, and should be treated as combat ammunition which is expended unhesitatingly, but only when the occasion demands.

(3) War emergency power is used primarily for combat.

CAUTION

Do not use war emergency power when the fuel supply is nearly exhausted in the tank which is being used. If the fuel supply in the tank is exhausted, the water being supplied to the fuel nozzle will flood the carburetor and engine stoppage will result.

(4) When in low or high blower the supercharger regulator resets to normal when the water supply is exhausted; WHEN IN NEUTRAL BLOWER, BELOW 3000 FEET, THE THROTTLE MUST BE RETARDED TO PREVENT OVERBOOSTING WHEN THE WATER SUPPLY IS EXHAUSTED.

WARNING

THE WATER INJECTION EQUIPMENT WILL BE OPERATED WHENEVER THE THROTTLE IS IN THE FULL OPEN POSITION. WHEN WATER INJECTION IS NOT DESIRED, THE LAST 3/8 INCH OF THROTTLE MOVEMENT MUST NOT BE USED.

Note

Holes for a safety-wire stop have been provided in the throttle quadrant to prevent inadvertent use of water injection. Since use of the water injection system necessitates breakage of the stop, a new safety-wire should be installed before next flight, making sure that the wire is installed correctly and is of the proper gage.

e. CRUISING.—The engine should be operated in "AUTO LEAN" for cruising power operation. If a cylinder temperature of 232°C. (450°F.) is exceeded, the mixture should be enriched.

(1) MAXIMUM.—While cruising operations may be conducted at any engine power below normal rated power, if minimum fuel consumption is of importance and if it is tactically feasible to do so, cruising operation should be conducted in a range not to exceed 65 per cent of normal rated power.

(2) RECOMMENDED.—Most efficient cruising operation will be obtained at power considerably below maximum cruising.

Note

Operation at approximately 150 knots indicated air speed at 1300 rpm, neutral blower, will result in near best range operation (approximately 42 gallons per hour).

CAUTION

When operating below 1400 rpm, reduce the electrical load as much as possible to prevent battery discharge.

f. VIBRATION.—Operation is smooth except at 2200 rpm at 30 to 35 inches Hg., and between 1750 and 1950 rpm. Operation in these ranges is not dangerous, but may be uncomfortable.

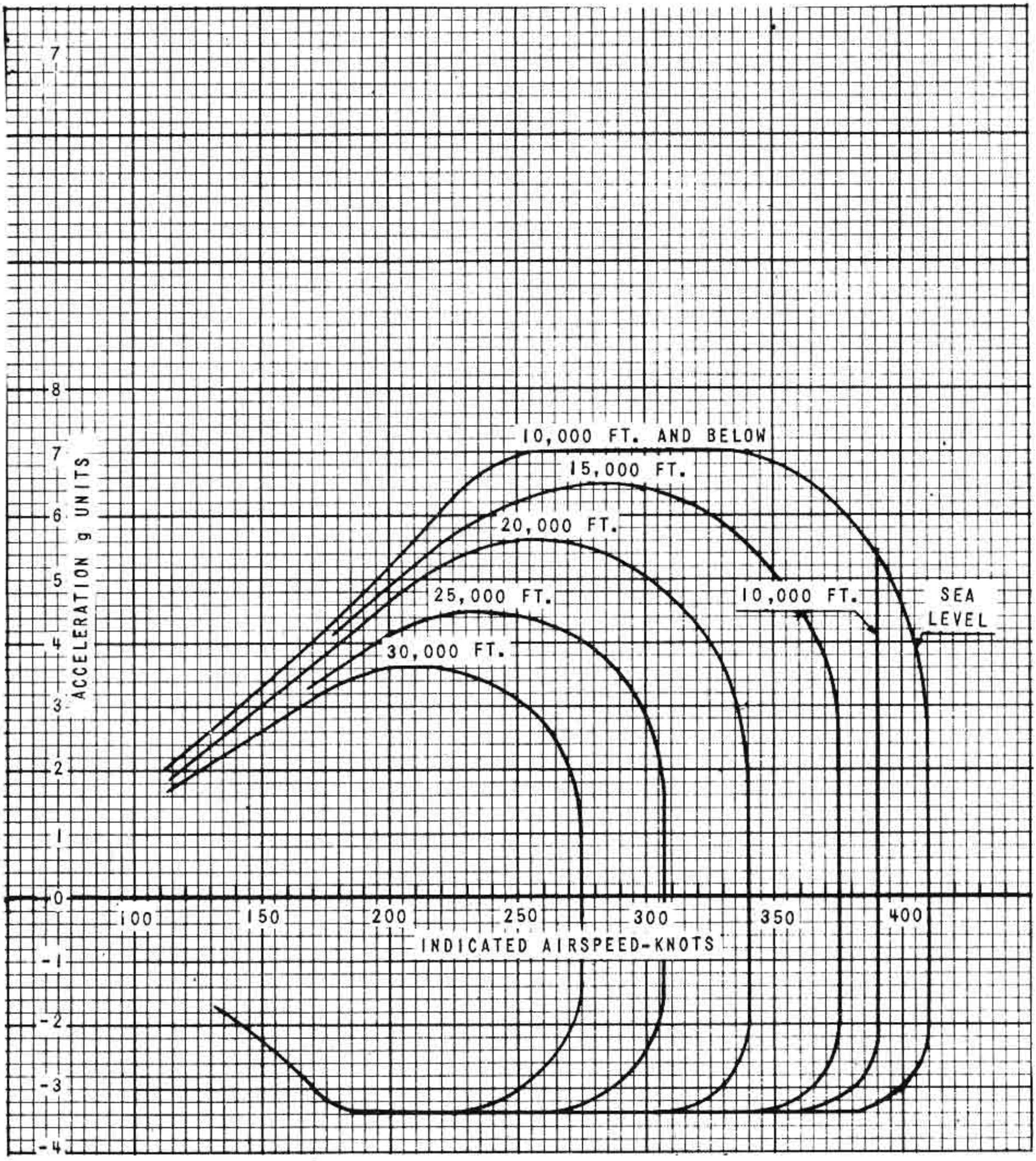
g. SURGING.—Avoid operation at high rpm with low manifold pressures in either low or high blower; power pulsations and surging are likely to result. If surging is encountered:

(1) Increase manifold pressure (open throttle).

(2) Reduce engine rpm or shift to lower blower and adjust power to the value desired.

h. MAXIMUM PERMISSIBLE INDICATED AIR SPEED AND ACCELERATIONS.

(1) The maximum permissible speeds and accelerations are shown on the graph below for a gross weight of 12,000 pounds. At other weights the permissible accelerations are such as to maintain a constant product of gross weight and acceleration, except that 7.5g positive and 3.4g



MODELS F4U-1 & 1D, FG-1 &1D, AND F3A-1 AIRPLANES
OPERATING FLIGHT STRENGTH DIAGRAM
GROSS WEIGHT 12,000 POUNDS

negative should not be exceeded. The limit of the actual accelerations and speeds that can be withstood with safety is indicated by a general buffeting or shaking. It is dangerous to continue increasing acceleration or speed once the buffet begins because the shaking and vibration increase the loads in the tail structure and so may cause damage to the stabilizer and elevator. Therefore, when buffeting is encountered, immediately reduce speed or acceleration or both. In general, this phenomenon occurs at lower indicated speed at the higher altitudes, as seen on the graph.

WARNING

Pilots should avoid steep dive angles because of the difficulty encountered in attempting to reduce speed and acceleration quickly if buffeting should occur.

(2) For convenience, the restrictions given in the graph may be simplified by the following approximations:

(a) For diving or maneuvering at 3.0*g.*

Altitude	Speed
10,000 Feet	390 Knots
20,000 Feet	335 Knots
30,000 Feet	255 Knots

i. GYRO HORIZON AND DIRECTIONAL GYRO INDICATORS OPERATING LIMITS.

The gyro horizon and directional gyro indicators shall be left uncaged at all times, except on maneuvers in which the operating limits of the indicator would be exceeded. The operating limits are:

	Climb & Dive	Bank, R & L
Gyro Horizon	70°	100°
Directional Gyro	55°	55°

15. MANEUVERS.

a. MANEUVER FLAPS.—The wing flaps have been designed for possible use in maneuvering. The flaps may be used to increase the lift and thereby decrease the radius of turns at low speeds (about 150 knots). The flaps are also useful in increasing the drag of the airplane so that it may be quickly decelerated to the optimum speed for a short radius turn. In general, flap deflections of 20° or less will be most helpful in improving maneuverability. Therefore, a setting of 20° has been established as the "maneuver flap" condition.

CAUTION

Flaps are not to be used at speeds greater than 200 knots. As stated above, the flaps have also been designed for use in maneuvering the airplane in combat. With typical maneuvering flap deflection of 20° or less the airplane may be maneuvered at equivalent "flaps up" accelerations up to 200 knots.

16. STALLS.

a. GENERAL.

(1) The stalling characteristics of the airplane are not abnormal, and warning of the approach of the stall exists in tail buffeting, the abnormal nose-up attitude, and increasing left wing heaviness with power on. The center of gravity positions enforced by wartime requirements are farther to the rear than would be normally desirable. This results in a low degree of longitudinal stability. While the elevator forces are generally normal in direction, they vary only a small amount in approaching the stall with power on, and the control movement is very small. Thus the elevator control force and position do not provide the normal degree of "feel" or warning of change in air speed or angle of attack. Pilots should observe carefully and familiarize themselves with this characteristic in the landing approach condition and in maneuvering turns which approach the stall at higher speeds. This should be done at various flap positions and powers until pilots are thoroughly familiar with the airplane in these conditions.

(2) The stall with power on is rather pronounced, particularly with flaps down, but is preceded by some warning in the nature of buffeting. In the carrier approach condition, the approach to the stall is indicated to some extent by increasing left wing heaviness and the increasing amount of right rudder required. The stall in this condition (flaps "DOWN," power "ON") is accompanied by a relatively sharp roll to the left.

Note

Pilots should familiarize themselves thoroughly with the stall, in both straight flight and tight turns.

(3) The indicated stalling speeds for a 11,300 pound fighter (178 U.S. gallons, 148 Imp. gallons, of fuel; 1200

rounds of ammunition) are given in the table below. For other weights see Appendix I, Plate I.

Condition	Flaps	Power	Indicated Stalling Speed—Knots
Landing	50°	Closed Throttle	75
Landing	30°	Closed Throttle	77
Landing	20°	Closed Throttle	79
Landing	50°	Power on (Level Flight) 23" Hg., 2400 RPM	66
Clean	Up	Closed Throttle	87
Clean	Up	Power on (Level Flight) 18" Hg., 2400 RPM	84

b. STALL WARNING LIGHT.

Note

The stall warning light is installed on Model F4U-1 airplanes numbers 17930 to 57643, Model F3A-1 airplanes number 04674 and subsequent and Model FG-1 airplanes numbers 13007, 13356, 13392 and subsequent.

(1) This light, located near the top of the main instrument panel (see Figure 5), will come on a few knots before the stall. A test switch is provided so that the pilot can check, while in flight, to see that the lamp is not burned out. The best check of the whole installation is provided by approaching the stall at a safe altitude. The arrangement is designed to warn the pilot that he is close to the stall, regardless of the load condition of the airplane, the acceleration (in turns or pull-outs), the throttle opening, or the flap setting, all of which cause the indicated speed to vary from that in straight flight at normal load with throttle closed. The instrument is adjusted primarily for the landing condition, power on, when the normal warning is less marked and the roll-off to the left, following the stall, more pronounced. The stall warning should operate from 4 to 8 knots above the stall in the landing condition, and 14 to 18 knots above the stall in the clean condition.

17. SPINS.

WARNING

NO INTENTIONAL SPINNING IS PERMITTED.

a. GENERAL.—If a spin should inadvertently develop in either the clean or landing condition, the pilot should apply full opposite controls, viz., controls against the stops. In recent spin tests, little difficulty was experienced in recovering from spins of four turns in each direction in the clean condition and from one turn in the landing condition. Use of ailerons against the spin will improve the recovery characteristics over ailerons neutral. The average recovery turns for a four-turn spin in the clean condition are about 1½ turns. In the landing condition the average recovery from a one-turn spin is ¼ turn.

b. RECOVERY TECHNIQUE.—As a result of spin tests, it is recommended that if a normal spin is inadvertently entered the following steps for recovery be initiated immediately.

(1) Apply full opposite controls sharply, leading with opposite rudder, and follow by applying full forward stick. Apply ailerons against the spin.

(2) Hold full reversed controls until rotation stops and airplane assumes normal diving attitude.

(3) Ease the airplane out of the ensuing dive. Do not pull the stick back too rapidly as a high speed stall may result requiring more altitude for recovery.

(4) The rate of rotation will probably increase after full opposite controls are used. Don't be alarmed; this is a good sign and recovery is starting.

(5) Use tabs if forces are too heavy, especially the elevator tab. The latter is effective in reducing push forces during spin recovery.

(6) Oscillation is present in left spins. The nose oscillates between a position varying from approximately on the horizon to 40 degrees to 50 degrees below the horizon. This does not mean that a flat spin is developing. Recovery will be normal. Recovery will be faster if controls are reversed when the nose is at the steeper angle in the oscillation.

(7) If full opposite controls cannot be held and the stick walks back, return the controls with the spin for a brief interval and repeat full recovery control.

Note

FULL FORWARD STICK (STICK AGAINST STOP) MUST BE APPLIED FOR SPIN RECOVERY IN THIS AIRPLANE. MAKE CERTAIN THAT FULL REVERSED CONTROLS ARE USED PROMPTLY AND SHARPLY AND HELD UNTIL RECOVERY IS EFFECTED.

18. PERMISSIBLE ACROBATICS.

a. All normal acrobatics are permissible when not carrying bomb, external tank, or similar load if the following precautionary measures are observed:

(1) Do not exceed allowable speeds and accelerations.

(2) Inexperienced pilots shall not enter loops or Immelmans at less than 280 knots indicated air speed. This speed may be lessened slightly as more experience is gained in these maneuvers.

(3) Inexperienced pilots shall not enter slow rolls at less than 180 knots indicated air speed.

(4) Inverted flight shall not exceed 10 seconds duration because of loss of oil pressure and possible damage to bearings, especially the thrust bearing, caused by the temporarily insufficient engine lubrication.

19. DIVING.

a. CHECK LIST.

(1) Cabin—closed.

(2) Landing gear control—"UP."

(3) Dive brake control—"OFF" or "ON" as desired.

(4) Wing flaps—"UP."

(5) Propeller control—Set at 2050 to 2250 rpm.

(6) Mixture—"AUTO RICH."

(7) Supercharger control—Neutral blower shall be used for all dives except those incident to military tactics at high altitudes.

(8) Throttle—slightly open. Shift to neutral blower before retarding throttle.

CAUTION

Fifteen to twenty inches of manifold pressure is recommended during prolonged dives. Manifold pressures much below 15 inches, if held in a prolonged dive, will foul up the engine in the same manner as do prolonged glides with closed throttle. Caution should be observed in diving from a high altitude, as manifold pressure will build up rapidly at a constant throttle setting. Care should be taken to open the throttle very slowly at completion of dive so partly cooled engine will not cut out.

(9) Fuel tank selector—"RESERVE."

(10) Cowl flaps—"CLOSED."

(11) Oil cooler flaps—"CLOSED."

(12) Intercooler flaps—"CLOSED."

(13) MAXIMUM RPM LIMIT—3060 RPM (NOT OVER 30-SECOND DURATION).

b. COCKPIT CABIN.—The cockpit cabin sliding section must be closed before entering high speed dives, as it is not designed for such speeds in the open position. In the open position, speeds up to 300 knots indicated are allowable.

c. DIVE BRAKE CONTROL.—The dive brake control may be operated at any speed within the normal airplane restrictions in Model F4U-1 airplanes number 82278 and subsequent and Model FG-1 airplanes number 76196 and subsequent. When the dive brake control is operated at speeds greater than 260 knots, the wheels will trail instead of extending fully and locking but are nevertheless effective as a dive brake. For all other Model F4U-1, FG-1, and F3A-1 airplanes, the limiting speed for operation of the dive brake control to extend or trail the landing gear is 380 knots but is unrestricted (within the normal airplane restrictions) with the landing gear fully extended and locked down.

CAUTION

DO NOT DIVE THE AIRPLANE WITH THE TAIL WHEEL EXTENDED (LANDING GEAR CONTROL TO "DOWN") AS DAMAGE TO THE TAIL WHEEL DOORS, DUE TO HIGH AIR LOADS, MAY RESULT.

d. SPEED AND ACCELERATION LIMITS.

(1) GENERAL.—The speed and acceleration limits of the airplane have been defined in paragraph 14.*b.* of this section; flight limitations are given in paragraph 1 of this section.

WARNING

Tests to date indicate that the airplane, if permitted, will attain much higher than the limit speeds. Pilots should gain familiarity with the diving characteristics of the airplane gradually, while maintaining absolute control over the diving speed. The speed limits should be first approached only after such familiarization, and in dives at moderate angles. Familiarity with the limitations imposed by the shake disturbance on pull-out should also be gradually acquired.

(2) CENTERLINE DROP TANK.—Because of the limited strength of the centerline drop tank the following restrictions shall not be exceeded when the full tank is carried:

(a) Positive acceleration—5g.

(b) Maximum speed—375 knots.

(3) CENTERLINE 1000 POUND BOMB.—When carrying a 1000 pound bomb on the centerline supports, the normal airplane restrictions apply except that 5g positive shall not be exceeded.

(4) TWIN PYLON BOMBS AND DROP TANKS. When carrying bombs up to 1300 lbs. or drop tanks on the twin pylons, the normal airplane restrictions apply, except that with drop tanks on the pylons, 5g and 375 knots shall not be exceeded.

20. APPROACH AND LANDING.

a. CHECK LIST.

(1) Shoulder harness—locked.

(2) Tail wheel—locked (for field).
free (for carrier).

(3) Electric fuel pump—"ON."

(4) Fuel tank selector—"RESERVE."

(5) Mixture—"AUTO RICH."

(6) Supercharger control—"NEUTRAL."

(7) Propeller control—2300 rpm to 2400 rpm.

(8) Cowl flaps—"CLOSED."

(9) Landing gear—"DOWN."

(10) Wing flaps—Set 50°, or as required, for field landing.
50° for carrier.

(11) Arresting hook—"UP" for field.
"DOWN" for carrier.

(12) Gun switches—"OFF."

(13) Gun charging knobs—"SAFE" (push in).

(14) Rocket and pylon switches—"OFF."

(15) Rocket safety plug removed.

b. RECOMMENDED SEQUENCE.

(1) Extend landing gear at a speed less than 200 knots.

(2) Lower flaps to desired setting.

(3) Observe items on check-off list.

(4) Open cabin.

(5) Air speed in approach—90 to 95 knots.

WARNING

Pilots should avoid flat approaches. Immediately after flaring out, no difficulty should be experienced in executing a normal three-point attitude landing.

c. FLAP SETTING.—For field landings, it is recommended that a setting of 30° be used until the pilot is familiar with the airplane. Lesser flap settings will result in increased ground run. Flaps full down shall be used for carrier landings. Flaps full down may be used for field landings, when a short run is desired, after experience with the airplane has been obtained.

d. CROSS-WIND LANDING.—Cross-wind landings can best be made by landing with tail slightly up and somewhat less than normal flap angle (about 30 degrees), all other normal landing conditions being about the same. Use some downwind rudder just prior to contact with the ground to head the airplane in the direction of motion over the ground. During the run after landing, there will be a tendency for the up-wind wing to rise, and the airplane will turn into the wind. Use a little rudder or brake for counteraction.

WARNING

Use the brakes cautiously until the tail wheel is on the ground.

e. MINIMUM RUN LANDING.

(1) Flap setting—full down (50 degrees).

(2) Propeller governor—maximum rpm ("INCREASE").

(3) Throttle—slightly open.

(4) Indicated air speed—approximately 95 knots.

(5) The approach should be rather flat as in a carrier landing; the nose should be high. Bring the airplane in about ten feet above the runway, close the throttle and drop the airplane to the runway. Use the brakes as necessary.

f. TAKE-OFF IF LANDING IS NOT COMPLETED.

(1) In the event that landing is not completed, the throttle should be advanced smoothly, followed by the propeller control, if necessary. Landing gear retraction should then be started, followed immediately by opening of the cowl and oil cooler flaps. The wing flaps should then be retracted. This procedure should be followed to

avoid overheating the power plant, which would result if protracted operation were undertaken in the landing condition.

Note

It is recommended that, unless compelling reasons exist for not doing so, time be taken to go through the above procedure.

21. STOPPING OF ENGINE.

a. Before shutting down the engine, use the following procedure for cooling:

(1) Cowl flaps—full "OPEN" while idling and for at least 10 minutes after stopping.

(2) Intercooler flap—"OPEN" to cool accessory compartment.

(3) Oil cooler flaps—"OPEN."

(4) Propeller control—maximum rpm ("INCREASE").

(5) Throttle—set for 800-900 rpm (near the red quadrant mark) to cool cylinder temperatures to approximately 170°C. (328°F.) or below.

b. To stop the engine:

(1) Electric fuel pump—"OFF."

(2) Mixture control—"IDLE CUT-OFF."

(3) Ignition switch—"OFF."

Note

As soon as the engine begins to cut out, move the throttle forward slowly to fill the carburetor with fuel for the next flight.

(4) Battery switch—"OFF."

(5) Fuel selector—"OFF."

(6) Turn off all switches used for flight (radio, lights, etc.).

(7) Leave cowl flaps "OPEN."

Note

Oil cooler flaps, intercooler flap and cockpit cabin must be closed as soon as the engine is cool.

c. OIL DILUTION PROCEDURE.

(1) In the event of a low temperature forecast, viz., below -5°C. (+23°F.), the oil in the warm-up circuit shall be diluted in the following manner:

(a) Open the manual shut-off valve in the oil dilution line. This valve is located on the side of the left hand oil tank support.

(b) Start engine (see paragraph 6, this section).

(c) Engine speed constant—1000 rpm.

(d) Oil dilution switch—"ON" (APPROXIMATELY FOUR MINUTES).

(e) Stop engine by moving mixture control to "IDLE CUT-OFF."

(f) Hold oil dilution switch on until engine stops.

(g) When a cold engine in which the oil was diluted prior to shut-down is subsequently started and, after running a short while, the oil pressure starts to fluctuate or drop, the dilution valve shall be opened intermittently for intervals of a few seconds over a period of about 15 seconds. If the oil pressure still does not steady out, stop the engine and wait for approximately five minutes before attempting another start.

(2) PRECAUTIONS.

(a) Do not overdilute.

(b) Guard against fire.

(c) Dilute only when justified by a forecast of low temperature, viz., below -5°C. (+23°F.).

(d) Allow adequate warm-up before taking off, except in cases of extreme emergency.

(e) Keep the oil system free from sludge and water.

(f) Check position of dilution line shut-off valve.

(g) Since the oil in the hydromatic propeller is not diluted, care must be taken to determine that the propeller pitch-changing mechanism is operating prior to take-off.

22. BEFORE LEAVING THE COCKPIT.

a. Install the surface control lock. This can be done by hooking the extension bar into the left rudder pedal, inserting the left and right hand pins into recesses in the foot troughs, and securing the clamp around the stick. The lock is not normally carried in the airplane.

Note

Make sure that the surface controls are locked whenever the airplane is parked; otherwise, damage to the rudders, elevators, or ailerons may result.

23. MOORING.

a. In the event of unfavorable weather conditions involving high wind velocities or heavy precipitation, or if the airplane is to remain parked for a considerable length of time, make certain that it is tied down securely. The following procedure shall be used:

(1) Lock the tail wheel.

(2) Place chocks fore and aft of the front wheels.

(3) Secure the tail by means of the hold-back link on the tail wheel housing.

(4) Keep the wings spread. Secure the wings by means of the tie down links in the outer panels.

(5) The landing gear drag links and towing links may also be used for tieing down.

24. MISCELLANEOUS.

a. TEST FOR MIXTURE CONTROL.—Although carburetors normally hold their calibration during several hundred hours of operation, it is realized that there are occasions when consistent metering cannot be maintained because of irregular schedules and inadequate servicing facilities. Under such conditions, it is recommended that frequent tank tests be run during routine flights in order to detect erratic metering. The following procedure is recommended:

(1) Just before take-off, "top off" tank to be used for test. (Either wing or drop tank is suitable for the purpose.) Do not use fuel from this tank until aloft and ready to start test run.

(2) After cruising altitude is reached, trim the airplane for level flight at usual cruising indicated air speed.

(3) Set the selector valve to the test tank, and record elapsed time in minutes and seconds for tank to run "dry" (as indicated by drop in fuel pressure). Record rpm, pressure altitude, and indicated air speed during test run.

Note

If insufficient time is available to empty the tank; a shorter run may be made. Data from runs of less than 45 minutes are unlikely to be reliable.

(4) Immediately after landing, have the test tank refilled from a calibrated pump, or from measuring cans if there is any doubt about the pump calibration. Record the amount of fuel required to refill the tank.

(5) Compare fuel consumption with records of previous flights or with published data. (Indicated air speed, gross weight, configuration, power conditions, and density altitude must be approximately the same for the flights compared.)

(6) A difference greater than ± 4 per cent in fuel consumption is considered an indication of unsatisfactory metering when actual fuel consumption is compared with optimum consumption of a well-maintained airplane. Over-rich (rather than over-lean) mixtures at low cruising powers usually result from erratic metering.

CAUTION

The carburetor vent line runs to the main fuel tank. Sticking of either vent valve can cause a false indication of over-rich mixture because of excessive fuel return to the main tank. A ground check for this condition can be made by disconnecting the vent line at the firewall or carburetor and operating the auxiliary fuel pump. Normal fuel return is not over two quarts per hour. If the return rate is excessive, and the offending valve cannot be seated, the rate of flow should be measured for subsequent use in the correcting tank test results.

b. If over-richness is definitely shown by carefully run tests, and adjustment or replacement of the offending carburetor is not practicable, manual leaning may be used at approximately 50 per cent power and below, to control mixture strength. The following method should be used:

(1) With mixture control in auto lean, fly at desired indicated air speed, using 32 inches Hg. manifold pressure and not more than 1700 rpm nor less than 1300 rmp. If 32 inches Hg. cannot be obtained, use full throttle. If indicated air speed obtained at 32 inches Hg. or full throttle and 1300 rmp is too high, reduce manifold pressure as required. Do not exceed 32 inches Hg. Allow a few minutes for engine temperatures to stabilize, then note head temperatures.

(2) Move mixture control slowly out of "AUTO LEAN" toward "IDLE CUT-OFF" until surging of rpm begins. Then move mixture control toward "AUTO LEAN." If this reduces surging to ± 10 rpm or less, the setting is satisfactory. If surging exceeds ± 10 rpm, move mixture control toward "AUTO LEAN," and note whether surging is reduced below limit. Repeat, if necessary. After a little experience, there should be no difficulty in obtaining the desired setting quickly with a minimum of readjustments.

(3) While making the adjustments just described, maintain a close watch on cylinder head temperature gage. Head temperatures must not go more than 5°C. (41°F.) above or 15°C. (59°F.) below the corresponding head temperatures observed when using "AUTO LEAN." Return mixture control to "AUTO LEAN" immediately if head temperatures go outside limits, and wait until temperatures stabilize before repeating attempt to lean manually. DO NOT STOP SHORT OF "AUTO LEAN" if enrichment is necessary to control head temperatures. Do not exceed limit of 232°C. (450°F.) at any time.

c. Manual leaning at more than 50 per cent power is not recommended, and should be avoided except in extreme emergencies. Engine damage may result at any power when manual leaning is done incorrectly. The procedure is particularly hazardous above the cruising power range.

d. If over-enrichment develops during a flight, the usual indications are low head temperature, loss of power, and, in extreme cases, a visible smoke trail. If possible, confirm suspected over-richness by a tank test before resorting to manual leaning. Indiscriminate leaning is dangerous.

Section III
OPERATING DATA

1. AIR SPEED CORRECTION TABLE.

The calibration below represents the air speed head (pitot tube) position error and gives the corrected indicated air speed for a given reading of the cockpit air speed indicator assuming zero scale error for the instrument itself.

Cockpit Air Speed Indicator Reading in knots	Clean Condition — Flaps Up		Landing Condition — Flaps Down	
	Correct Indicated Air Speed in knots	Correction in knots	Correct Indicated Air Speed in knots	Correction in knots
70	—	—	67	—3
80	—	—	78	—2
90	88	—2	89	—1
100	99	—1	100	0
110	110	0	111	+1
120	122	+2		
130	132	+2		
140	143	+3		
150	153	+3		
160	163	+3		
170	174	+4		
180	184	+4		
190	194	+4		
200	205	+5		
220	225	+5		
240	246	+6		
260	266	+6		
280	287	+7		
300	308	+8		
350	—			
400	—			

2. SPECIFIC ENGINE FLIGHT CHART.

a. The specific engine flight chart summarizes the operating limits of the engine. It gives the supercharger setting, manifold pressure, rpm, altitude range and BHP for several different operating conditions. Other conditions affecting the operation of the power plant, such as oil pressures and temperatures, are also specified. The rpm's and manifold pressures at a given supercharger control setting for take-off, military, and war emergency operation must never be exceeded; the five-minute time limit for each of these conditions should not be exceeded. The altitudes corresponding to the supercharger control settings show the approximate altitude range for operation at that setting. Operation below the lower altitude shown for a given supercharger control setting should not be undertaken as less power will be obtained, carburetor air temperatures will be dangerously high, and fuel economy will suffer. When changing power conditions, the controls should be adjusted to the settings appropriate to the new condition in the sequence which follows, in order to avoid excessive pressures within the cylinders:

(1) Increasing power — Mixture, rpm, manifold pressure.

(2) Decreasing power — Manifold pressure, rpm, mixture.

b. In order to obtain the maximum in performance and reliability from the engine, when urgently needed under combat conditions, it is recommended that the pilot operate it at its power limits no more often than is necessary for proper familiarity and training.

AIRPLANE MODELS
F4U-1, FG-1, F3A-1

SPECIFIC ENGINE FLIGHT CHART

ENGINE MODEL
R-2800-8W

CONDITION	FUEL PRESSURE (LB SQ IN.)	OIL PRESSURE (LB SQ IN.)	OIL TEMP °C	OIL TEMP °F
DESIRED	17	60-90	60-80	140-176
MAXIMUM	18	100	100	212
MINIMUM	16	50	40	104
IDLING	7	25		

MAX. PERMISSIBLE DIVING RPM 3060

CONDITION	ALLOWABLE OIL CONSUMPTION	
NORMAL RATED (MAX CONT.)	U.S QT HR	IMP PT/HR
MAX. CRUISE	U.S QT HR	IMP PT/HR
MIN. SPECIFIC	— U.S QT HR	— IMP PT/HR
OIL GRADE (S) 1100	(W) 1100	

SUPERCHARGER TYPE: TWO STAGE, TWO SPEED

FUEL GRADE: 100 130 OCTANE — SPEC. AN-F-28

OPERATING CONDITION	RPM	MANIFOLD PRESSURE (BOOST)	HORSE-POWER	CRITICAL ALTITUDE WITH RAM	CRITICAL ALTITUDE NO RAM	BLOWER	USE LOW BLOWER BELOW	USE NEUTRAL BLOWER BELOW	MIXTURE CONTROL POSITION	FUEL FLOW (GAL HR) U.S	FUEL FLOW (GAL HR) IMP	MAXIMUM CYL TEMP °C	MAXIMUM CYL TEMP °F	MAXIMUM DURATION (MINUTES)
TAKE-OFF	2700	54.0	2000	S.L	S.L	N	—	—	AUTO RICH	290	240	260	500	5
WAR EMERGENCY	2700	57.5	2250	S.L	S.L	N	17000	8000	AUTO LEAN	245	205	—		5
	2700	59.0	2135	15000	12500	L				245	205			
	2700	59.5	1975	20000	17000	H				245	205			
MILITARY	2700	52.5	2000	2500	2000	N	20000	6000	AUTO LEAN			260	500	30
	2700	53.0	1800	18500	16000	L								
	* 2700	53.0	1650	23000	21000	H								
NORMAL RATED (MAX. CONT.)	2550	44.0	1675	7000	5500	N	21000	10000	AUTO LEAN					—
	2550	49.5	1625	19000	16500	L								
	2550	49.5	1550	24000	22000	H								
MAXIMUM CRUISE	2150	34.0	1070	10000	10000	N	22000	13000	AUTO LEAN	83	69	232	450	
	2150	34.0	970	20500	20500	L				93	77			
	2050	34.0	950	26000	26000	H				82	68			
MINIMUM FUEL CONSUMPTION	1300	30	570	5000	5000	N	22000	15500	AUTO LEAN	42	35	232	450	
	1500	26.5	570	10000	10000					43	36			
	1800	23.5	600	15500	15500					51	42			
	1550	28	600	15500	15500	L				50	42			
	1700	26	595	20000	20000					53	44			
	1800	25	610	22000	22000					56	47			
	1700	28	660	22000	22000	H				57	48			
	1750	25.5	600	25000	25000					58	48			
	2000	25.5	650	30000	30000					65	54			

REMARKS: * Above 25000 ft. use 2550 RPM and full throttle.

Section IV

EMERGENCY OPERATING INSTRUCTIONS

1. EMERGENCY EGRESS.

a. The entire cabin section can be released in flight in case of emergency. The two release handles, one on either side of the cabin structure, are plainly marked "CABIN EMERGENCY RELEASE." These two handles are safety-pinned to prevent inadvertent release of the cabin and to permit using the handles for pushing the cabin fully closed. The safety pins (painted red) are attached to wire loops adjacent to the release handles and must be pulled free (aft) before the release handles can be moved. The release handles disengage the front rollers from the cabin. As the cabin is pushed upward, the rear rollers are disengaged and the cabin is freed of the airplane, to be carried away by the slipstream.

b. To release the cabin in an emergency in flight:

(1) Pull the safety pin loops.

(2) Pull both cabin release handles inboard simultaneously and push them forward.

(3) Break cabin free with upward push on the release handles.

2. EMERGENCY LANDING GEAR OPERATION.

a. The landing gear can be extended if there is complete failure of the hydraulic system, that is, even if no action can be obtained by operating the hand pump. The emergency gear extension is actuated by a CO_2 system on the main gear and a spring system on the tail wheel (see figure 28). However, before resorting to emergency landing gear extension, attempt to lower the gear with the hand pump, since subsequent retraction may be desired and will be impossible once the CO_2 system is operated. To lower the landing gear with the hand pump:

(1) Move the landing gear control to "DOWN."

(2) Operate the hand pump until the landing gear indicators show that the gear is fully down and locked.

b. The following procedure is used for emergency extension of the landing gear in case of actual failure of the hydraulic system.

(1) Close throttle and reduce speed to about 110 knots.

(2) Open the emergency landing gear release valve. This valve is located to the left of the pilot's seat.

Note

The CO_2 system will extend the landing gear regardless of the position of the landing gear control handle, but it is recommended that the control handle be placed in the "DOWN" position.

(3) Further reduce speed to about 90 knots (keep above the stalling speed) while the landing gear is extending.

(4) Check the indicators that the landing gear and tail wheel are fully locked "DOWN."

c. The emergency extension of the landing gear is started at a comparatively high speed so that the air-flow will assist in opening the landing gear doors. Turning the emergency landing gear release valve admits CO_2 to a sequence valve which actuates two unloader valves, the unloader valves by-passing the hydraulic oil at the bottom of the landing gear and tail wheel struts directly back to the hydraulic reservoir. The sequence valve in turn admits CO_2 pressure to the top of the landing gear struts, thereby extending the gear. The early models incorporating a pull handle emergency release work on much the same principle. In this case, pulling the release first actuates the unloader valves and then operates a cutter valve which releases the CO_2 pressure to the landing gear struts.

3. LIFE RAFT.

a. The one-man, parachute-type life rafts are used by pilots operating these airplanes.

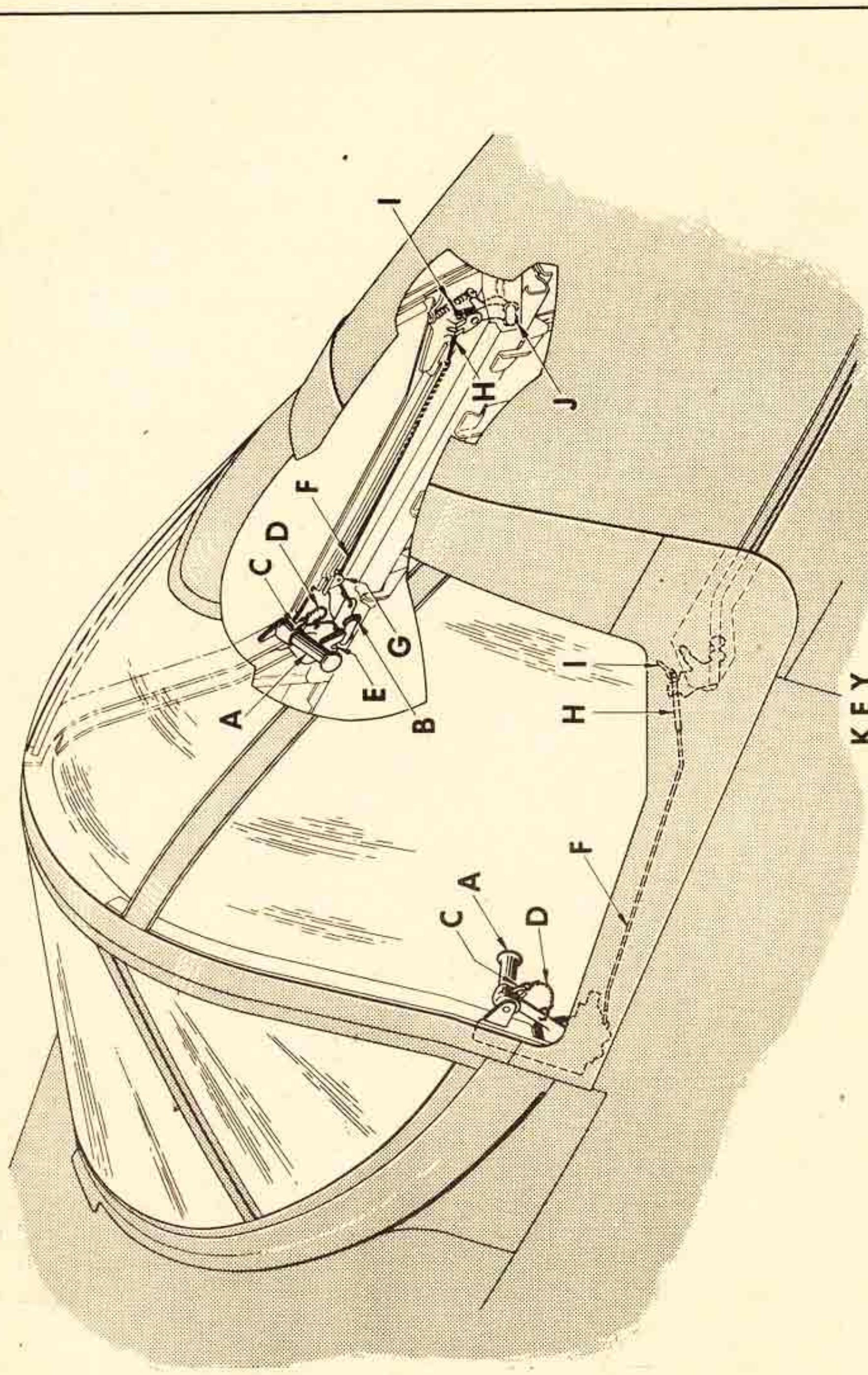


Figure 27—Cabin Emergency Release

4. ENGINE FAILURE DURING FLIGHT.

a. Engine failure is noticeable in either of the following conditions:

(1) Freezing of engine.
(2) Drop in altitude and loss of speed.

Note

If the engine fails but does not freeze, no absence of engine noise is apparent since the windmilling propeller simulates normal engine operation. Also, in this condition manifold pressure can be increased and decreased normally, and the propeller blade angle can be changed within certain limits. While the propeller is windmilling, the hydraulic system can be operated normally. However, if the engine should freeze or rough operation should necessitate stopping the engine by placing the propeller governor control in high pitch (minimum rpm) position, the hydraulically controlled units must be operated by the hand pump.

b. If altitude permits, attempt to find the cause of engine failure by the following procedure:

(1) The selected tank may be empty. Switch to another tank.

(2) If it is apparent that the fault does not lie in fuel system operation, and altitude still permits, check the following:

(a) Move the mixture control to "AUTO RICH."
(b) Test the magnetos individually.

c. If, after completing the above operations, the engine does not start, prepare for an emergency landing. Refer to paragraph 5., below.

Note

The gliding ratio of this airplane in the clean condition at 140 knots indicated air speed (best gliding speed) is 13:1.

5. FORCED LANDINGS.

a. GENERAL.

(1) In the event of a forced landing over land, the pilot should consider a number of variables in order to determine his best landing attitude. These include altitude, type of terrain and the characteristics of the airplane.

(2) Landings in soft or uneven terrain such as golf courses or ploughed fields and in rough, rocky, or tree stump terrain should be made with landing gear up. Most nose-overs occur as a result of landing in such territory with the landing gear down, and nearly all serious injuries and fatalities result from nosing over.

(3) Pilots should remember that ground which appears smooth and level from the air frequently turns out to be rough, crossed with ditches, soft or full of obstructions when the actual landing is made.

(4) All forced landings should be made well above the stalling speed. There will be no control of the airplane if an attempt is made to land at or slightly above stalling speed. The plane should be on the ground before that stage of deceleration is reached.

b. BELLY LANDINGS.

(1) Preparation for belly landing:

(a) Release droppable fuel tanks or bombs.

(b) Landing gear—"UP."

(c) Landing flaps—"DOWN."

(d) Remove rocket safety plug. (If rockets are carried.)

(e) Shoulder harness and safety belt—"LOCKED."

(f) Jettison the cockpit sliding section.

(g) Fuel tank pressure release—"AFT."

(2) Prior to contact with the ground:

(a) Drop pilot's seat several inches.

(b) Switches (battery, ignition)—"OFF."

(c) Fuel selector—"OFF."

(d) Master armament switch—"OFF."

c. WATER LANDINGS (DITCHING).

(1) The same procedure as that outlined for belly landings is applicable to ditching.

Note

THIS AIRPLANE HAS EXCELLENT WATER CHARACTERISTICS DUE TO THE INVERTED GULL WING WHICH CAUSES IT TO PLANE ON CONTACT WITH THE WATER. BECAUSE OF THE PLANING FEATURE, A FULL-STALL LANDING. IS NOT NECESSARY.

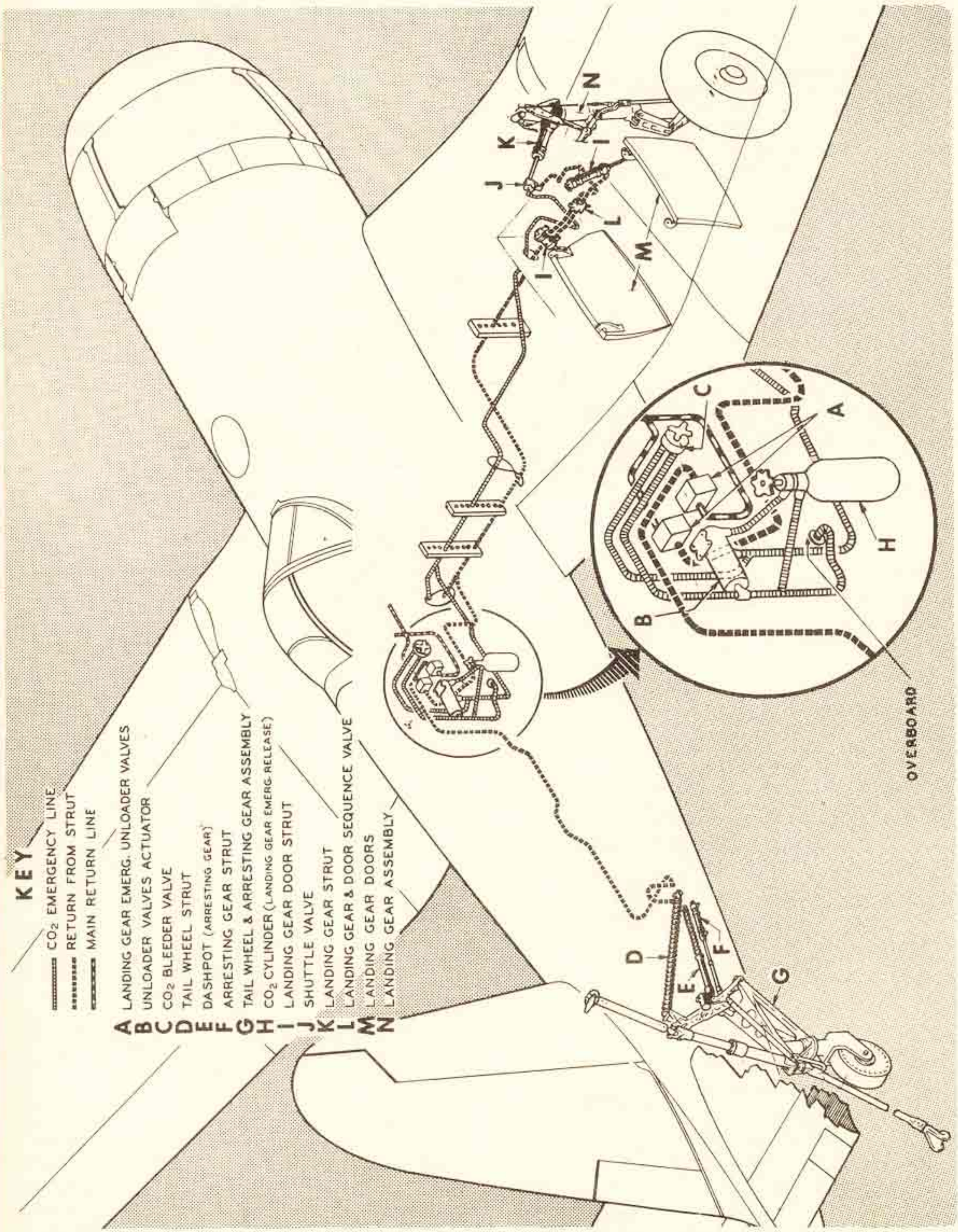


Figure 28—CO_2 System—Emergency Landing Gear Operation

Section V
OPERATIONAL EQUIPMENT

1. OPERATION OF OXYGEN EQUIPMENT.

a. GENERAL.—A diluter-demand type oxygen supply system is located to the right of the pilot's seat (see figures 4 and 30). The diluter-demand regulator is similar in operation to the demand regulator except that an air admission valve, which allows air from the outside to enter the breathing system, is incorporated. The amount of air admitted is dependent upon the altitude up to approximately 30,000 feet, beyond which 100 per cent oxygen is automatically delivered.

Note

Provision is made to install an oxygen flow indicator on the diluter-demand regulator. This indicator is government furnished and is installed in the field.

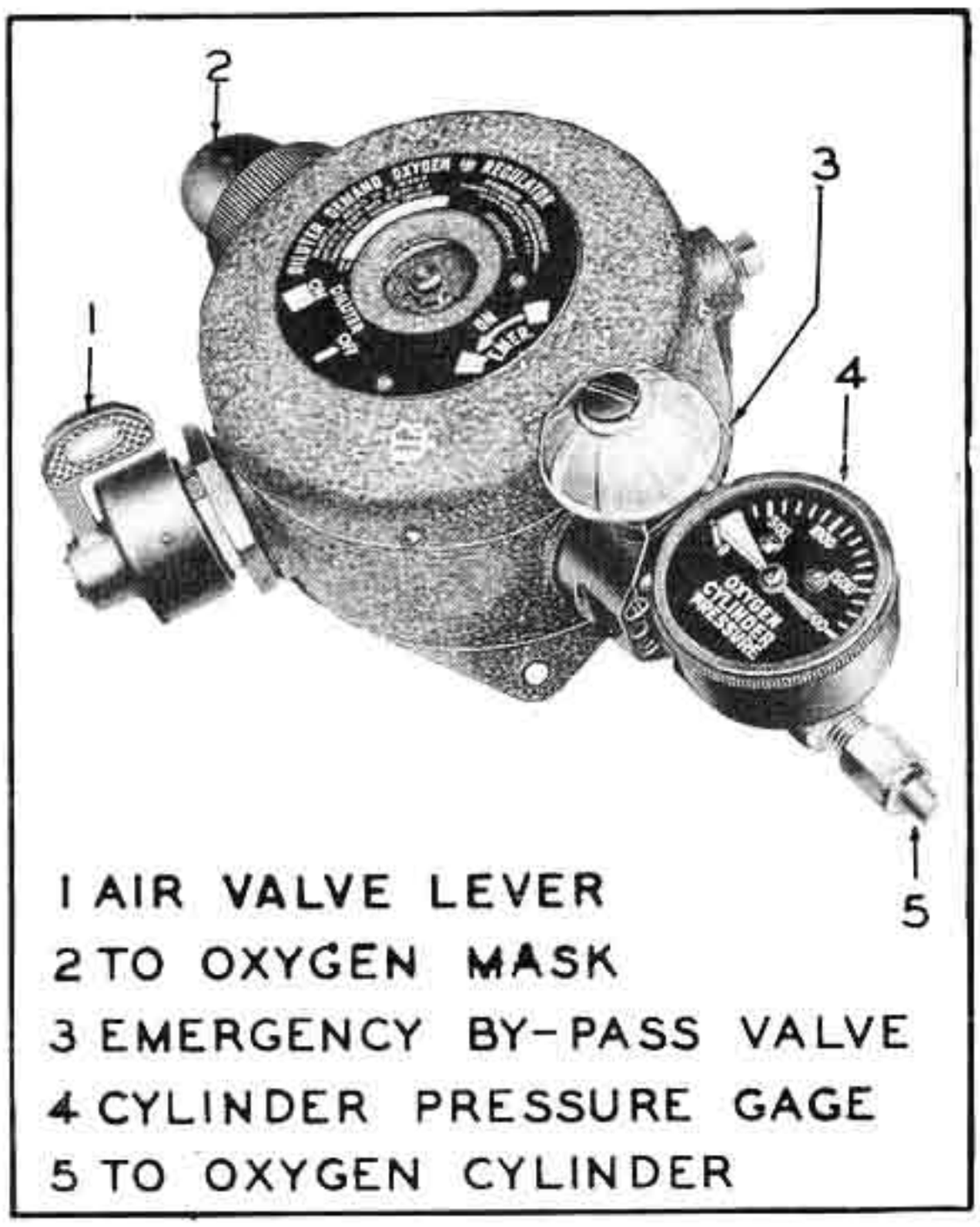


Figure 29—Diluter-Demand Regulator

b. WHEN TO USE OXYGEN.

(1) During normal operations the diluter-demand lever should be turned to the "ON" or "NORMAL OXYGEN" position, thus obtaining the maximum economy and endurance from the oxygen supply aboard.

Note

If symptoms suggestive of oxygen deficiency, such as drowsiness, dizziness, dimming of vision, awkward performance of routine tasks, or nausea, should occur, descend immediately to 10,000 feet, using the emergency oxygen supply, and inspect the oxygen system in accordance with paragraph 1.*c.*, below.

(2) The emergency valve (small red knob on regulator) shall be used only if the diluter-demand regulator becomes inoperative or if anoxia is suspected. When used, open the emergency valve slowly and obtain the minimum flow required.

(3) Use oxygen on all flights above 10,000 feet.

(4) On all flights of more than four hours between 8,000 and 10,000 feet, oxygen shall be used a minimum of 15 minutes out of every hour.

(5) Use oxygen on night flights above 5,000 feet.

Note

When carrying a drop tank with main tank full, it is possible to operate for a period longer than necessary to exhaust the oxygen supply. Study the Oxygen Consumption Table below and the Flight Operation Instruction Charts in Appendix I carefully and plan oxygen flights accordingly.

OXYGEN CONSUMPTION TABLE

ALTITUDE IN FEET	DILUTER-DEMAND REGULATOR WITH DILUTER "OFF"	DILUTER-DEMAND REGULATOR WITH DILUTER "ON"
	ENDURANCE HOURS	ENDURANCE HOURS
5,000	1.8	7.0
10,000	2.1	8.3
15,000	2.6	10.0
20,000	3.3	8.8
25,000	4.1	6.0
30,000	5.0	5.0
35,000	6.5	6.5
40,000	8.3	8.3

c. The following items shall be checked at regular intervals when the airplane is on the ground, and whenever possible before flights in which oxygen is to be used, to assure proper functioning of the oxygen system:

(1) Check the regulator emergency by-pass valve to determine that it is closed.

(2) Open cylinder valve. Pressure gage should read 1800 ± 50 p.s.i. if cylinder is fully charged.

(3) Close the cylinder valve. If pressure drops more than 100 pounds in five minutes there is excessive leakage. The system should be repaired prior to use.

(4) Check mask fit by squeezing off the corrugated breathing tube and inhaling lightly. Mask will collapse on face if there is no leakage. DO NOT USE A MASK THAT LEAKS. Never check mask fit, as outlined, with EMERGENCY FLOW "ON."

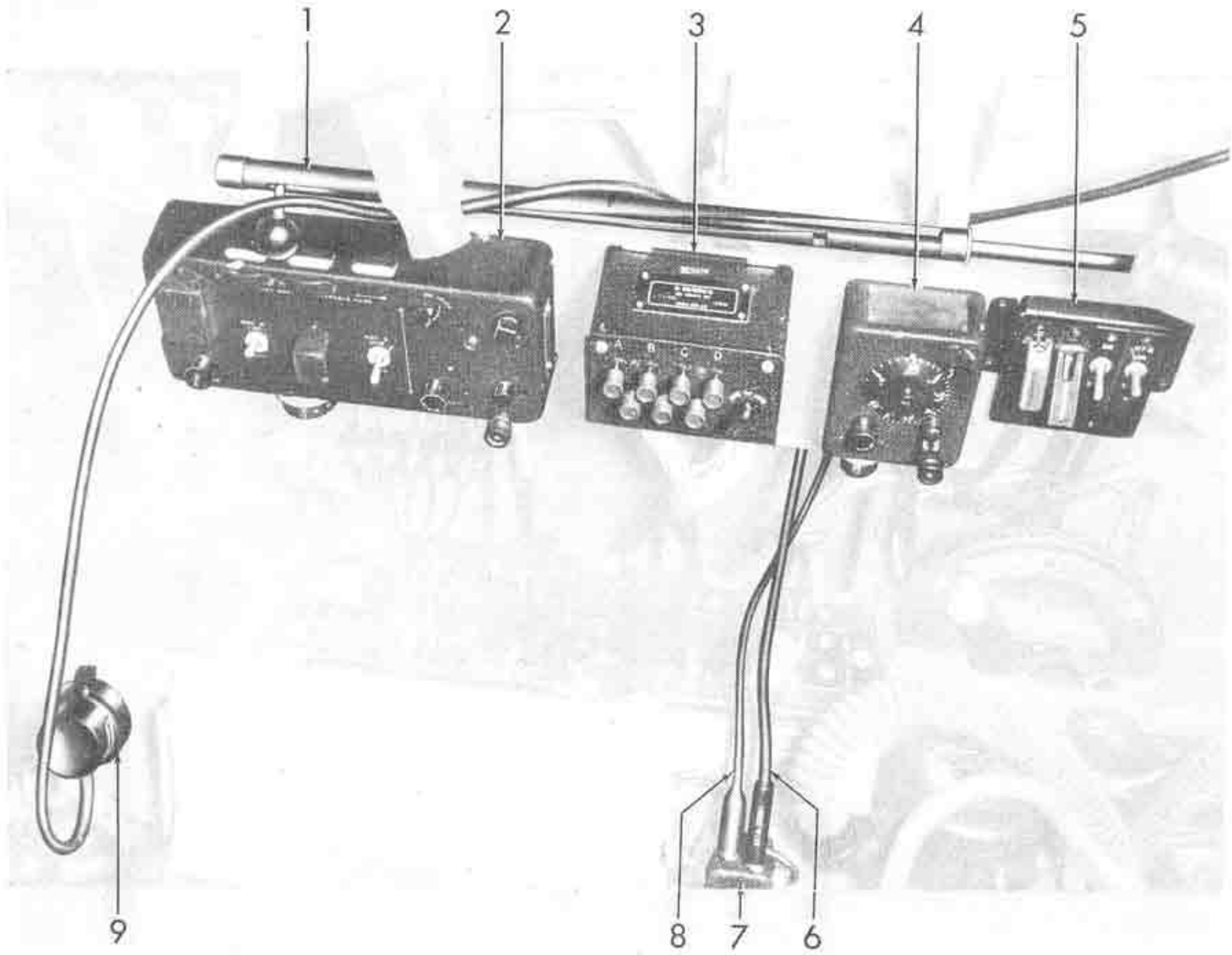


Figure 30—Radio and Communications Controls

1. Navigation Antenna Control
2. Receiver Control Box
3. Transmitter Control Box
4. Range Receiver Control Box (Coffee Grinder)
5. Remote Control Switch Panel
6. Mask Microphone Pigtail
7. Pilot's Jackbox
8. Headset Extension Cord
9. Hand Microphone

(5) Open cylinder valve. Breathe several times to determine that regulator is functioning properly. Check emergency by-pass valve by turning handle toward "ON" position until the oxygen flows into the mask. Close emergency valve.

(6) Upon completion of oxygen flight, close cylinder valve.

2. OPERATION OF RADIO AND RADAR EQUIPMENT.

a. GENERAL.—This airplane is furnished with AN/ARC-5 communication, AN/ARR-2 navigation, and AN/APX-1 identification radio and radar equipment.

(1) The emergency radio and battery switches, located on the pilot's distribution box, should be "ON" for all radio operation; the equipment will take about one minute to warm up. The "OFF" position of the radio switch is used in cases of emergency under conditions similar to those of the emergency generator switch. See paragraph 3.*a.*(3).

Note

On F4U-1 airplanes number 49760 to 82378, F3A-1 airplanes number 08649 and subsequent, and FG-1 airplanes number 13741 and subsequent, a master radio switch, performing the same operation as the emergency radio switch, is mounted on the pilot's distribution box.

b. AN/ARC-5-VHF COMMUNICATION—RECEIVING.

(1) EQUIPMENT.

Receiver	*Frequency*
R-23/ARC-5	190 to 550 kilocycles
R-28/ARC-5	100 to 156 megacycles

(2) OPERATION.

(a) Plug headphone and microphone plugs into the pilot's jack box.

(b) On the receiver control box, push up either the HF or VHF switch, depending on the particular pretuned frequency desired.

1. If VHF is chosen: on the transmitter control box, select the desired channel (A, B, C, or D). Selection is dependent on operational requirements.

Note

The toggle switch must be in the "ON" position to operate transmitting equipment on either HF or VHF.

2. If the HF receiver is chosen: on the receiver control box, adjust the sensitivity control to an agreeable noise level.

(c) On the receiver control box, turn the COMM volume knob to the desired intensity.

Note

Either HF or LF ferry receiver can be used, one at a time; they cannot be used together.

(d) To operate LF ferry receiver:

1. On the range receiver control box, turn the tuning knob to obtain the desired dial frequency reading.

2. Turn SENS knob clockwise to the desired volume intensity.

3. The CW-VOICE switch is set to "VOICE" for voice communication and to "CW" for homing or code reception.

(e) To turn off equipment:

1. HF and VHF: on the receiver control box, throw the HF (or VHF) switch to the "OUT" position.

2. LF ferry receiver: on the range receiver control box turn SENS knob fully counterclockwise.

c. AN/ARC-5-VHF COMMUNICATION—TRANSMITTING.

(1) EQUIPMENT.

Transmitter	*Frequency*
T-19/ARC-5	3-4 megacycles
T-23/ARC-5	100-156 megacycles

(2) OPERATION.

(a) Plug headphone and microphone plugs into pilot's jack box.

(b) On transmitter control box, select either HF or VHF, depending on the particular frequency desired:

1. If VHF is chosen: select the desired channel (A, B, C, or D). Selection is dependent on the pretuned frequency to be used.

2. If HF is chosen: place the switch in the number "2" position and proceed as outlined below.

(c) Microphone selection and operation:

1. If hand microphone is used, depress button on microphone to talk.

2. If mask microphone is needed, push throttle switch button.

3. Hold microphone as close to the lips as possible and speak clearly and distinctly. It is not necessary to shout.

(d) To turn off equipment:

1. Depending on the type of microphone used, release either the hand microphone button or the throttle switch button for the mask microphone.

d. AN/ARR-2 NAVIGATION.

(1) EQUIPMENT.

Receiver	*Frequency*
R-4/ARR-2	234 to 258 megacycles

(2) OPERATION.

(a) On NAVIG panel: Set VOICE-NAV indicator to "NAV."

(b) Turn CHAN SEL indicator to the particular channel desired for the six channels available.

(c) Turn SENS knob clockwise to obtain a comfortable volume intensity.

(d) Vary pitch (or beat note) by turning PITCH knob to a desirable frequency.

(e) To turn off equipment:

1. Turn the VOICE-NAV indicator back to "VOICE."

2. Turn the SENS knob fully counterclockwise.

e. AN/APX-1 IDENTIFICATION.

(1) EQUIPMENT.

Receiver
RT-22/APX-1

(2) OPERATION.

Note

Before take-off check to see that a complete destructor circuit test has been made. On F4U-1 airplanes number 49981 and subsequent, F3A-1 airplanes number 08649 and subsequent, and FG-1 airplanes number 13791 and subsequent, it will be necessary to set the code indicator before take-off.

(a) On the IFF remote control panel: switch the ON-OFF switch to the "ON" position.

(b) Set the CODE indicator to the desired position of the six positions available. (Set to position number 1 if no other has been previously specified.)

(c) Throw the G BAND switch "ON" or to "TMPRY", depending upon particular requirements.

(d) To turn off equipment:

1. Turn off the G BAND switch and the ON-OFF switch.

Note

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

3. OPERATION OF ELECTRICAL EQUIPMENT.

a. GENERAL.—The electrical power for the airplane is supplied by a 24 volt, direct current, single wire system in which the framework of the airplane acts as a ground return. Power may be supplied by one of three sources: the 75 ampere generator, the 24 volt, 17 ampere-hour battery, or the external power receptacle.

Note

In all airplanes with an electric starter, provision is made for two 24 volt, 17 ampere-hour batteries, both of which are installed in the airplane when it leaves the factory. The use of the pair of batteries is optional since two batteries are needed only for cold weather starting.

(1) VOLTAMMETER.—A voltammeter, located on the right hand sub-instrument panel, indicates the generator output in amperes. This will vary according to the charge condition of the battery and the amount of electrical equipment being used. A push button is supplied on the voltammeter which, when pushed, indicates voltage. When the engine is stopped, or when at any time the rpm is less than 1300, push the button in to indicate battery voltage. The generator voltage should read between 27.5 and 25.5 volts.

Note

If the voltammeter reading is over 28.5, turn the battery switch "OFF" to prevent damage to the battery.

(2) BATTERY SWITCH.—A battery switch is provided which disconnects the battery from the remainder of the electrical system. With this switch in the "OFF" position, the generator cannot deliver current to the battery, nor can the battery deliver current to any external load except the recognition lights and the inertia switch. When the airplane is on the ground with engine off, the battery switch, recognition light switches and inertia switch should be "OFF." This will prevent any inadvertent drain on the battery. For starting the engine and for all ground running and flight operation, the battery switch should be "ON." If, however, any difficulty is encountered with the voltage regulator, the battery switch may be switched to "OFF" to prevent damage to the battery. Smoke emerging from the battery box on the lower right side of the cockpit will give ample warning that the battery is being overcharged. With the battery switch "OFF," the operation of the electrical system will be normal as long as the generator is charging (engine turning more than approximately 1300 rpm), since the generator will feed current directly into the system.

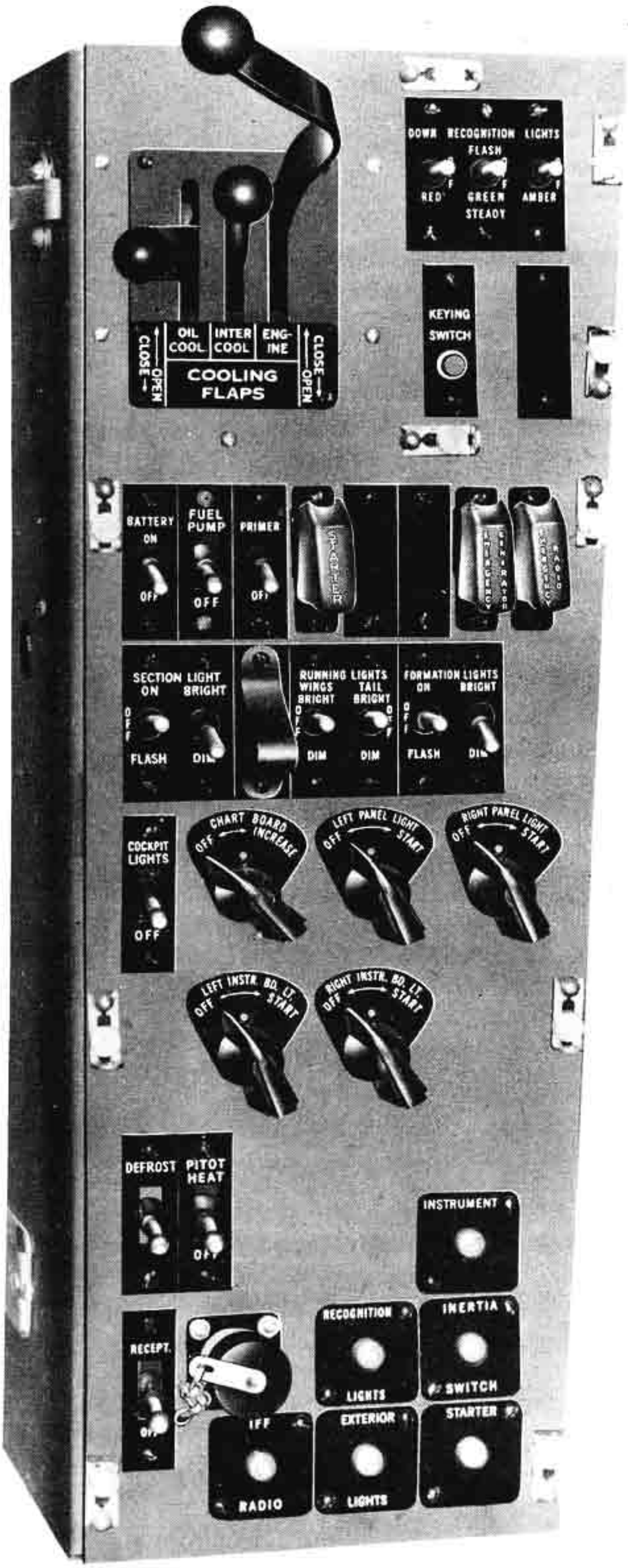


Figure 31—Pilot's Distribution Box

WARNING

Do not turn main battery switch on while engine is not running unless mixture control is in "IDLE CUT-OFF." If the battery switch is turned on with the mixture control in any position but "IDLE CUT-OFF," and the fuel pump switch is on, the lower cylinders will be flooded with raw fuel, resulting in damage to the engine when it is subsequently started.

CAUTION

Since the battery switch is designed for a normal current load not to exceed 50 amperes (75 amperes on airplanes with Bureau serial number 17932 F4U-1, 13342 FG-1, 04740 F3A-1 and subsequent), care should be taken not to impose any severe loads on the electrical system unless the generator is delivering current. With the generator delivering power, the current comes directly from the generator and, hence, cannot harm the battery switch.

(3) EMERGENCY GENERATOR SWITCH.—The emergency generator switch, located on the pilot's distribution box, is normally closed. Power for the electrical system is thus obtained from the generator, regulated by the voltage regulator and measured by the voltammeter.

(a) A faulty generator, voltage regulator, or battery will be indicated by an erratic or improper reading on the voltammeter. Open the emergency generator switch; this will isolate the generator from the remainder of the electrical system. If the fault is not with the battery, it will automatically take over the load as long as the battery switch is on. All electrical equipment unessential to flight should be turned off. When two batteries are installed, radio and IFF operation will last about one-half hour running on the batteries alone.

(4) INSTRUMENT SWITCH.—On F4U-1 airplanes number 49760 to 82378, F3A-1 airplanes number 08649 and subsequent, and FG-1 airplanes number 13741 and subsequent, an instrument switch is installed on the pilot's distribution box. This switch operates the electric fuel gage, electric oil temperature gage, carburetor air temperature warning light, and remote compass. It is of the switch-breaker type and is used in conjunction with the battery switch; it must be "ON" for all airplane and engine operation. Subsequent to F4U-1 number 82378, this switch is removed from the airplane and replaced by the instrument circuit breaker; thus instruments formerly operated by the instrument switch become energized when the battery switch is turned "ON."

(5) CIRCUIT BREAKERS.—Almost all the electrical circuits of the airplane are protected by circuit break-

ers most of which are located on the armament switch panel on the left side of the cockpit; the rest, of which there are six, are located on the pilot's distribution box. These are the instrument, recognition lights, inertia, IFF radio, exterior lights, and starter circuit breakers. If an electrical overload of sufficient magnitude and duration occurs in a circuit, the circuit breaker button will pop out, thus breaking the circuit. Allow a minute or so to elapse and push the button back in. If the circuit has been seriously disturbed, as by a "short," the button will pop out again indicating that the circuit cannot be further operated until the necessary repair has been made.

(6) SWITCH BREAKERS.—Those circuits not protected by circuit breakers have circuit breakers incorporated in the respective "ON"-"OFF" switches. When a short occurs in one of these circuits, the switch will be thrown automatically to "OFF." Treat this action the same as a circuit breaker in allowing some time to elapse before returning the switch to the "ON" position. If the circuit is seriously disturbed, the switch breaker will snap off again.

(7) APPROACH LIGHT.—The approach light is located in the leading edge of the left hand outer panel. For carrier-based operations a fixed guard is placed over the approach light switch (located on the pilot's distribution box) holding the switch in the "OFF" position, the approach light being turned on automatically by the extending arresting hook. The switch guard may be removed for land-based operations, permitting operation of the approach light without extension of the arresting hook.

(8) STARTER RHEOSTATS.—The left panel light, the right panel light, the left instrument board light, and the right instrument board light are fluorescent and are controlled by starter rheostats. To operate the rheostat, turn it to the "START" position, hold it there for a moment, and release it; it will spring back to a position approximately midway between "START" and "OFF." The remaining distance to the "OFF" position is the rheostat part of the switch by which the intensity of the light can be controlled. If the light does not go on, repeat the procedure.

4. OPERATION OF ARMAMENT.

a. GUNS.

(1) GENERAL.—The airplane is armed with six .50 caliber Browning machine guns in the outer panels. There are six ammunition boxes, two per gun, in each outer panel, supplying 400 rounds of ammunition to each inboard and intermediate gun and 375 rounds to each outboard gun. The guns are charged hydraulically and fired electrically. The controls include the gun charging knobs (see Section I, paragraph 3.*e.*(9); the master armament switch and the individual switches for each pair of guns

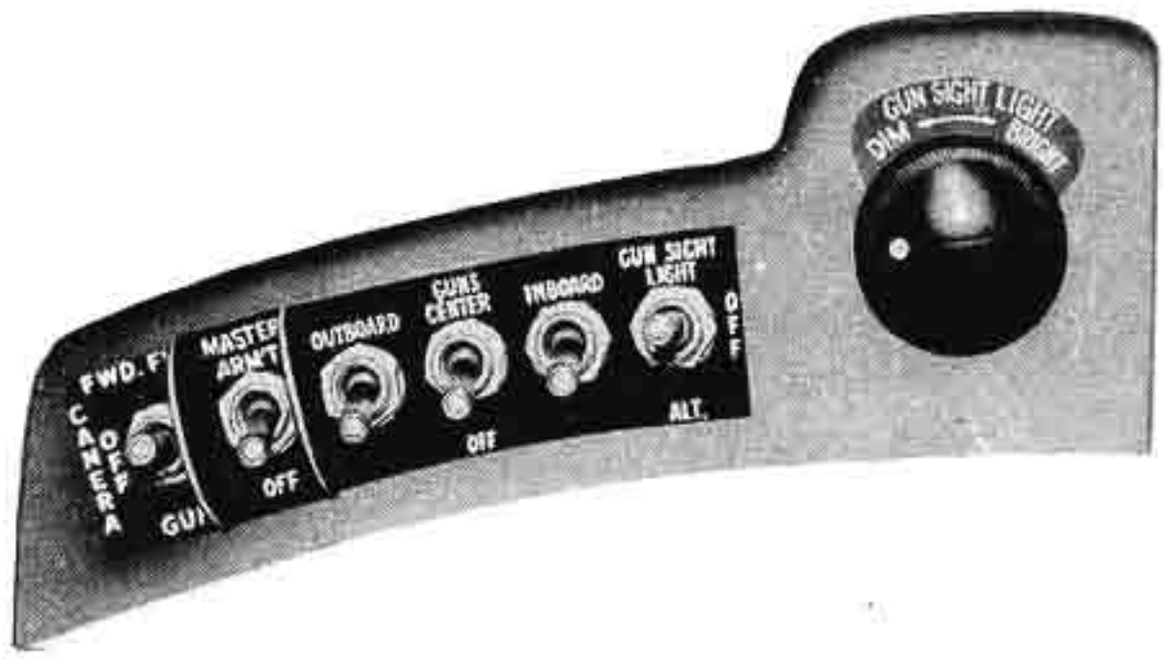


Figure 32—Gun Switch Box

(inboard, intermediate and outboard), all located on the gun switch box above the instrument panel; and the trigger switch on the control stick.

(2) Procedure for gun firing is as follows:

(a) Turn on the master armament switch.

(b) Turn on the individual gun switches.

(c) Press the trigger switch; the guns will fire as long as it is closed.

Note

If the trigger switch sticks and the trouble cannot be remedied easily, uncontrolled automatic firing will take place; turn off the master armament switch and use it as a trigger. In order to stop a "runaway" gun, depress the proper charging knob and turn it to "SAFE."

(3) GUN SIGHT.—The Mark 8 illuminated gun sight is located on the cowl deck above the instrument panel. The gun sight switch and the rheostat for the gun sight light are on the gun switch box. The gun sight switch has three positions, "ON," "OFF," and "ALT." Turn to the "ALT" position (alternate filament) whenever the light goes out. Spare bulbs for the sight are carried above the instrument panel on the right hand side.

(4) GUN CAMERA.—The gun camera is installed in the right hand outer panel. The control switch, located on the gun switch box, has the following positions: "FORWARD FIRING," "GUNS," and "OFF." The camera circuit is in series with the gun trigger switch on the control stick and will take motion pictures of either gun or rocket targets without firing the guns or rockets.

(a) Control settings for pictures of gun targets are:

1. Master armament switch—"ON."
2. Gun camera switch—"GUNS."
3. Press trigger switch.

(b) Control settings for pictures of rocket targets are:

1. Master armament switch—"ON."
2. Gun camera switch—"FORWARD FIRING."
3. Press the button on the rocket firing switch.

Note

The above settings do not include provision for gun firing or rocket launching; for these, either the individual gun switches must be turned "ON" or the rocket safety plug must be inserted.

(5) GUN HEATING.—Provisions for electric gun heaters are installed in the wings. The gun heaters may be installed when needed. Electrical connections are available at the junction box just outboard of the wing guns.

b. BOMBS.

(1) GENERAL.—Provision is made for carrying bombs on the twin pylons. A set of switches located on the bomb switch box controls bomb arming and selection of the bomb to be released. The thumb switch for releasing the bombs is located on the control stick.

Figure 33—Bomb Switch Box

(2) BOMB ARMING.—Bombs will be fused according to the purpose of the mission. This fusing is done on the ground. If the bomb is to be armor piercing, the tail will be fused; if it is to be anti-personnel, the nose and tail should be fused for explosion on contact. The bomb arming switch is a single-throw type with two positions, "ARMING" and "OFF," and must be on to complete the arming procedure. If the bomb is not armed it will fall safe and will not explode.

(3) BOMB RELEASE.—Bombs may be released either manually or electrically in the same manner as droppable fuel tanks. Refer to Section II, paragraph 4.*b.*(2) for complete release instructions.

c. ROCKETS.

(1) GENERAL.—Provision is made for installing four rocket launchers on each outer wing panel. The rockets are fired in pairs, the outboard pairs being launched first—either one pair at a time or in automatic succession. The controls for firing the rockets are as follows:

(a) Master armament switch, located on the gun switch box.

(b) The rocket power switch, the SINGLE—AUTO selector switch and the rocket safety plug are on the Mark 3 station distributor which is installed in the right hand side of the cockpit, just aft of the main instrument panel.

(c) The rockets are launched by means of a thumb button on the rocket firing switch, which is located on the left hand side of the cockpit in a position corresponding to that of the Mark 3 station distributor.

Note

The camera switch, located in the gun switch box, must be turned to "FORWARD FIRING" in order to operate the camera with the rockets.

(2) ROCKET ARMING.—The rocket arming switch located on the Mark 3 station distributor provides the pilot with a fusing choice, depending on the use of the rockets. The switch has two positions, "SAFE" and "ARM." If the switch is turned to "SAFE," the detonation will be delayed, permitting a certain amount of penetration before exploding; if turned to "ARM," the rockets will explode on contact. All rockets are armed simultaneously and cannot be armed individually.

(3) ROCKET SAFETY PLUG.—When the electrical safety plug is removed, the electrical circuits are opened, making it impossible to launch the rockets.

Note

An indicator light is provided on the station distributor box which shows, when lighted, that the rockets are ready to be fired. The light will glow when the safety plug is inserted and the rocket power switch and master armament switch are in the "ON" position. The brilliancy may be regulated by turning the barrel of the light.

WARNING

The rocket safety plug shall be inserted only in flight. For all take-offs and landings with rockets installed, the safety plug shall be removed.

Figure 34—Rocket Station Distributor Box

(4) STATION INDICATING DIAL.—A dial is installed on the Mark 3 station distributor, indicating the next pair of rockets to be launched. This dial is provided with a handle which is pulled out and turned to reset the dial at number 1 position for each new mission with rockets.

(5) ROCKET LAUNCHING.—The procedure for launching the rockets is as follows:

(a) See that the rocket safety plug is inserted.

(b) Turn master armament switch "ON."

(c) Flip back the guard over the rocket power switch and turn the switch "ON."

(d) Arm the rockets, if desired.

(e) Set SINGLE — AUTO switch.

Note

If set at "SINGLE" the rocket release button must be pressed once for each pair of rockets. If set at "AUTO," the rockets are fired in pairs at 1/10 second intervals.

(f) Press the rocket release button on the firing switch.

d. CANNONS.

(1) GENERAL.—Provision is made for the installation of cannon wings on F4U-1 airplanes. Planes so equipped are known as F4U-1C's. The wings contain four 20 mm M-2 automatic cannons and four ammunition boxes, two per cannon, in each outer panel, supplying 220 rounds of ammunition to each cannon. There is no hydraulic gun charging on these airplanes; therefore, the gun charging knobs are inoperative and the cannons must be charged manually on the ground.

CAUTION

There is no way of making the cannons safe after the airplane is in flight.

The cannons are fired electrically. The controls include the master armament switch; the individual switches for each pair of cannons, all located on the gun switch box above the instrument panel; and the trigger switch on the control stick. The intermediate gun switch is blocked off on these airplanes.

(2) PROCEDURE FOR OPERATION OF CANNONS.

(a) Turn on the master armament switch.

(b) Turn on the individual gun switches.

(c) Press the trigger switch; the cannons will fire as long as it is closed.

Note

If the trigger switch sticks and the trouble cannot be remedied easily, uncontrolled automatic firing will occur; turn off the master armament switch and use it as a trigger.

(3) The Mark 3 illuminated gun sight and the gun camera are operated in the same manner for the cannons as they are for the .50 caliber guns. (Refer to paragraph 4.*a.*, this section, for operation.)

Note

Since the F4U-1C outer panels are interchangeable with those containing rocket and machine gun installations, F4U-1C fuselages will be likely to have the rocket installation provided in the cockpit.

e. SIGNAL PISTOL.—Six cartridges for the Pyrotechnic Pistol may be carried just below the main instrument panel. The Signal Pistol may be carried in clip or holster and shall be fired overboard, only.

OPERATING CHARTS, TABLES, CURVES AND DIAGRAMS

INDEX

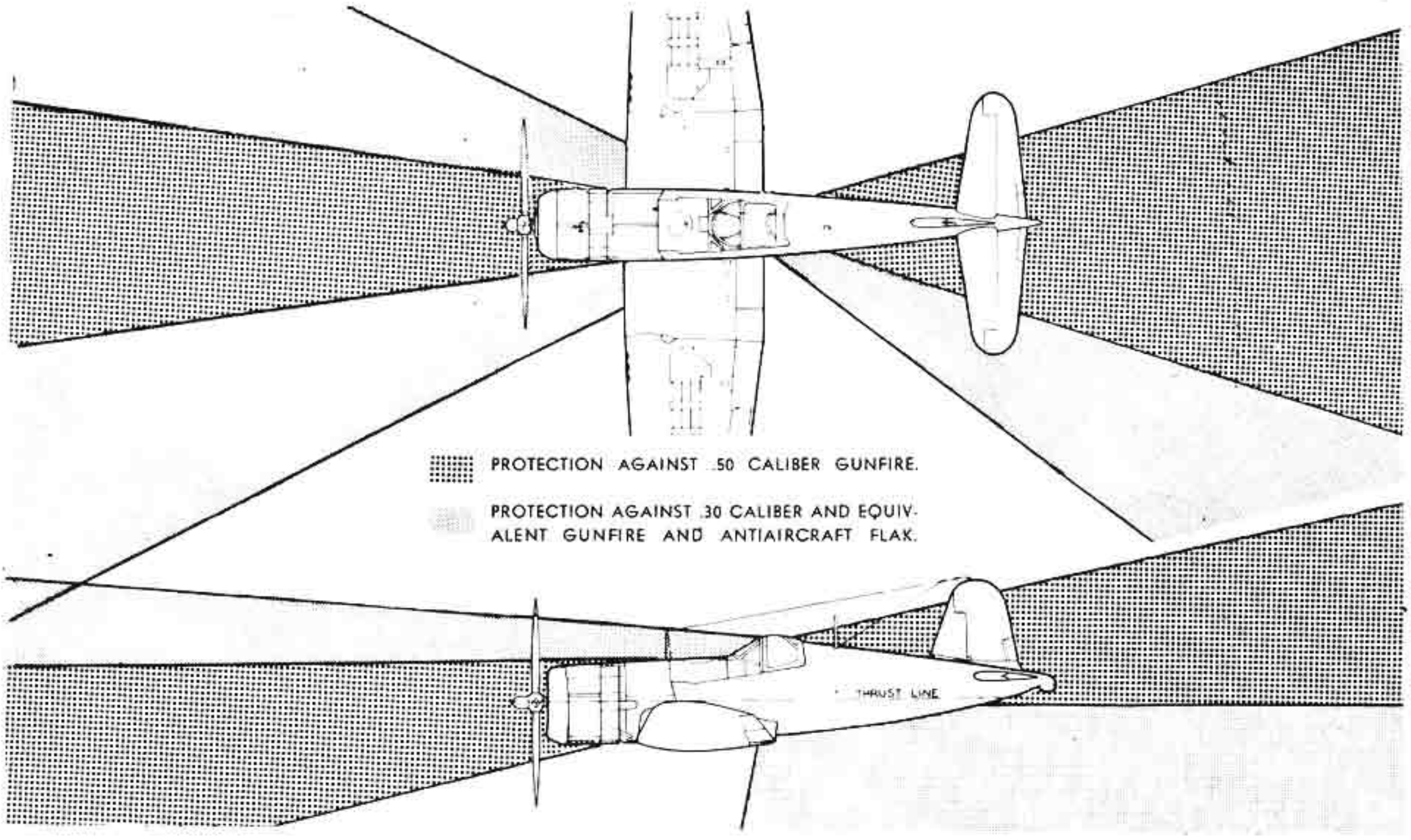


Figure 35—Protection Against Gunfire

Appendix I of this publication shall not be carried in aircrdft on combat missions or when there is a reasonable chance of its falling into the hands of the enemy.

RESTRICTED

AIRPLANE MODELS
F4U-1, FG-1, F3A-1

TAKE-OFF, CLIMB AND LANDING CHART

ENGINE MODEL
R-2800-8W

TAKE-OFF DISTANCE (IN FEET) FOR 20° FLAP SETTING

GROSS WEIGHT (IN LBS.)	HEAD WIND (KNOTS)	HARD SURFACE RUNWAY						SOD-TURF RUNWAY						SOFT SURFACE RUNWAY					
		AT SEA LEVEL		AT 3000 FT.		AT 6000 FT.		AT SEA LEVEL		AT 3000 FT.		AT 6000 FT.		AT SEA LEVEL		AT 3000 FT.		AT 6000 FT.	
		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.
11700	0	680	1350	810	1620	1020	2090	710	1380	850	1650	1070	2110	790	1460	960	1770	1350	2330
	15	450	980	550	1190	700	1560	470	1000	580	1210	740	1600	520	1050	650	1890	870	1720
	30	260	650	340	810	440	1010	270	660	350	820	460	1100	310	690	400	870	540	1180
	45	120	360	170	470	230	650	130	370	180	480	250	670	140	380	200	500	290	710
13100	0	910	1870	1080	2270	1370	3070	950	1910	1140	2330	1460	3160	1090	2050	1330	2550	1740	3440
	15	620	1380	750	1690	980	2340	650	1410	790	1740	1040	2400	750	1510	980	1860	1240	2600
	30	380	870	460	1160	680	1640	400	890	490	1190	660	1680	450	970	570	1270	790	1810
	45	190	550	260	780	360	1030	200	560	280	730	380	1050	230	590	280	780	430	1130
14200	0	1110	2380	1330	2970	1730	4250	1170	2440	1410	3050	1860	4380	1370	2640	1680	3310	2290	4810
	15	770	1780	940	2250	1240	3260	810	1830	1000	2300	1330	3160	950	1960	1180	2490	1640	3660
	30	480	1240	600	1580	810	2340	510	1280	640	1620	870	2400	590	1350	760	1740	1070	2600
	45	260	760	340	990	490	1530	280	780	370	1010	530	1560	330	850	430	1080	650	1680

NOTE: INCREASE DISTANCE 10% FOR EACH 10°C (18°F) ABOVE 0°C (32°F)

ENGINE LIMITS FOR TAKE-OFF 2700 RPM AND 54" HG. AT SEA LEVEL

CLIMB DATA

FOR COMBAT CLIMB: Use Military Power for 5 Min. Only — Then Normal Power

See Specific Engine Flight Chart for Operating Limits

FOR FERRY CLIMB: Use Maximum Cruising Power

GROSS WEIGHT (IN LBS.)	TYPE OF CLIMB	SEA LEVEL TO 5000 FT. ALT.					TO 10000 FT. ALT.					TO 15000 FT. ALT.					TO 20000 FT. ALT.					TO 25000 FT. ALT.					TO 30000 FT. ALT.				
		BEST I.A.S. (KNOTS)	FT./MIN. AT ALT.	TIME FROM S.L.	FUEL FROM SEA LEVEL		BEST I.A.S. (KNOTS)	FT./MIN. AT ALT.	TIME FROM S.L.	FUEL FROM SEA LEVEL		BEST I.A.S. (KNOTS)	FT./MIN. AT ALT.	TIME FROM S.L.	FUEL FROM SEA LEVEL		BEST I.A.S. (KNOTS)	FT./MIN. AT ALT.	TIME FROM S.L.	FUEL FROM SEA LEVEL		BEST I.A.S. (KNOTS)	FT./MIN. AT ALT.	TIME FROM S.L.	FUEL FROM SEA LEVEL		BEST I.A.S. (KNOTS)	FT./MIN. AT ALT.	TIME FROM S.L.	FUEL FROM SEA LEVEL	
					U.S.	IMP.				U.S.	IMP.				U.S.	IMP.				U.S.	IMP.				U.S.	IMP.				U.S.	IMP.
11700	Combat	135	2700	2	18	15	135	2700	4	26	21	130	2600	6	34	28	130	1900	8	44	36	125	1500	11	55	45	120	500	19	79	66
	Ferry	130	1500	4	14	11	130	1400	7	19	15	130	1200	11	25	20	130	1000	16	31	25	125	700	22	39	31	—	—	—	—	—
13100	Combat	135	2100	2	20	16	135	2100	5	30	25	130	1600	8	42	33	130	1400	11	55	44	125	1000	15	71	59	—	—	—	—	—
	Ferry	130	1100	5	16	13	130	1000	10	23	19	130	800	16	32	26	130	600	23	45	34	125	300	34	56	45	—	—	—	—	—
14200	Combat	135	1800	3	27	18	135	1800	5	34	28	130	1300	9	48	40	130	1100	13	64	53	125	700	19	80	73	—	—	—	—	—
	Ferry	125	800	6	18	15	125	700	12	27	22	125	500	21	39	31	125	400	32	54	43	—	—	—	—	—	—	—	—	—	—

NOTE: INCREASE ELAPSED CLIMBING TIME 6% FOR EACH 10°C (18°F) ABOVE 0°C (32°F) FREE AIR TEMPERATURE

FUEL INCLUDES WARM-UP AND TAKE-OFF ALLOWANCE (10 U.S. GALS., 8 IMP. GAL.)

LANDING DISTANCE (IN FEET) FOR 30° FLAP SETTING

GROSS WEIGHT (IN LBS.)	BEST I.A.S. APPROACH (KNOTS)	HARD DRY SURFACE						FIRM DRY SOD						WET OR SLIPPERY					
		AT SEA LEVEL		AT 3000 FT.		AT 6000 FT.		AT SEA LEVEL		AT 3000 FT.		AT 6000 FT.		AT SEA LEVEL		AT 3000 FT.		AT 6000 FT.	
		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.	GROUND ROLL
10000	90	1920	910	2080	990	2550	1090	2000	990	2180	1090	2350	1200	3110	2100	3380	2290	3670	2510
11000	95	2080	970	2280	1090	2480	1210	2140	1030	2390	1200	2610	1330	3390	2410	3710	2530	4020	2760

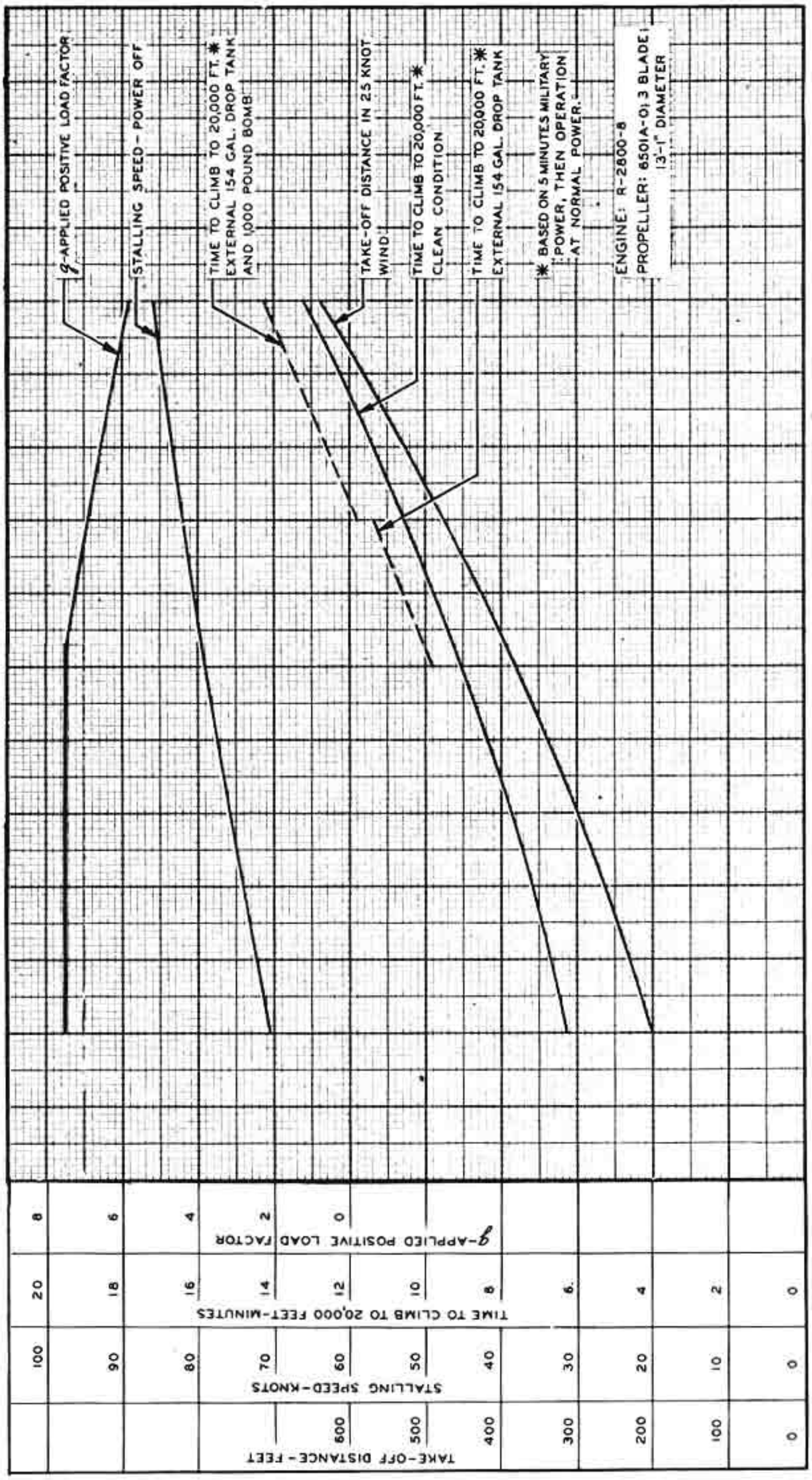
NOTE: FOR GROUND TEMPERATURES ABOVE 35°C (95°F) INCREASE APPROACH I.A.S. 10% AND ALLOW 20% INCREASE IN GROUND ROLL

LEGEND: Red figures have not been flight checked
I.A.S. — Indicated air speed.
S.L. — Sea level.
U.S. — U.S. gallons.
Imp. — Imperial gallons.

REMARKS: Take-off and climb data include the effect of the drag increment of either one 154 U.S. gal. (128 Imp. gal.) drop tank or one 1000 lb. bomb in the 13100 lb. condition. For the 14200 lb. condition, the effect of the drag increment for any combination of two units (bombs, tanks, bomb and tank) is included

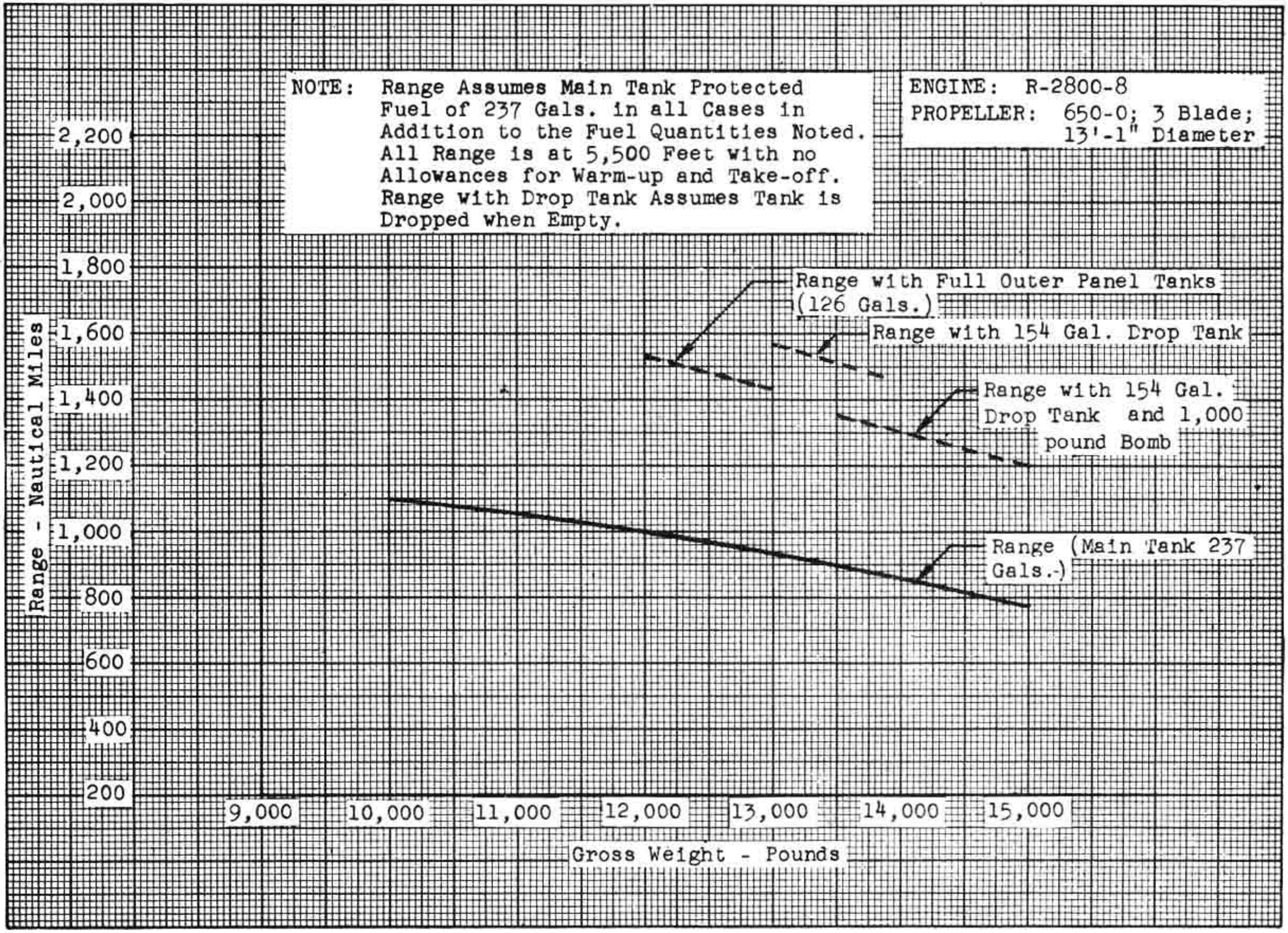
Above performance is for 6501A-0 13 foot, 1 inch propeller

RESTRICTED

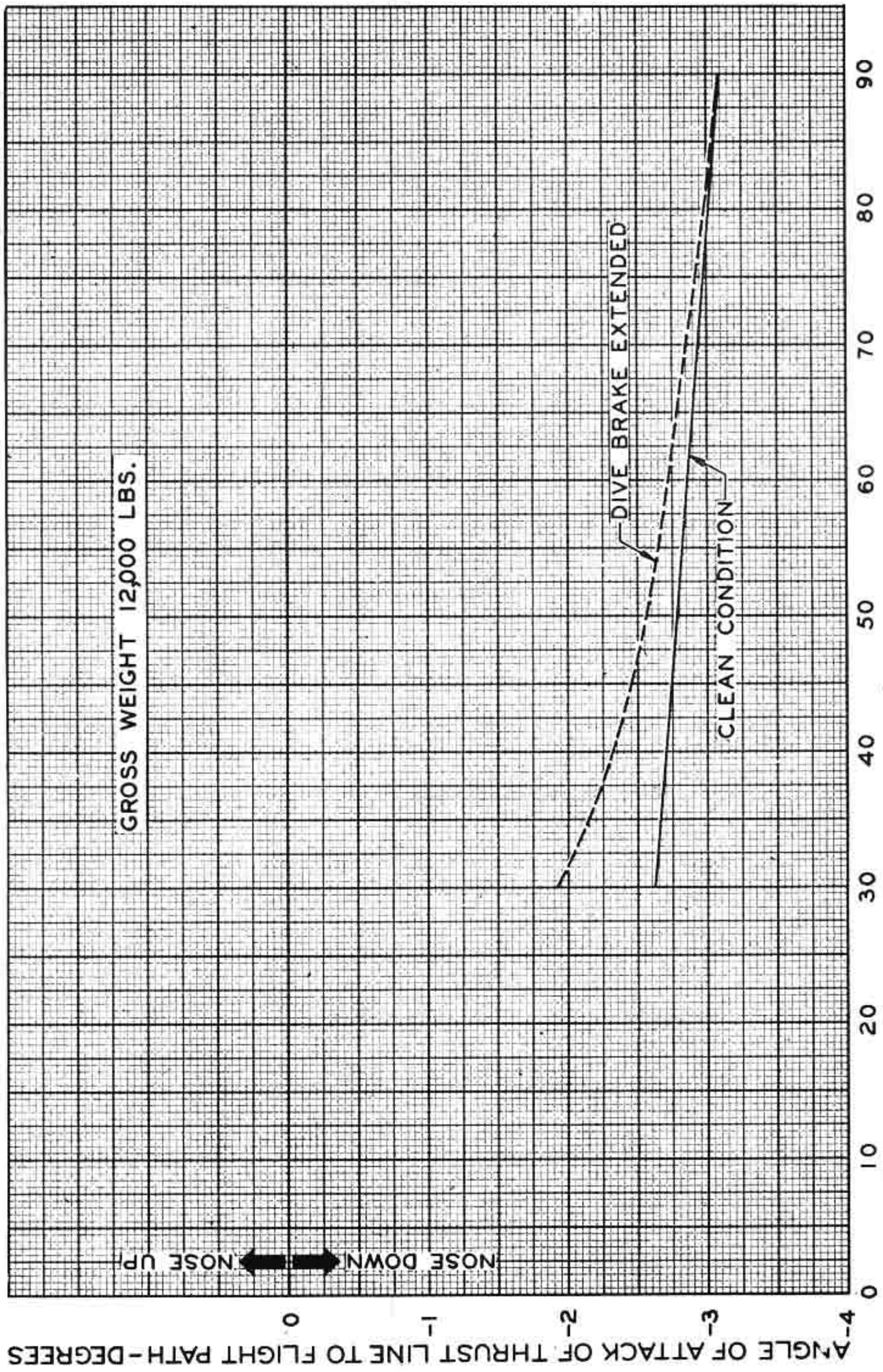


Variation of Performance with Weight—Plate I

Appendix I of this publication shall not be carried in aircraft on combat missions or when there is a reasonable chance of its falling into the hands of the enemy.

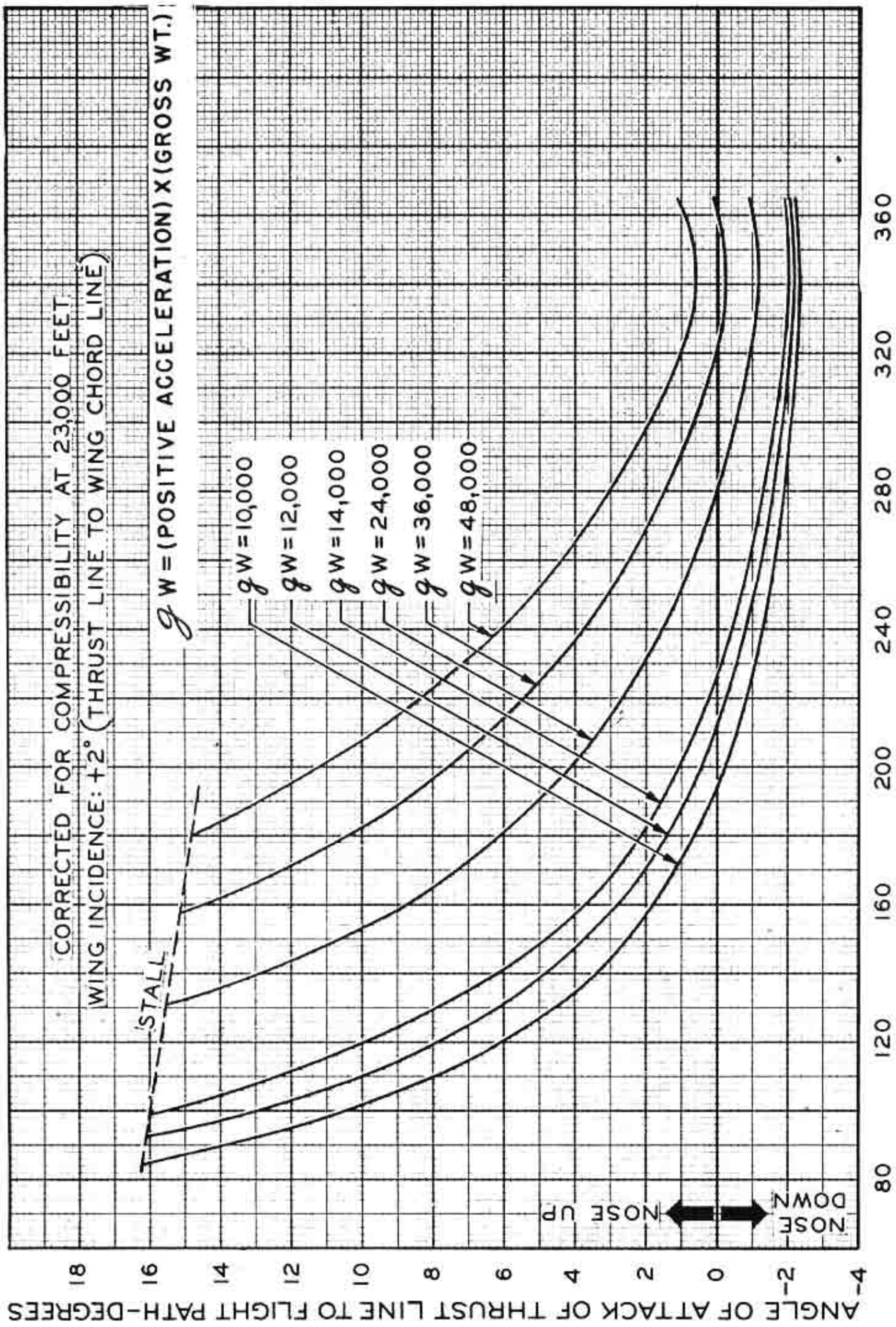


Variation of Performance with Weight—Plate II



Angle of Attack at Terminal Velocity vs. Dive Angle

Appendix I of this publication shall not be carried in aircraft on combat missions or when there is a reasonable chance of its falling into the hands of the enemy.



Angle of Attack vs. Cockpit Airspeed Indicator Reading

Appendix I of this publication shall not be carried in aircraft on combat missions or when there is a reasonable chance of its falling into the hands of the enemy.