RESTRICTED AN 01-195FA-1

PRELIMINARY

Pilot's Handbook
of
Flight Operating Instructions

NAVY MODELS

F2G-1 • F2G-2
Airplanes

PUBLISHED UNDER JOINT AUTHORITY OF THE COMMANDING GENERAL, ARMY AIR FORCES, THE CHIEF OF THE BUREAU OF AERONAUTICS, AND THE AIR COUNCIL OF THE UNITED KINGDOM

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1 August 1945

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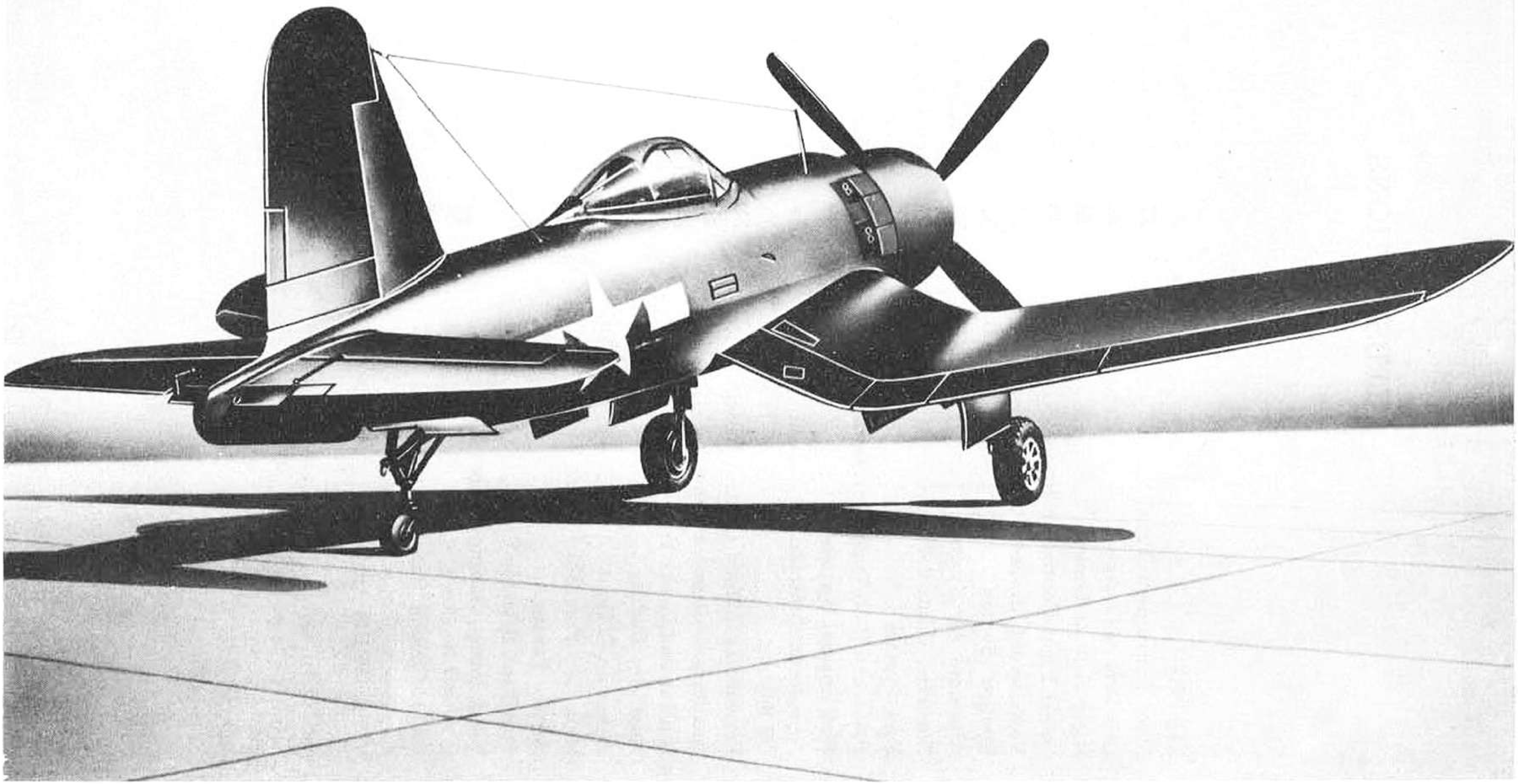


Figure 1 — The F2G

SECTION I
DESCRIPTION

1. GENERAL.

a. THE AIRPLANE. ***(See figure 1.)*** — The F2G airplane, manufactured by the Goodyear Aircraft Corporation of Akron, Ohio, is a single place, single engine, fighter plane. Structurally, it is a low-wing monoplane of the inverted gull wing type, with approximate weights and dimensions as follows:

Weight, empty	10,500 lbs.
Weight, gross (depending on fuel and armament)	13,500 to 17,000 lbs.
Length	33 ft. 10 in.
Height (level flight position, empty)	16 ft. 4 in.
Height (three point position, empty)	15 ft. 5 in.
Height (wings folded, three point)	16 ft. 4 in.
Span (wings spread)	41 ft. 0 in.
Span (wings folded)	17 ft. 1 in.

The F2G-1 is a land-based plane whose wings may be folded only by manually removing the wing locking pins and manually raising the wings. The F2G-2 is fully adapted for carrier based operation with arresting hook and hydraulic wing folding.

Armament consists of either four or six .50 caliber machine guns, eight wing-mounted aircraft rockets, and either two bombs of up to 1000 pounds each or two 11 3/4 inch rockets on the center section pylons. One or both of the pylon mounted bombs or rockets may be replaced by droppable fuel tanks as the activity of the plane requires.

b. POWER PLANT.

(1) GENERAL. — The engine is a Pratt & Whitney R-4360-4 Wasp Major, with four rows of seven cylinders each. The propeller of the F2G-1 is a 14-foot Hamilton Hydromatic, while the carrier-based F2G-2 has a 13-foot 7-inch Hamilton Super-hydromatic.

(2) SUPERCHARGER SYSTEM. — The supercharger is of the single-stage type with the impeller located conventionally in the induction system, that is, between the carburetor and the cylinders. The impeller drive provides two gear

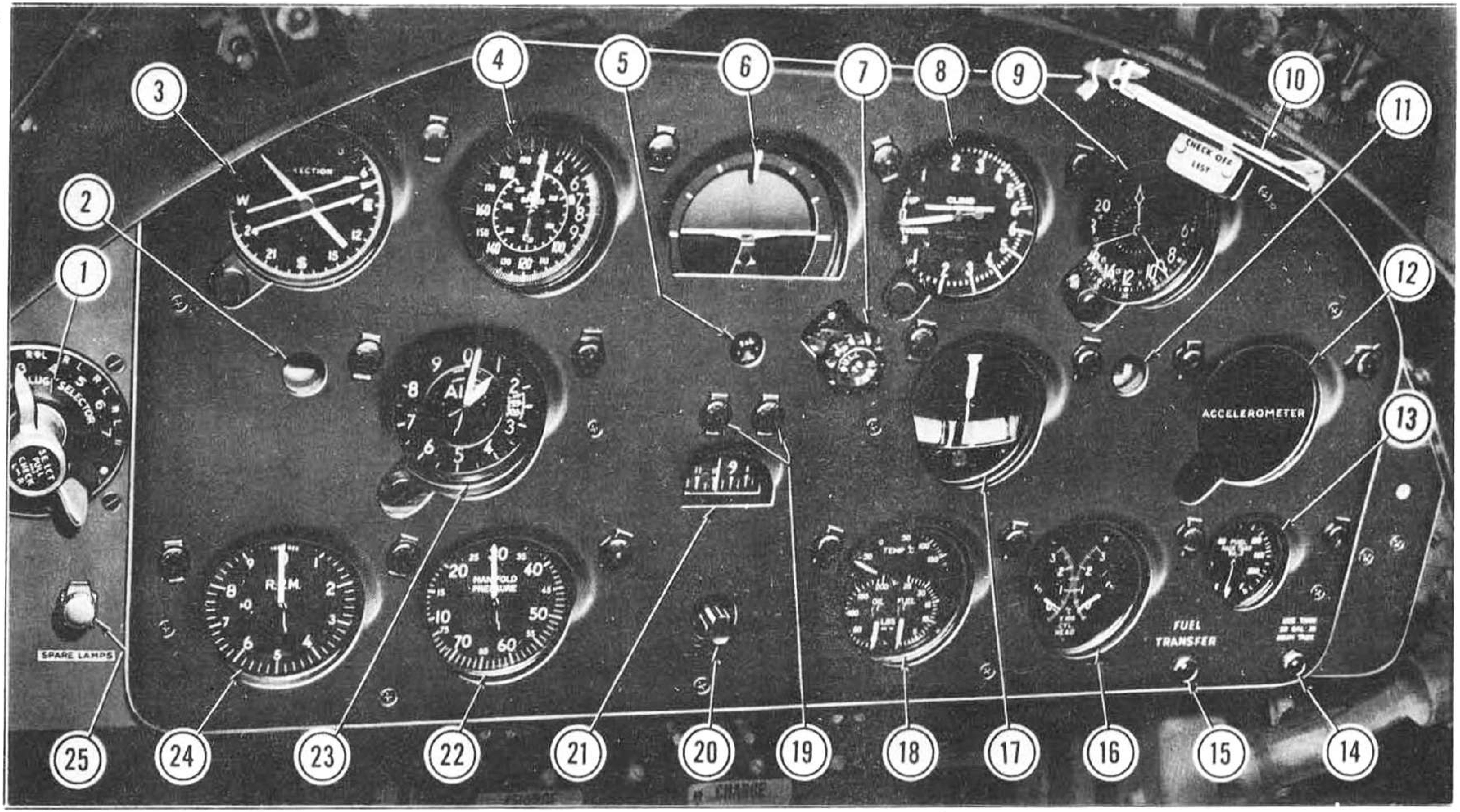


Figure 2 — Main Instrument Panel

1 Ignition Switch
2 Chartboard Mounting Socket
3 Compass
4 Airspeed Indicator
5 Adjustment Knob — Gyro Horizon
6 Gyro Horizon
7 Caging Knob — Gyro Horizon
8 Rate-of-Climb Indicator
9 Clock
10 Check List Holder
11 Chartboard Mounting Socket
12 Accelerometer
13 Fuel Quantity Gauge
14 Fifty-gallon Warning Light
15 Transfer Completion Light
16 Head Temperature Gauge
17 Turn-and-Bank Indicator
18 Engine Gauge Unit (Fuel and Oil Pressure, Oil Temperature)
19 Instrument Lights (21 in total)
20 Caging and Setting Knob — Directional Gyro
21 Directional Gyro
22 Manifold Pressure Gauge
23 Altimeter
24 Tachometer
25 Spare Lamp Dispenser

trains with ratios of 6:1 and 7.5:1.

Each of these gear trains incorporates a hydraulic coupling unit which serves as a clutch for engaging and disengaging the drive. The coupling in the high-ratio gear train serves the additional purpose of varying the blower speed by providing for controlled slippage between the halves of the coupling unit.

Two different systems of supercharger control are used in the F2G airplanes. These systems are interchangeable. In one type of control system the pilot regulates blower speed manually. In this case the supercharger control lever on the control quadrant (see 1, figure 5) regulates the flow of oil to the supercharger hydraulic couplings and so regulates impeller ratios. With the control lever at its lowest point the impeller is running at low ratio; as the lever is started upward out of its low position the blower is shifted from low ratio to high ratio, but at this point slippage in the high ratio coupling is at a maximum and permits only a slight increase in blower speed. As the control lever is raised further, the degree of slippage in the coupling is reduced until, with the lever at the top of its travel, coupling slippage is at a minimum and blower speed closely approaches the 7.5:1 maximum ratio.

The second system of supercharger control depends on an automatic power control unit, installed on the engine, which provides for variation of blower speed with changes in throttle setting and manifold pressure. Under conditions of low power output (up to about half throttle) the impeller is running in low ratio. Advancing the throttle beyond the mid point varies the blower ratio progressively through the high ratio range. Maximum blower ratio is reached at, or slightly before, the full-throttle position.

In operation there is always a lag between the new throttle (or supercharger control) setting and the establishing of a new manifold pressure due to the time required for the coupling to reach its new ratio. For this reason, increases in throttle or supercharger settings (as the case may be) should be smooth and progressive rather than abrupt. Otherwise the manifold pressure will lag behind the setting, and then may build up rapidly to values higher than the pilot intended.

The pilot may determine which of the two control systems is employed in his plane by examining the supercharger control lever. If the manual type control is installed, the control lever will move freely up and down through its quadrant. If the automatic type is installed, the control lever will be locked in its down position by a bolt through the quadrant above the lever, or it may be removed entirely.

(3) IGNITION. — The ignition system of this engine is unique in that it employs seven dual magnetos in place of the usual one or two. These magnetos are mounted spoke-wise on the front engine section, one in front of each front cylinder. Each magneto supplies ignition for both plugs of each of the four cylinders behind it. In checking the magnetos the pilot has two controls to use. One of these grounds out one, or the other, or both sides of all of the magnetos at once as does the conventional ignition switch. The other control may be set to ground out either side of any one magneto.

A booster coil, energized by the starter switch, furnishes supplementary ignition current for starting. As long as the starter is cranking, the booster coil is functioning also.

2. FLIGHT AND POWER PLANT CONTROLS.

a. GENERAL. — The cockpit of the F2G is designed to place instruments and controls in the most logical and accessible positions. Figures 2, 3, and 4 show the general arrangement of the pilot's compartment. Notice that the electrical controls are grouped at the pilot's right, while hydraulic and mechanical controls are principally at his left.

b. ENGINE CONTROLS.

(1) CONTROL QUADRANT. *(See figure 5.)* — The power plant control quadrant at the pilot's left mounts the throttle lever, mixture control, propeller governor control, and supercharger control. A friction knob on the inboard face of the quadrant controls the freedom of movement of the supercharger, propeller, and throttle controls. This knob does not affect the mixture control lever.

(*a*) THROTTLE CONTROL. — As has already been noted, the throttle lever of some F2G airplanes controls both throttle setting and blower speed. Otherwise throttle operation is entirely conventional. Later installation of water-injection systems is provided for by the incorporation of a latch on the throttle lever and an injector valve microswitch in the quadrant housing. In order to operate in the combat power range provided by water injection, the pilot will raise the latch hook and push the throttle lever full forward. This latch and the injector micro-switch are installed in the present quadrants but are not utilized. The button in the top of the throttle lever is for control of a throat or mask microphone. (Refer to section V, paragraph 3,*b*,(7).

(*b*) MIXTURE CONTROL. — The mixture

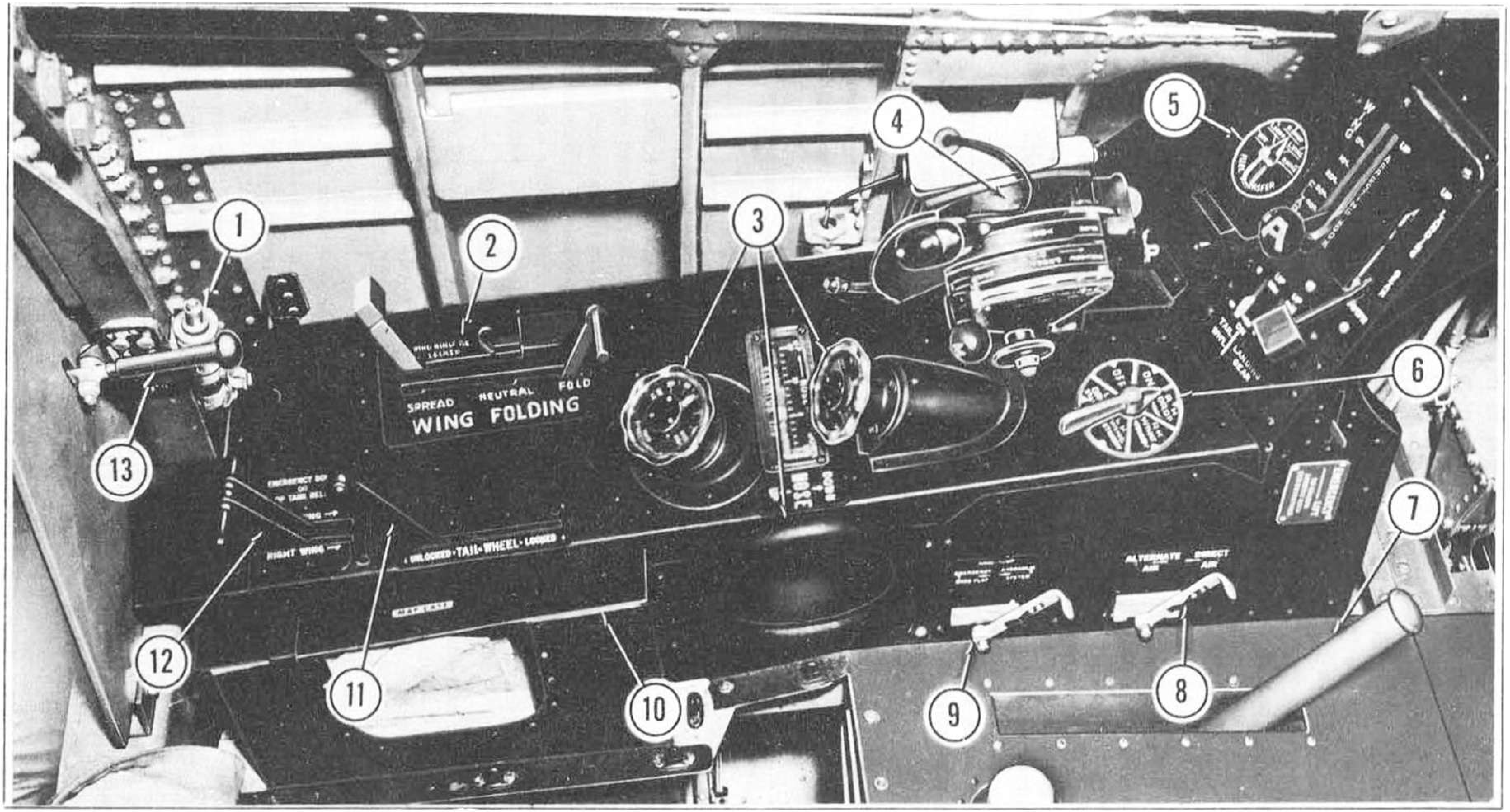


Figure 3 — Left Side of Cockpit

1 Anti-blackout Air Supply
2 Wing Folding Controls
3 Trim Controls
4 Power Plant Control Quadrant
5 Forward Left-Hand Control Panel
6 Fuel Tank Selector Valve
7 Hand Hydraulic Pump
8 Alternate Air Control
9 Hand Pump Selector Valve
10 Map Case
11 Tail Wheel Lock
12 Bomb or Drop Tank Emergency Release
13 Shoulder Harness Lock

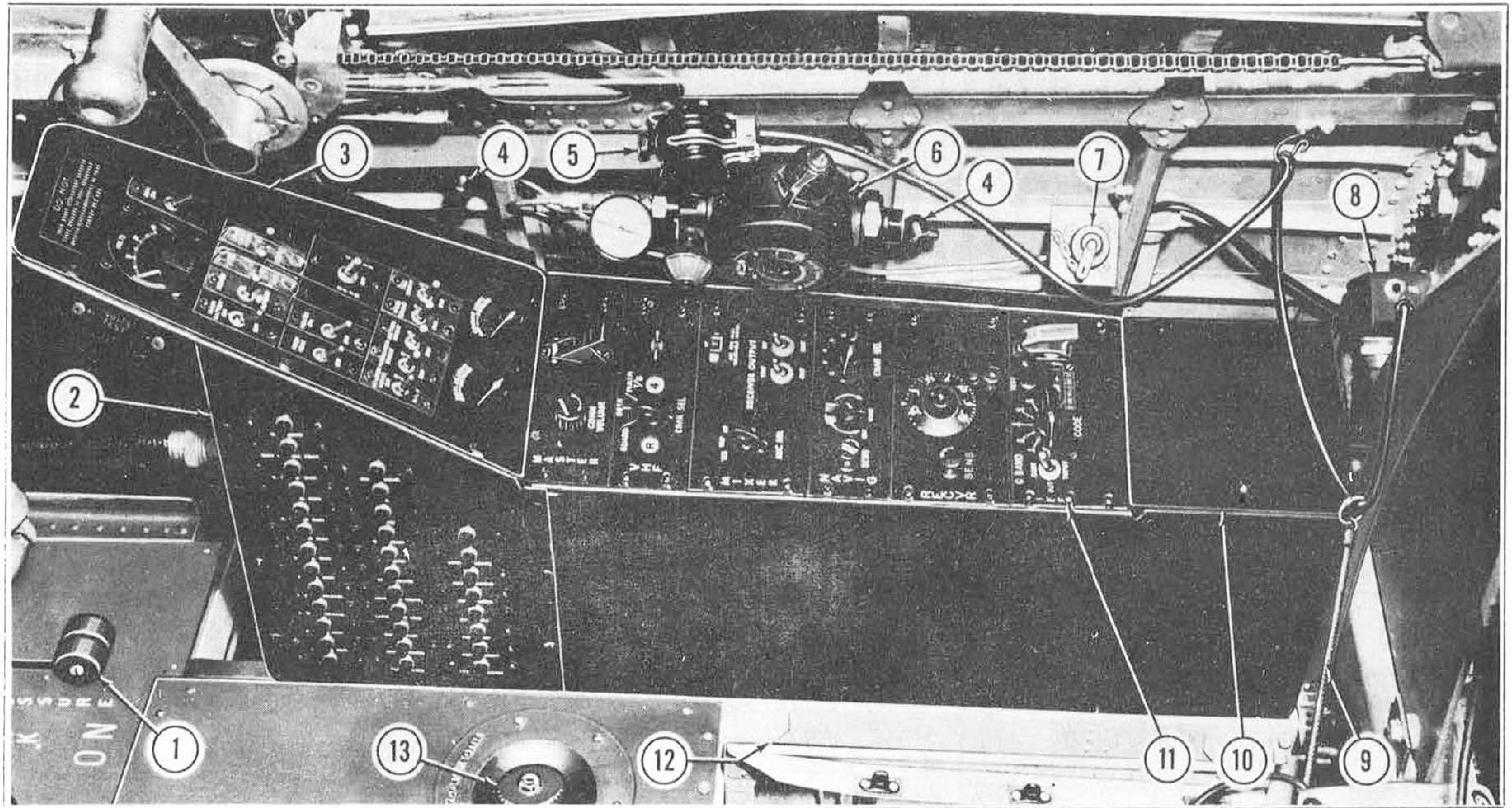


Figure 4 — Right Side of Cockpit

1 Main Fuel Cell Pressure Release
2 Electrical Circuit Breaker Panel
3 Forward Right-Hand (Electrical) Control Panel
4 Cockpit Light
5 Hand Microphone
6 Oxygen Regulator
7 Flying Suit Electrical Receptacle
8 Radio Jack Box
9 Microphone Cord Bungee
10 Cockpit Locker
11 Radio Control Panel
12 Chartboard Stowage Socket
13 Oxygen Bottle Valve

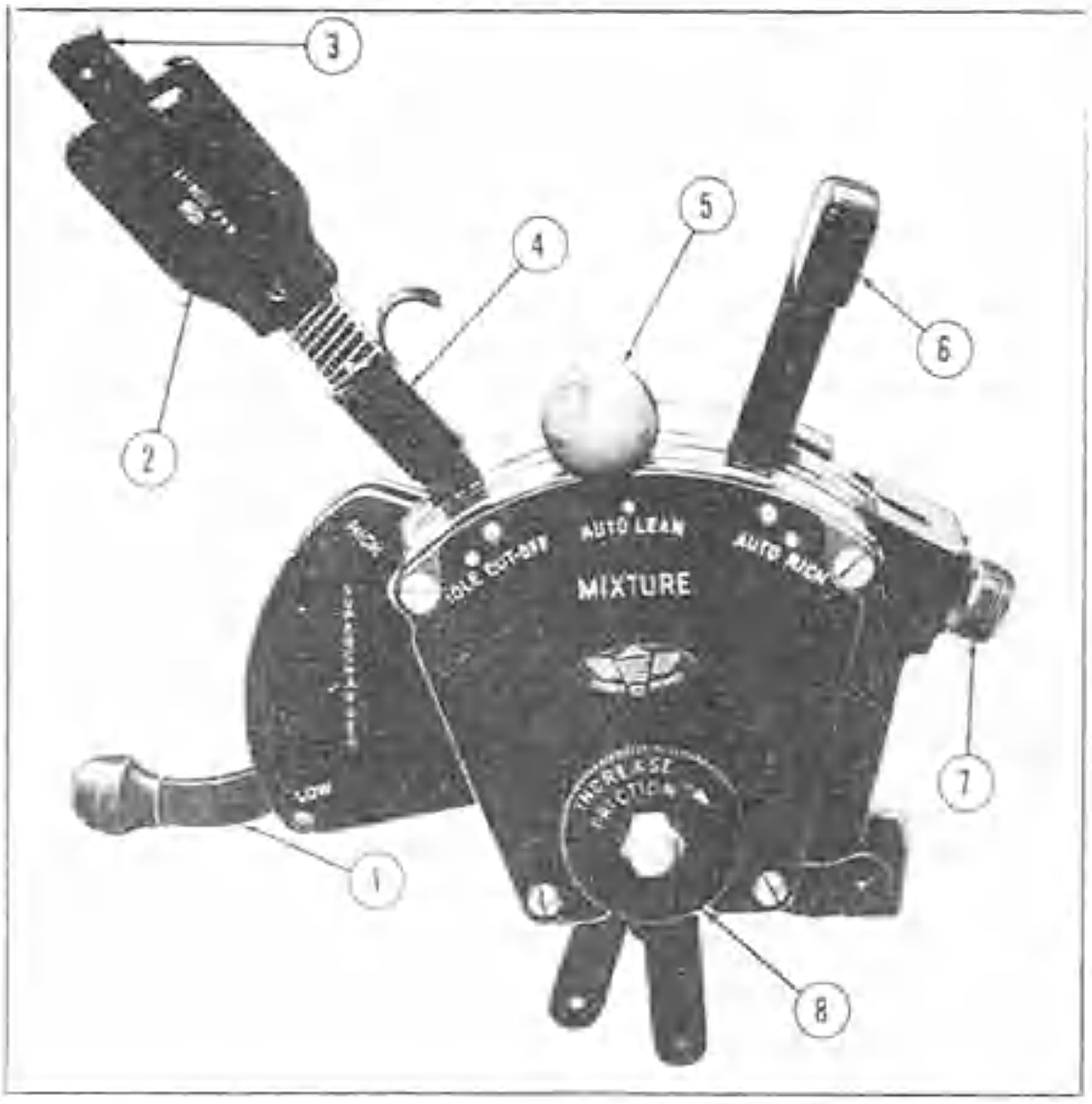


Figure 5 — Power Plant Control Quadrant

1 Supercharger Control
2 Throttle Lever
3 Throat Microphone Switch
4 Emergency Power Latch
5 Mixture Control Lever
6 Propeller Governor Control Lever
7 Micro-Switch Connection
8 Friction Control Knob

control lever on the quadrant provides for three settings: ***AUTO RICH, AUTO LEAN,*** and ***IDLE CUT-OFF.*** The carburetor provides for only these three distinct mixture levels so that it is not possible to get a progressive variation through the mixture range.

WARNING

Operation of the engine in Auto-Lean mixture setting is prohibited until such time as the Navy issues an official directive lifting this restriction. Until that time, all engine operation must be in Auto-Rich mixture setting.

1. AUTO RICH. — For all ground operations and for all flight operations above Maximum Cruise power, the mixture control shall be set at ***AUTO RICH.*** This setting should also be used under any conditions where the auto-lean cylinder head temperature limit of 218°C is exceeded. (Refer to warning above.)

2. AUTO-LEAN. — The correct position of the mixture control lever for the auto-lean setting is determined by feeling for the notch in the carburetor. This setting should be used for operation at Maximum Cruise power and below.

FIGURE 6 - DELETED

3. IDLE CUT-OFF. — This setting is used in stopping the engine (refer to section II, paragraph 17.*d*); the control lever should be in this position at all times that the engine is not operating.

(*c*) PROPELLER GOVERNOR CONTROL. — The forward-most position of the propeller control lever gives approximately 2700 rpm, the rear-most position gives approximately 1200 rpm. Since the control simply adjusts the governor setting, these values represent the maximum rpm of the propeller during normal conditions of climb or level flight. Inadequate throttle settings will result in lower rpm than those given above.

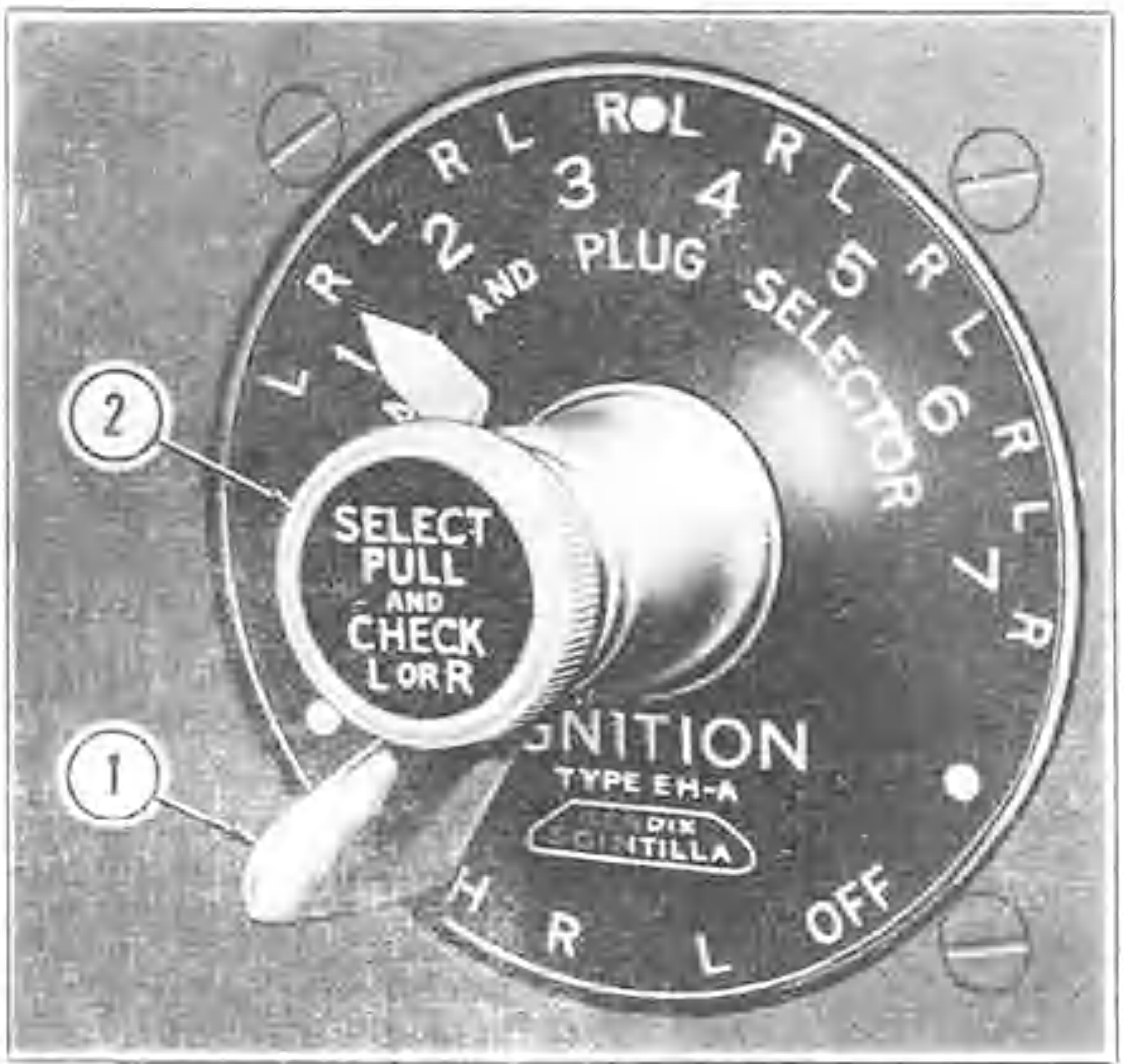


Figure 7 — Ignition Switch

1 Master Switch
2 Plug Selector Switch

(2) IGNITION SWITCH. *(See figure 7.)* — The ignition switch comprises two distinct controls. The lower lever is a conventional magneto grounding switch with positions ***BOTH, R, L,*** and ***OFF.*** When this lever is in the ***BOTH*** position, both plugs on every cylinder are firing. Turned to ***R,***

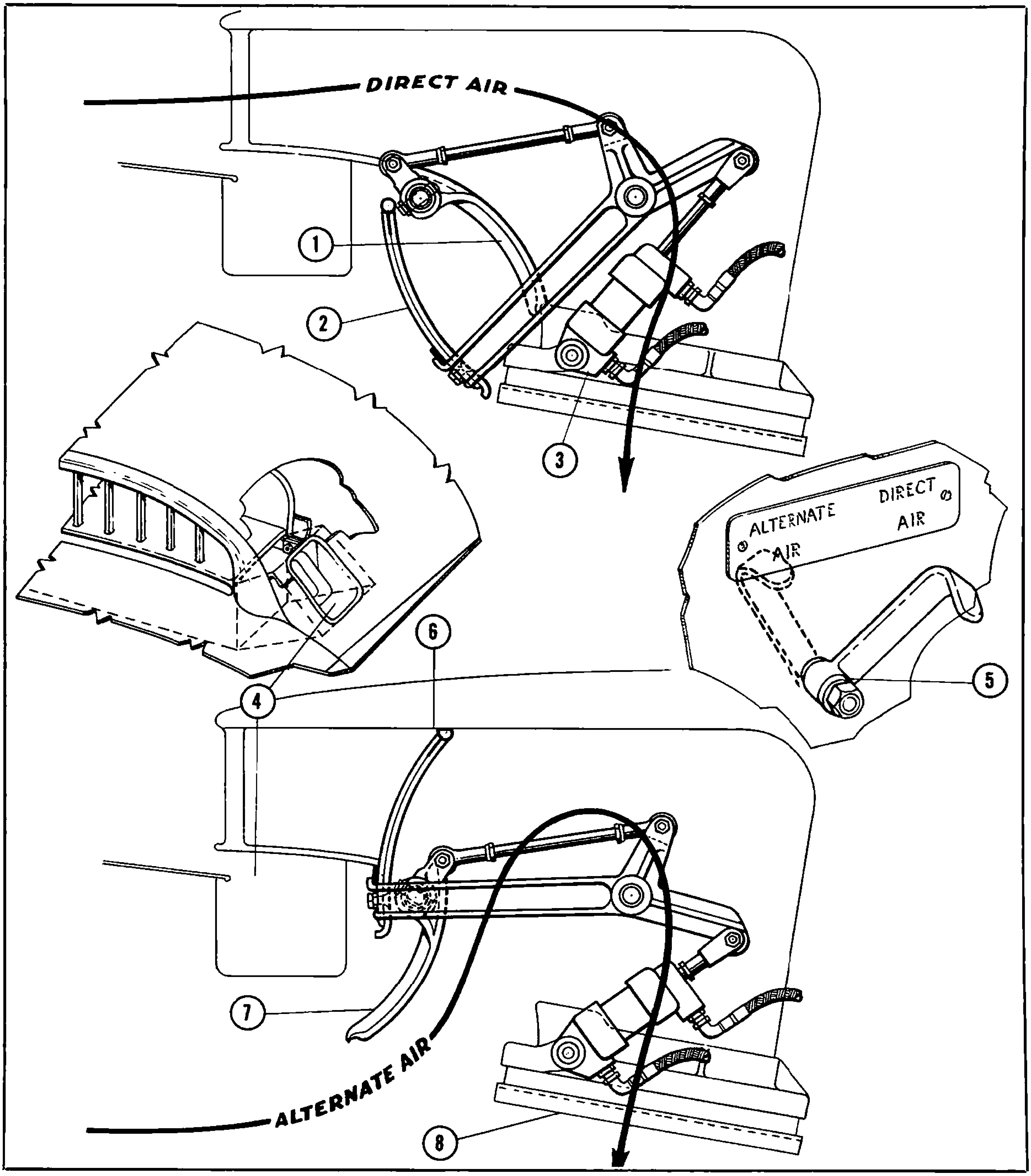


Figure 8 — Alternate Air System

1 Alternate Air Door — Closed
2 Visor — Down
3 Hydraulic Cylinder
4 Boundary Layer Exhaust
5 Cockpit Control
6 Visor — Raised
7 Alternate Air Door — Open
8 Carburetor Throat

the switch grounds out the circuits supplying all of the left hand plugs and the engine is running on the right hand plugs only. The reverse of this condition exists when the switch is turned to *L*. The *OFF* position is for grounding out the entire ignition system and preventing the firing of any plug.

The other control of the switch is operated by the center knob marked ***SELECT PULL AND CHECK L OR R***. This knob serves to cut out the four plugs on the corresponding side of the selected cylinder bank. As the knob indicates, the pointer should be rotated to the bank being tested, and the knob then pulled out and turned left or right as desired.

Note

It is only as the knob is turned to *R* or *L* after being pulled out that grounding contact is made.

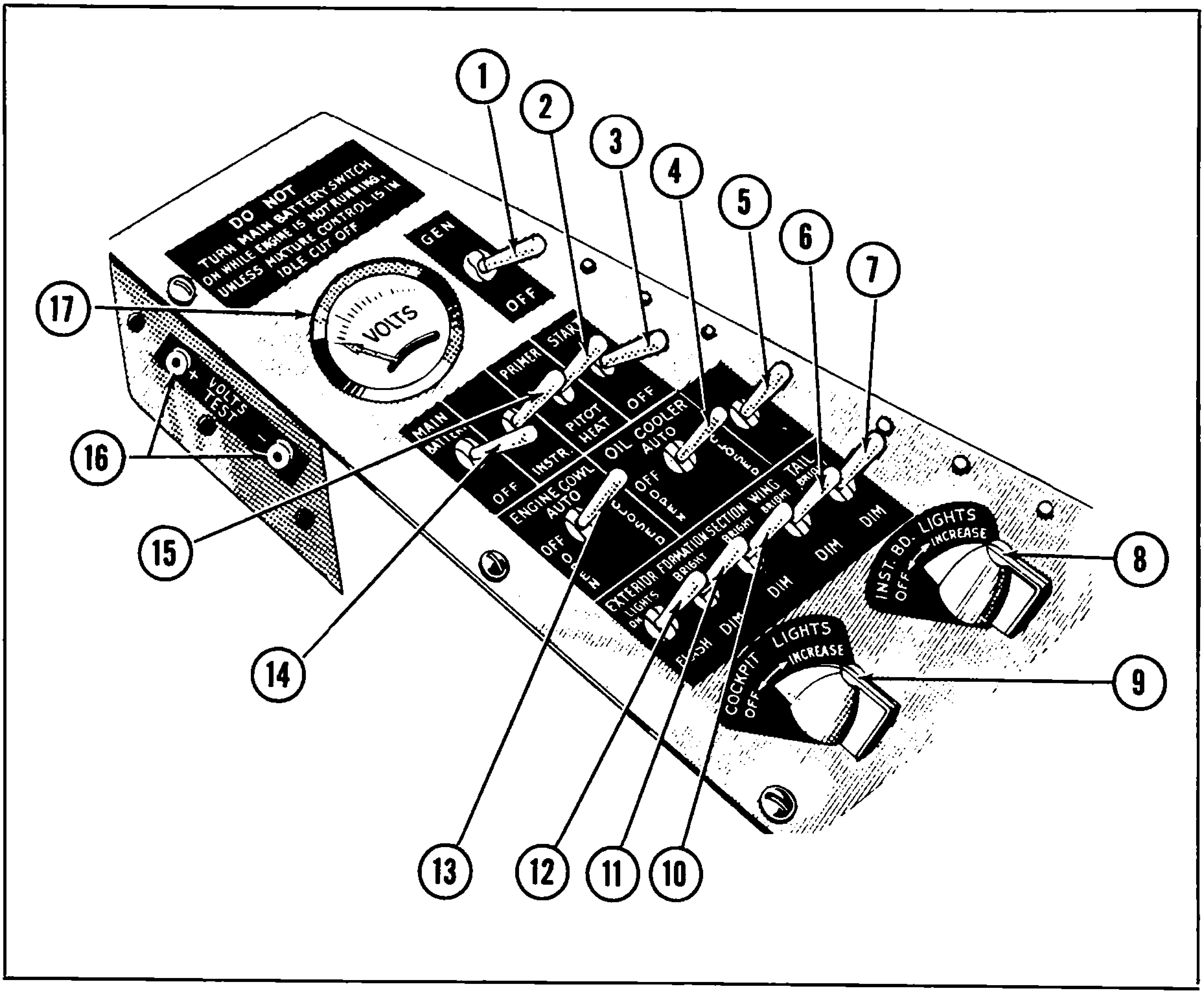


Figure 9 — Electrical Control Panel

1 Generator Switch
2 Primer and Pitot Heat Switch
3 Starter Switch
4 Oil Cooler Flap Switch
5 Defroster Switch (not utilized)
6 Wing Lights Switch
7 Tail Light Switch
8 Instrument Lights Switch and Rheostat
9 Cockpit Lights Switch
10 Section Light Switch
11 Formation Lights Switch
12 Exterior Lights Master Switch
13 Cowl Flaps Switch
14 Master Battery Switch
15 Instrument and Oil Dilution Switch
16 Voltage Test Jacks
17 Generator Voltmeter

(3) ALTERNATE AIR CONTROL. *(See figure 8.)* — Although the Stromberg injection carburetor is not highly susceptible to icing, the F2G provides an alternate supply of sheltered air for use under severe conditions. When humidity and temperature conditions are such that the pilot suspects icing, or when rain, snow or other precipitation is building a carburetor throat obstruction, he should move the control full aft to ***ALTERNATE AIR***. This actuates a pair of hydraulic struts on the carburetor throat, swinging a visor upward into the scoop to block off the normal flow of rammed air. At the same time a gate just above the carburetor opens to allow air to be drawn from the engine accessory compartment. This air is warmed by radiation from the engine and oil coolers and, although it provides very low ram pressures, is a highly satisfactory supply.

CAUTION

The forward ***DIRECT AIR*** position is the normal operating position. The control should ***always*** be set to ***DIRECT AIR*** for engine starting and for take-off.

Note

Do not set the control lever at any position other than full forward or full aft.

(4) COWL FLAPS CONTROL. *(See 13, figure 9.)*

(*a*) The engine cooling flaps are actuated by an electric unit driving a flexible shaft and screw jack system. The flexible shaft lies in a horse-shoe shape about the engine mount ring. From it branch the screw operated struts or jacks, one to each flap. As the control switch on the right-hand control panel is moved to ***OPEN***, the electric motor drives the shaft to extend the struts and open the flaps; moving the control switch to ***CLOSED*** reverses the actuating motor and telescopes the struts to close the flaps.

(*b*) The control switch has four positions: ***OPEN***, ***CLOSED***, ***AUTO***, and ***OFF***. By watching the movement of the flaps the pilot may open or close them to any intermediate setting, or he may leave the switch in the ***OPEN*** or ***CLOSED*** position to operate the flaps to their limits. The flap actuator mechanism contains a limit switch which turns the motor off when the flaps have reached the end of their travel, so no damage will result from leaving the switch engaged after the flaps are fully opened or closed.

(*c*) The cowl flap control is entirely manual so that the ***AUTO*** position of the switch serves no purpose.

CAUTION

Do not use the ***AUTO*** position of this switch at any time.

c. FUEL SYSTEM. *(See figure 10.)*

(1) GENERAL. — The F2G has a main fuel cell of 235 U. S. (195 Imp.) gallon capacity in the fuselage, forward of the cockpit, and a 37½ U. S. (31 Imp.) gallon fuel cell in each outer wing panel. These three tanks are all of the self-sealing type. Two supplementary droppable tanks of any of the following types can be carried on pylons under the wing center section:

Navy Standard 150 US (125 Imp.) gallon, steel
Navy Standard 150 US (125 Imp.) gallon, self-sealing
Navy Standard 100 US (83 Imp.) gallon, self-sealing
P-38, 171 US (142 Imp.) gallon, steel
P-38, 159 US (132 Imp.) gallon, self-sealing

When the P-38 type tanks are being used, or when the plane has taken off without drop tanks or bombs, the bottom of the pylon is faired with a streamlined cover to reduce drag. This fairing cannot be used with Navy tanks or with bombs. *(See figure 11.)*

The fuel is handled by three pumps: the engine driven pump, which delivers the fuel to the carburetor and maintains correct carburetor pressure; an auxiliary fuel pump, submerged in the main cell, which serves to deliver vapor free fuel to the engine driven pump and can in emergency supply the carburetor with fuel at operating pressures; a transfer pump, whose function is to transfer the fuel from the auxiliary and droppable tanks to the main cell.

Examination of figure 10 will indicate that fuel to the carburetor is normally delivered only from the main fuel cell, and that the other tanks serve only to refill the main cell. For this reason the fuel system accessories, such as the quantity gauge and indicator, transfer indicator, tank pressurizing controls and vapor return line are all associated with the main cell.

The fuel quantity gauge, on the main instrument panel, is calibrated to give accurate readings during level flight at 175 knots indicated air speed when the plane is in normal fighter condition. A red warning light on the main instrument panel comes on when the fuel in the main cell gets down to the 50 US (43 Imp.) gallon level. This light may be tested by pressing the fixture in, push-button fashion; if the lamp fails to glow, a new lamp should be installed.

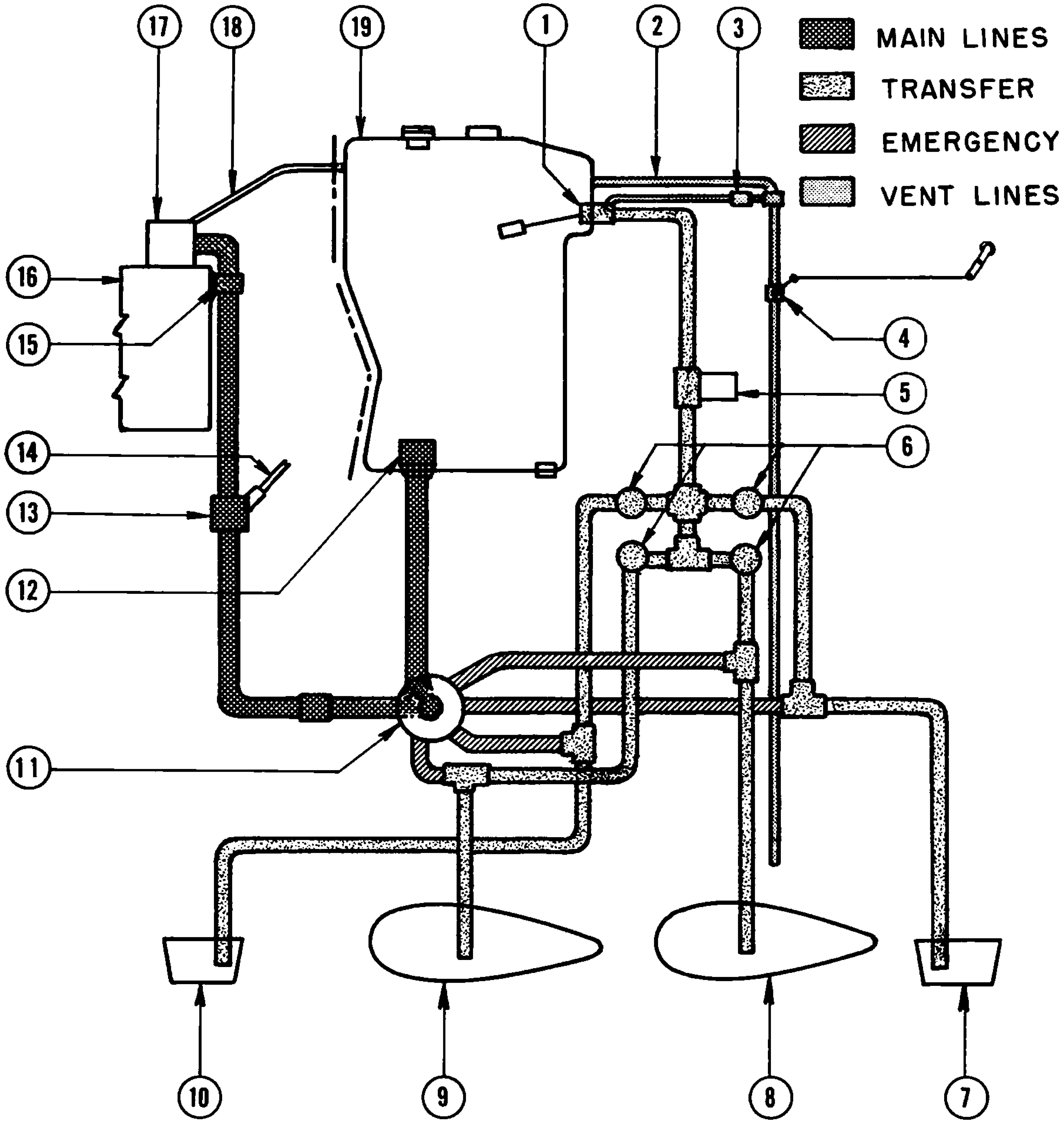


Figure 10 — Fuel System

1 Transfer Float Valve
2 Main Cell Vent Line
3 Transfer Light Pressure Switch
4 Pressure Release Valve
5 Transfer Pump
6 Transfer Solenoid Valves
7 Right Wing Tank
8 Right Droppable Tank
9 Left Droppable Tank
10 Left Wing Tank
11 Selector Valve
12 Submerged Pump
13 Strainer
14 Oil Dilution Line
15 Engine Driven Pump
16 Engine
17 Carburetor
18 Vapor Return Line
19 Main Cell

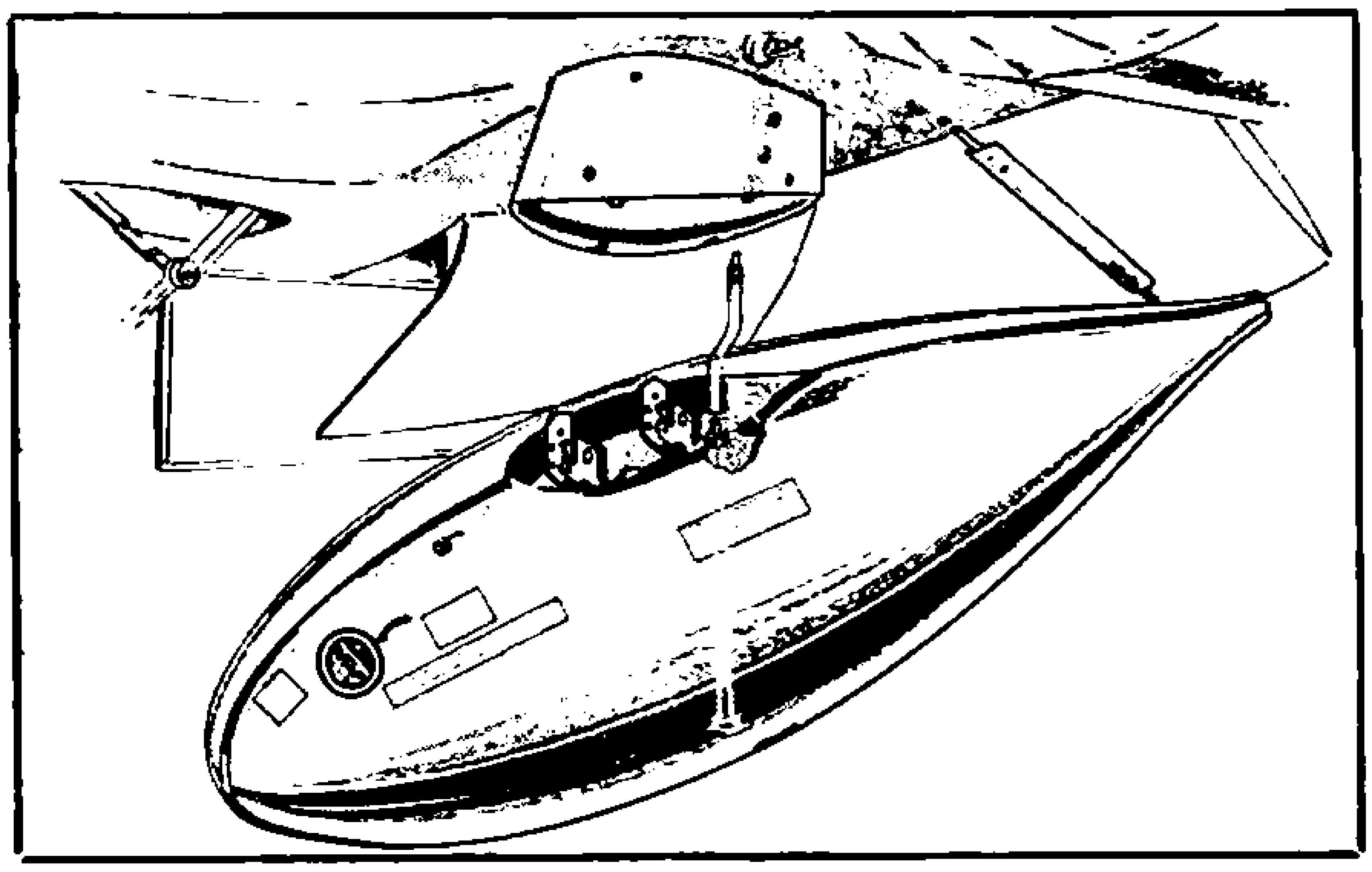


Figure 11 — Pylon and P-38 Type Drop Tank

(2) SUBMERGED FUEL PUMP CONTROL. — The switch controlling the submerged fuel pump is located on the left-hand control panel beside the wing flap control. *(See 2, figure 12.)* It has three positions: ***OFF, BOOSTER,*** and ***EMERGENCY.*** When the switch is in the normal operating ***(BOOSTER)*** position, the submerged pump is running at low speed and develops pressures in the delivery line up to about 11 lbs/sq in. Turning the switch to ***EMERGENCY*** increases the pump speed and builds fuel pressures up to carburetor requirements, and makes continued engine operation possible after failure of the engine-driven pump.

The submerged pump serves three important purposes:

(*a*) It removes absorbed air from the fuel thus helping to avoid vapor-lock.

(*b*) It maintains superatmospheric pressures in the fuel lines supplying the engine driven pump to prevent vapor-lock.

(*c*) It serves to supply fuel to the carburetor at required pressures in case of failure of the engine driven pump.

WARNING

The submerged pump should always be running at ***EMERGENCY*** speed during take-off.

(3) FUEL TANK SELECTOR VALVE. — The tank selector control is mounted on the left-hand control shelf. (See *b*, figure 3.) Its six positions are ***OFF, ON*** (main tank) ***RH DROP STANDBY, RH WING STANDBY, LH WING STANDBY, LH DROP STANDBY.*** For all normal operation, this control remains in the ***ON*** position. It is only on failure of the transfer system or of the main cell, when it becomes necessary to draw fuel directly from the wing or drop tanks, that other settings are used. In such event, with the selector in ***L. H. DROP STANDBY*** for instance, the fuel bypasses both the transfer pump and the main cell, and is drawn directly from the drop tank to the engine driven pump.

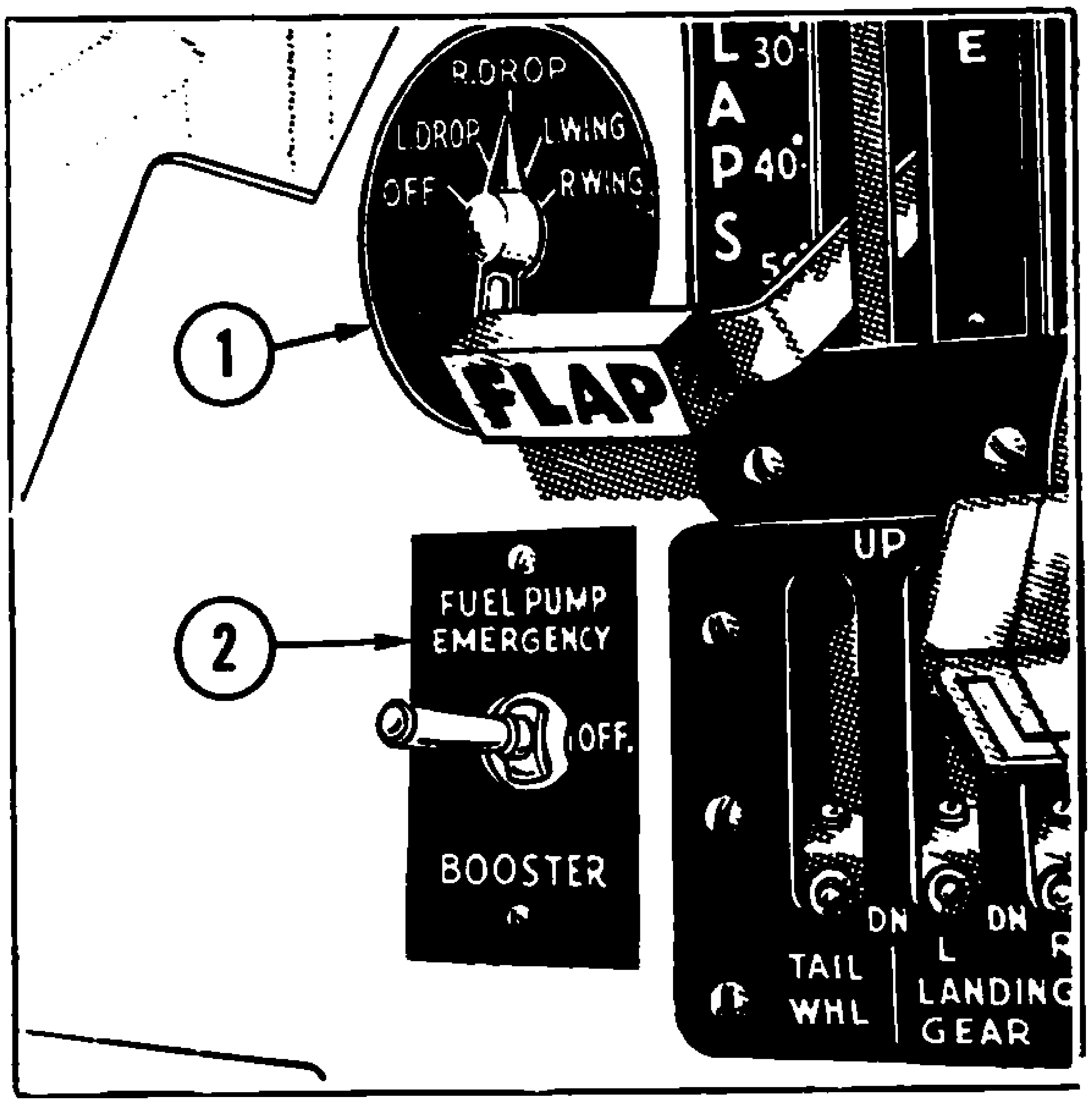


Figure 12 — Fuel System Switches
1 Fuel Transfer Switch
2 Submerged Fuel Pump Switch

(4) FUEL TRANSFER CONTROLS.

(*a*) FUEL TRANSFER SWITCH. *(See 1, figure 12.)* — This switch is on the left-hand control panel beside the switch for the submerged pump. Its five positions are ***OFF, L DROP, R DROP, L WING,*** and ***R WING.*** It is interconnected electrically with both the fuel selector valve and the submerged fuel pump, so that operation of the transfer system depends not only on the setting of the transfer switch but also on the settings of the other two controls:

1. The transfer switch *must* be set to one of the four tank settings for *all* transfer operations

2. For normal operation, the submerged fuel pump switch is in ***BOOSTER*** position, and the selector valve is ***ON.*** Turning the selector valve to any other setting will stop the transfer pump.

3. In case of failure of the selector valve micro-switch or its solenoid the transfer system may still be operated by turning the submerged pump switch to ***EMERGENCY.*** In this position this switch energizes the transfer system directly.

(*b*) FUEL TRANSFER LIGHT. — An amber light at the lower right-hand side of the main instrument panel tells the pilot when fuel from any one tank has been completely transferred, or that

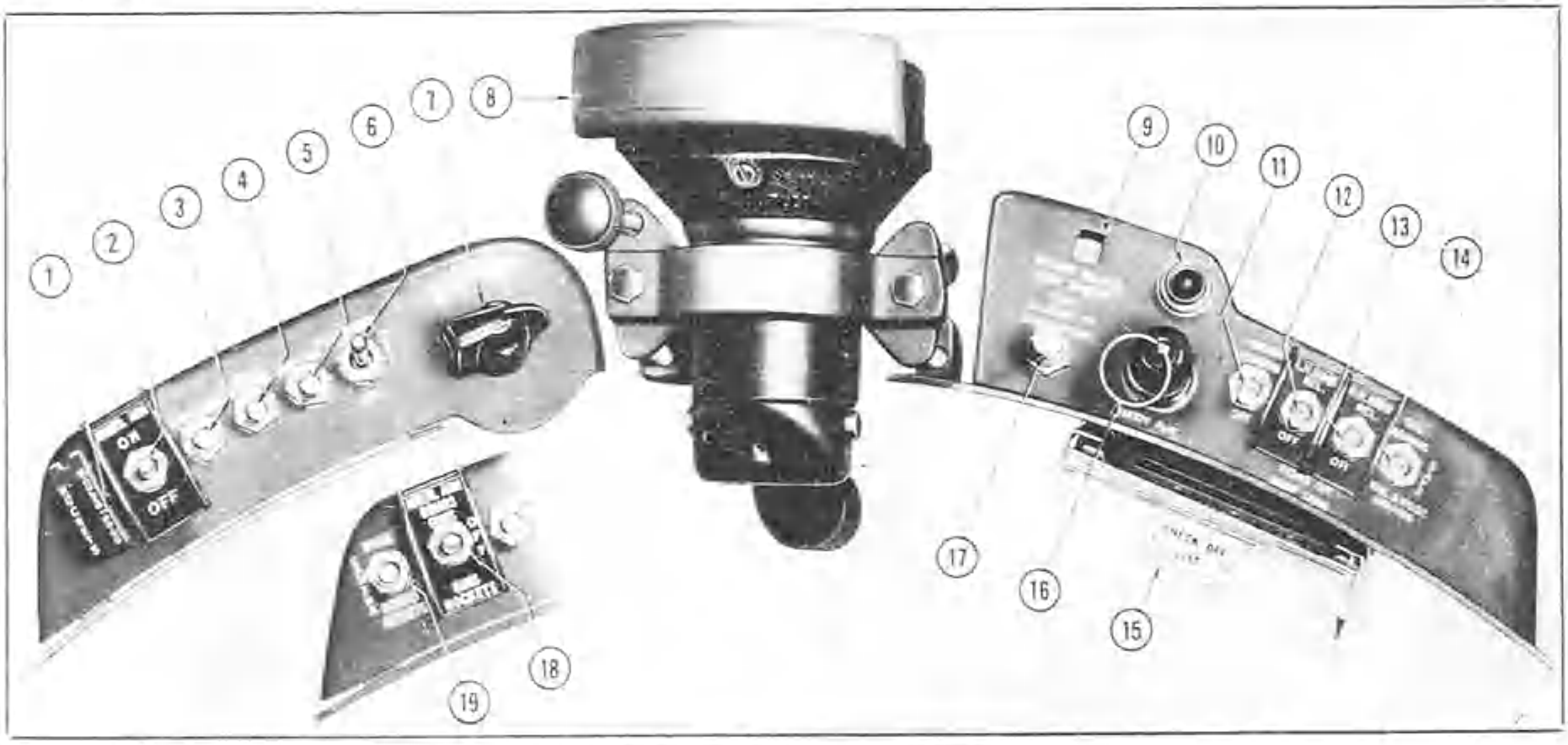


Figure 13 — Armament Controls

1 Shielded Rocket Switch
2 Master Armament Switch
3 Gun Selector Switch — Outboard
4 Gun Selector Switch — Center
5 Gun Selector Switch — Inboard
6 Gun Sight Switch
7 Gun Sight Rheostat
8 Gun Sight
9 Rocket Station Indicator
10 Rocket Arming Warning Light
11 Rocket Arming Switch
12 Bomb Selector Switch — Left-Hand
13 Bomb Selector Switch — Right-Hand
14 Bomb Arming Switch
15 Check-off Lists
16 Rocket Safety Plug
17 Rocket Station Reset Button
18 Master Armament Switch (early models F2G-1)
19 Camera Switch (early models F2G-1)

the transfer system is failing to function. At any time that the transfer pump is on and no fuel is being delivered to the main tank the amber warning light will glow.

Note

It is quite possible, especially at higher altitudes, for the flow of fuel to be interrupted by vapor bubbles in the line. As such a bubble reaches the main cell, the transfer light will come on even though the transfer is not yet complete. The pilot should let the light glow for at least thirty seconds before assuming that that tank has been emptied.

(c) TRANSFER FLOAT VALVE. — A float valve in the main tank will check the flow of the transferred fuel as the main tank becomes full, and prevent over-flow. The amber transfer light does *not* come on in this case since transfer is not yet complete.

(5) MAIN CELL PRESSURE RELEASE. — During flight operations below 18,000 feet the main fuel tank vent line is open and the tank is not pressurized. As the plane reaches an altitude of about 18,000 feet a valve in the vent line automatically closes; at this and higher levels the tank is pressurized by the normal vaporizing of the fuel up to the relief valve setting of 2¼ lbs/sq in.

This pressure should be released prior to engaging in combat by opening a bypass valve provided for the purpose. The valve lever projects upward through the floor just aft and to the right of the right-hand rudder pedal. *(See 1, figure 4.)* Kick the knob forward to release pressure; pull it aft to reclose the vent line.

Note

This valve will not be incorporated in all planes. Absence of the control lever from the cockpit floor indicates that the main cell is not pressurized.

(6) DROP TANK RELEASE. — The pilot may jettison the droppable fuel tanks in two ways:

(a) ELECTRICALLY. *(See figure 13.)*

1. Master armament switch — ***ON*** (or to ***BOMBS-GUNS*** in early models).

2. Bomb release switches to ***L. H. RELEASE***, or ***R. H. RELEASE*** or both, as the instance requires.

3. Press the bomb release button on the top of the control stick.

(*b*) MANUALLY. — Pull the Emergency Bomb or Drop Tank Release at the after end of the left-hand control shelf. *(See 12, figure 3.)* Pulling either lever forward jettisons the tank on the corresponding side of the plane.

(7) PRIMING CONTROL. — The engine priming system consists of a switch on the electrical control panel *(see 2, figure 9)*, a solenoid valve on the carburetor, and priming lines leading both to the intake valve chambers of the cylinders of banks 7, 1 and 2, and to the supercharger housing. Since priming is necessarily performed before engine starting, the fuel pressure necessary for priming is supplied by the submerged electrical fuel pump.

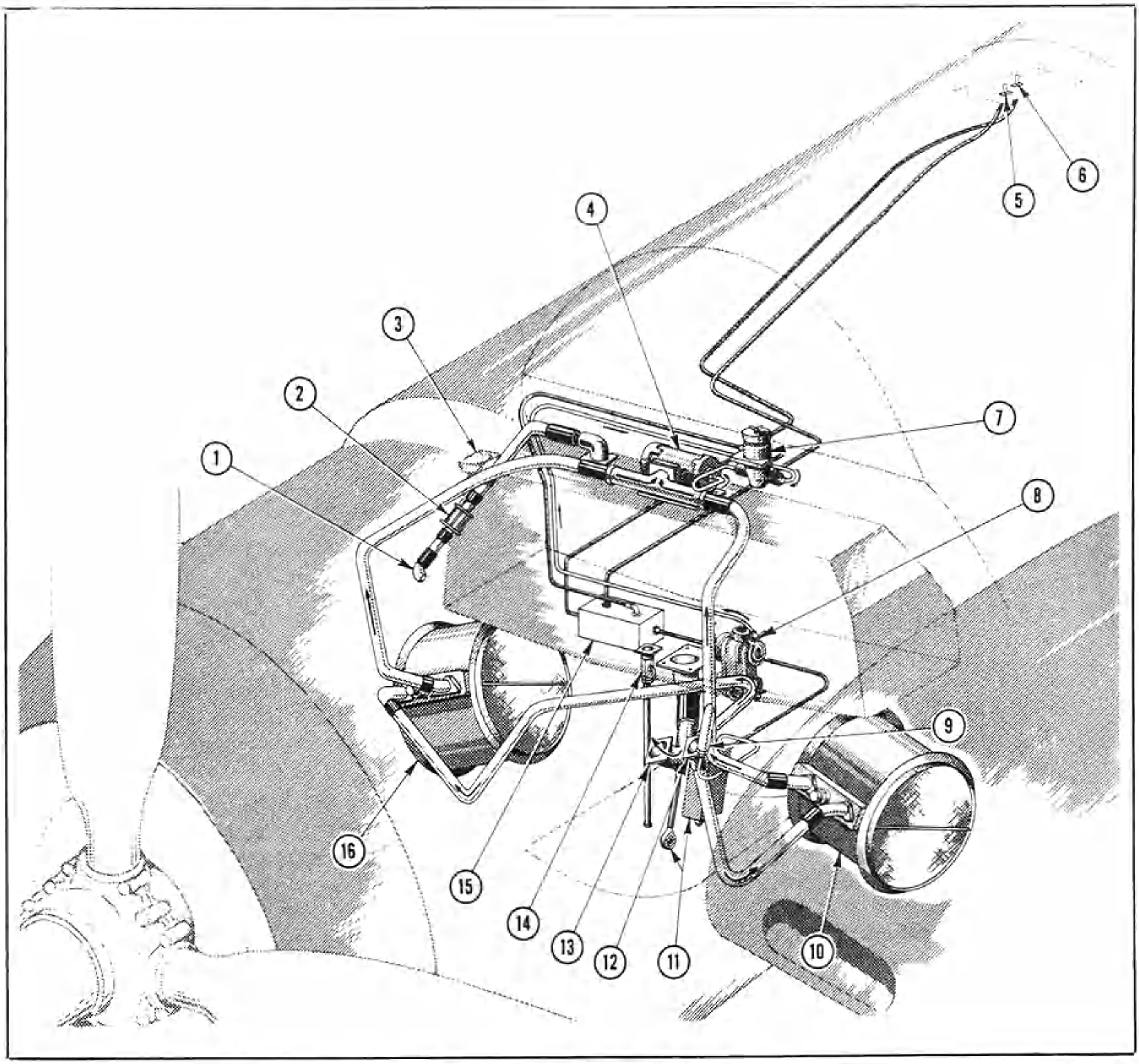
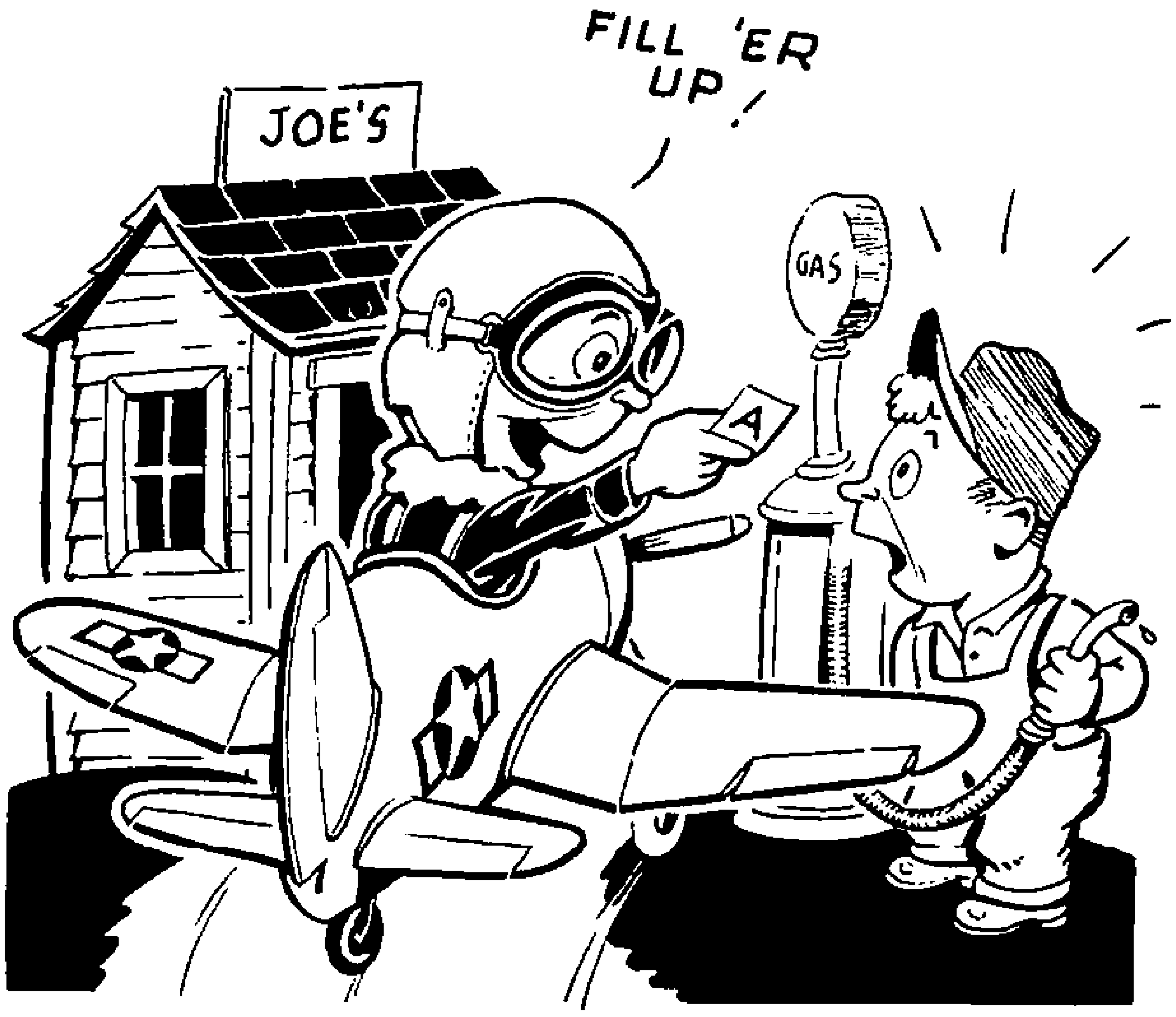


Figure 14 — Oil System

1 Crankcase Vent Connection
2 Pressure Relief Check Valve
3 Tank Filler Cap
4 Diverter Valve
5 Oil Dilution Control Switch
6 Oil Cooler Flap Control Switch
7 Oil Dilution Solenoid Valve
8 Oil Dilution Shut-off Valve
9 Thermostatic Unit
10 Left-Hand Oil Cooler
11 Flap Actuator Motor
12 Engine Connection — Oil Out
13 Engine Connection — Oil In
14 Tank Drain Valve
15 Electrical Junction Box
16 Right-Hand Oil Cooler



d. OIL SYSTEM. *(See figure 14.)*

(1) GENERAL. — The lubrication system of the F2G-1 comprises a 30½ US (25.4 Imperial) gallon tank (26½ gallons of oil and four gallons of foaming space), the engine driven pumps, and two oil coolers. A diverter valve on the top of the main tank directs the flow of cold oil through a central warm-up chamber in the tank. As the temperature of the return oil approaches normal operating levels the diverter valve shifts to circulate the oil through the entire tank. Flow of oil through the oil coolers is also thermally controlled to shorten warm-up time.

(2) OIL COOLER FLAP CONTROL. — The oil cooler flap is operated by an electric actuator with both manual and thermostatic controls. The actuator control switch is on the right-hand control panel and has four positions: ***OFF, OPEN, CLOSE*** and ***AUTO***. *(See 4, figure 9.)* For all normal operation, the switch should be kept in the ***AUTO*** position with the thermostatic system operative. The ***OPEN*** and ***CLOSE*** positions are for momentary contact; upon release the switch springs back to ***OFF*** from either of these settings. The actuator motor contains a limit switch which will turn the motor off as the flap reaches the full closed or full open positions, so that no damage can result from holding the pilot's control switch in position too long.

Note

The permissible operating range for oil-in temperatures is from 40°C (104°F) to 85°C (185°F). 100°C (212°F) is permissible during climb for periods not exceeding five minutes.

(3) OIL DILUTION CONTROL. — This plane has provision for oil dilution, but the parts necessary for installation are supplied only in kit form to be installed later at the discretion of the service.

The purpose of oil dilution is to lower the viscosity of the engine lubricating oil during cold weather and consequently both to lower the cranking torque required for engine starting and to improve initial lubrication of the moving parts.

The process of diluting the oil with gasoline must be done while the oil is fluid and circulating. Hence, the pilot must anticipate a cold start and provide for it by diluting the oil before stopping the engine. The gasoline in the oil is quickly driven off after the engine warms up. (Refer to section II, paragraph 4,c.)

The oil dilution switch is combined with the instrument switch on the right-hand control panel. *(See 15, figure 9.)*

Note

When the oil dilution system is installed, a substitute name plate bearing the words ***OIL DILUTION*** is put on this switch. Otherwise, the upper part of the switch plate is blank.

The switch is of the momentary contact type, that is, it springs back to ***OFF*** upon release. When the switch is pushed forward to ***OIL DILUTION*** a solenoid valve opens to permit gasoline to flow from the fuel system into the diverter valve on the top of the oil tank. Normally, the switch is held in this position for about two minutes to accomplish full dilution. The submerged fuel pump should be in emergency operation during oil dilution.

e. LANDING GEAR CONTROLS. *(See figure 15.)*

(1) GENERAL. — Both the main landing wheels and the tail wheel and their covering doors are extended and retracted hydraulically. In the event of failure of the hydraulic system during flight the main wheels can be lowered by releasing compressed carbon dioxide into the actuating struts; under such emergency conditions the tail wheel is lowered and locked by spring action.

The landing gear can be lowered in flight for use as a dive brake. On the F2G-1 planes, only the main wheels are lowered for this purpose and the tailwheel remains retracted; on the F2G-2 planes, all three wheels are lowered.

(2) LANDING GEAR EXTENSION AND RETRACTION CONTROL. — The lever controlling the hydraulic raising and lowering of the landing gear

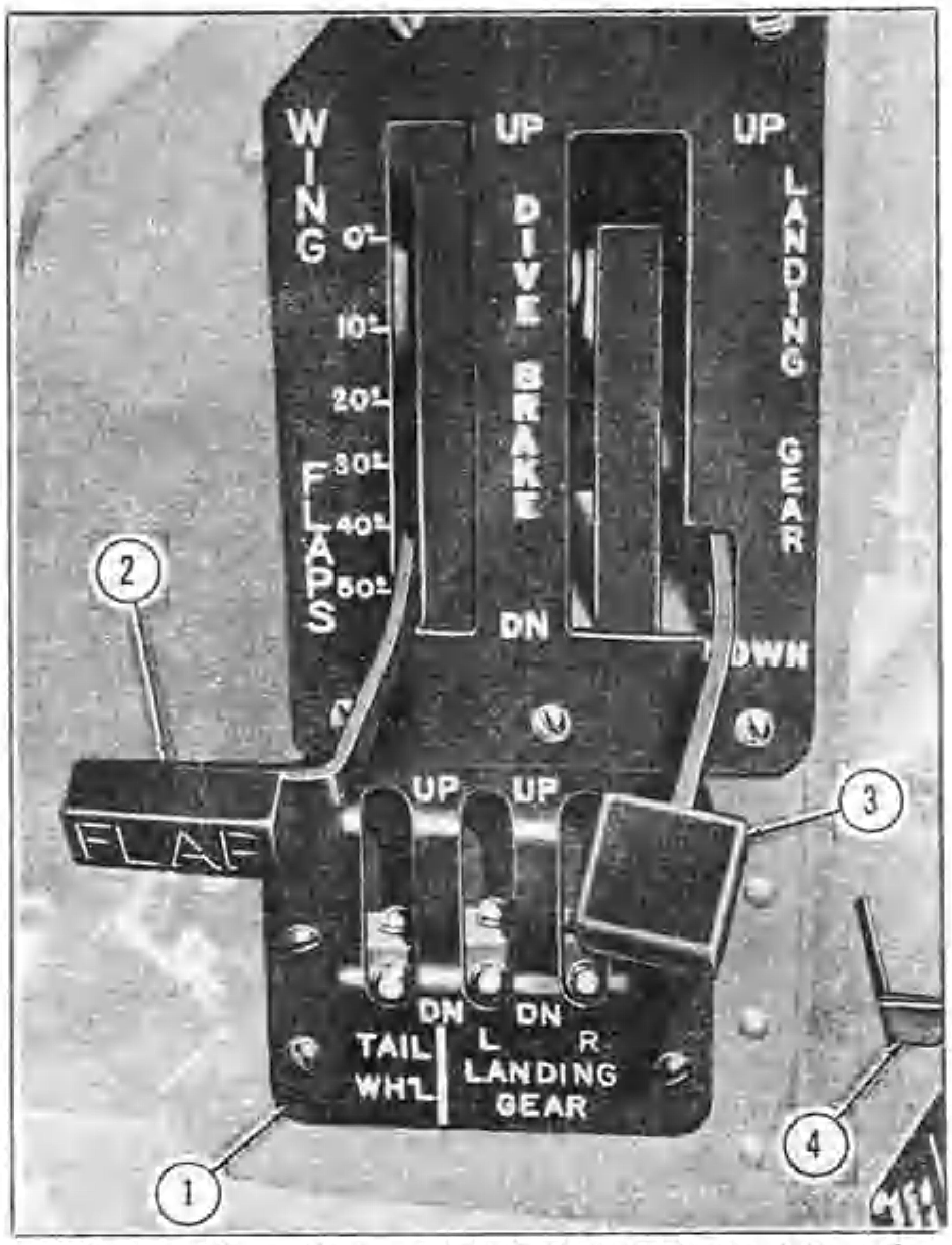


Figure 15 — Forward Left-Hand Control Panel

1 Landing Gear Position Indicators
2 Wing Flap Control
3 Landing Gear and Dive Brake Control
4 Emergency Landing Gear Release

(F2G-2 has arresting hook control in place of dive brake)

is on the forward left-hand control panel. *(See 3, figure 15.)* As the control lever is moved from ***UP*** to ***DOWN*** (in the ***LANDING GEAR*** slot) the tail wheel and main wheel doors open and the wheels are lowered. The correct sequence of door and landing gear motion is maintained automatically. Returning the control to ***UP*** reverses this action, retracting the gear.

An automatic safety latch holds the control lever in the ***DOWN*** position as long as the weight of the plane is on the landing wheels. When the plane lifts off the ground, the latch is withdrawn electrically and the landing gear control is freed. An emergency lever on the vertical panel beside the main control serves to withdraw the latch mechanically in case of electrical failure. *(See 4, figure 15.)* If, with the plane airborne, the landing gear control remains locked ***DOWN***, raise the emergency lever and hold it up until the landing gear control is moved out of the ***DOWN*** position.

CAUTION

Never raise the emergency lever when the plane is on the ground.

(3) DIVE BRAKE CONTROL. — The landing gear control lever serves also as the dive brake control. In the F2G-1, the lever is shifted to the left-hand ***(DIVE BRAKE)*** slot and moved to ***DN*** to lower only the main wheels. In the F2G-2, the landing gear is simply moved to ***DOWN***, and both main wheels and tail wheel extend.

(4) EMERGENCY CO_2 CONTROL. — A valve on the lower auxiliary panel (between the rudder pedals) controls the carbon dioxide system. Turning this valve counter-clockwise releases the compressed gas from the emergency bottle, delivering it directly into the landing gear struts. *(See 2, figure 16.)*

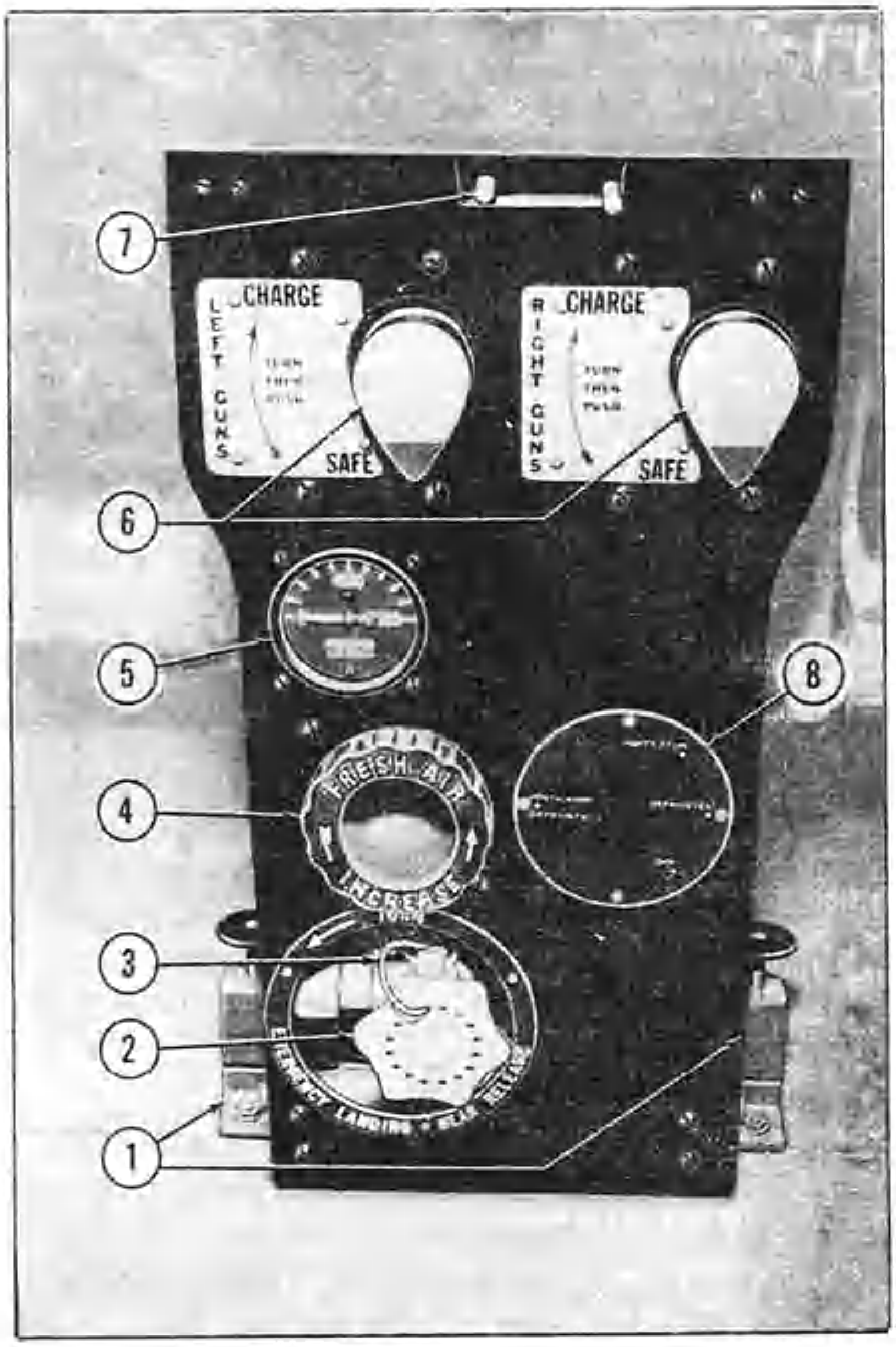


Figure 16 — Auxiliary Instrument Panel

1 Surface Control Lock Clamp
2 Emergency Landing Gear CO_2 Valve
3 CO_2 Valve Safety Pin
4 Ventilator Valve
5 Hydraulic Pressure Gauge
6 Gun Charging Knobs
7 Panel Catch
8 Defroster Control Plate (not utilized)

Note

The CO_2 system functions independently of the regular landing gear control. The position of the latter has no effect on the emergency extension of the gear.

Although the initial bottle pressure of the CO_2 is high, the effective pressure that it can develop in the landing gear hydraulic cylinders is lower than normal hydraulic pressure. For this reason, the air speed of the plane should be reduced to near-stalling values before opening the CO_2 valve, in order to minimize the air load acting against the landing gear during extension.

(5) TAIL WHEEL LOCK. *(See 11, figure 3.)* — The tail wheel lock control is on the left-hand panel aft of the trim controls. This is a conventional locking system. In the unlocked condition the tail wheel is free to "caster" or swivel; when locked, the tail wheel is held in a fore-and-aft plane. Push the control lever forward to lock the tail wheel, rearward to unlock it

(6) BRAKES. — The brake hydraulic systems are entirely independent of each other and of the main hydraulic system. *(See figure 17.)* The brake reservoir is carried on the rudder pedal as an integral part of the brake master cylinder. *(See 4, figure 17.)* The action of the brake pedal is conventional: pressing the upper end (toe end) of the rudder pedal forward actuates the master cylinder and applies the brake. No provision is made either for parking brakes or for adjustment of the brake control relative to the rudder pedal.

(7) ARRESTING HOOK CONTROL. — The arresting hook control of the F2G-2 is on the forward left-hand control panel beside the landing gear control. The two controls are so designed that it is impossible to lower the arresting hook without first extending the landing gear, and likewise impossible to retract the landing gear without first raising the arresting hook.

f. SURFACE CONTROLS.

(1) GENERAL. — Aileron, elevator and rudder controls are conventional. All three of these major control surfaces are equipped with trim tabs, adjustable from the cockpit. The ailerons and elevators also have servo tabs for the purpose of reducing stick loads.

(2) RUDDER PEDALS. *(See figure 17.)* — The rudder pedals may be adjusted for the comfort of the pilot. To adjust the pedals rearward, hook the toes under the pedals and pull both pedals back as many notches as desired. To adjust them forward, press the toes on the ratchet pawls; this releases the ratchets and lets the pedals swing full forward, from which position they may be pulled back again to the desired setting.

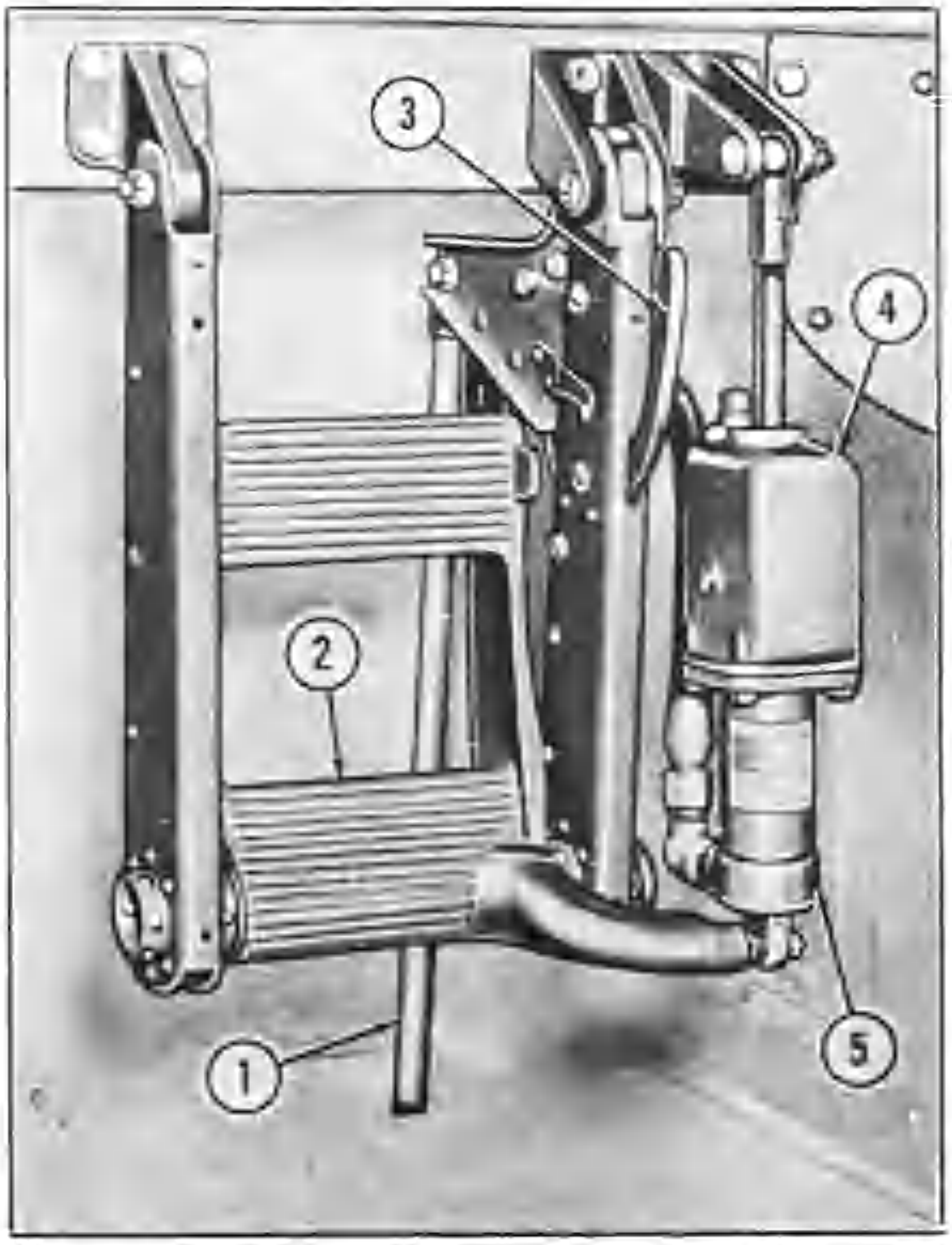


Figure 17 — Rudder and Brake Pedal

1 Rudder Control Rod
2 Pedal
3 Pedal Adjustment Pawl
4 Hydraulic Brake Reservoir
5 Hydraulic Brake Cylinder

(2) AUXILIARY RUDDER. — *(See figure 18.)* The conventional rudder is supplemented by a hydraulically actuated auxiliary rudder which is operative during low speed, high powered flight such as a carrier "wave-off." The auxiliary rudder operates in only two positions, neutral and 12½ degrees to the right. During high speed or maneuvering flight, it remains fixed in the neutral position and serves as a supplementary fin area. However, when the wing flaps are lowered to any setting greater than 30 degrees, a hydraulic linkage automatically swings the auxiliary rudder to its rightward position, where it remains until the flaps are again raised to a setting less than 30 degrees. Its effect during such low speed flight is to maintain directional and lateral control and to relieve the pilot of the necessity of using strong rudder correction should full throttle power be required. The motion of the auxiliary rudder is deliberate rather than abrupt so that the pilot experiences no sudden rolling or yawing effects due to its deflection, and has ample time to make such minor adjustments in rudder trim as may be required.

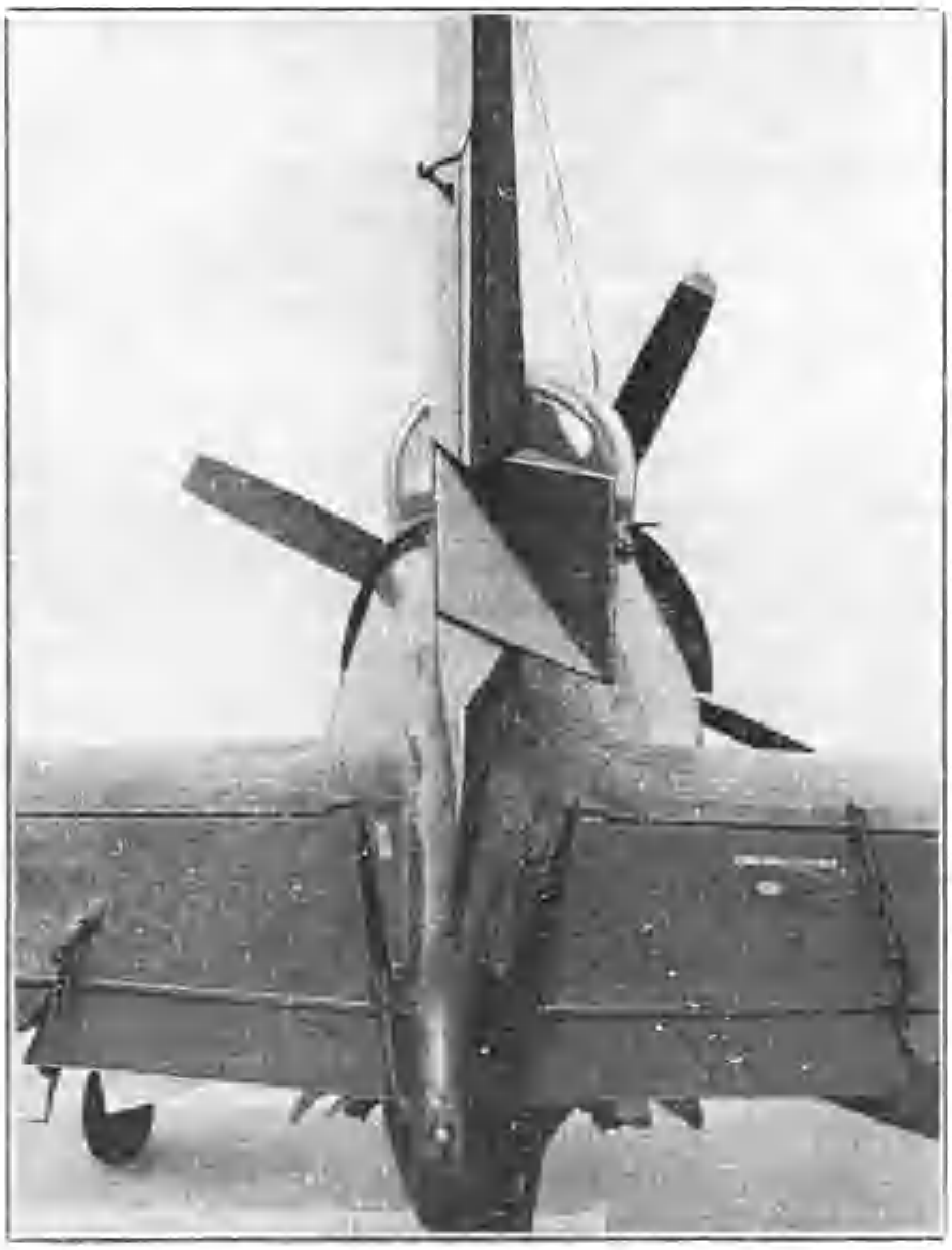


Figure 18 — Auxiliary Rudder — (Deflected)

(4) TRIM CONTROLS. *(See 3, figure 3.)* — The three trim controls are on the shelf at the pilot's left hand. These hand wheels are positioned for logical motion in trimming. The axis of each wheel is roughly parallel with one of the three principal axes of the plane; rotation of any hand wheel trims the plane about that principal axis and in the same direction of rotation. The aileron and rudder trim wheels are of transparent plastic through which the trim indicators show the direction and amount of the trim setting. The elevator trim indicator is on the top of the shelf between the other two controls. The trim angle indicated is the angle established between the tab and the control surface to which it is attached.

Note

Motion of the stick and rudder pedals will produce slight rotations of the trim controls; actual trim settings are not influenced by this motion.

(5) WING FLAP CONTROL.

(*a*) GENERAL. — The flap control lever is on the forward, left-hand control panel. *(See figure 15.)* The flaps may be set at any 10 degree position between full up and 50 degrees full down by simply moving the control lever up or down to the desired setting.

Note

In order to get accurate flap settings when the setting is being reduced, move the control lever slightly beyond (above) the desired point and then move it down to the correct position.

(*b*) EQUALIZATION OF FLAP ANGLES. — There is no mechanical provision for insuring equal flap settings on both wings. The flap angles are equalized by the aerodynamic loads against them. If the flaps on one wing have been damaged in any manner that prevents their lowering, the other flaps will still move to the selected setting, with a resultant strong rolling moment acting on the plane.

WARNING

If the plane has been exposed to combat or other conditions that may have injured the flap mechanism the pilot should test the operation of his flaps while at a safe altitude.

(*c*) BLOW-UP SPEEDS. — A "blow up" mechanism in the flap hydraulic system makes it possible for the flaps to retreat under excessive air loads. At full down (50 degrees) the flaps start blowing up at 100 to 115 knots indicated, at lesser settings the "blow up" air speeds are correspondingly higher. When air speeds are reduced below these values again the flaps automatically return to their original settings.

CAUTION

In spite of this protective device, flaps should not be left full down at airspeeds in excess of 130 knots indicated.

(*d*) EMERGENCY OPERATION. — A hand pump selector valve on the face of the left control shelf *(see 9, figure 3)* insures the lowering of the flaps even after loss of hydraulic pressure. This control has two positions — *HYDRAULIC SYSTEM* and *EMERGENCY WING FLAPS*, which indicate the two possible outlets for fluid delivered by the hand hydraulic pump. When this control is in the *HYDRAULIC SYSTEM* position, the purpose of the hand pump is conventional; it delivers fluid to the accumulator and thence to any hydraulically operated unit. In the *EMERGENCY WING FLAP* setting, the entire output of the hand pump is directed to the wing flaps so that the possibility of reserve fluid being wasted on some less essential operation is minimized. (For operation of the hand pump, refer to section V, paragraph 5,*b*.)

(6) WING FOLDING CONTROLS.

(*a*) The wing folding and locking controls (F2G-2) are on the left-hand control shelf. (See figure 3.)

(*b*) To fold the wings, release the latch holding the locking control in position and move the locking control to ***UNLOCKED***. When the latch is released and the locking control is moved aft, the wing hinge pin locks are relieved and the pin is freed for extraction. Placing the folding control in the ***FOLD*** position extract the wing hinge pins and folds the wings in the proper sequence. When the operation is complete, move the folding control to ***NEUTRAL***. The wings may be folded or spread manually by means of the hand pump whenever the engine is not running.

(*c*) To spread the wings, move the wing folding control to ***SPREAD***. This action moves the wings to their complete spread position and inserts the hinge pins in proper sequence. When this operation is complete, move the locking control forward and see that the latch locks firmly behind the control lever. This action locks the wing hinge pins.

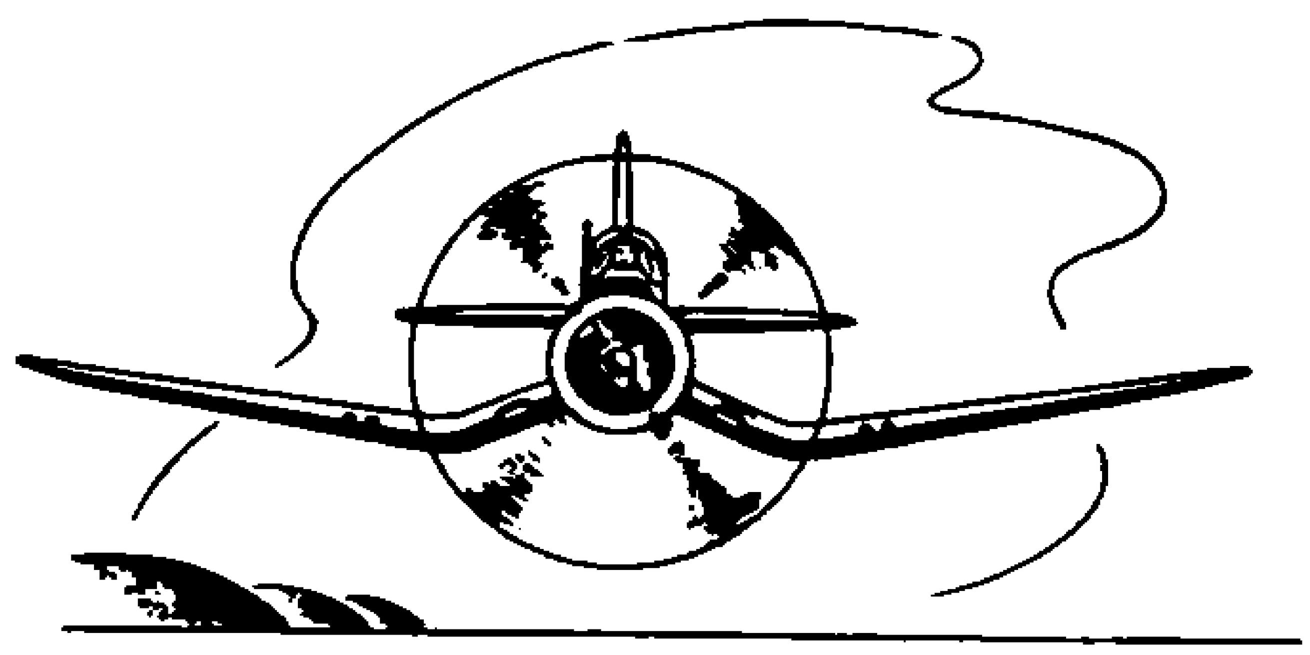
Note

For all flight operations, the wing folding control shall be in the ***SPREAD*** position and the locking control shall be forward in its locked position.

(*d*) 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 joint. These doors will not close until the outer panels are completely spread and the wing hinge pins are "home."

(*e*) A red warning flag has been provided at each wing folding joint to indicate when the wing hinge pin lock is not in position. The warning flag will drop flush with the wing surface only when the locking pin is actually in the locked position.

(*f*) No provision is made in the wing folding part of the hydraulic system to keep the outer panels "in step"; that is, 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 them to shift positions, blowing one down and the other up. When fully folded, the wings should be locked by means of the jury struts. When the wings are fully folded and the jury struts are installed, the wings may, by temporarily unlocking the jury struts, be moved to vertical for 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. To fold only one wing, hold the opposite wing down (two or three men at the tip). By locking the "up" wing with a jury strut, the wings will remain in this position as long as the wing fold control is in ***NEUTRAL***.



SECTION II
NORMAL OPERATING INSTRUCTIONS

1. BEFORE ENTERING THE COCKPIT.

a. FLIGHT LIMITATIONS. — The pilot should thoroughly familiarize himself with the following list of flight limitations and restrictions:

(These limitations may be supplemented or superseded by instructions included in Service publications.)

(1) MANEUVER LIMITATIONS. (Refer to Permissible Acrobatics, section II, paragraph 14,*f.*)

(*a*) Intentional spins are not permitted.

(*b*) Inverted flight — permitted only as long as normal oil pressure is indicated.

(2) AIR SPEED LIMITATIONS.

Item	*Operation*	*Limitation*
Landing Gear	Lowering	No Restriction
Dive Brake	Lowering	380 knots
Wing Flaps (50°)	Landing Approach	130 knots
Wing Flaps (20°)	Maneuvering	200 knots
Ailerons	Full Throw	300 knots
Cooling Flaps (Cowl)	Open	No Restriction*
Cooling Flap (Oil cooler)	Open	No Restriction*
Cooling Flap (Oil cooler)	Closed	390 knots
Droppable Fuel Tank	Maximum Diving Speed	375 knots
Droppable Fuel Tank	Releasing	300 knots
Canopy, open	Full Yaw	150 knots
Canopy, open	0° Yaw	200 knots

*The engine cowl and oil cooler flaps are designed to withstand all airloads within the speed range of the plane. However, in the open condition they may be the cause of tail buffeting during high speed flight. Refer to section II, paragraph 14,e,(4).

b. WEIGHT AND BALANCE. — Before entering the cockpit, obtain information concerning the take-off weight and location of center of gravity. Bear in mind that unnecessary weight aft of center of gravity (such as superfluous baggage or radio) will have an adverse effect on longitudinal stability and should be dispensed with. Refer to section II, paragraph 13,*a*.)

c. ACCESS TO THE COCKPIT. — Enter the cockpit from the right-hand side, using the steps and handholds shown in figure 19.

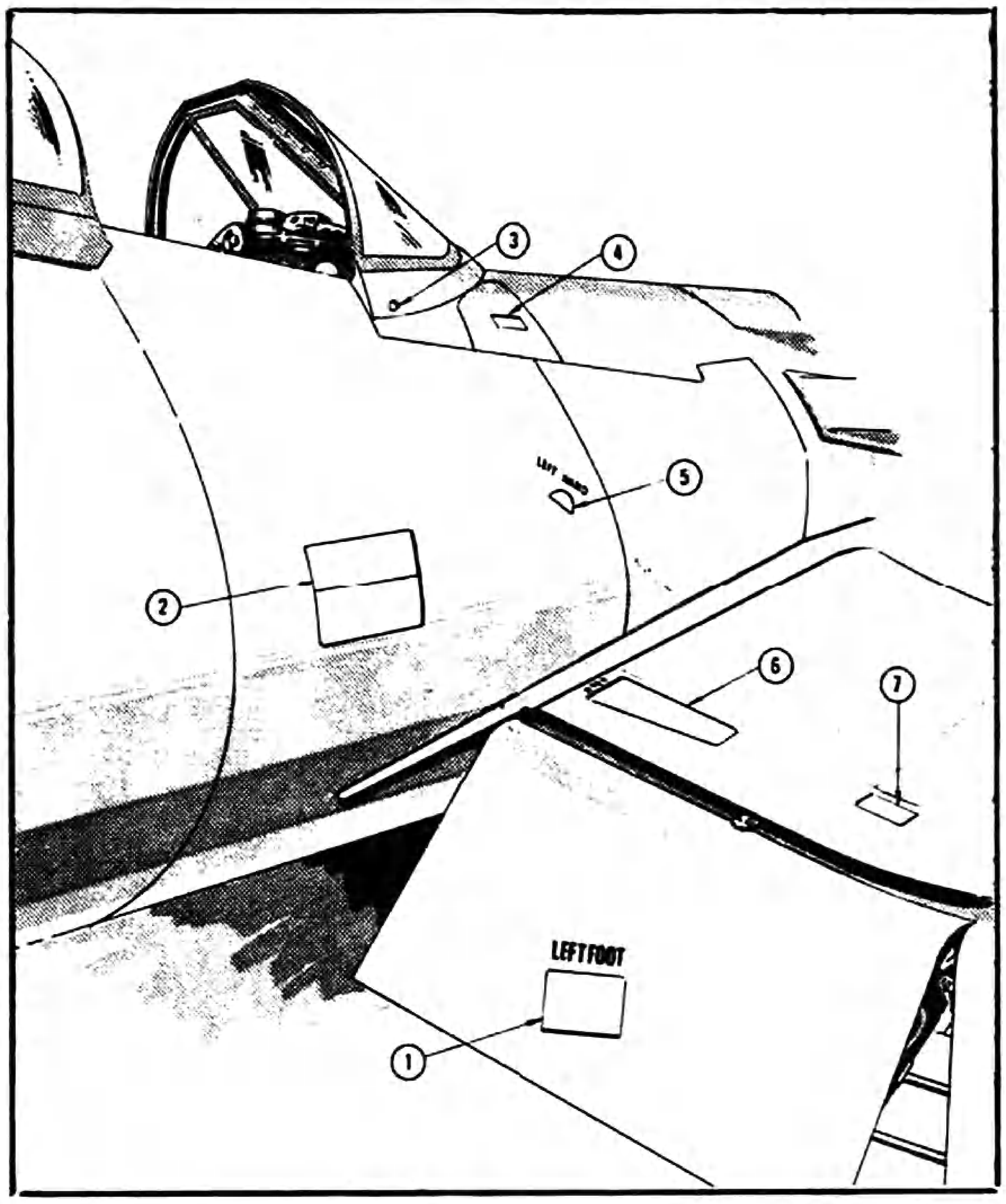


Figure 19 — Access to Cockpit

1 Flap Step (left foot)
2 Fuselage Step and Flap Control
3 Canopy Release Button
4 Upper Fuselage Hand-Hold (right hand)
5 Lower Fuselage Hand-Hold (left hand)
6 Wing Step (right foot)
7 Wing Hand-Hold (right hand)

(1) Lower the wing flaps by means of the lever in the right-hand fuselage step, (see 2, figure 19). Opening this step exposes a hand lever which is linked mechanically to the flap control lever in the cockpit. As this lever is pulled it moves the flap control to its 50 degree (full down) position. If there is pressure in the hydraulic system, the flaps will lower; if there is no pressure, the pilot can push the flap down.

(2) Place the left foot in the flap step, the right hand in the wing handhold, and the left hand in the lower fuselage handhold.

(3) Step up onto the wing, right foot in the wing step and right hand in the upper fuselage handhold.

(4) Place the left foot in the fuselage step.

(5) Press the canopy release button *(see 3, figure 19)* and slide the canopy back.

Figure 20 — Main Cell Pressure Release Valve

Note

Steps are provided on the left side of the plane so that the mechanic may leave the cockpit as the pilot is entering.

2. ON ENTERING THE COCKPIT.

a. GENERAL COCKPIT CHECK. — Other check lists for engine starting, take-off, and landing are given under those headings. Refer to section II, paragraphs 5,*b*, 10,*b* and 16,*b* respectively.

Check the following items immediately on entering the cockpit:

(1) Oxygen pressure. (Refer to section V, paragraph 2,*d*.)

(2) Radio operation (as instructed by the Service).

(3) Armament safe.

(*a*) Rocket plug removed.

(*b*) Master armament switch — ***OFF.***

(*c*) Gun chargers—***SAFE.***

(4) Operation of cowl flaps and oil cooler door.

(5) Fuel transfer and quantity lights. (Press the fixture in to test the lamp.)

(6) Rudder pedal adjustment. (Refer to section I, paragraph 2,*f*,(2).)

(7) Circuit breakers; none should be sprung out.

CAUTION

Simply resetting an open breaker does not remedy the trouble. Do not take off until the cause of any open circuit has been determined and corrected. (Refer to section V, paragraph 4,*d*.)

(8) Gun sight lamp; both filaments should be tested.

Note

For checking numbers (2), (4), (5), and (8) above, the master battery switch must be ***ON.*** Do not turn this switch on while the engine is not running without first checking to see that the mixture control is in ***IDLE CUT-OFF.***

b. GENERAL NIGHT FLIGHT CHECK. — Besides the items listed in the General Cockpit Check, the following should be checked before any flight which may not be completed before sundown.

(1) Instrument board lights including chartboard light.

(2) Supply of spare lamps for instrument lights.

(3) Cockpit lights.

(4) External lighting:

(*a*) Each of the four systems at both ***BRIGHT*** and ***DIM.***

(*b*) Master switch at both ***ON*** and ***FLASH.***

3. FUEL SYSTEM MANAGEMENT.

(See figure 10.)

a. NORMAL OPERATION. — Refer to section I, paragraph 2,*c* for a description of the fuel system. For all normal flight conditions the engine is supplied entirely with fuel drawn from the main cell. Fuel from drop tanks and wing tanks is transferred to the main fuel cell in that order. Fuel system controls should be set as follows:

(1) Tank selector valve—***ON.***

(2) Submerged pump switch:

(*a*) For take-off and landing—EMERGENCY.

(*b*) For other normal flight—BOOSTER.

(3) Fuel transfer switch.

(*a*) For take-off—OFF.

(*b*) Immediately after take-off, use following sequence depending on tanks being carried:

1. ***L.DROP***

2. ***R.DROP***

3. ***L.WING***

4. ***R.WING***

5. ***OFF***

Note

The transfer light which normally comes on at the completion of a transfer operation may glow for short periods merely because of bubbles in the lines. Let the transfer light glow steadily for at least thirty seconds before assuming that that tank is empty.

(4) Tank pressurizing valve—*ON.*

(5) Emergency drop tank release levers — forward as necessary to jettison empty tanks.

WARNING

Do not release droppable tanks at speeds greater than 300 knots.

b. OPERATION IN EVENT OF FAILURE OF ENGINE DRIVEN PUMP. — In the event that the engine driven fuel pump should fail to deliver fuel to the carburetor at required pressures, switch the submerged pump to *EMERGENCY* operation. Otherwise, management of the fuel system should be normal, as indicated in the paragraph above.

c. OPERATION IN EVENT OF FAILURE OF TRANSFER SYSTEM. (Refer to section IV, paragraph 2,*b.*)

d. COMBAT OPERATION.

(1) Jettison drop tanks as required. Pull emergency controls forward. *(See 12, figure 3.)*

(2) Submerged pump switch — *EMERGENCY. (See 2, figure 12.)*

(3) Main cell pressure release valve-forward. *(See figure 20.)*

WARNING

The main fuel cell is normally pressurized at altitudes greater than 18,000 feet. This pressure prevents the tank from sealing in the event of combat damage. Never engage in combat without first releasing the tank pressure.

(4) Tank selector valve—*ON* (main tank). *(See 6, figure 3.)*

(5) Transfer Switch — *L WING, R WING,* in that order, to complete the transfer of fuel, then *OFF.*

4. OIL SYSTEM MANAGEMENT.

a. GENERAL. *(See figure 14.)* — The engine lubricating system is entirely automatic, with thermostatic units controlling the flow through the oil coolers, the flow through the main oil tank, and the position of the oil cooler flap. (Refer to section I, paragraph 2,*d* for description of the engine lubricating system.)

b. NORMAL OPERATION.

(1) Oil cooler switch — *AUTO. (See 4, figure 9.)*

(2) Oil pressures and temperatures as indicated in Power Plant Chart, section III.

Note

Oil pressures normally decrease with increase of altitude. Pressures as low as 70 lbs/sq in. can be expected at full throttle, 2550 rpm at 25,000 feet.

c. OIL DILUTION. — (Refer to section I, paragraph 2,*d*,(3) for description of the oil dilution system.)

Note

Oil dilution systems are installed by the Service only as required by the tactical assignment of the plane. The following procedures apply only to such planes as have had this installation completed.

(1) PROCEDURE.

(*a*) The oil should be diluted while the engine is still warm and the oil fluid (75°C - 85°C oil temperature).

(*b*) Dilution is to be employed whenever a cold start is anticipated. It should not be required when the start will be made at temperatures above -5°C (23°F).

(*c*) Check to see that the oil dilution plug valve is open. *(See 8, figure 14.)* This valve is accessible through the oil cooler flap. *(See 12, figure 21.)*

(*d*) Turn fuel pump switch to *EMERGENCY. (See 2, figure 12.)*

(*e*) With the engine running at about 1000 rpm, press the switch *(see 15, figure 9)* forward to *OIL DILUTION.*

(*f*) After holding the switch forward approximately two minutes, stop the engine by moving the mixture control to *IDLE CUT-OFF (see 5, figure 5)*; keep the switch at *OIL DILUTION* until the engine has stopped.

(2) STARTING AFTER DILUTION.

(*a*) Use normal procedures in starting the engine. (Refer to Engine Starting, paragraph 5, below.)

(*b*) If, after the engine has run a short while, the oil pressure starts to fluctuate or drop, push the *OIL DILUTION* switch forward for a few seconds and release for a few seconds. Repeat this three or four times.

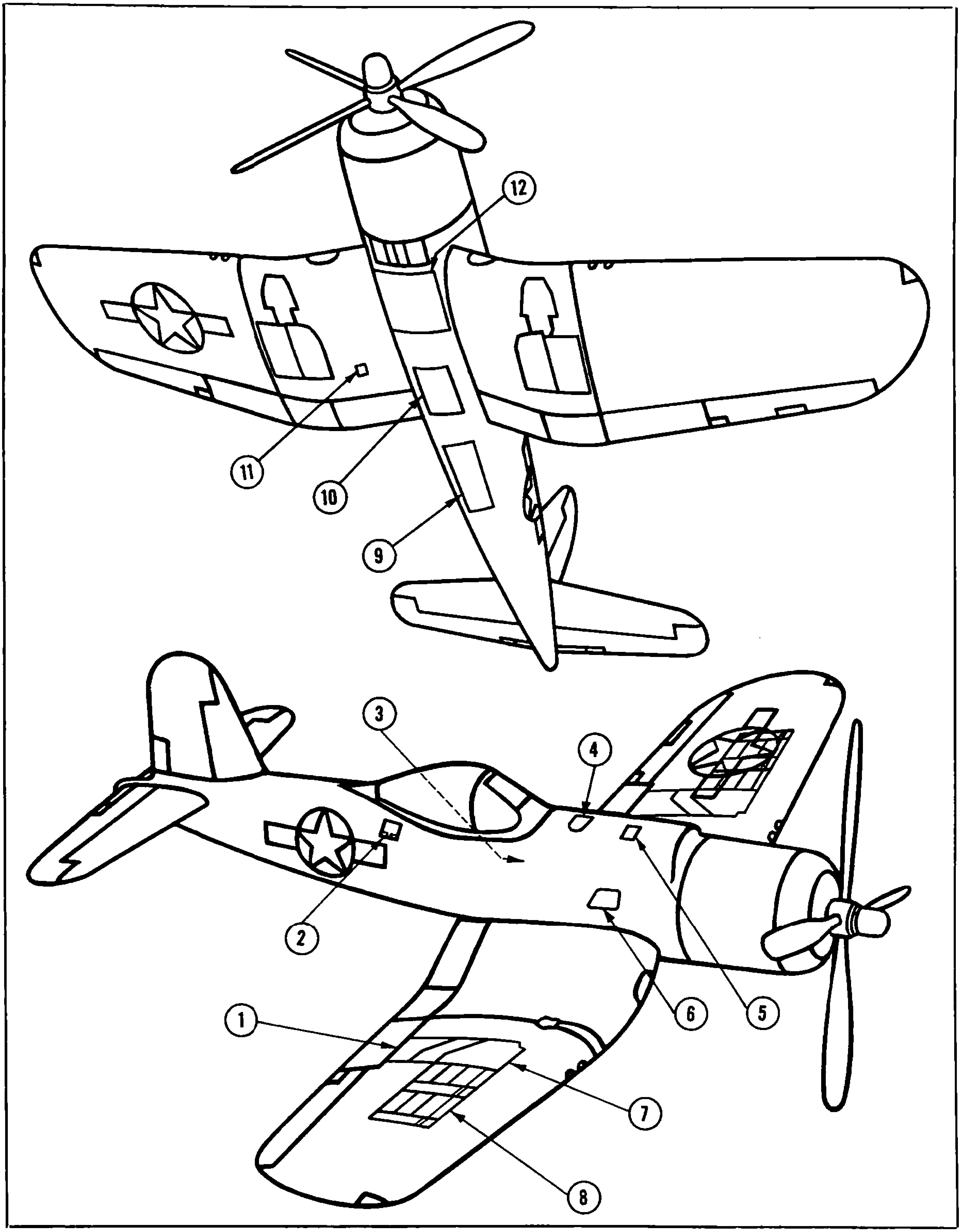


Figure 21 — Service Points

(c) If the oil pressure still does not steady out, stop the engine and wait for about five minutes before trying another start.

(3) PRECAUTIONS.

(a) Do not over dilute.

(b) Be on the alert for fire.

(c) Dilute only when justified by a forecast of low temperature.

(d) Allow adequate warm-up time except in cases of extreme emergency. (Refer to Scramble Take-off, section II, paragraph 10,c.)

(e) Particular care should be taken to keep the oil system free of sludge and water when it is necessary to operate under these temperature conditions.

CAUTION

The presence of the diluting gasoline will not prevent the formation of ice crystals in the oil system. Such crystals may clog oil strainers or small passages in the engine.

(f) Be sure the oil dilution plug valve is open, otherwise the oil dilution procedure accomplishes nothing.

(g) Since the oil in the hydromatic propeller of the F2G does not circulate through the engine system and hence is not diluted, it is essential that the operation of the propeller pitch changing mechanism be checked before take-off.

5. ENGINE STARTING.

a. GENERAL.

(1) Except in emergencies, the engine should be started with external, or "shore," power by means of the receptacle on the underside of the right wing. (See 11, figure 21.)

(2) In cold weather the oil should be heated if it has not already been diluted prior to stopping. (Refer to Oil Dilution, paragraph 4,c above.) In extremely cold weather the engine should be preheated also.

(3) If the engine has not run for several hours, the propeller should be rotated two or three turns by hand before starting. If there is any reason to believe that gasoline or oil has collected in the lower cylinders, the bottom spark plugs should be removed.

(4) This engine has unusually long intake pipes leading from the blower to the cylinders. Gasoline may condense and collect in these pipes during the cranking operation if the mixture control is in any position other than *IDLE CUT-OFF*; this gasoline may then be drawn all at once into the cylinders as engine speed picks up. This may "hydraulic" the engine, causing extensive damage and at best, necessitating a major overhaul. Drains are provided in the intake pipes to prevent any such accumulation of fuel, but in spite of this precaution, the instructions concerning adjustment of the mixture control during starting should be carefully followed.

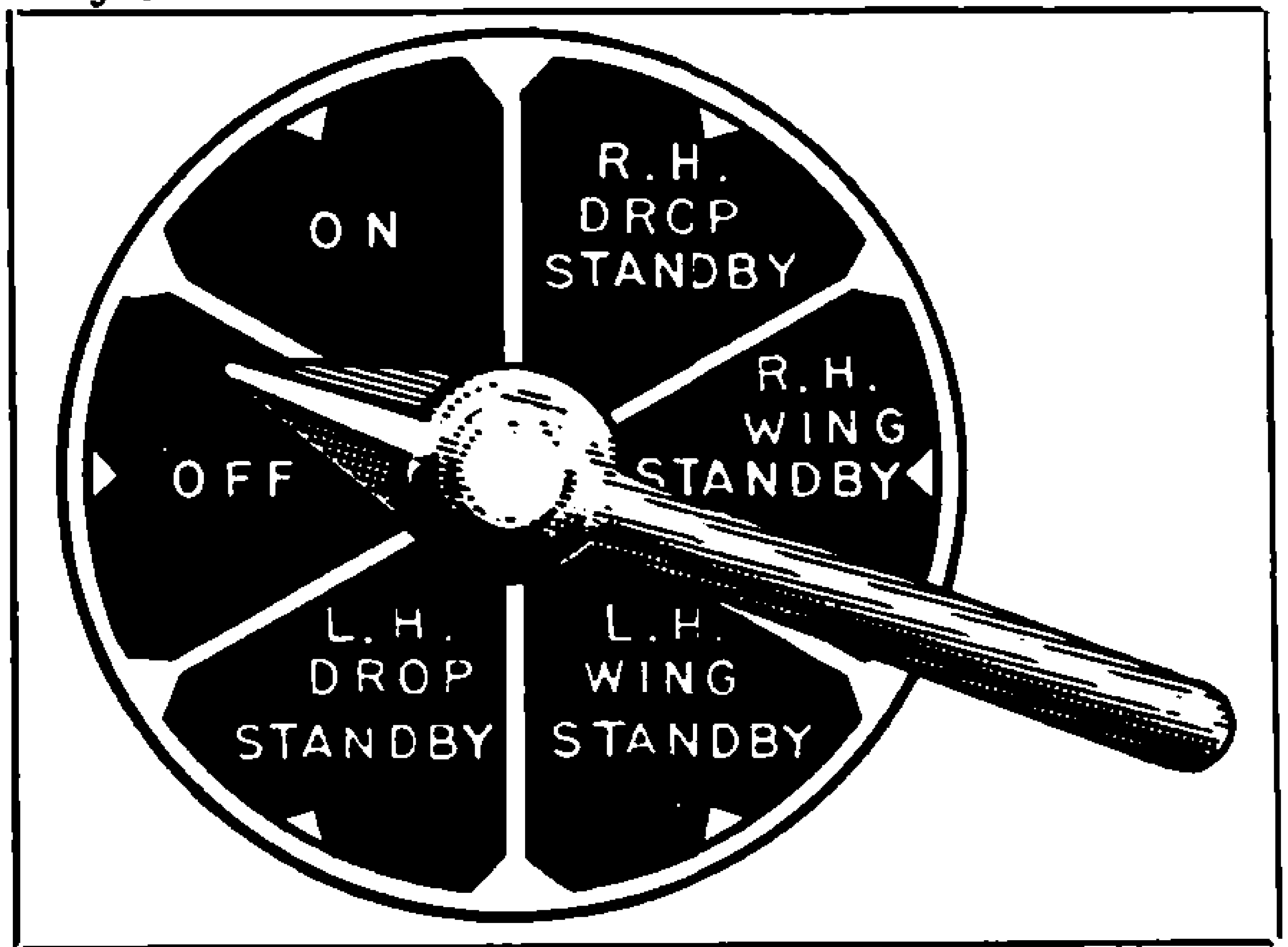


Figure 22 — Fuel Tank Selector Valve

b. PRE-STARTING CHECK-OFF.

(1) Ignition switch — *OFF. (See 1, figure 7.)*

(2) Fuel tank selector valve — *ON. (See figure 22.)*

(3) Mixture control — *IDLE CUT-OFF. (See 5, figure 5.)*

(4) Propeller control — full forward (high rpm). *(See 6, figure 5.)*

(5) Supercharger control full down, low blower. (Applies only where supercharger is manually controlled. Refer to section I, paragraph 1,b,(2).)

(6) Alternate air control — *DIRECT AIR. (See 2, figure 23.)*

(7) Generator switch — *ON (See 1, figure 9.)*

(8) Battery switch — *ON (See 14, figure 9.)*

Nomenclature — Figure 21

1 Flap Door (outboard gun)
2 Auxiliary Fuel Cell Filler
3 CO_2 Bottle Replacement and Brake Reservoir Fillers (inside cockpit)
4 Main Fuel Cell Filler
5 Hydraulic Reservoir Filler
6 Oil Tank Filler
7 Gun Compartment Doors
8 Ammunition Compartment Doors
9 Fuselage Mid-section Access Door (Baggage, Battery, Radio, etc.)
10 Fuselage Forward Section Access Door (CO_2 Drain Valve, Oxygen Refill, etc.)
11 External Power Receptacle
12 Oil Cooler Flap

(9) Oil cooler switch — *AUTO.* *(See 4, figure 9.)*

(10) Instrument switch — *INSTR.* *(See 15, figure 9.)*

(11) Fuel pump switch — *BOOSTER.* *(See 2, figure 12.)*

(12) Fuel transfer switch — *OFF.* *(See 1, figure 12.)*

(13) Engine cowl switch — *OPEN* until cowl flaps are fully extended. *(See 13, figure 9.)*

(14) Wing flaps control — *UP.* (See 2, figure 15.)

Note

If the pressure in the hydraulic system is insufficient to raise the flaps, pump them up by means of the hand pump.

c. STARTING PROCEDURE.

(1) Prime the engine. Refer to section I, paragraph 2,c,(7) for description of the priming system.) At temperatures above 4°C (40°F) holding the primer switch to *PRIMER* for two or three seconds should be enough. At lower temperatures this period must be increased. *(See 2, figure 9.)*

Note

Do not prime to the extent that gasoline runs from the blower drain; with this engine such drainage indicates over-priming and should be avoided. In case over-priming does occur, wait until all flow of gasoline from the drain has stopped before cranking. (Refer to Overloading, paragraph *d*(1), below.)

(2) Crack the throttle to about one-eighth open. *(See 2, figure 5.)*

(3) Turn the ignition switch to *BOTH.* *(See 1, figure 7.)*

(4) Press the starter switch to *START.* *(See 3, figure 9.)*

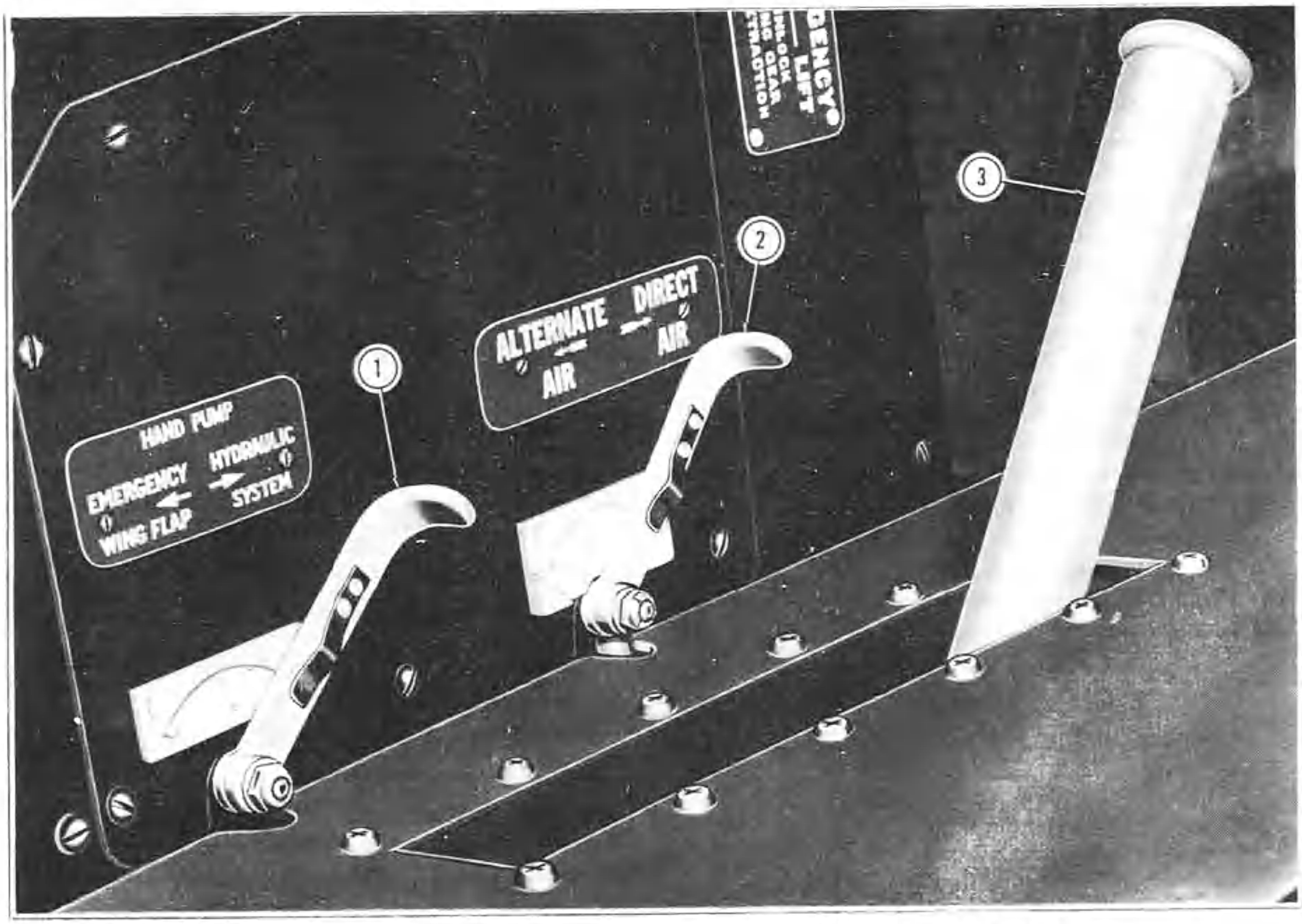


Figure 23 — Hand Pump, Selector Valve and Alternate Air Control

1 Hand Pump Selector Valve
2 Alternate Air Control
3 Hand Hydraulic Pump

CAUTION

Do not use the starter continuously for periods of more than one minute. Allow two minutes between such cranking periods for the starter and ignition booster coil to cool.

(5) As quickly as the engine fires, move the mixture control forward to *AUTO RICH.* *(See 5, figure 5.)* Be ready to move it back to *IDLE CUT-OFF* immediately if the engine stops firing.

CAUTION

It is very important that the engine not be cranked while the mixture control is in any position other than *IDLE CUT-OFF.* (Refer to paragraph 5,*a*,(4) above.) Always start on the prime, shifting out of *IDLE CUT-OFF* only when the engine starts.

(6) With the engine running, throttle back to 600 or 700 rpm until sure that oil pressure is satisfactory.

CAUTION

If oil pressure does not show a rise almost immediately, stop the engine and have the difficulty investigated.

(7) After about 30 seconds of low speed operation for checking oil pressure rise, adjust the throttle to give about 1000 rpm with the propeller control remaining in its forward (high rpm) position.

d. FAILURE TO START. — The R-4360 is an easy starting engine, and any difficulty that is experienced in starting will probably be traceable to one of the following causes:

(1) OVERLOADING.

(*a*) This is the most common cause of starting trouble and is a result either of excessive priming or of allowing the engine to crank while the mixture control is out of the *IDLE CUT-OFF* position.

(*b*) In warm weather overloading is evidenced by draining of fuel from blower and intake pipe drains. In cold weather a small amount of such drainage does not necessarily indicate overloading; under such temperatures a better indication of overloading is the presence of liquid fuel in the exhaust pipes, particularly those of the primed cylinders.

(*c*) In addition to its effect on engine starting, overloading has the serious effect of washing the oil off the cylinder walls, making them liable to scoring during the first moments of operation. This hazard is greatest at low temperatures, but is sufficient at any time to warrant caution in the use of primer and mixture control.

(*d*) If overloading exists, the engine should be cleared as follows:

1. Turn the fuel pump switch *OFF.* *(See 2, figure 12.)*

2. Leave the mixture control in *IDLE CUT-OFF.*

3. Open the throttle wide (full forward). *(See 2, figure 5.)*

4. Ignition switch to *BOTH.* *(See 1, figure 7.)*

5. Press the starter switch forward, cranking the engine through six or eight turns to clear it out.

Note

With the ignition turned on, it frequently happens that a start is effected during this clearing-out process. Be ready to adjust the mixture control and to throttle back immediately to avoid overspeeding.

6. If the engine did not start while it was being cleared, turn the ignition switch *OFF* and repeat the normal starting procedure, being more careful in moving the mixture control out of *IDLE CUT-OFF.*

(2) UNDERPRIMING.

(*a*) If the engine fails to start and there is no indication of overloading, the trouble may be that insufficient fuel is reaching the cylinders. This condition is best indicated by the absence of gasoline odor or vapors in the exhaust pipes. During cold weather it may exist even though fuel is draining from the blower section.

(*b*) This condition is probably a result of insufficient pressure at the carburetor, vapor lock at the carburetor, or priming for too short a time. Repeat the starting procedure, increasing the priming time slightly and operating the mixture control with caution to feed a little more fuel to the engine.

(3) IGNITION TROUBLE. — If the engine refuses to start but neither of the above conditions applies, have the booster coil and ignition switch leads inspected.

6. ENGINE WARM-UP.

a. The pre-starting check-off list (refer to paragraph 5,*b*, above) also applies to the engine warm-up period.

Note

The ignition switch should be at *BOTH* during warm-up except as noted under

"ENGINE GROUND TEST" below.

b. Run the engine at about 1000 rpm until the oil temperature reaches 40°C (104°F).

7. ENGINE GROUND TEST.

a. IGNITION CHECK.

(1) Open the throttle until engine speed reaches 2000 rpm. *(See 2, figure 5.)*

CAUTION

Cooling of the cylinder head and ignition harness is insufficient for prolonged ground operation at more than 1400 rpm. Periods of operation at higher speeds for ground test should be kept as short as possible and head temperatures should be kept below 218°C (425°F) during such periods.

(2) Move the master ignition switch from ***BOTH*** to ***LEFT***, and from ***BOTH*** to ***RIGHT***, allowing a few seconds for the engine speed to steady at each switch position. *(See 1, figure 7.)* The normal drop between ***BOTH*** and either side is about 60 to 80 rpm. Any drop greater than 100 rpm is considered excessive and indicates ignition failure of some kind. The maximum allowable difference between ***LEFT*** and ***RIGHT*** is 40 rpm.

(3) Turn the ***BANK AND PLUG SELECTOR*** knob *(see 2, figure 7)* to each of the seven banks in sequence, pulling the knob out and turning it to ***L*** and ***R*** at each bank position. As before, hold the switch at each of these fourteen positions for a few seconds in order to hear and feel the operation of the engine at each setting. Little or no drop in rpm will be observed, but the engine will be rough and the exhaust will pop if plugs fail.

(4) Noticeable vibration of the engine relative to the airplane structure will usually result when one or more cylinders are misfiring due to malfunctioning spark plugs. At low engine speeds on either or both breaker assemblies, freedom from vibration is an excellent indication of proper functioning of the engine, particularly of the ignition system.

(5) Failure of a plug to fire does not necessarily mean that the plug is faulty or needs replacing. Its failure may be due only to "loading up" during low speed operation at too rich mixtures. When there is evidence that a plug is misfiring, run the engine at about 33 inches manifold pressure for a few seconds and then recheck the ailing bank and side as before.

b. ENGINE GAUGE CHECK. *(See 18, figure 2.)* — With the engine running at 2000 rpm, check the oil pressure, oil temperature and fuel pressure. Refer to the Power Plant Chart, section III, for normal operating limits.

Note

Oil pressures will vary with rpm and temperature and need cause no alarm by falling to as low as 25 lb/sq in. with the engine idling or by rising to somewhat over 100 lb/sq in. with cool oil at take-off rpm. Fuel pressures may be as low as 8 or 10 lb/sq in. at idling speeds but should come up to chart levels at about 800 rpm.

c. ENGINE IDLING CHECK. — Records show that a large number of forced landings and crashes result from improper carburetor idling adjustment. The pilot should realize that he can prevent this type of accident by making the following very simple checks.

(1) IDLING SPEED. — Idling speeds must be great enough to insure continued engine operation during glides, but should not be so great as to necessitate undue use of the brakes during taxiing. Since the propeller of the F2G develops considerable thrust even at very low rpm, the engine idling speed should be held to about 450 rpm.

Note

The engine should not be permitted to idle at this low speed for long periods. Run it up to 1000-1200 rpm occasionally to clear the engine out and minimize oil fouling and scavenging troubles.

(2) IDLING MIXTURE CHECK. — If idling mixtures are too rich, a carbon deposit will build up on the spark plugs during idling operation. This may not be evident during low power operation or even during the ignition check (refer to paragraph *a* above) but still may result in faulty engine operation during take-off. On the other hand, if idling mixtures are too lean, the engine may cut out during glides. The following check can be made ***in about five seconds*** and will indicate whether either of these hazardous conditions exists.

(*a*) Idle the engine with the throttle lever pulled back to its limit, and the mixture control lever in ***AUTO RICH***. *(See 2 and 5, figure 5.)*

(*b*) Pull the mixture control lever slowly and steadily back into the ***IDLE CUT-OFF*** position, watching the tachometer at the same time for any change in engine speed.

Note

Return the mixture control to ***AUTO RICH*** before the rpm drops to a point where the engine cuts out, but not before a definite drop in rpm is observed.

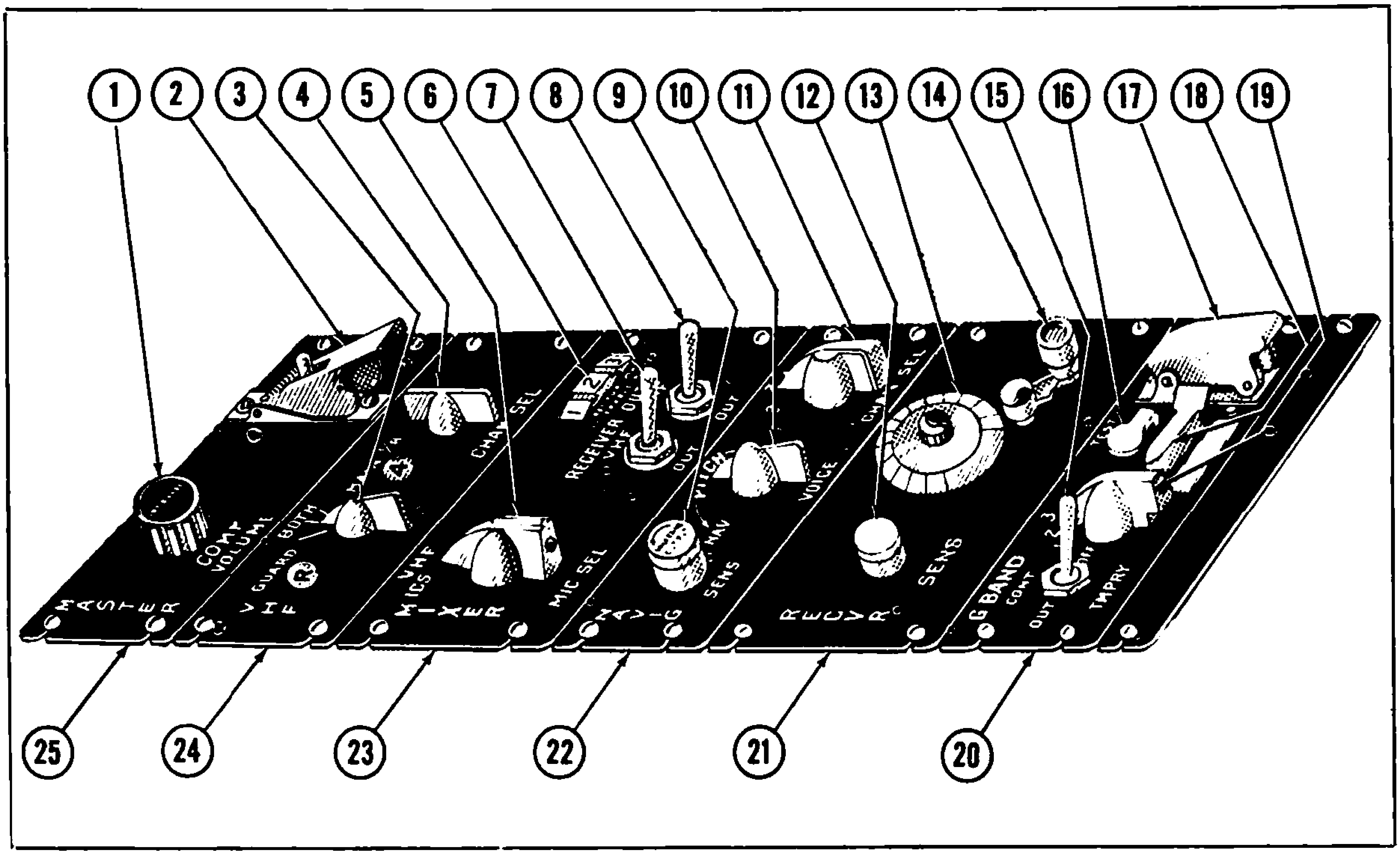


Figure 24 — Radio Control Panel

1 Master Volume Control
2 Master Radio Switch
3 VHF Monitor Control
4 VHF Channel Selector
5 Microphone Selector
6 HF Sensitivity Control
7 VHF Receiver Output Switch
8 HF Receiver Output Switch
9 Navigation Receiver Sensitivity Control
10 Pitch Control and Oscillator Switch
11 Navigation Channel Selector
12 LF Receiver Sensitivity Control
13 LF Receiver Tuning Dial
14 LF Receiver Tuning Control
15 IFF G Band Selector Switch
16 IFF Test Jack
17 IFF Manual Destructor Switch
18 IFF Emergency Channel Guard
19 IFF Channel Selector
20 IFF Panel
21 LF (Range) Receiver Panel
22 Navigation Receiver Panel
23 Mixer Panel
24 VHF Transceiver Panel
25 Master Radio Control Panel

(c) The momentary increase in engine speed on leaning should be about 5 rpm. If it is more than 10 rpm, the setting is too rich. If there is no perceptible increase, the setting is too lean and the engine will be liable to cut out in a glide or on advancing the throttle.

8. ACCESSORY CHECK.

a. PROPELLER GOVERNOR CHECK.

(1) Open the throttle to about 2000 rpm. *(See 2, figure 5.)*

(2) Move the propeller control from full forward (high rpm) to full back (low rpm). *(See 6, figure 5.)* The engine speed should drop to about 1200 rpm.

(3) Return the propeller control to its forward position and throttle back.

b. GENERATOR SYSTEM CHECK.

(1) Disconnect external power source, if used, and make sure that the generator and battery switches are on.

(2) With engine idling, turn on some light electrical load such as the cockpit or instrument lights.

(3) Slowly increase engine rpm and and watch voltmeter for a dip in voltage. The dip, which should occur at approximately 26.5 volts, indicates that the reverse current cut-out has closed. If the voltage does not dip, it is an indication that the cut-out has failed to close.

(4) If no voltage dip is observed by the time the voltage reaches 27 volts, make a second check by turning the battery switch to "OFF". If the cockpit or instrument lights remain on, it is an indication that the reverse current cut-out closed but that the dip was not observed. Turn the battery switch back to "ON".

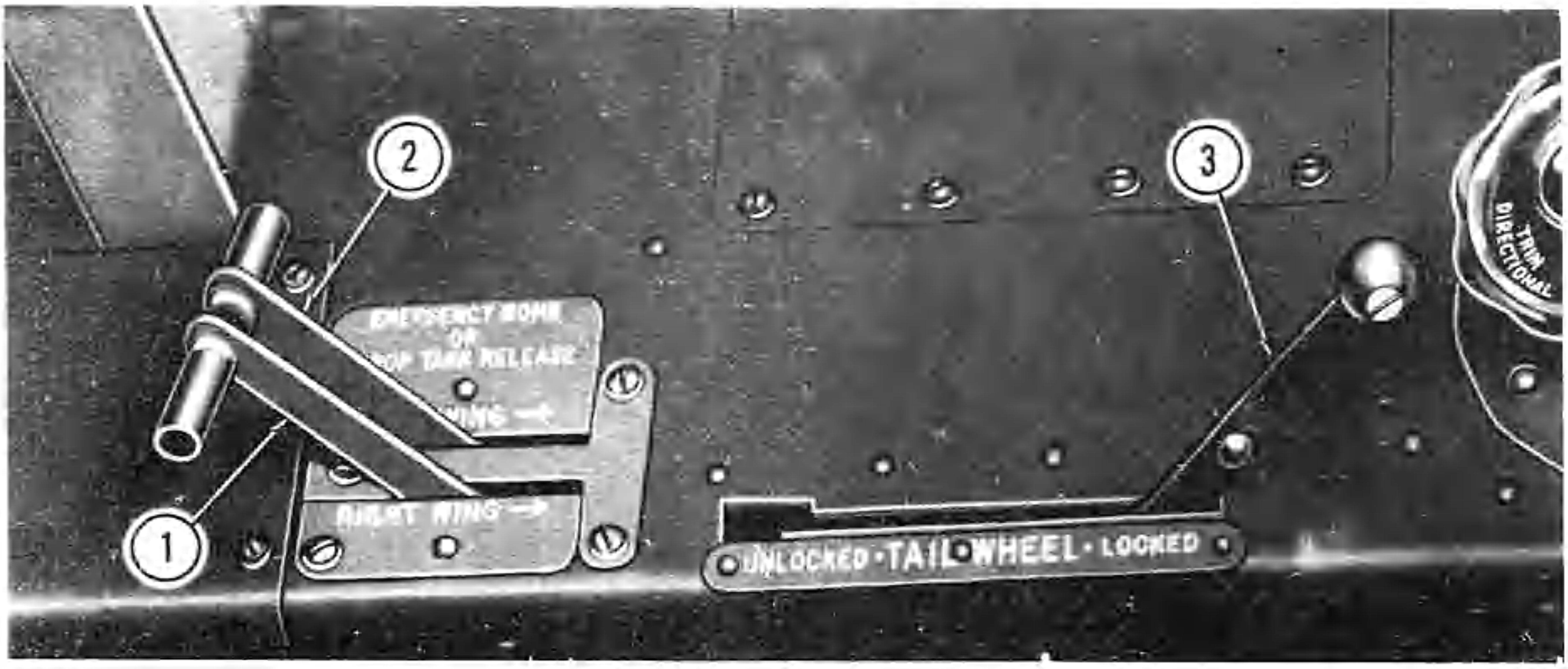


Figure 25 — Emergency Bomb Release and Tail Wheel Lock

1 Emergency Bomb or Drop Tank Release — Right Wing
2 Emergency Bomb or Drop Tank Release — Left Wing
3 Tail Wheel Lock Control

(5) Increase the engine rpm and observe the voltmeter. The voltage should increase to about 28.0 volts and then remain at that value regardless of any further increase in engine rpm.

(6) If the reverse current cut-out does not close or if the voltmeter reading is too low (does not reach 27.5 volts) or too high (reads more than 28.5 volts,) the condition should be corrected before taking off.

Note

The generator cuts in at an engine speed of about 1350 rpm. When operating at lower engine speeds, reduce the electrical load as much as possible to avoid rapid battery discharge.

c. RADIO CHECK. — The communications equipment should be tested according to local instructions of the Service. Refer to section V, paragraph 3 for details of radio operation.

9. TAXIING.

a. Control the airplane directionally by means of brakes. Disregard rudder action completely.

b. Wherever possible, let the plane roll freely, avoiding unnecessary use of the brakes.

c. Use low power in taxiing. Taxiing at 1000 or 1200 rpm is poor practice and is unnecessary if the idling mixture has been properly adjusted. (Refer to section II, paragraph 7,c.) Taxiing at such power levels leads to overheating of the brakes, even to the point that the brake disks may fuse and then freeze completely after the plane is airborne. Such a condition makes subsequent landing extremely hazardous.

d. Never taxi with flaps down. Lowered flaps are subject to considerable damage from stones and debris picked up by the propeller wash.

e. Lock the tail wheel for cross wind taxiing. *(See 3, figure 25.)*

10. TAKE-OFF.

a. GENERAL.

(1) FLAP SETTINGS.

(*a*) For normal operation it is recommended that flaps be set at 20° for take-off. Actually, any flap setting from 0° to 50° may be used, the higher settings giving shorter ground runs.

CAUTION

When 11¾ inch rockets are mounted on pylons, flap settings must not exceed 30°.

(*b*) The decrease in ground run resulting from high flap settings is small, but such settings appreciably lower the rate of climb after take-off. Take-off at high flap settings should be made only when it is necessary to use the shortest possible ground run.

Note

When an obstacle is to be cleared after take-off, a 30° flap setting should be used.

(*c*) With flaps full down, the tail cannot be held on the ground at manifold pressures greater than about 39 inches. The wheels will also start slipping on a wooden deck at approximately the same manifold pressure.

(2) TAB SETTINGS.

(*a*) It is important that the correct tab

Figure 26 — Shoulder Harness Lock

settings be made before take-off. The slight left wing heaviness that is evident in this plane just as it becomes airborne can be minimized if trim settings are correct and if the plane is not lifted off prematurely.

(*b*) Proper tab adjustment is especially important when high flap settings are used. Elevator trim should be about 2° NOSE UP for full flaps. (See Minimum Run Take-offs, paragraph *d*, below.)

(*c*) It may be noticed that the trim controls rotate slightly when the stick and pedals are moved. The actual tab settings are not affected by this motion.

b. CHECK LIST FOR ALL TAKE-OFFS.

(1) Shoulder harness and safety belt secured.

(2) Shoulder harness lock lever at *LOCK* with the minimum shoulder freedom required for normal pilot motion. *(See figure 26.)*

(3) Canopy latched in the full open position.

(4) Stick and rudder pedals free.

(5) Seat and rudder pedals adjusted. (Refer to section V, paragraph 8,*b*, and section I, paragraph 2,*l*.)

(6) Wing flaps set as required. (Refer to Flap Settings, paragraph 10,*a*,(1) above.)

(7) Fuel selector valve—*ON. (See figure 22.)*

(8) Submerged fuel pump—*EMERGENCY. (See 2, figure 12.)*

(9) Propeller governor control—full forward (high rpm). *(See 6, figure 5.)*

(10) Mixture control—*AUTO-RICH. (See 5, figure 5.)*

(11) Rudder tab control — six degrees *NOSE RIGHT. (See 4, figure 27.)*

(12) Aileron tab control — four degrees *RIGHT-WING DOWN. (See 2, figure 27.)*

(13) Elevator tab control — one degree *NOSE UP. (See 1 and 3, figure 27.)* (Refer also to Minimum run Take-off, paragraph *d* below.)

(14) Alternate air control—*DIRECT AIR.*

(15) Tail Wheel—*LOCKED. (See 3, figure 25.)*

(16) Main battery switch—*ON. (See 14, figure 9.)*

(17) Generator switch—*ON. (See 1, figure 9.)*

(18) Oil cooler flap switch—*AUTO. (See 4, figure 9.)*

(19) Engine cowl flaps open as required.

(20) Check ignition. (Refer to Ignition Check, paragraph 7,*a* above.)

(21) Main fuel cell full. *(See 13, figure 2.)*

(22) Oil and head temperatures and manifold

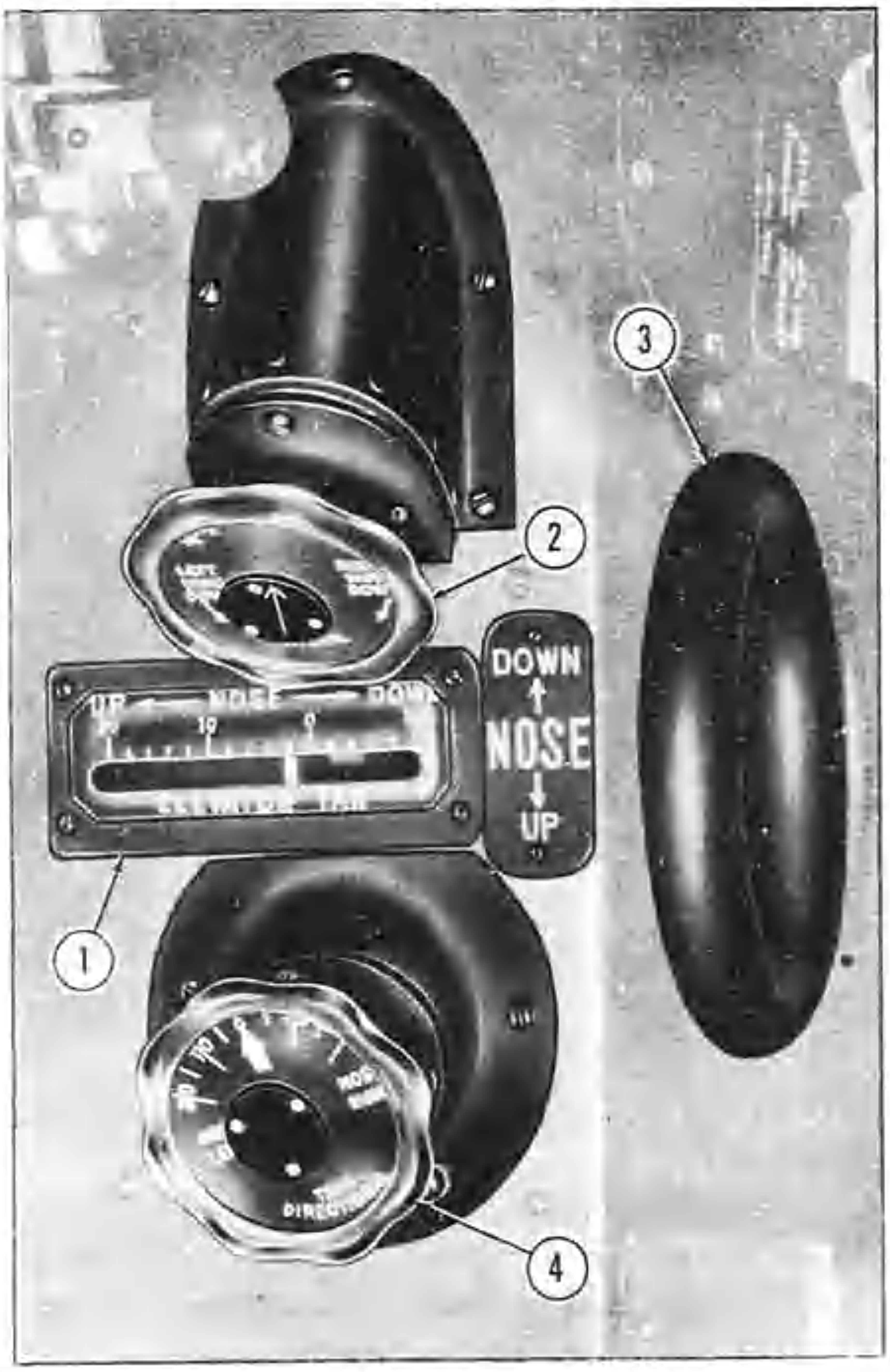


Figure 27 — Trim Controls

1 Elevator Trim Indicator
2 Aileron Tab Control and Indicator
3 Elevator Tab Control
4 Rudder Tab Control and Indicator

pressures should be kept within the limits indicated in the Power Plant Chart. Section III.

(23) Wings spread and locked. (Applies to F2G-2 only.)

(24) Fuel transfer switch — OFF.

c. SCRAMBLE TAKE-OFF. — An emergency take-off can be made as soon as the oil temperature reaches 20°C, the oil pressure steadies, and the engine responds well to throttle.

CAUTION

Do not, even in emergency, try to shorten warm-up time by closing the cowl flaps. (Refer to section II, paragraph 6.)

d. MINIMUM-RUN TAKE-OFF.

(1) Wing flaps full down — 50°. *(See 2, figure 15.)*

(2) Propeller governor control full forward (high rpm). *(See 6, figure 5.)*

(3) Manifold pressure — 52 inches.

(4) Elevator tabs — three to four degrees *NOSE UP. (See 1 and 3, figure 27.)*

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

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

(7) Take-off when minimum flying speed is reached. This speed will be between about 72 knots indicated and about 85 knots indicated, depending on the gross weight of the plane. (The lower speed is for a 12,000 pound plane with no bombs and with an absolute minimum of fuel, while the higher speed is for the 16,000 pound loading which includes 598 U.S. (499 Imp.) gallons of fuel.)

(8) The nose will be slightly heavy at take-off. If the take-off is made from an unpaved or muddy runway, the tail should be held slightly lower than indicated above.

e. CATAPULT TAKE-OFF.

(1) Shoulder harness and safety belt tight.

(2) Tighten the friction knob of the control quadrant to give the maximum friction which still permits adjustment of the throttle and propeller controls.

(3) Place the head firmly against the head rest.

(4) Place the feet against the rudder pedals with the legs stiff.

(5) Brace the right arm.

(6) Push the throttle full forward, hooking the thumb of the left hand behind the throttle and propeller control levers while the fingers grip the forward edge of the control quadrant. Keep the left elbow straight.

f. ENGINE FAILURE DURING TAKE-OFF.

(1) If the engine fails during take-off, land straight ahead, regardless of the nature of the terrain.

(2) As many as possible of the operations listed below should be performed in the order given:

(a) Jettison bombs or drop tanks by pulling both ***EMERGENCY RELEASE*** levers forward. (See *1* and *2*, figure 25.)

(b) Landing gear — ***UP***, unless there is sufficient runway straight ahead for a wheels-down landing. *(See 3, figure 15.)*

(c) Ignition switch — ***OFF***. *(See 1, figure 7.)*

(d) Main battery switch — ***OFF***. *(See 14, figure 9.)*

(e) Lower the seat.

(f) Fuel tank selector — ***OFF***. *(See figure 22.)*

WARNING

The stalling speed for any loading will be approximately nine knots higher with power off than with power on. Refer to paragraph 14,c,(3) below for actual stalling speeds.

11. CLIMB.

a. AFTER TAKE-OFF.

(1) Move the landing gear control to *UP*. *(See 3, figure 15.)* Check the landing gear position indicators *(see 1, figure 15)* to make sure that all wheels are fully retracted.

(2) Adjust propeller, throttle, and supercharger (where applicable) controls. (Refer to Power Plant Chart, Section III.)

(3) Turn submerged pump to *BOOSTER*. *(See 2, figure 12.)*

(4) Turn the transfer switch to select a drop tank or wing tank. (See 1, figure 12.) Refer to section II, paragraph 3 for details of transfer system operation.

(5) Raise the wing flaps. *(See 2, figure 15.)*

WARNING

Do not raise the flaps until a safe altitude is reached and then only by degrees; otherwise the loss of lift will be abrupt and may cause a serious loss of altitude.

(6) Close the canopy. *(See figure 28.)*

Figure 28 — Canopy Control Crank

b. TEMPERATURE CONTROL DURING CLIMB.

(1) The cowl flaps should be adjusted to hold engine temperatures somewhat below the maximum specified for the power used. (Refer to the Power Plant Chart, section III.)

(2) Cylinder and oil temperatures are materially reduced, and are more easily controlled, if the climb is made at a speed 10 to 15 knots higher than "best airspeed." (Refer to the Take-Off, Climb and Landing Chart, Appendix I, for best airspeeds for climb under various loading, power and altitude conditions.) This increased airspeed does not result in much loss of rate of climb.

(3) Any tendency for the oil to overheat can be checked more quickly by reducing the engine speed than by throttling alone.

(4) Refer to the Power Plant Chart, section III, for temperature limits under various power conditions.

c. NORMAL AND MILITARY CLIMBS. (Refer to the Power Plant Chart, section III.)

(1) Except as required by military tactical needs, climbs should be made at less than the rated power of the engine. This normal climb should be at about "Maximum Cruise" power output: 2000 rpm and 31 inches manifold pressure.

(2) Military climb may be entirely at rated power, or at military power for five minutes and rated power thereafter, as directed by the service. In either case, the pilot should watch head temperatures carefully, and should never allow manifold pressures to exceed the limits indicated by the Engine Calibration Curves, Appendix I. Refer to the Power Plant Chart, section III, for specific operating conditions.

12. CRUISING FLIGHT.

Refer to the Power Plant Chart, section III, and the Flight Operation Instruction Chart, Appendix I, for specific operating conditions for level flight.

13. GENERAL FLYING CHARACTERISTICS.

a. STABILITY. — The F2G is stable in all permissible loading conditions. However, during low speed, high power flight such as climb or carrier approach, the longitudinal stability becomes quite low, especially under loading conditions that have shifted the center of gravity back near the rearward limit. In the cruising condition the plane has a high degree of stability at all permissible center of gravity positions.

b. TRIM CHANGES.

(1) Extending the landing gear, wing flaps, or cooling flaps has little effect on the trim of the airplane.

(2) Application of power at low airspeeds will produce some change in lateral trim. This is easily corrected by means of rudder and aileron tabs. (Refer to paragraph 10,*a* above.)

(3) Deflection of the auxiliary rudder (refer to section I, paragraph 2,*f*,(3),) should be accompanied by a reduction in right rudder trim, the

amount of the reduction depending on the power being used.

(3) The trim control knobs will rotate slightly with movement of the stick and rudder pedals. This motion does not effect the actual tab settings.

c. MANEUVERABILITY. — It will be noticed that this airplane is readily maneuverable, that control forces are light, and that the amount of stick motion necessary for control is small, particularly at high speeds. These factors, while providing for good control, make it possible to impose severe aerodynamic loads which might result in overstressing the wing structure. Pilots unfamiliar with this plane should not perform abrupt or high speed maneuvers until they have become accustomed to this characteristic. (Refer also to the Airspeed Limitations Table, section II, paragraph 1.)

14. MANEUVERS AND ACROBATICS.

a. AILERON THROW. — Full stick throw of the ailerons shall not be used at speeds greater than 300 knots indicated. At higher speeds the use of ailerons shall be limited to the same stick force as is required for full throw at 300 knots.

b. MANEUVER FLAPS. — When lowered to 20 degrees the wing flaps effectively reduce the radius of turns made at moderate airspeeds. Higher flap settings are not recommended as aids to maneuvering. When using the 20 degree "maneuver flap" setting, air speeds should not exceed 200 knots indicated.

c. STALLS.

(1) The stalling characteristics of the airplane are not abnormal, and warning of the approach of the stall exists in slight tail buffeting, the unusual nose-up attitude, and increasing left wing heaviness with power on. 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 airspeed 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 abrupt, particularly with flaps down, but is preceded by some warning in the nature of buffeting.

(3) STALLING SPEEDS UNDER VARIOUS CONDITIONS.

LOADING*					STALLING SPEED — KNOTS				
GALS.		TANKS FULL			POWER ON**	POWER OFF			
						FLAP SETTINGS			
U.S.	IMP.	MAIN	AUX.	DROP.	50° FLAP SETTING	0°	20°	30°	50°
0	0				—	88	80	78	76
234	195	x			71	94	85	82	80
298	249	x	x		73	95	86	84	81
448	373	x	x	x	75				
598	499	x	x	xx	79				

* All loadings include 4 guns and 1200 rounds of ammunition.
** "Power on" means minimum power necessary to maintain level flight.
Figures in red are preliminary, subject to revision after flight check.

d. SPINS.

WARNING

No intentional spinning of this airplane is permitted.

(1) GENERAL.

(*a*) No flight tests have been made to determine the spinning characteristics of the F2G airplane. However, the FG-1 type has been thoroughly spin tested and since the two planes are of similar configuration it is felt that the following FG-1 spin information and recovery techniques should apply to the F2G also.

(*b*) Control forces for recovery will be high, approaching the pilot's strength limits. Both hands must be used on the stick. Nevertheless, it is important that full opposite controls, including ailerons, be used.

(*c*) In a well developed spin the airplane should be abandoned only if full recovery controls cannot be applied and held, and/or the airplane reaches an altitude below 3,000 feet.

(2) RECOVERY TECHNIQUE. — It is recommended that if a normal spin is inadvertently entered, the following steps for recovery be taken immediately:

(*a*) Apply full opposite controls sharply: lead with opposite rudder and follow by applying full forward stick. Apply ailerons against the spin.

(*b*) Hold full reversed controls until rotation stops and the airplane assumes a normal diving attitude.

(*c*) 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.

(*d*) 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.

(*e*) Use the tabs, especially the elevator tabs, if forces are too heavy.

e. DIVES.

(1) GENERAL. — The airplane has excellent diving characteristics, but accelerates very rapidly. Pilots should be aware of this and should not hold steep dive angles for more than very short periods when the plane is in the clean condition.

WARNING

Avoid steep dive angles because of the difficulty encountered in attempting to reduce airspeed if buffeting should take place.

(2) CHECK-OFF LIST.

(*a*) Canopy — closed.

(*b*) Landing gear control — *UP.*

(*c*) Dive brake control — *UP* or *DN* as desired.

(*d*) Wing flaps — *UP.*

(*e*) Propeller control — set at 2400 rpm or lower.

(*f*) Mixture — *AUTOMATIC RICH.*

(*g*) Throttle — slightly open.

(*h*) Cowl flaps — *CLOSED.*

(*i*) Oil cooler flap — *CLOSED.*

(3) DIVE BRAKES. — The limiting speed for lowering dive brakes is 380 knots. Although it is recommended that airspeed be reduced below 380 knots before lowering the brakes, a safe margin above stalling speed should be maintained, since lowering the brakes will further reduce speed and will encourage a stall.

CAUTION

Do not use the wing flaps as a dive brake.

(4) HIGH SPEED EFFECTS DURING DIVES.

(*a*) Several undesirable effects are apt to accompany high speed flight, particularly during dives and at high altitudes. These disturbances, characteristic of all high speed airplanes, become most serious as the airspeed exceeds about three-quarters the speed of sound and are associated with shock waves and other compressibility effects of the air.

(*b*) Buffeting is one of the most common of the high speed disturbances. It is aggravated by open cowl or oil cooler flaps, movement of the control surfaces, or any other factor that causes turbulence. When buffeting occurs, see that the cooling flaps are closed and then reduce the speed and acceleration as quickly as is possible within the limits of safety.

Note

Action to decrease the applied acceleration will have a more immediate effect in reducing the buffeting than will a reduction in speed.

(*c*) In high altitude dives with the true airspeed greater than about three-quarters of the speed of sound, the pilot may find stick forces so great that he can not pull the plane out of the dive. At lower altitudes, he will probably be able to pull out with normal stick forces.

(*d*) At these high speeds the elevator tab may be found ineffective in assisting a pull-out. If this condition is found to exist, the tab should be restored to its original position; otherwise as the plane reaches lower altitudes and the tab regains its effectiveness, a very abrupt pull out may result.

(*e*) Do not attempt to reduce the speed of a dive either by cutting the throttle or by yawing, since either of these actions tends to steepen the dive angle and so, instead of reducing speed, increases it.

(5) ENGINE OPERATION DURING DIVES.

(*a*) Engine speed must never exceed 3060 rpm. Speeds close to this maximum should not be held for more than 30 seconds.

(*b*) Experience has proven that difficulty is often encountered due to faulty oil scavenging and nose sections loading up with oil in prolonged dives at low engine rpm. It is therefore recommended that, when tactically possible, all prolonged dives be conducted with governor control set for maximum cruising, 2230 rpm (plus or minus 100).

(*c*) Fifteen inches of manifold pressure is recommended during prolonged dives. However, any manifold pressure above 15 inches may be used provided the engine speed does not exceed 2550 rpm. Higher manifold pressures increase the diving speed and should not be used if the diving speed is critical. Manifold pressures below 15 inches, if held during a prolonged dive, may foul up the engine. In other words, enough manifold pressure should be used in a prolonged dive to keep the engine reasonably warm and to burn away any oil that may pass the piston rings.

Note

The above instructions apply only to prolonged dives.

(*d*) If the maximum overspeed rpm is exceeded, the following procedure is recommended:

1. Close the power control immediately.

2. Move propeller control to high pitch (low rpm).

3. Reduce air speed as quickly as is practical to minimum speed for safe glide.

CAUTION

When diving from a high altitude, manifold pressure will build up rapidly at a constant throttle setting. Always open the throttle very slowly at completion of a prolonged dive so that the engine, which is partly cooled, will not cut out.

f. PERMISSIBLE ACROBATICS.

(1) WITHOUT BOMBS OR EXTERNAL TANKS.

(*a*) Loop.

(*b*) Aileron roll.

(*c*) Snap roll.

(*d*) Chandelle.

(*e*) Immelman turn.

(*f*) Wing-over.

(*g*) Vertical turn.

(*h*) Inverted flight (for entering dives or gunnery runs).

CAUTION

Periods of inverted flight must be as short as possible. The F2G has no provision for engine lubrication in this attitude and oil pressure drops off quickly. Inverted flight must not continue after oil pressure has fallen below normal.

(2) WITH BOMBS OR EXTERNAL TANKS.

(*a*) Wing-over.

(*b*) Vertical turn.

(*c*) Aileron roll (for entering dives but not permitted when carrying external tanks).

15. NIGHT FLYING.

Refer to section II, paragraph 2 for the night flight check-off.

16. APPROACH AND LANDING.

a. GENERAL.

(1) AIRSPEEDS. — Approach speeds vary with loadings and flap settings. Refer to the Take-Off, Climb, and Landing Chart, Appendix I, and to the Table of Stalling Speeds, section II, paragraph 14,*c*,(3).

(2) LOWERING FLAPS AND LANDING GEAR. — Both the flaps and landing gear must be lowered at speeds below 200 knots indicated. The flaps incorporate a "blow-up" device for relieving high speed air loads, but in spite of this provision, the 200 knot limit should always be observed.

CAUTION

The landing gear should be extended at speeds providing safe margins above stalling speeds. The wheels, on lowering, check the speed of the plane and may throw it into a stall.

b. APPROACH CHECK-OFF LIST.

(1) Canopy open. *(See figure 28.)*

(2) Shoulder harness—*LOCK. (See figure 26.)*

(3) Tail wheel — *LOCKED* for ground landing; UNLOCKED for carrier landing.(See 3,fig.25.)

(4) Fuel tank selector — *ON. (See figure 22.)*

(5) Submerged fuel pump — *EMERGENCY. (See 2, figure 12.)*

(6) Fuel transfer pump — *OFF.* *(See 1, figure 12.)*

(7) Propeller control — 2230 (plus or minus 100) rpm. *(See 6, figure 5.)*

(8) Mixture control — *AUTO RICH.* *(See 5, figure 5.)*

(9) Cowl flap switch — *CLOSE* until the flaps are about ¼ open. *(See 13, figure 9.)*

(10) Oil cooler flap switch — *AUTO.* *(See 4, figure 9.)*

(11) Alternate air control — *DIRECT AIR.* *(See 2, figure 23.)*

(12) Landing gear — *DOWN.* *(See 3, figure 15.)*

(13) Wing flaps — *50 DEGREES* or as required for field landing. *(See 2, figure 15.)*

(14) Master armament switch — *OFF.* *(See figure 13.)*

(15) Rocket safety plug removed. *(See figure 13.)*

(16) Gun charging knobs at *SAFE* and pushed in. *(See 6, figure 16.)*

(17) Supercharger control — full down, low blower. (Applies only where supercharger is manually controlled; refer to section I, paragraph 1,*b*,(2).)

(18) Arresting hook control *UP* for field landing, *DOWN* for carrier landing. (Applies to F2G-2 only.)

Note

In the F2G-2 airplanes, a switch actuated by the arresting hook control is placed in series with the master armament switch. In such planes, the entire armament circuit is deenergized automatically when the arresting hook is lowered for carrier landing.

c. TAKE-OFF IF LANDING IS NOT COMPLETED.

(1) Advance throttle smoothly. *(See 2, figure 5.)*

(2) Propeller control full forward. *(See 6, figure 5.)*

(3) Retract landing gear. *(See 3, figure 15.)*

(4) Open cowl flaps. *(See 13, figure 9.)*

(5) Raise the wing flaps. *(See 2, figure 15.)*

(6) Retract arresting hook (as applicable).

d. MINIMUM-RUN LANDING.

(1) Wing flaps — *50 DEGREES.* *(See 2, figure 15.)*

(2) Propeller control — full forward. *(See 6, figure 5.)*

(3) Throttle — slightly open. *(See 2, figure 5.)*

(4) Airspeed — refer to Airspeeds, paragraph 16,*a*,(1) above.

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

e. 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 down-wind 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.

f. TAXIING AFTER LANDING. — The wing flaps should be retracted to avoid damage during taxiing. (Refer to paragraph 9,*d* above.)

17. STOPPING THE ENGINE.

a. If the cylinders are hot due to hard taxiing, let the engine idle a short time at 800-1000 rpm to cool the cylinders below 218°C (425°F).

b. If a cold weather start is anticipated, and if the oil dilution system is installed in the plane, dilute the oil as instructed in section II, paragraph 4,*c*,(1).

c. Be sure the propeller control is full forward (high rpm). *(See 6, figure 5.)*

d. Stop the engine by pulling the mixture control to *IDLE CUT-OFF.* *(See 5, figure 5.)*

e. Turn the ignition switch to *OFF.* *(See 1, figure 7.)*

CAUTION

Do not turn the ignition off until after the engine has stopped.

18. BEFORE LEAVING THE COCKPIT.

a. CHECK-OFF LIST.

(1) Cowl flaps full open until the engine is completely cooled.

(2) Main battery switch — *OFF.* *(See 14, figure 9.)*

(3) Fuel transfer, fuel pump and radio switches ***OFF.*** (See 1 and 2, figure 12, and 2, figure 24.)

Note

The generator switch should be turned ***OFF*** only for testing or emergency purposes.

(4) Fuel tank selector valve — *OFF. (See figure 22.)*

(5) Oxygen bottle valve closed. ***(See figure 29.)***

(6) All lights — ***OFF. (See 8, 9 and 12, figure 9.)***

b. SURFACE CONTROL LOCK. — If the plane is to be exposed to wind conditions that will cause flapping of the control surfaces, the surface control lock should be installed. (Refer to section V, paragraph 8,*h.*)

19. MOORING.

a. If the plane is to be parked out for a considerable length of time, or if winds of moderately high velocities are anticipated, the following precautions should be taken:

(1) Chock the main wheels, fore and aft.

(2) Tie the plane down securely at the following points:

(*a*) Tie-down links in the outer wing panels.

(*b*) Hold-back link on the tail wheel.

(*c*) Towing links on the main landing gear.

(3) If possible, install locally fabricated battens on elevators, rudder and ailerons. In any case, see that the surface control lock is installed in the cockpit. (Refer to section V, paragraph 8,*h.*)

b. If winds of hurricane velocities are forecast, the following additional precautions should be taken:

(1) Moor the plane in level flight position, either by raising the tail on an earth mound, or by dropping the main wheels into pits, preferably the latter. The plane should be set facing into the anticipated direction of the wind.

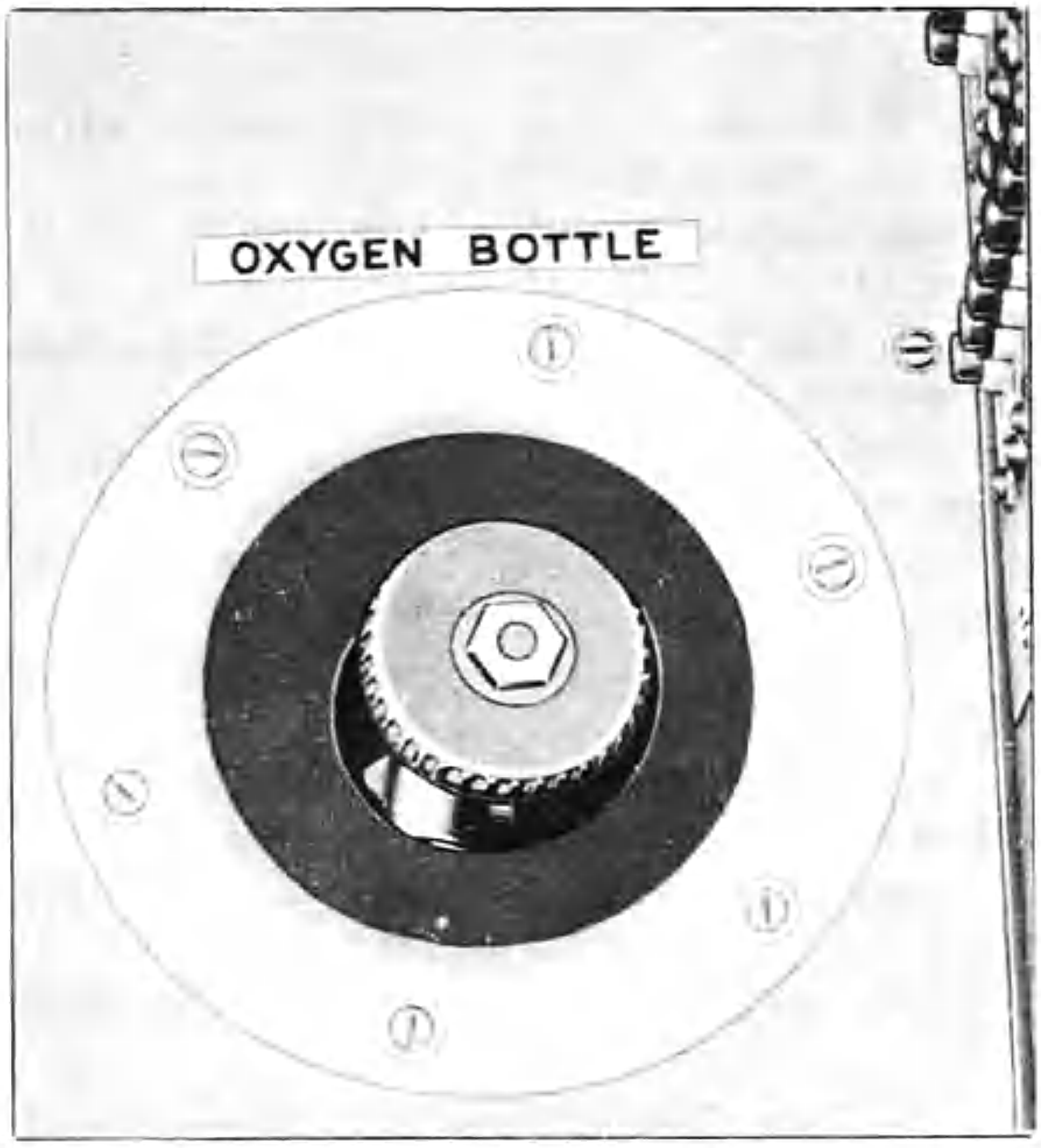


Figure 29 — Oxygen Bottle Valve

(2) Four-inch timbers or straight tree trunks, securely lashed along the top of the wing at its line of greatest camber will further reduce the lift.

CAUTION

Such "spoilers," unless securely fastened in place, may be more of a hazard than a help.

(3) Do not moor the plane within one and one-half lengths of another plane.

(4) Tie the plane down as indicated above, using 1/4-inch steel cable or the equivalent.

SECTION III
OPERATING DATA

1. AIRSPEED INSTALLATION (POSITION ERROR) CORRECTIONS.

The location of the pitot-static head in relation to the airflow over the wing introduces an error which varies with changes in the angle of attack and hence with changes in speed. The following table indicates the magnitude and direction of the error at various air speeds and with flaps both up and down. It will be noticed that the actual air speed (neglecting temperature and pressure effects) is greater than the indicated air speed in the high speed ranges, and less than the indicated at flaps-down landing speeds. This correction must be considered when flying close to stalling speeds, and so is unlike the airspeed indicator errors introduced by temperature and pressure variations.

AIRSPEED INSTALLATION CORRECTION TABLE

I. A. S.	Correction
FLAPS RETRACTED	
100 Knots	Subtract 1 Knot
150 Knots	Add 3 Knots
200 Knots	Add 5 Knots
300 Knots	Add 8 Knots
FLAPS EXTENDED	
70 Knots	Subtract 3 Knots
80 Knots	Subtract 2 Knots
90 Knots	Subtract 1 Knot
100 Knots	Zero Knots
110 Knots	Add 1 Knot

Figures in red are preliminary: subject to revision following flight check.

POWER PLANT CHART

AIRCRAFT MODEL(S)	PROPELLER(S)	ENGINE MODEL(S)
F2G-1,-2		R-4360-4

GAUGE READING	FUEL PRESS.	OIL PRESS.	OIL TEMP.	COOLANT TEMP.		
DESIRED	22	85	60-75			
MAXIMUM	23	90 (4)	95			
MINIMUM	21	80	40 (6)			
IDLING	14	25				

MAXIMUM PERMISSABLE DIVING RPM: {3060 for 30 sec.
MINIMUM RECOMMENDED CRUISE RPM:
MAXIMUM RECOMMENDED TURBO RPM: —

OIL SPEC.: AN-VV-O-~~446~~, GRADE 1100
FUEL SPEC.: AN-F-28, GRADE 100/130

WAR EMERGENCY (COMBAT EMERGENCY)			MILITARY POWER (NON-COMBAT EMERGENCY)			OPERATING CONDITION			NORMAL RATED (MAXIMUM CONTINUOUS)			MAXIMUM CRUISE (NORMAL OPERATION)		
MINUTES			30 MINUTES			TIME LIMIT			UNLIMITED			UNLIMITED		
			232 °C			MAX. CYL. HD. TEMP.			232 °C			218 °C		
			AUTO-RICH			MIXTURE			AUTO-RICH			AUTO-LEAN (9)		
			2700			R. P. M.			2550			2000		
MANIF. PRESS.	SUPER-CHARGER	FUEL (1) Gal/Min	MANIF. (3) PRESS.	SUPER-CHARGER	FUEL (1) Gal/Min	STD. TEMP. °C	PRESSURE (7) ALTITUDE	STD. TEMP. °F	MANIF. (3) PRESS.	SUPER-CHARGER	FUEL (2) GPH	MANIF. (3) PRESS.	SUPER-CHARGER	FUEL (2) GPH
						-55.0	40,000 FT.	-67.0						
—	—	—	—	—	—	-55.0	38,000 FT.	-67.0	—	—	—	—	—	—
						-55.0	36,000 FT.	-67.0						
						-52.4	34,000 FT.	-62.3						
—	—	—	—	—	—	-48.4	32,000 FT.	-55.1	—	—	—	—	—	—
						-44.4	30,000 FT.	-48.0						
						-40.5	28,000 FT.	-40.9						
—	—	—				-36.5	26,000 FT.	-33.7						
			F.T.	HIGH	3.3	-32.5	24,000 FT.	-26.5	F.T.	HIGH	180	F.T.	HIGH	85
			F.T.	HIGH	3.8	-28.6	22,000 FT.	-19.4	F.T.	HIGH	205	F.T.	HIGH	91
—	—	—	F.T.	HIGH	4.2	-24.6	20,000 FT.	-12.3	F.T.	HIGH	230	F.T.	HIGH	96
			F.T.	HIGH	4.6	-20.7	18,000 FT.	- 5.2	F.T.	HIGH	255	F.T.	HIGH	101
			(8) F.T.	HIGH	5.0	-16.7	16,000 FT.	2.0	F.T.	HIGH	280	F.T.	HIGH	108
—	—	—	46.0	HIGH	5.3	-12.7	14,000 FT.	9.1	(8) F.T.	HIGH	300	(8) F.T.	HIGH	115
			47.0	INTERMED.	5.4	- 8.8	12,000 FT.	16.2	43.5	INTERMED.	302	31	INTERMED.	117
			47.5	INTERMED.	5.5	- 4.8	10,000 FT.	23.4	43.5	INTERMED.	304	31	LOW	117
—	—	—	48.5	INTERMED.	5.7	- 0.8	8,000 FT.	30.5	43.5	INTERMED.	306	31	LOW	115
			49.5	INTERMED.	5.9	3.1	6,000 FT.	37.6	43.5	INTERMED.	308	31	LOW	113
			50.5	INTERMED.	6.0	7.1	4,000 FT.	44.7	43.5	LOW	309	31	LOW	110
—	—	—	51.5	INTERMED.	6.2	11.0	2,000 FT.	51.8	43.5	LOW	305	31	LOW	108
			52.0	LOW	6.3	15.0	SEA LEVEL	59.0	43.5	LOW	301	31	LOW	105

GENERAL NOTES

(1) Gal/Min: Approximate U.S.gallons per minute.
(2) GPH: Approximate U.S.Gallons per hour.
(3) F.T.: Means full throttle operation.

Note: To determine consumption in British Imperial units, multiply by 10 then divide by 12. Red figures are preliminary subject to revision after flight check

TAKE-OFF CONDITIONS: 2700 rpm, 52 in., auto-rich, direct air, low blower, 232°C max. cyl. temp.

CONDITIONS TO AVOID:

SPECIAL NOTES

(4) May be as high as 400 lb/sq in. immediately after cold start.

(6) 40°C minimum oil temperature for take-off.
(7) Values are for zero ram.
(8) Full throttle (critical) altitudes will vary with ram and carburetor entrance condition. If more manifold pressure than that listed immediately below is obtained at full throttle, reduce the throttle setting as required to observe that manifold pressure limit.
(9) Use auto-rich for all operation above 2000 rpm

Power settings are tentative and are selected for simplicity, pending calibration and further power control development. They are not intended for official demonstration.

DATA AS OF 3-21-45 BASED ON BuAer estimates based on A.E.L. data.

SECTION IV
EMERGENCY OPERATING INSTRUCTIONS

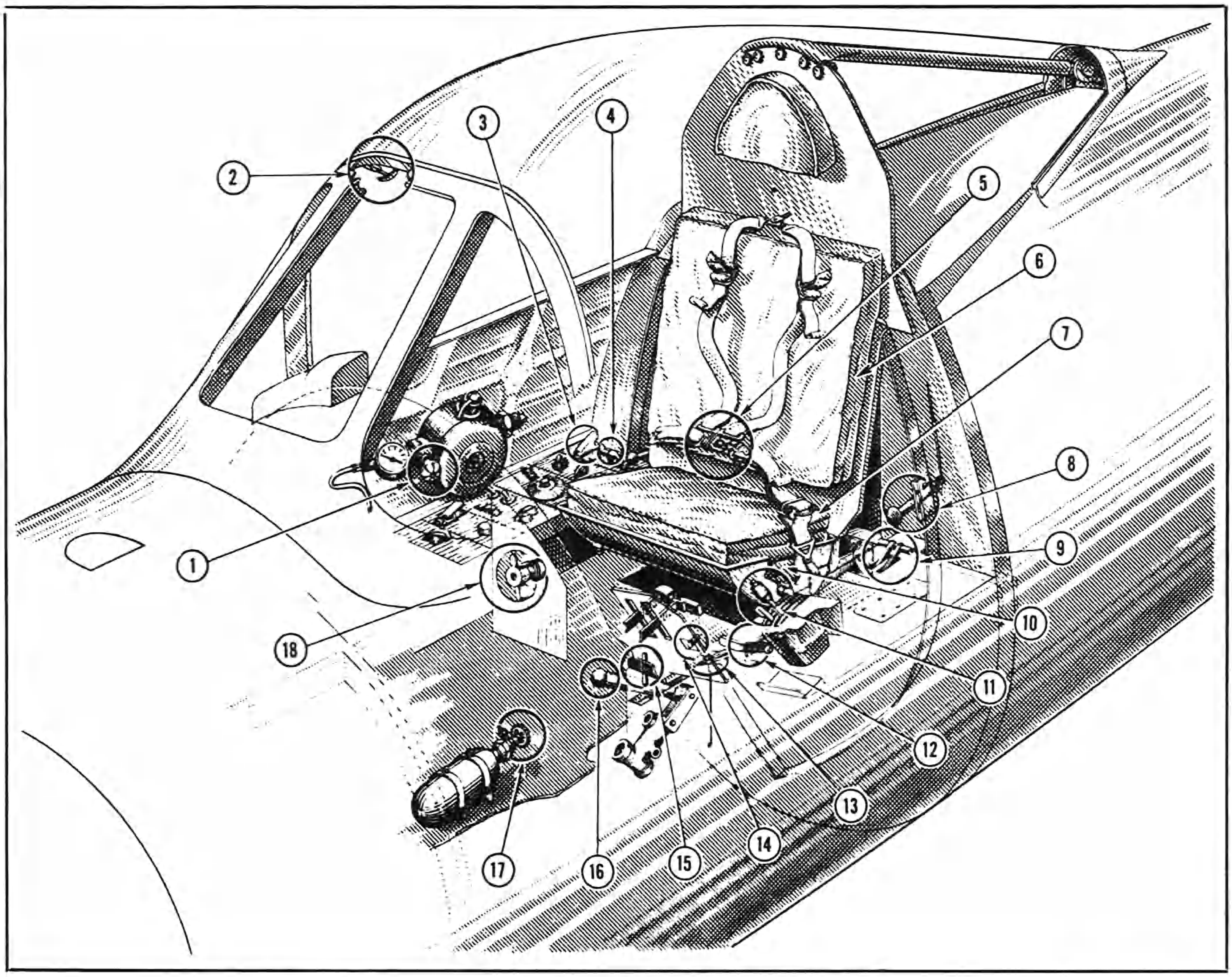


Figure 31 — Emergency Controls and Facilities

1 Emergency Oxygen Valve
2 Emergency Canopy Release
3 IFF Manual Destructor Switch
4 IFF Emergency Channel Guard
5 Safety Belt and Shoulder Harness Release
6 Back Pad Emergency Kit (part of parachute assembly)
7 Seat Pad Life Raft (part of parachute assembly)
8 Shoulder Harness Lock
9 Emergency Bomb or Drop Tank Release
10 Parachute Pack
11 Emergency Power Throttle Latch
12 Hand Pump Selector Valve
13 Fuel Tank Selector Valve
14 Fuel Pump Emergency Switch
15 Emergency Landing Gear Release
16 Hand Hydraulic Pump
17 Emergency CO_2 System (Landing Gear)
18 Ignition Switch

1. HYDRAULIC SYSTEM FAILURE.

(Refer to section V, paragraph 5, for description of the hydraulic system.)

a. FAILURE OF ENGINE DRIVEN PUMP. — If hydraulic pressure drops during flight and the plane has not been exposed to combat or other conditions which might have broken a hydraulic line, the trouble may be due to failure of the engine driven pump. In such case, with the hand pump selector valve at ***HYDRAULIC SYSTEM*** position *(see 12, figure 31)* the hand hydraulic pump can be used to supply operating pressure for any part of the system.

b. FAILURE DUE TO LOSS OF FLUID. — If combat or other condition has resulted in loss of hydraulic fluid, the hand pump selector valve should be shifted to ***EMERGENCY WING FLAP.*** ***(See 12, figure 31.)*** This reserves the remaining fluid for lowering of the wing flaps. This is accomplished by normal use of the flap control ***(see 2, figure 15)*** and then pumping the flaps down by hand.

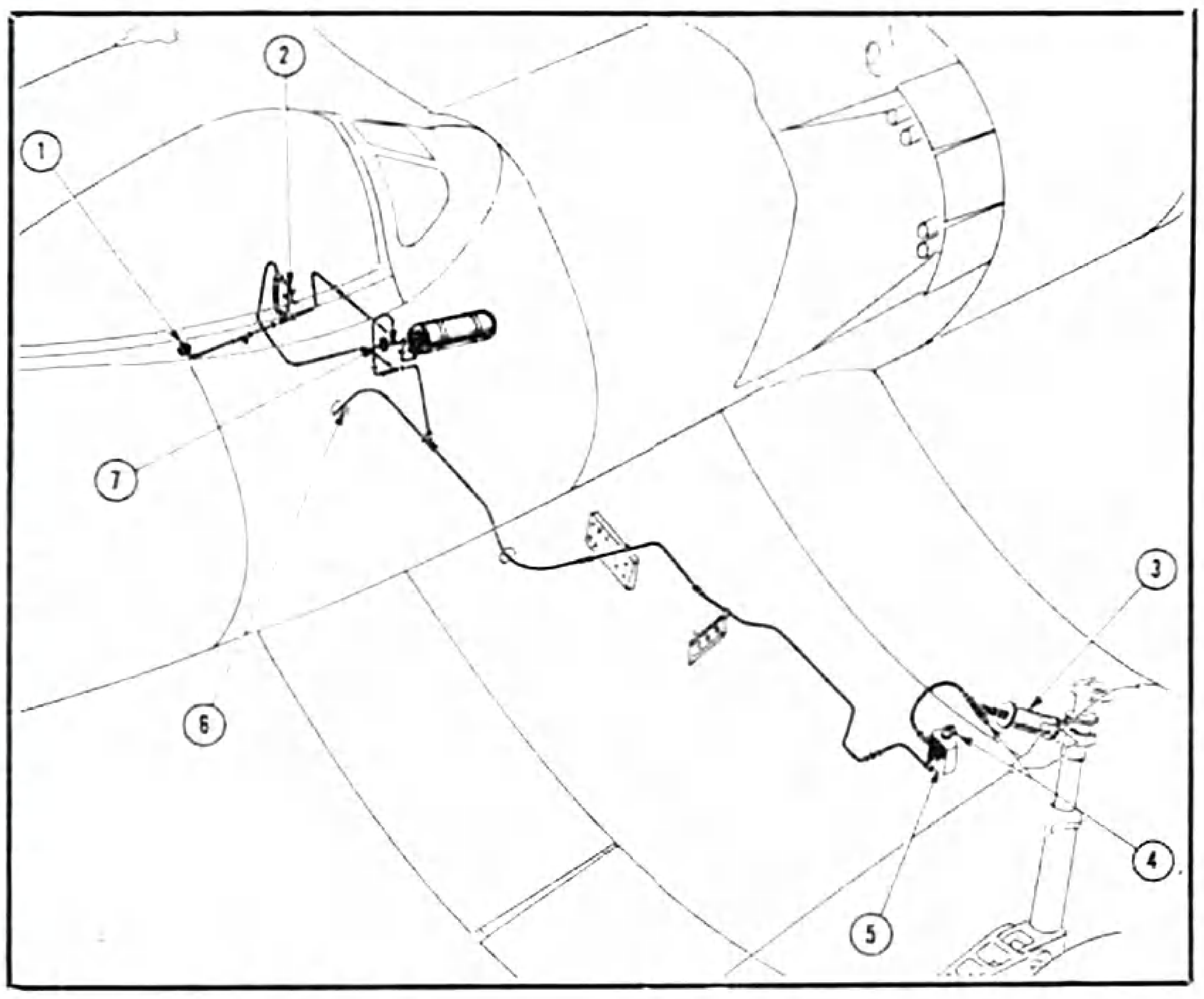


Figure 32 — Emergency Landing Gear CO_2 System

1 Overboard Line
2 CO_2 Needle-type Drain Valve (under floor)
3 Landing Gear Hydraulic Strut
4 Hydraulic Line Connections
5 Shuttle Valve (prevents flow of CO_2 into hydraulic system)
6 CO_2 Line to Left Wing
7 Cockpit Control — CO_2 Bottle Valve

c. EMERGENCY EXTENSION OF LANDING GEAR. ***(See figure 32.)*** (Refer to section I, paragraph 2.e.(4) for description of CO_2 system.) — The following procedure is used for emergency extension of the landing gear following hydraulic system failure.

Note

This emergency procedure should not be used if the hydraulic gauge indicates pressure in the system. In such case, a mild pull-out following a short dive, or even rapid operation of the hand pump (both while the landing gear control is in the ***DOWN*** position) will help in freeing the landing gear.

(1) Close the throttle ***(see 2, figure 5)*** to reduce the airspeed to about 115 knots indicated.

(2) Pull the safety pin from the emergency CO_2 control and turn the emergency CO_2 valve full left. ***(See 3 and 2, figure 33.)***

Note

The position of the regular landing gear control lever has no effect on emergency extension of the gear.

(3) Reduce the air speed until the landing gear indicators show that the wheels are fully extended. Here also a mild pull-up or pull-out will assist in the extension of the landing gear.

CAUTION

Keep the air speed high enough to provide a safe margin above stalling speed; as the landing gear extends it will act as a brake, further reducing the air speed and encouraging a stall.

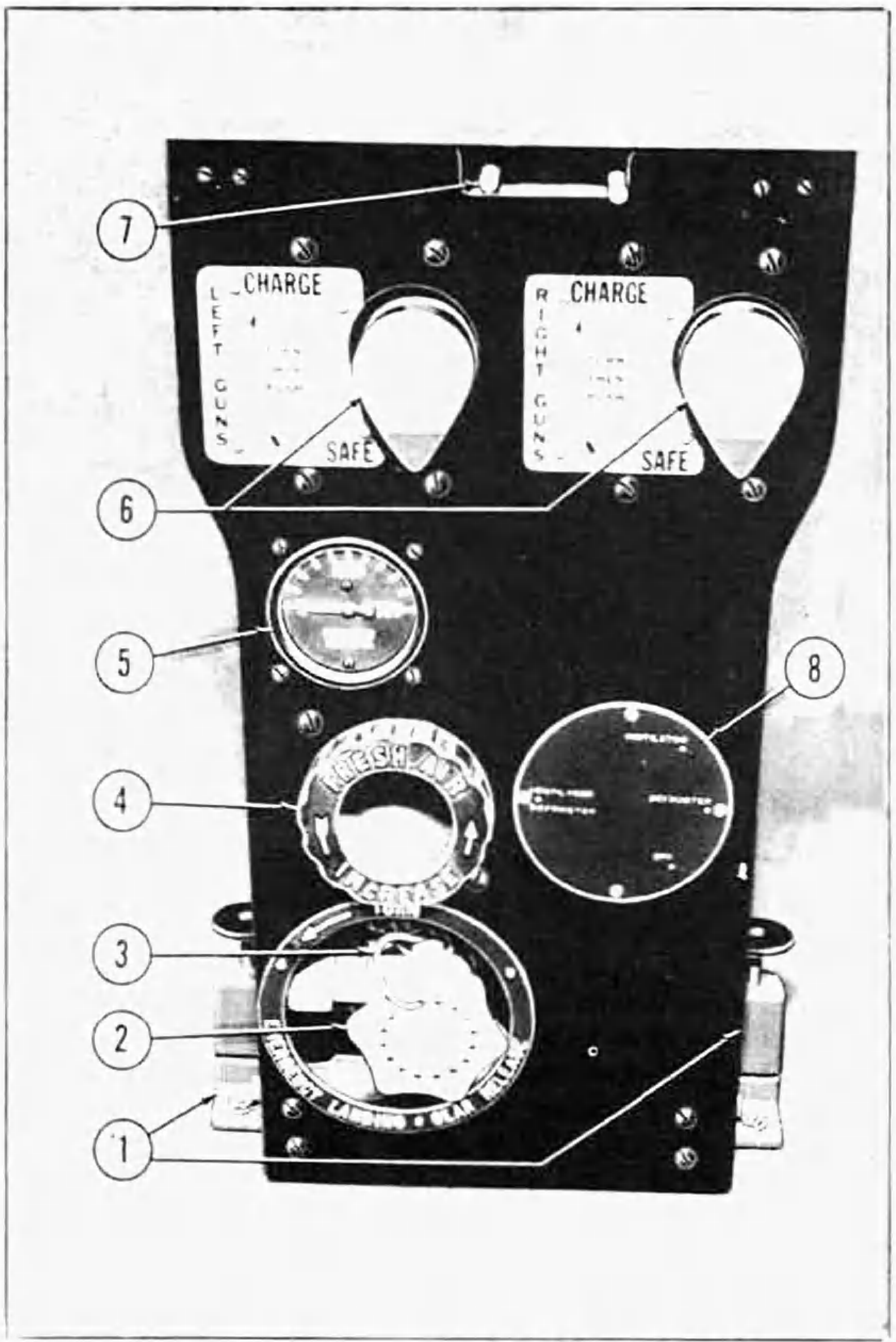


Figure 33 — Auxiliary Instrument Panel

1 Surface Control Lock Clamp
2 Emergency Landing Gear CO_2 Valve
3 CO_2 Valve Safety Pin
4 Ventilator Valve
5 Hydraulic Pressure Gauge
6 Gun Charging Knobs
7 Panel Catch
8 Defroster Control Plate (not utilized)

d. EMERGENCY EXTENSION OF ARRESTING HOOK. — The emergency CO_2 system does not control the arresting hook. In case of loss of hydraulic pressure the arresting hook may still be lowered by moving the control lever to *DN*. This releases the trapped oil in the hydraulic strut and a compression spring in the arresting hook assembly forces the hook down.

2. FUEL SYSTEM FAILURES.

(Refer to section I, paragraph 2,c for a description of the fuel system.)

a. FAILURE OF ENGINE DRIVEN PUMP. — In the event that the engine driven fuel pump should fail to deliver fuel to the carburetor at required pressures, switch the submerged pump to *EMERGENCY* operation. *(See 2, figure 34.)* Otherwise, management of the fuel system should be normal. (Refer to section II, paragraph 3,*a*.)

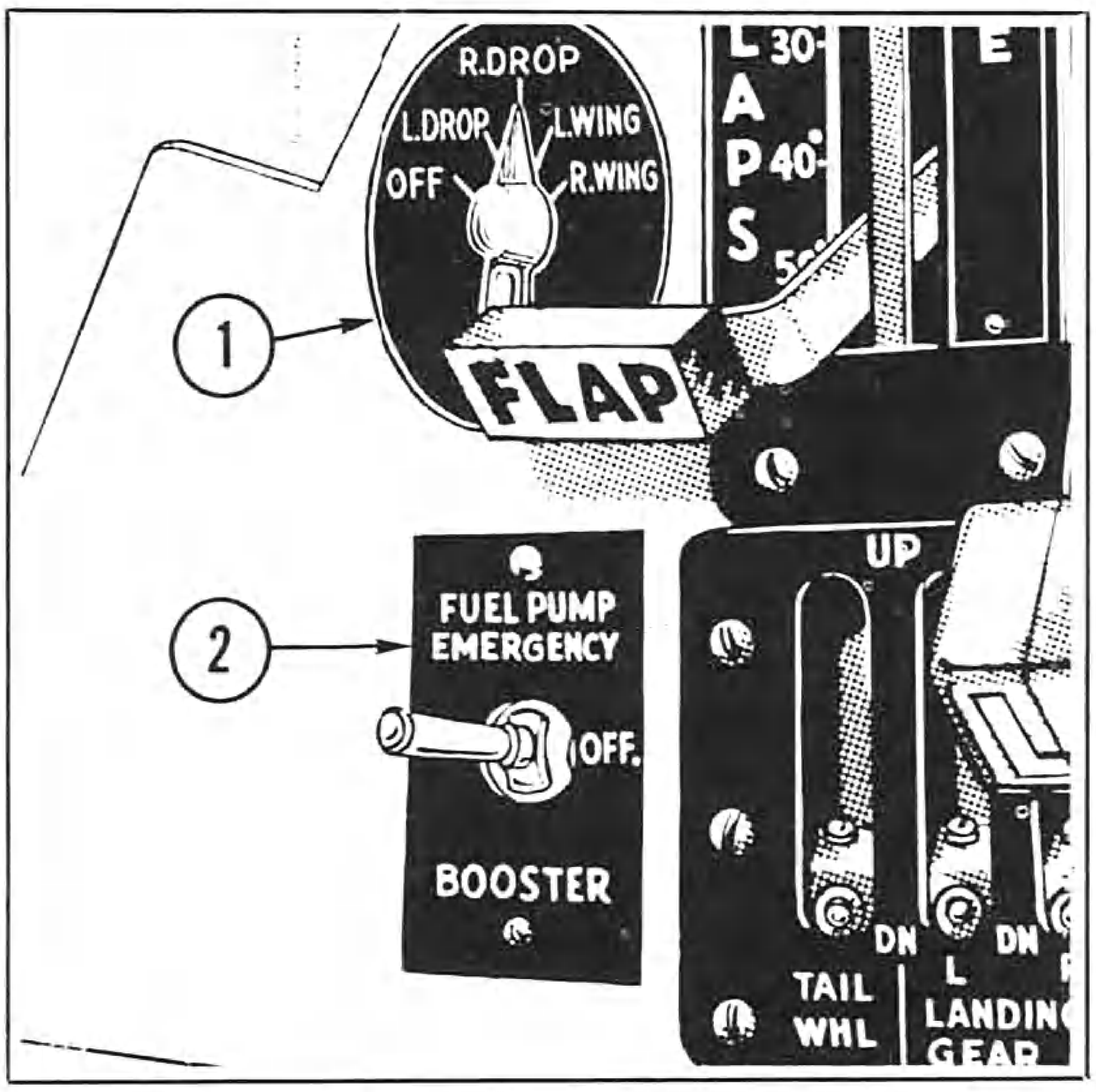


Figure 34 — Fuel System Switches

1 Fuel Transfer Switch
2 Submerged Fuel Pump Switch

b. FAILURE OF TRANSFER SYSTEM. — Should part or all of the transfer system be rendered inoperative during flight, the following procedure should be used:

(1) Switch the submerged pump to *EMERGENCY*. *(See 2, figure 34.)* If failure of the transfer system is due to trouble in the microswitch on the fuel tank selector valve or in its relay, turning the submerged pump switch to *EMERGENCY* will permit the transfer system to function normally once more.

(2) If the above procedure does not correct the trouble, turn the fuel selector valve to *L. H. DROP STANDBY, RH DROP STANDBY, LH WING STANDBY,* or *RH WING STANDBY* as the tanks being carried, or the damage to the system, dictates. (See 13, figure 31.)

(3) When fuel is being delivered directly from the wing tanks or droppable tanks to the engine driven pump by means of the tank selector valve, the pilot has no quantity gauge, transfer light or any other device to keep him informed as to the amount of fuel remaining in any of these tanks. The following table will be of value in determining the approximate length of time required to empty each of the tanks when flying at cruising speeds. Of course, the lengths of time will be shortened under conditions of higher power output.

TANK	CAPACITY — GALS. U.S.	IMP.	APPROX. TIME* MINUTES
Navy Drop	100	83	51
Navy Drop	150	125	77
P-38 Drop	159	132	81
P-38 Drop	171	142	88
Wing	37½	31	19
Main — 50 gal. warning	50	42	26

*Based on maximum cruise condition at 10,000 feet, fuel consumption 117 U. S. gallons per hour. (See Power Plant Chart, section III.)

Note

The vapor return line returns fuel to the main tank at a rate of about 5 to 8 gallons per hour. *(See 18 figure 10.)* The pilot should bear in mind that this small, but possibly important, amount is accumulating in the main cell during emergency operation on auxiliary tanks.

Figures in red are preliminary; subject to revision after flight check.

3. EMERGENCY EGRESS.

If the canopy mechanism has been damaged in such a way that the pilot finds he cannot operate it prior to making a landing, or if it is necessary to abandon the plane during flight, the canopy may be easily jettisoned. To do this, pull the emergency release handle with a sharp, quick motion. *(See figure 35.)* This releases the canopy and lifts the forward edge into the airstream. (Refer to section V, paragraph 8.)

WARNING

The canopy will be whipped violently from the plane. Do not "freeze" onto the release handle!

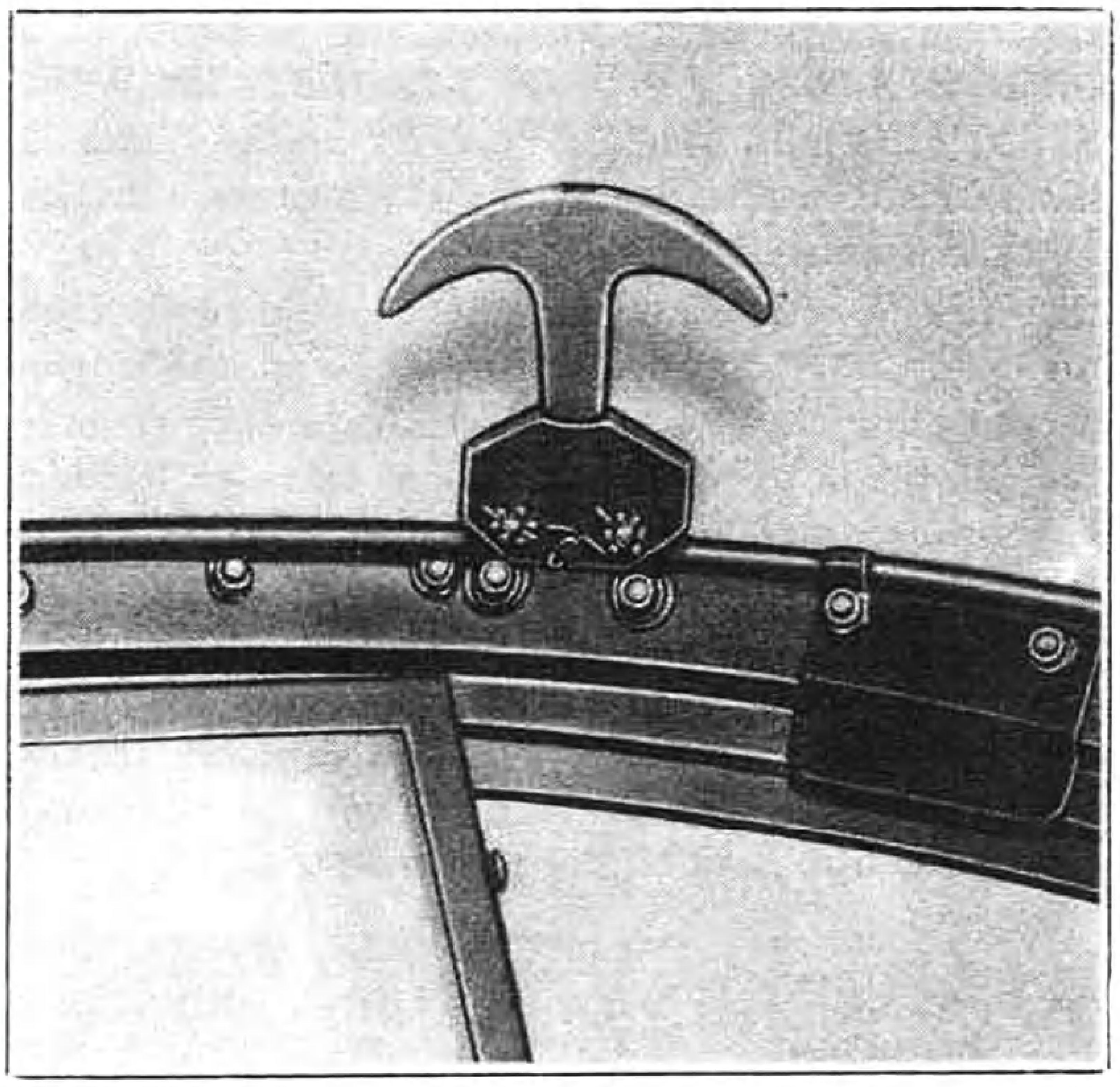


Figure 35 — Canopy Jettison Handle

4. EMERGENCY LANDINGS.

a. BELLY LANDINGS.

(1) Most fatal landing accidents result from planes nosing over. If an emergency landing must be made on any field not provided with suitable or adequate runways, it should be a belly landing. Danger of nosing over is reduced to a minimum by this procedure; damage to the plane and risk to the pilot are far less than in a wheel landing on a bad field.

(2) In making a belly landing, use the following procedure:

(*a*) Open the canopy. *(See figure 28.)*

(*b*) Turn ignition switch to ***OFF***. *(See 18, figure 31.)*

(*c*) Turn main battery switch ***OFF***. *(See 14, figure 9.)*

(*d*) Jettison tanks or bombs by means of the release handles. *(See 9, figure 31.)*

(*e*) Make sure the landing gear control is ***UP***. *(See 3, figure 15.)* If the landing gear has been partially lowered and the control is left ***DOWN***, the danger of nosing over and of structural damage to the plane is increased. On striking the ground, the gear is kept from retracting by the fluid in the struts and will upset the plane or will itself be driven up through the wing. If the control has been returned to ***UP***, the force of landing will simply push the wheels back into the wheel wells.

(*f*) Make sure that the shoulder harness is locked to hold the shoulders firmly against the seat back. *(See 8, figure 31.)*

Note

If the emergency landing has been made in unfriendly territory, the pilot should insure that the IFF equipment has been destroyed by throwing the emergency destructor switch before leaving his seat. *(See 3, figure 31.)* The force of the landing will probably already have tripped the inertia switch, and the use of the manual control is only a precautionary measure.

b. DITCHING. — The same procedure as that outlined for belly landings is applicable to ditching. (Refer to paragraph 4,*a* above.)

Note

These airplanes have excellent water landing characteristics due to the inverted gull wing which causes them to plane on contact with the water. Because of the planing feature, a complete stall landing is not necessary.

SECTION V
OPERATIONAL EQUIPMENT

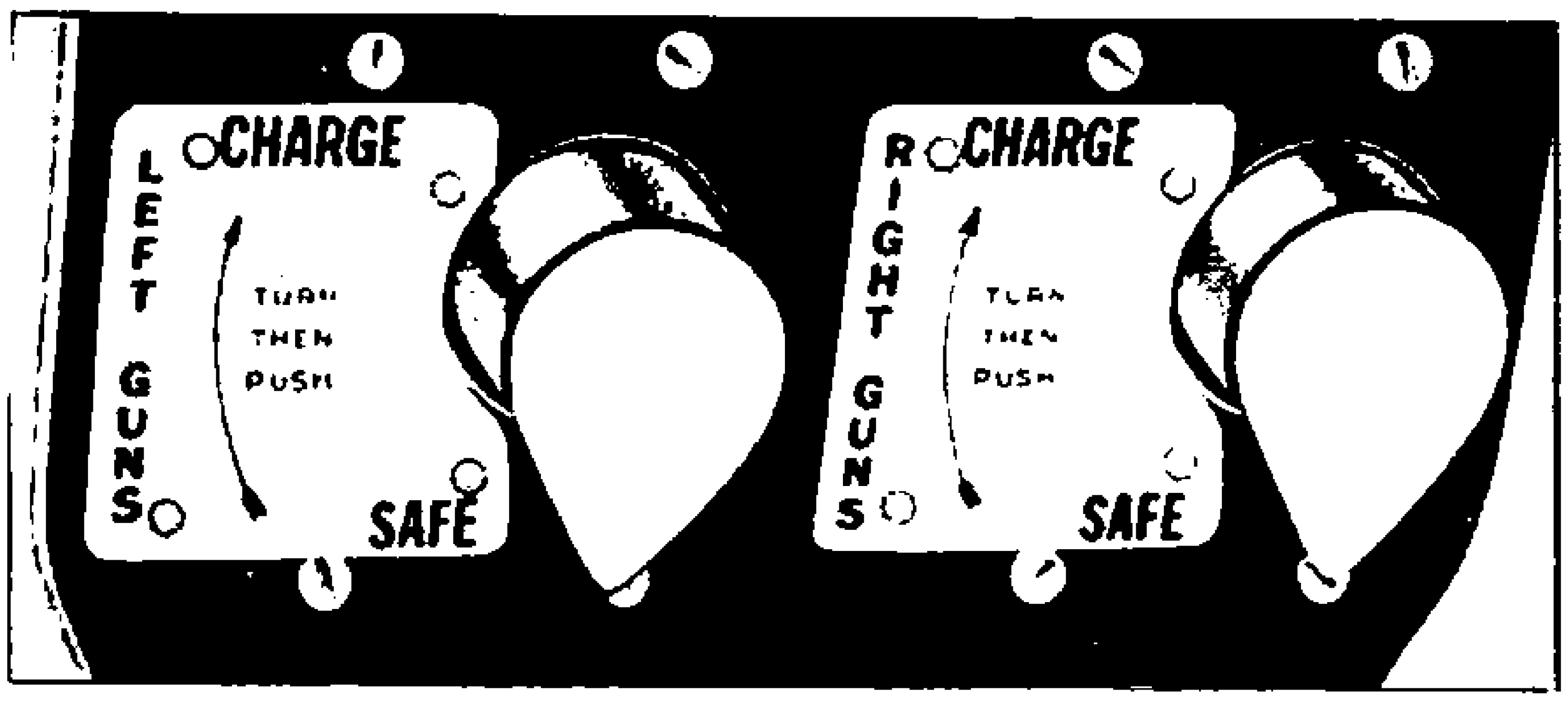


Figure 36 — Gun Charging Controls

1. ARMAMENT.

The following description and operational instruction applies to the standard armament installations of the F2G-1 and F2G-2. In certain early F2G-1 airplanes, the armament controls differ from the standard installation as follows: a camera selector switch occupies the position of the rocket firing switch (see figure 37); the master-armament switch has three positions: ***BOMBS-GUNS, OFF, GUNS-ROCKETS;*** the control stick has a trigger and one thumb button instead of the standard trigger and two thumb buttons. Operational differences between this control system and the standard form are noted under the instructions for each type of armament.

a. GUNS.

(1) GENERAL. — The F2G-1 airplane has four .50 caliber machine guns mounted two in each outer wing panel. The F2G-2 has three guns in each panel. The ammunition boxes carry 400 rounds for each gun except that the two extra guns of the F2G-2 have only 375 rounds each.

(2) GUN CHARGING. ***(See figure 36.)***

(*a*) The gun charging knobs are on the auxiliary panel between the rudder pedals, each knob charging and safing the guns on the corresponding side of the plane.

(*b*) The chargers themselves are hydraulic cylinders which throw the bolts of the guns open when the knobs are set at ***SAFE*** or close the bolts when the knobs are set at ***CHARGE.***

Note

It is necessary to press the knob in after turning it to ***SAFE*** or ***CHARGE.*** The valve does not open and the chargers do not move until the knob is pressed in. When the charger completes its stroke, the knob springs out again.

(*c*) The actual charging and safing operations are similar to the closing and opening of the breech of a bolt action rifle. Charging consists of pushing the bolt forward, putting a live shell in the chamber, and leaving the gun loaded and cocked ready for firing. When the gun is safed the bolt is withdrawn, the shell is extracted from the chamber and a new shell advances from the belt into position for the next charging. The breech stays open as long as the control remains at ***SAFE.***

(*d*) Unnecessary safing and charging will result in the extraction and wasting of unfired rounds just as the opening and closing of the bolt of a rifle will do the same thing.

Note

Pressing the knob a second time to be certain that the charging or safing operation has been completed will not result in loss of ammunition and is a recommended practice.

(3) GUN FIRING CONTROLS.

(*a*) The master armament switch and the gun selector switches ***(see 2, 3, 4, 5, figure 37),*** and the trigger on the control stick ***(see figure 38)*** are connected in series with the firing solenoids on the guns and must all be closed before the guns will fire.

(*b*) To fire the guns, turn the master armament switch (see 2, figure 37,) to ***ON***, turn the desired gun selector switches up and press the trigger switch on the control stick. The guns will fire as long as the trigger is held.

(4) GUN STOPPAGE.

(*a*) STOPPAGE OF ALL GUNS. — If all of the guns fail to fire initially or if they stop firing before ammunition is exhausted, the difficulty is more likely to be in the control system than in the guns themselves. Check the following possible causes:

1. Initial failure to fire may result from insufficient hydraulic pressure at the chargers. Check the hydraulic gauge ***(see 5, figure 33)*** and if necessary, operate the hand pump to bring the pressure up.

Note

The hand pump selector valve must be at ***HYDRAULIC SYSTEM. (See 1, figure 23.)***

2. Initial failure to fire may result from

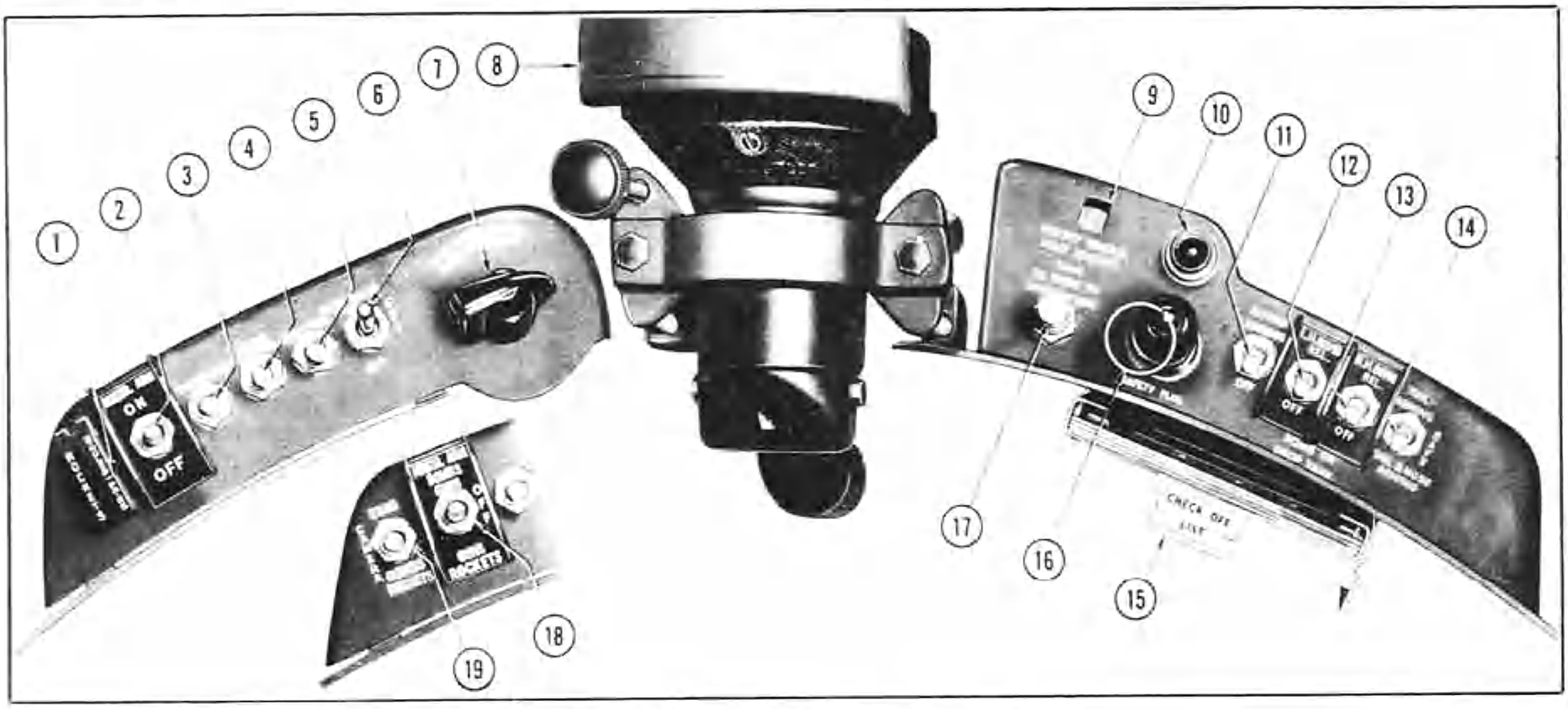


Figure 37 — Armament Controls

1 Shielded Rocket Switch
2 Master Armament Switch
3 Gun Selector Switch — Outboard
4 Gun Selector Switch — Center
5 Gun Selector Switch — Inboard
6 Gun Sight Switch
7 Gun Sight Rheostat
8 Gun Sight
9 Rocket Station Indicator
10 Rocket Arming Warning Light
11 Rocket Arming Switch
12 Bomb Selector Switch — Left-Hand
13 Bomb Selector Switch — Right-Hand
14 Bomb Arming Switch
15 Check-off Lists
16 Rocket Safety Plug
17 Rocket Station Reset Button
18 Master Armament Switch (early models F2G-1)
19 Camera Switch (early models F2G-1)

incomplete charger action. With the control knobs at ***CHARGE***, press them in and hold them for several seconds. Test the guns once more.

3. Initial failure or stoppage of all the guns may result from electrical failures; check the following:

a. Are other electrical appliances (radio, gun sight, etc.) operating normally, indicating that the power supply is satisfactory? If they are not functioning, check to see that the generator switch is on (forward position). ***(See 1, figure 40.)***

Note

This switch must be on, not only to keep the battery charged but also to heat the guns.

b. Is the master armament switch on?

c. Are the gun selector switches on?

d. Has the gun heater circuit breaker opened? ***(See figure 39.)***

(*b*) STOPPAGE OF ONLY PART OF GUNS.

1. If one or more of the guns fails initially or stops firing while the others continue, check the following possible electrical causes:

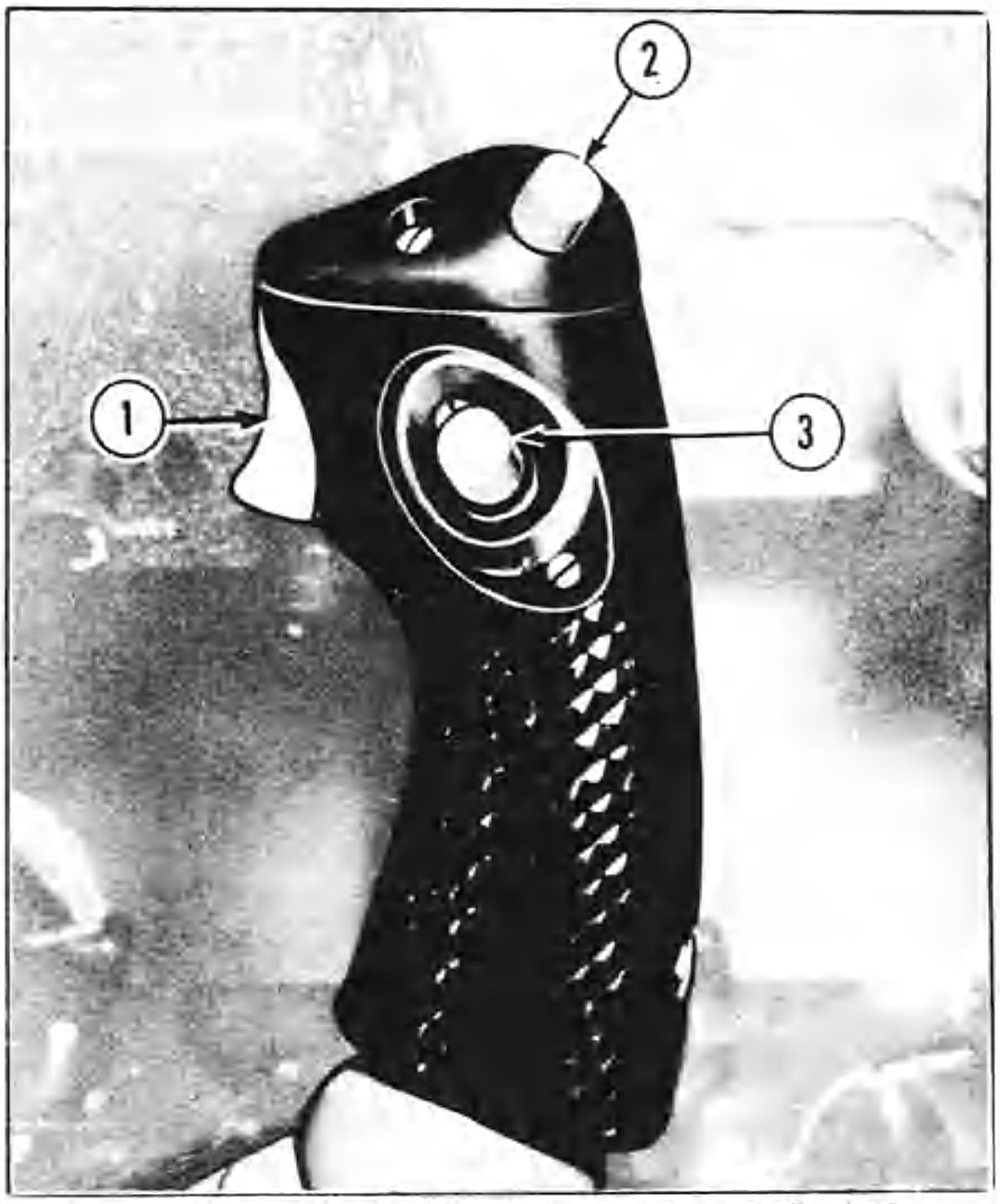


Figure 38 — Control Stick Armament Switches

1 Machine Gun Trigger
2 Bomb (and Pylon Mounted Rocket) Button
3 Wing Rocket Button

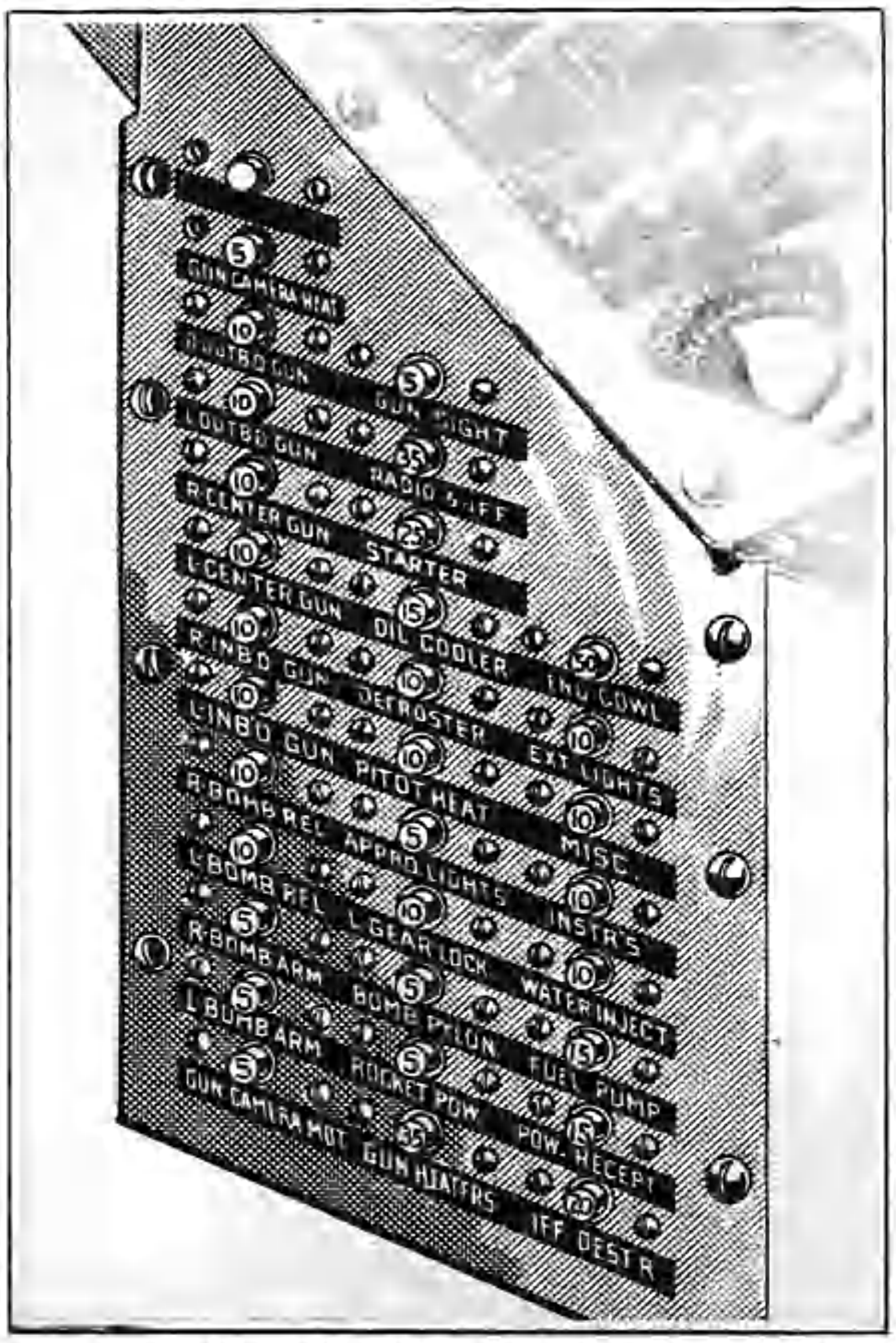


Figure 39 — Electrical Circuit Breaker Panel

a. Is the selector switch for that gun turned on? *(See 3, 4, 5, figure 37.)*

b. Has the circuit breaker for that gun opened? *(See figure 39.)* If this has happened, reset the breaker by pressing it in. If it opens again, electrical malfunctioning is indicated.

2. If the trouble is not in the electrical controls, the stoppage is probably due to failure of the gun or ammunition. The pilot's only treatment for such trouble is to safe and charge the gun two or three times in an attempt to reduce the stoppage.

(5) GUN HEATING. — The guns are heated by electrical units mounted on the gun breeches. There is no cockpit control for these heaters; they are energized directly from the generator and are heated at any time that the engine is running and the generator switch *(see 1, figure 40)* is on.

Note

These heaters are connected into the generator circuit ahead of the reverse current cut out and so are not subject to the 1350 rpm minimum speed that governs battery charging. The generator voltage level necessary for closing the gun heater relay is reached at low engine speeds.

(6) GUN CAMERA.

(*a*) DESCRIPTION.

1. The gun camera, located in the inboard leading edge of the right outer panel, is a 16 mm, AN type N-6A, magazine loading unit. Access is through a small door beneath the camera.

2. A manually set dial on the camera provides for pre-selection of any of the three operating speeds of 16, 32 or 64 frames per second; the lens may be adjusted to ***B, H*** or ***D*** (bright, hazy, or dull) for any of the three operating speeds.

3. The camera is heated by a built-in electrical unit which automatically maintains correct operating temperatures as long as the master armament switch is ***ON***.

Note

In early planes with camera switches (see 19, figure 37) it is necessary to turn this switch to either the ***GUN*** or the ***BOMB-ROCKET*** position to heat the camera.

(*b*) OPERATION. — The gun camera operates when the master armament switch is on and any one of the three armament controls on the stick is pressed. This means that the camera records every firing of guns or rockets and every release of bombs. The camera may be used independently of bombs, guns and rockets by having the master armament switch ***ON***, the gun selector and bomb release switches ***OFF***, the rocket safety plug removed, and then pressing one of the armament controls on the stick.

Note

In some early F2G-1 airplanes a camera switch replaces the standard rocket firing switch. (See 19, figure 37.) On these planes the camera may be operated by means of either the gun trigger or the bomb-rocket thumb button, but only after the camera switch has been turned to the corresponding position.

(7) GUN SIGHT.

(*a*) The Mark 8 gunsight is equipped with a two filament lamp for projection of the target image. One filament serves for normal use and is lighted when the gun sight switch is at ***ON***. *(See 6, figure 37.)* The other filament, lighted by turning the switch to ***ALT***, is a "spare" for use in case the first filament burns out.

(*b*) The brilliance of the gun sight target can be controlled by the gun sight rheostat. *(See 7, figure 37.)*

b. BOMBS.

(1) GENERAL. — The F2G airplane carries either one or two bombs of up to 1000 pounds each on pylons mounted on the under side of the wing center section.

(2) BOMB ARMING. — The bomb arming switch is a double-throw type with three positions, ***TAIL, SAFE,*** and ***NOSE AND TAIL.*** The pilot will select the type of arming he desires. This selection will depend on the use of the bomb. If it is to be armor piercing, arm the tail of the bomb; if it is to be anti-personnel, arm both nose and tail for explosion on contact. If the bomb is not armed, it will fall safe and will not explode.

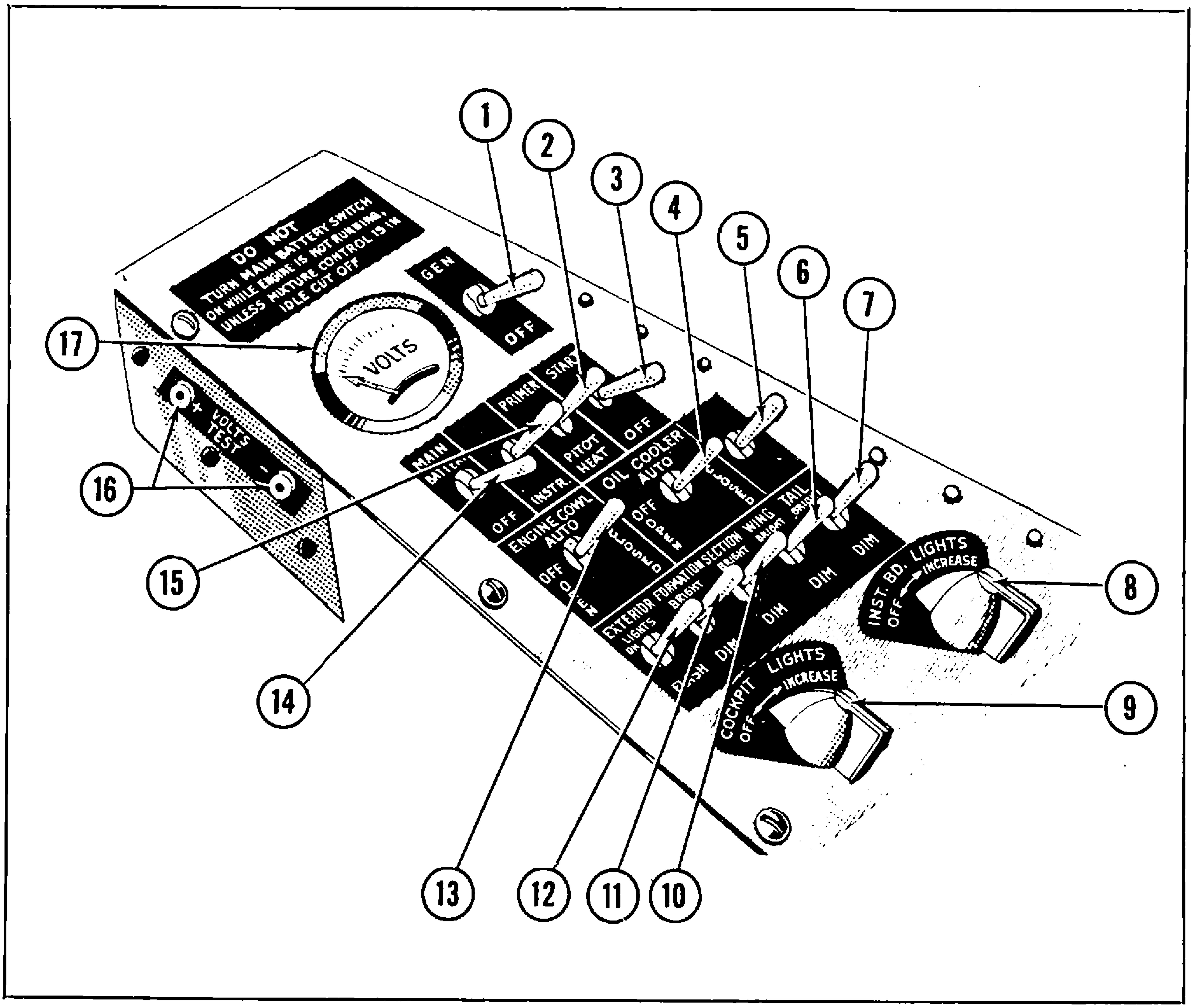


Figure 40 — Electrical Control Panel

1 Generator Switch
2 Primer and Pitot Heat Switch
3 Starter Switch
4 Oil Cooler Flap Switch
5 Defroster Switch (not utilized)
6 Wing Lights Switch
7 Tail Light Switch
8 Instrument Lights Switch and Rheostat
9 Cockpit Lights Switch
10 Section Light Switch
11 Formation Lights Switch
12 Exterior Lights Master Switch
13 Cowl Flaps Switch
14 Master Battery Switch
15 Instrument and Oil Dilution Switch
16 Voltage Test Jacks
17 Generator Voltmeter

Note

Turning the arming switch to one of the arming positions does not actually arm the bomb, it merely locks the arming wire or wires so that the bomb arms itself on ***leaving the plane.*** Returning the arming switch to ***SAFE*** leaves the bombs in their original unarmed condition.

(3) BOMB RELEASE. — The bombs may be either released tactically or jettisoned in emergency by manual or electrical means.

(*a*) ELECTRICAL RELEASE.

1. Master armament switch — ***ON.*** (See 2, figure 37.)

Note

In early models, with the double throw armament switch, this switch must be set to ***BOMBS-GUNS.*** (See 18, figure 37.)

2. Selector switches on as desired. *(See 12 and 13, figure 37.)*

3. Arming switch set as desired. (Refer to Bomb Arming, paragraph (2) above.)

4. Press the thumb switch on the top of the control stick to release the selected bomb or bombs.

(*b*) MANUAL RELEASE.

1. Arming switch set as desired. (Refer to Bomb Arming, paragraph (2) above.)

Note

Some early F2G-1 airplanes have only one thumb switch on the control stick. This switch serves both to drop bombs and to launch rockets, its function at any time being determined by the setting of the master armament switch. (See 2, figure 37.)

2. Pull emergency bomb release lever or levers forward to release the bomb or bombs. *(See 1 and 2, figure 25.)* Each lever releases the bomb on the corresponding side of the plane.

c. 11.75 INCH ROCKETS.

(1) GENERAL. — Two 11¾-inch rockets, weighing about 1250 pounds each, can be carried on the center section pylons in place of bombs or drop tanks. These rockets are released either electrically or manually just as are bombs or drop tanks. Their propellant charges are ignited by lanyard operated switches after the rockets have fallen clear of the propeller circle. They are armed automatically in flight by the pressure of the propellant gases, hence the rocket arming switches serve no purpose in their launching.

(2) ELECTRICAL RELEASE.

(*a*) Master armament switch — ***ON.***

Note

In early model planes with the double throw armament switch, this switch should be at ***BOMBS-GUNS.*** (See 18, figure 37.)

(*b*) Bomb selector switches — ***ON*** as desired.

(*c*) Press the bomb release thumb switch on the top of the control stick to launch the selected rocket or rockets. (See figure 38.)

(3) MANUAL RELEASE.

(*a*) Master armament switch set as for electrical release above.

(*b*) Pull the emergency bomb release lever or levers forward to launch the rocket or rockets. *(See 1 and 2, figure 25.)* Each lever releases the rocket on the corresponding side of the plane.

(4) JETTISONING ROCKETS. — Since the 11.75 inch rockets are armed only by the action of the propellant gases it is possible to release them in the safe condition simply by pulling the emergency release levers while the master armament switch is ***OFF.*** Dropped in this fashion, the propellant charge is not ignited and the rocket falls like a bomb. However, such "safe" dropping of rockets is not completely trustworthy, since the fuse is designed to withstand the shock of only a 40 foot free fall and may detonate on impact when dropped from greater altitudes.

d. WING-MOUNTED ROCKETS.

(1) GENERAL. — The outer wing panels have provision for mounting rocket launchers. These launchers, four under each wing, are normally removed except where the tactical assignment of the plane makes the use of rockets probable. Either 3½ or 5-inch standard Naval aircraft rockets may be used.

(2) ROCKET ARMING. *(See figure 37.)* — The arming of the wing rockets is similar to the arming of bombs. When the arming switch (11) is turned to ***ARMING,*** solenoid devices on the launchers engage the nose arming wires so that as the rockets are launched the arming wires are withdrawn from the nose fuses and the projectiles are ready to detonate on impact. There is one important difference between the arming of bombs and the arming of rockets which pilots should keep in mind, particularly in the event of jettison-

ing the rockets in emergencies. The 3½-inch practice rocket has a nose fuse only and may be jettisoned in a safe condition by launching the rocket while the arming switch is at ***OFF***. The standard 5-inch rocket, however, is normally equipped with both nose and tail fuses. (These rockets are also supplied for special purposes either with nose fuse only or with tail fuse only.) The nose fuse is armed as explained above. The tail fuse, designed for delayed action, is armed ***automatically*** during rocket flight by the pressure of the propulsion gases. This means that if the 5-inch rocket is launched, even though the arming switch is ***OFF***, the rocket still is not in a safe condition; it will be fully armed for delayed or penetrating detonation.

(3) ROCKET FIRING.

(*a*) FIRING IN PAIRS.

1. Master armament switch — ***ON***. (See 2, figure 37.)

2. Safety plug — inserted (See 16, figure 37.)

3. Rocket switch — ***PAIRS***. (See 1, figure 37.)

4. Station indicating dial at *1*. (See 9, figure 37.)

5. Press the rocket firing button on the control stick. (See figure 38.) Two rockets will be launched each time this button is pressed, the order of launching being 1R, & 1L, 2R & 2L, 3R & 3L, 4R & 4L, (numbering from inboard out).

(*b*) SINGLE FIRING.

1. Master armament switch — ***ON***. (See 2, figure 37.)

2. Safety plug — inserted. (See 16, figure 37.)

3. Rocket switch — ***SINGLE***. (See 1, figure 37.)

4. Station indicating dial at *1*. (See 9, figure 37.)

5. Press the rocket firing button on the control stick. (See figure 38.) One rocket will be launched each time this button is pressed until four rockets have been fired. The order of firing is 1L, 2R, 3L, 4R, (numbering from inboard out).

6. Reset the station indicating dial to *1* by means of the reset button. (See 17, figure 37.)

7. Turn rocket switch to ***PAIRS***. (See 1, figure 37.)

8. Press the rocket firing button on the control stick. The remaining four rockets will be launched singly in the following order: 1R, 2L, 3R, 4L.

Note

Some early F2G-1 airplanes have rocket firing circuits which differ from that described above. (Refer to section V, paragraph 1.) These planes can fire rockets only in pairs, the procedure being as follows: Safety plug and station indicator as above, master armament switch ***GUNS-ROCKETS*** (see 18, figure 37), press button on stick. Firing order of the pairs will be as above.

(4) ROCKET SAFETY PLUG. *(See 16, figure 37.)* — An electrical safety plug is located on the right-hand armament switch box. When the plug is removed, the electrical circuits are opened, making it impossible to launch the rockets.

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.

2. OXYGEN SYSTEM.

a. GENERAL. — The oxygen for pilot consumption during high altitude flight is carried in a high pressure bottle under the cockpit floor. The main valve of this bottle projects up through the floor forward of the right side of the pilot's seat. *(See figure 29.)* The pilot's oxygen mask, normally carried in the cockpit locker *(see 10, figure 4)* attaches to the diluter-demand regulator on the right-hand side of the cockpit. *(See figure 41.)*

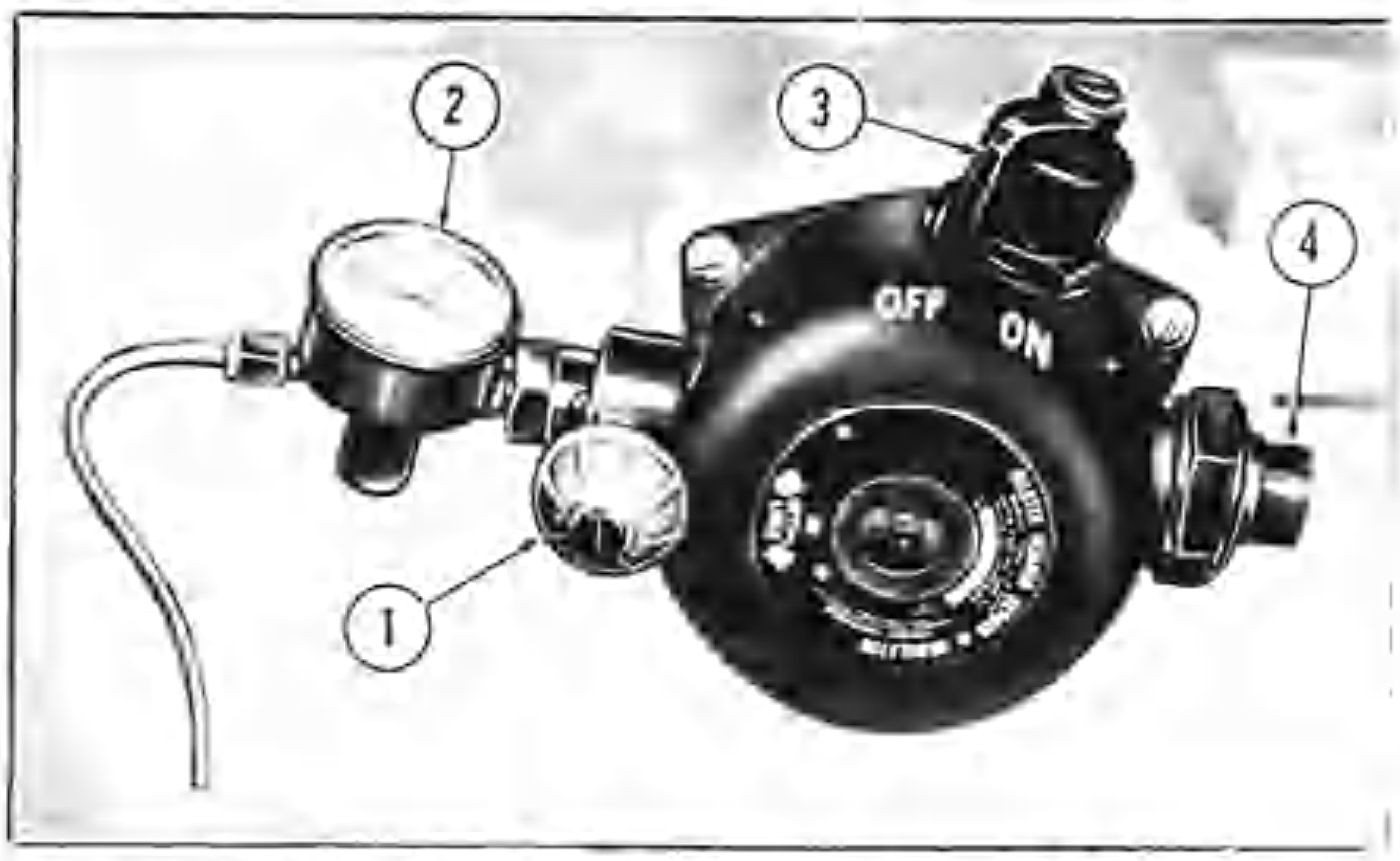


Figure 41 — Diluter-Demand Oxygen Regulator

1 Emergency Valve
2 Pressure Gauge
3 Diluter Valve Control
4 Mask Connection

b. USE OF OXYGEN. *(See figure 41.)*

(1) The diluter-demand regulator allows outside air to enter the breathing supply system. The

amount of air admitted decreases as altitude increases, and above approximately 30,000 feet 100 percent oxygen is automatically delivered. During normal operations the diluter lever (3) should be turned to the *ON* position, thus providing 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 *d* below.

(2) When climbing directly to altitudes of 30,000 feet or above at an average rate of climb exceeding 500 feet per minute, the diluter valve (3) shall be turned to *OFF* before take-off, and 100 percent oxygen shall be used throughout the flight until return to an altitude of 10,000 feet.

(3) The emergency valve (small red knob (1) on regulator) shall be used only in flight above 25,000 feet, or if the diluter-demand regulator becomes inoperative. When used, open the emergency valve slowly and obtain the minimum flow required.

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

(5) 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.

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

c. OXYGEN ENDURANCE.

OXYGEN CONSUMPTION TABLE

Altitude in Feet	Diluter-Demand Regulator With Diluter *OFF* Endurance Hours	Diluter-Demand Regulator With Diluter *ON* Endurance Hours
0	1.5	6.8
5,000	1.8	8.1
10,000	2.1	9.8
15,000	2.6	10.6
20,000	3.3	9.3
25,000	4.1	5.8
30,000	5.2	5.2
35,000	6.5	6.5

d. OXYGEN SYSTEM CHECK. *(See figure 41.)* — 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 (1) to determine that it is closed.

(2) Open the cylinder valve. Pressure gauge (2) should read 1800 (plus or minus 50) lb/sq in. if the cylinder is fully charged.

(3) Close the cylinder valve. If the 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.

(5) Open the cylinder valve. Breathe several times to determine whether the regulator is functioning properly. Check the emergency bypass valve (1) by turning the knob counter-clockwise until oxygen flows into the mask. Close the emergency valve.

e. REFILLING OXYGEN BOTTLE. — The oxygen cylinder may be either refilled or removed and replaced. The refill valve is under the cockpit floor and is accessible through the forward fuselage section access door. *(See 10, figure 21.)* When the bottle is fully charged, the gauge on the regulator *(see 2, figure 41)* should read 1800 (plus or minus 50) lb/sq in.

CAUTION

Never let the O_2 pressure drop below 300 lb/sq in. before refilling. This minimum pressure is necessary to keep atmospheric moisture from entering the bottle.

3. COMMUNICATIONS EQUIPMENT

a. DESCRIPTION. — The F2G is equipped at the factory with five radio units mounted in the fuselage behind the auxiliary tank. *(See figure 42.)* Provision is made for the addition of a sixth unit should the activities of the plane be such as to require it.

The first five of the following units are installed in every plane:

(1) VHF TRANSCEIVER (AN/RT18-ARC-1). — This is a very high frequency unit which both transmits and receives radiotelephone communication either between planes, or between plane and ground. It has 10 pre-set frequency channels in the

range between 100 and 156 megacycles. The channels to be used in any flight operation are tuned at the transceiver unit prior to take-off; they may then be selected as desired by means of a channel selector on the radio panel in the cockpit. One of the 10 channels is a guard channel which may be used separately or in conjunction with one of the pre-set channels.

The distance over which the VHF equipment can communicate varies with surrounding conditions. Ordinarily, it is considered to be limited to line-of-sight distances although this characteristic should not be trusted implicitly. Many instances have been noted when this equipment transmitted and received from points beyond the horizon.

(2) HF TRANSMITTER (AN/T19-ARC-5). — This high frequency transmitter operates on a single, pre-set frequency in the range between 3.0 and 4.0 megacycles. The frequency to be used is established before the flight, and can not be changed from the cockpit.

(3) LF RECEIVER (AN/R23-ARC-5). — The low frequency range receiver is intended primarily for the reception of domestic navigational radio signals and flight information; it is ordinarily removed from planes operating beyond the limits of continental North America.

The pilot may tune the set to any point within its frequency range (.19 to .55 megacycles) by means of a crank on the ***RECVR*** section of the control panel.

(4) NAVIGATION RECEIVER (AN/R4-ARR-2A). — This receiver is designed for reception of special navigational signals of extremely high frequency. The pilot may select any of the six channels pre-tuned before flight.

(5) IFF UNIT (AN/R22-APX-1). — The controls for the IFF (Identify Friend or Foe) equipment are on the aftermost section of the radio panel. They are a G band control switch, a code channel selector, a shield for the emergency channel, a jack for testing the unit, and a shielded switch for manual detonation of the destructor cartridges in the IFF set. An inertia switch *(see 5, figure 42)* is connected in parallel with the manual destructor switch and insures the complete destruction of the IFF unit in the event of a crash landing in unfriendly territory. When the plane strikes the ground or other object with a force equivalent to from 10 to 13 g's, a pendulum-like mass in the inertia switch is displaced, the destructor circuit is completed, and the destructor cartridges in the IFF set are exploded.

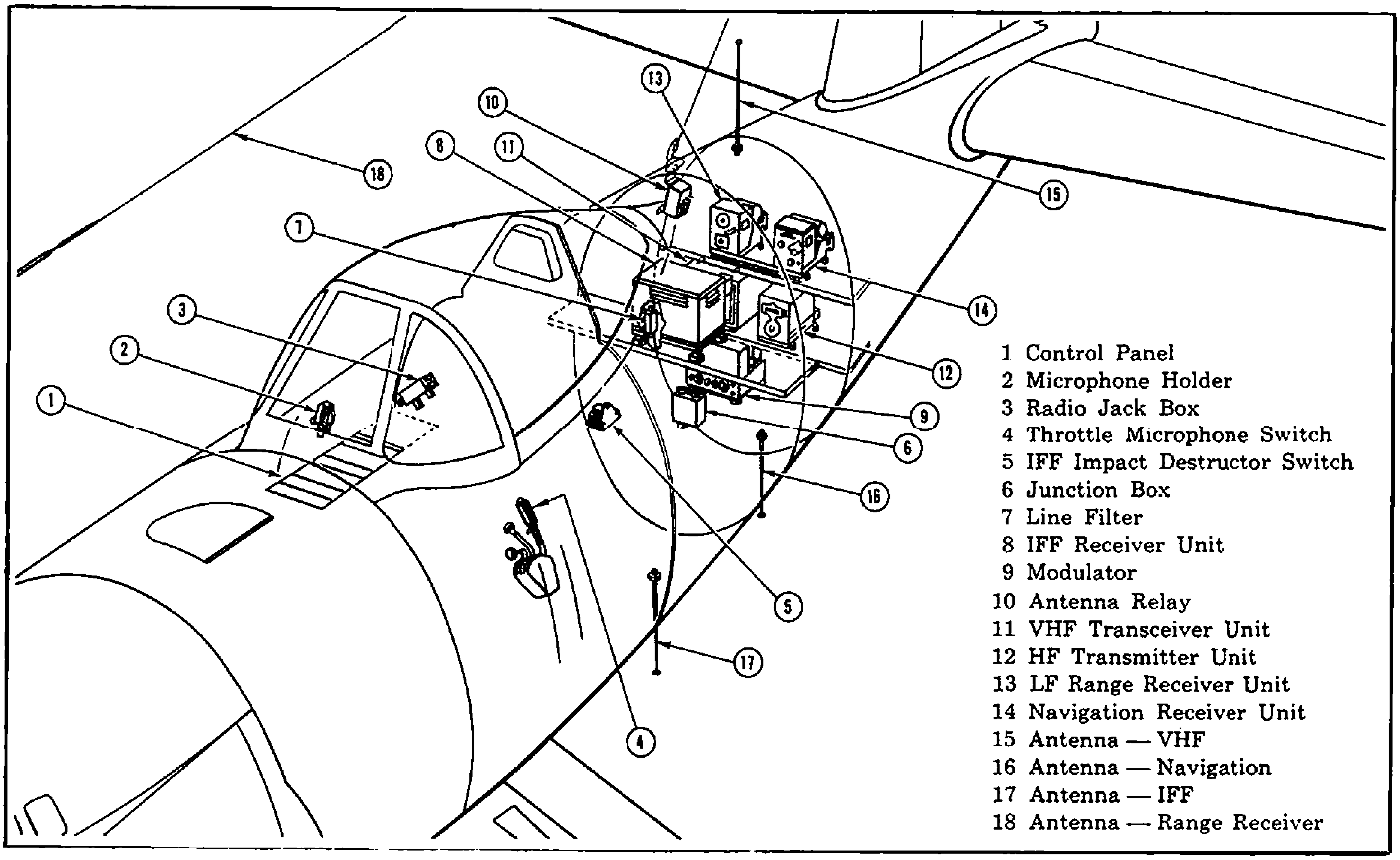


Figure 42 — Radio Installation

The destructor circuit may be disconnected by removing an electrical connector plug at the IFF unit.

CAUTION

The destructor circuit must be carefully tested before the plug is reinserted.

(6) HF RECEIVER (AN/R26-ARC-5).—This auxiliary high frequency receiver unit may be readily installed whenever the need arises. It operates on a single pre-set frequency in the range between 3.0 and 6.0 megacycles.

b. OPERATION. *(See figure 43.)*

(1) MASTER CONTROLS.

(*a*) The master radio switch (2) controls the electrical power for all the units and should be on at all times that the plane is in flight. It is equipped with a safety hood to prevent its being accidentally turned off. With this switch on, the power tubes of all the sets are heated and the receiver dynamotors are running.

(2) VHF CONTROLS.

(*a*) The channel selector (4) selects the ten pre-tuned transmission and reception channels. The selected channel is indicated by the number showing through a small opening at the left of the selector knob.

(*b*) The guard channel selector (3) makes it possible for the pilot to operate solely on the guard channel, to monitor on the guard channel while operating on the main channels, or to cut the guard channel out entirely and operate only on

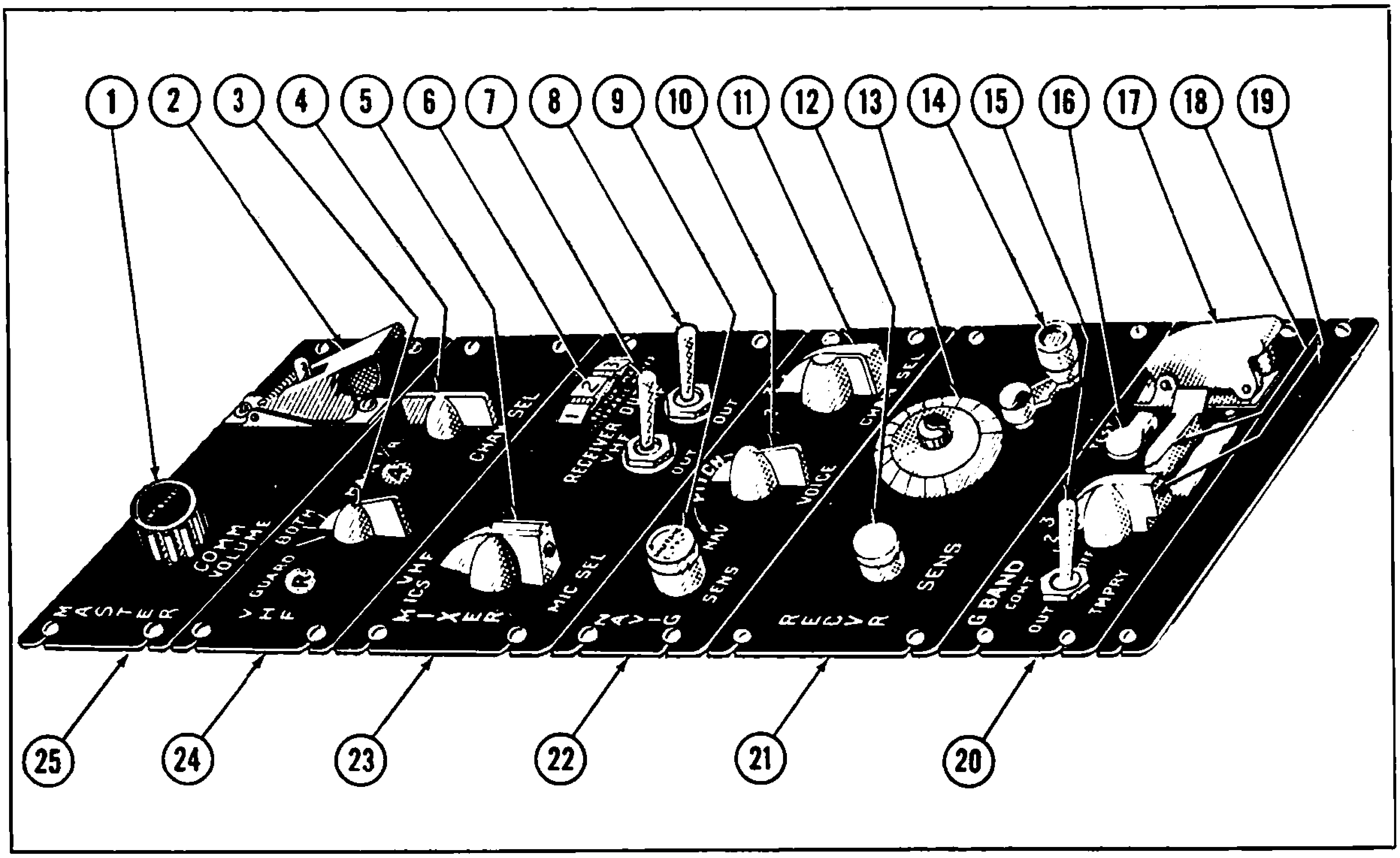


Figure 43 — Radio Control Panel

1 Master Volume Control
2 Master Radio Switch
3 VHF Monitor Control
4 VHF Channel Selector
5 Microphone Selector
6 HF Sensitivity Control
7 VHF Reducer
8 HF Reducer
9 Navigation Receiver Sensitivity Control
10 Pitch Control and Oscillator Switch
11 Navigation Channel Selector
12 LF Receiver Sensitivity Control
13 LF Receiver Tuning Dial
14 LF Receiver Tuning Control
15 IFF G Band Selector Switch
16 IFF Test Jack
17 IFF Manual Destructor Switch
18 IFF Emergency Channel Guard
19 IFF Channel Selector
20 IFF Panel
21 LF (Range) Receiver Panel
22 Navigation Receiver Panel
23 Mixer Panel
24 VHF Transceiver Panel
25 Master Radio Control Panel

the main channels.

(*c*) Transmission on VHF is controlled by the microphone selector switch (5), and the microphone switches. (Refer to Microphones and Headset, paragraph (7) below.)

(*d*) The volume or sensitivity of VHF reception is regulated by the master volume control (1), and the VHF output switch (see paragraph (3),(*b*) below.)

(3) MIXER CONTROLS.

(*a*) The microphone selector switch (5) connects the microphone with either the VHF or the HF transmitter as the pilot desires. The ICS (interior communications system) position of this switch serves no purpose in this installation.

(*b*) The receiver output switches (7) and (8) cut off the outputs of the VHF and HF receivers.

(*c*) The HF sensitivity control (6) regulates the output of the HF receiver. With the HF output switch (8) on (forward) and the output of the other receivers reduced, adjust the sensitivity control to the maximum tolerable noise level.

(4) NAVIGATIONAL CONTROLS.

(*a*) In adjusting the navigational receiver the sensitivity control (9) should be turned to its lowest point of distinct reception with the master volume control (1) set at its maximum output. If too much noise is heard from other receivers, reduce their output temporarily while the navigation unit output is being adjusted. It will be necessary to readjust the sensitivity control occasionally during flight to maintain the desired volume. In general, signals will be stronger at higher altitudes.

Note

The above method of reception gives a sharp position indication which cannot otherwise be obtained.

(*b*) The Nav-Voice control (10) varies the pitch or tone of the navigational signal, or when turned to its extreme clockwise position cuts out the beat oscillator and adapts the unit for reception of voice. If voice is to be used, instructions will ordinarily be given prior to take-off. Be sure this control is set for the kind of reception desired.

(*c*) The channel selector (11) is used for selection of the desired pre-set channel. It has six channel positions, each of which corresponds to a wave length tuned at the set before flight.

(5) RECEIVER CONTROLS. — The controls on the ***RECVR*** panel are for the low frequency range receiver.

(*a*) The sensitivity control (12) regulates the output or volume of the receiver, but does not turn the LF set on or off. The receiver is turned on and off by the master radio switch (2).

(*b*) The tuning crank (14) and indicator dial (13) provide the only tuning of the set. There is no pre-selection and pre-tuning to certain channels as in the other receivers.

(6) IFF CONTROLS. — Information concerning the operation of this equipment should be obtained from the communications officer in charge.

(7) MICROPHONES AND HEADSET. *(See figure 44.)*

(*a*) The hand microphone, carried in a clip on the right-hand side of the cockpit, plugs into the ***MIC*** jack (4) of the radio jack box (2). This microphone has an integral push-button type switch which must be held depressed while transmitting.

Note

Pressing the microphone switch starts the dynamotor on the transmitter. Avoid rapid "keying" of the microphone switch since such operation results in heavy current drain as well as in overheating of the dynamotor.

(*b*) One end of the mask microphone cord (5) is permanently connected at the jack box, while the other end is to be plugged into the receptacle on the oxygen mask. When a throat or

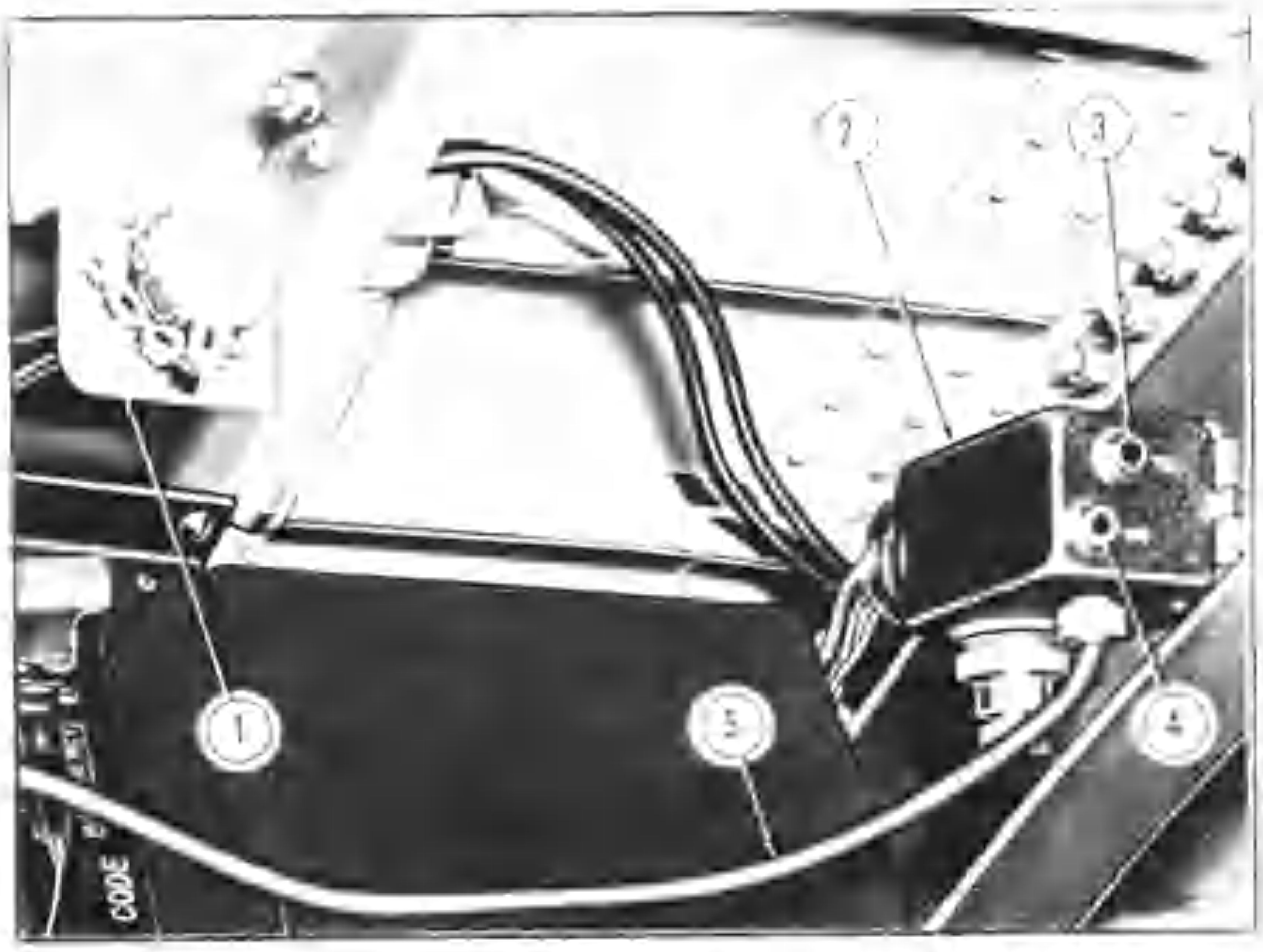


Figure 44 — Power and Radio Outlets

1 Flying Suit Electrical Receptacle
2 Radio Jack Box
3 Headset Jack
4 Hand Microphone Jack
5 Throat or Mask Microphone Cord

mask microphone is being used, transmission is controlled by the microphone switch on the throttle lever.

(c) The radio headset plugs into the *TEL* jack (3) of the radio jack box (2).

4. ELECTRICAL SYSTEM.

a. POWER SUPPLY. — Power for the electrical system is supplied by a 75-ampere engine driven generator charging a 24-volt, 34-ampere-hour battery.

The generator is equipped with an automatic control which keeps the charging voltage at 27½ (plus or minus one-quarter) volts at all rpm above the cut-in speed (about 1350 rpm tachometer reading). As long as the generator is charging (generator switch turned to *GEN* and rpm above 1350) the generator voltage will be indicated by the voltmeter on the right-hand electrical control panel. The pin jacks on the face of the shelf beside the voltmeter are for a test meter used in checking the generator voltage.

The electrical power supply of the plane is normally supplemented by the use of external power for all starting and ground operations. The external power receptacle is on the underside of the wing center section *(see 11, figure 21)*. It is protected by a hinged rectangular door that is readily snapped open with a screw driver.

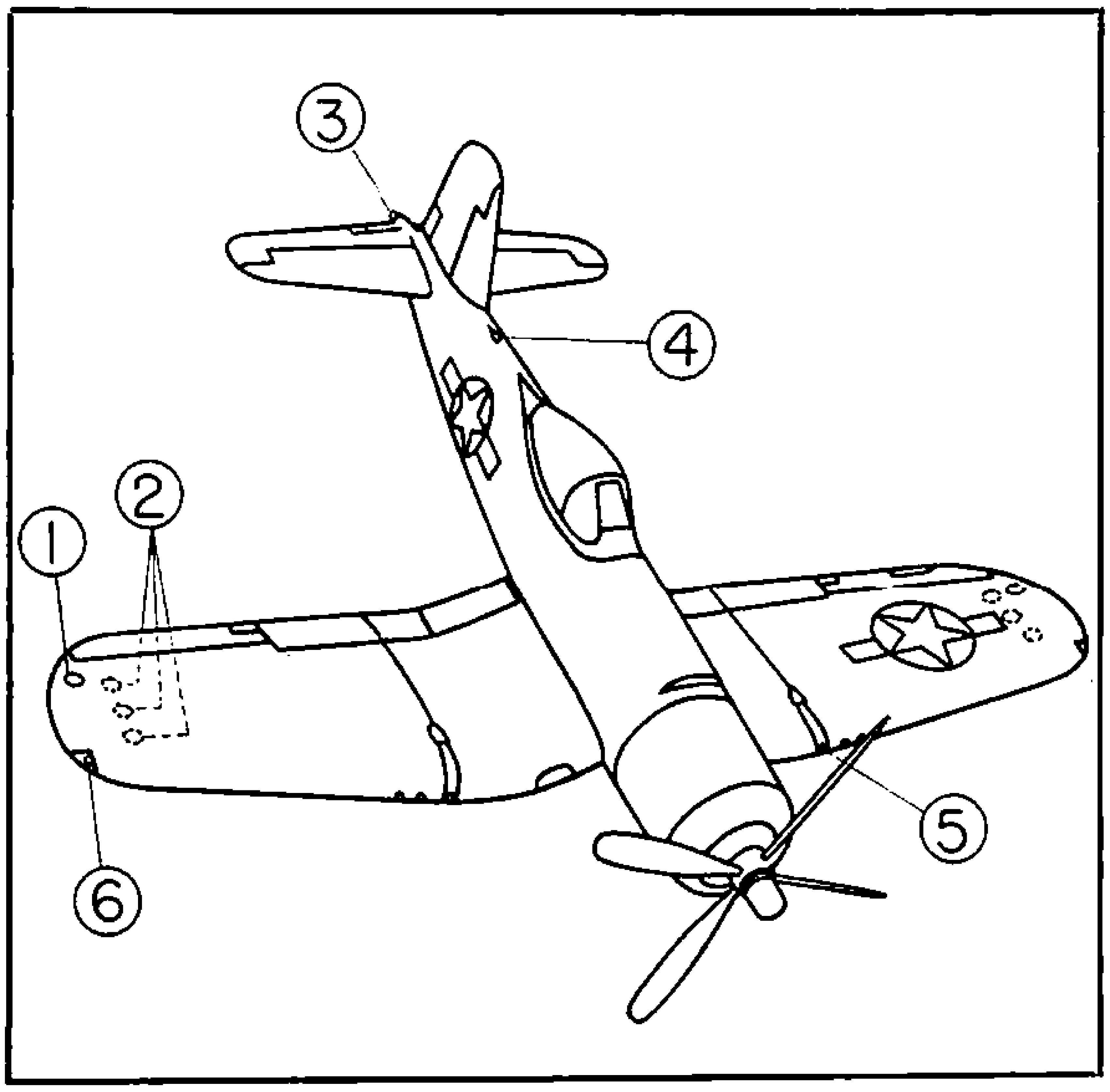


Figure 45 — Exterior Lights

1 Formation Lights
2 Recognition Lights (underside of wing — not connected)
3 Tail Light
4 Section Light
5 Approach Light
6 Wing Lights

b. MASTER BATTERY SWITCH. — The battery switch *(see 14, figure 40)* disconnects the battery from the entire electrical system except the inertia switch in the IFF destructor circuit.

c. MISCELLANEOUS ELECTRICAL CIRCUITS. *(See figure 40.)*

(1) INSTRUMENTS. — The engine gauge unit, compass and fuel quantity gauge depend upon battery power for their operation. These instruments are all on a single circuit controlled by the *INSTR* switch on the electrical control panel. This is a three position switch whose forward position (unmarked) will be used for oil dilution in any planes having this system installed.

(2) COCKPIT LIGHTS. — A combination switch and rheostat controls the lights provided for cockpit illumination. These lights (two above the control panel on each side of the cockpit) are fitted with red direct illuminating lamps and with individual fixture switches by means of which any light may be turned out while the others remain on.

The rheostat control regulates the illumination and, when turned counter-clockwise to its limit, turns the lights off.

(3) INSTRUMENT PANEL LIGHTS. — Twenty-one concealed lamps illuminate the instruments on the main instrument panel with direct red light. A combination switch and rheostat *(see 8, figure 40)* controls both these lights and an exposed light at the top of the panel. This auxiliary lamp, intended for lighting the chartboard, may be turned off by means of a switch on the fixture itself.

The instrument lamps can be removed and replaced by opening the snap lid covering each. Ten spare lamps are carried in two dispensers under the ignition switch at the left end of the instrument panel. *(See 25, figure 2.)*

Note

These lamps are very small and cannot be handled with gloves. The lid of each fixture holds the lamp in place; the lamp will drop out as quickly as the lid is opened.

(4) EXTERIOR LIGHTS. *(See figure 45.)* — The F2G has five types of external lights — formation, section, running, tail and approach. (The outer panels have complete recognition light installations, although these are not connected with the electrical system.) The approach light is controlled by a manual switch in the left wheel well. In the F2G-2 it is controlled automatically by a microswitch on the arresting hook so that it is on whenever the airplane is in carrier-approach condition. All other exterior lights have individual switches on the electrical control panel, each switch

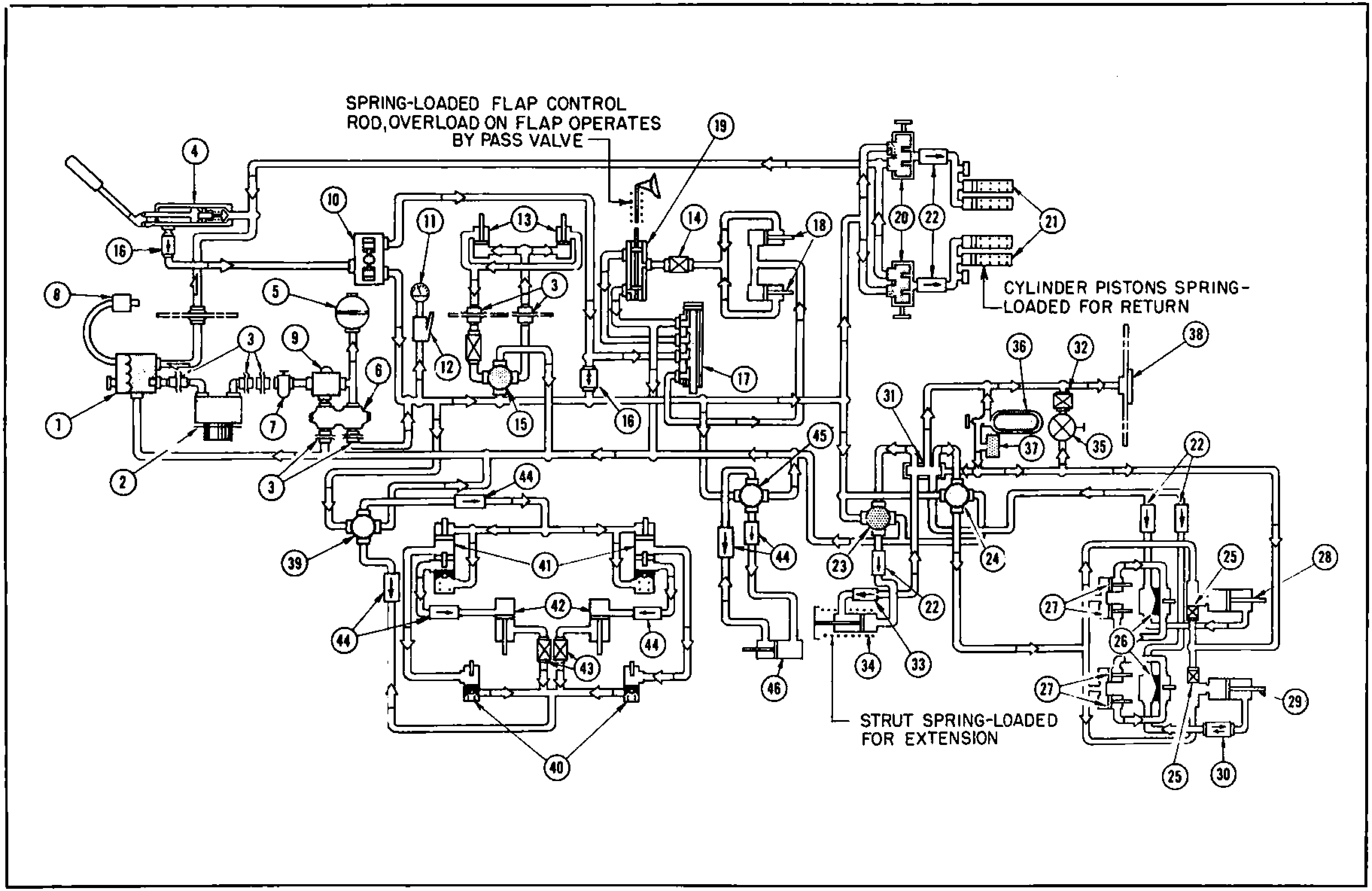


Figure 46 — Hydraulic System — Schematic Diagram

having positions for *BRIGHT, OFF* and *DIM. (See 6, 7, 10, 11, figure 40.)* A master switch *(see 12, figure 40)* to the left of the others, controls all of the exterior lights. In its forward *(ON)* position it is a conventional toggle switch supplying steady current to the four branch circuits; in its rearward *(FLASH)* position it is a momentary contact switch by means of which the pilot may use his exterior lights for signalling purposes.

(5) PITOT-STATIC TUBE HEATER. — An electrical heating unit in the pitot-static tube serves to prevent icing of the tube and so eliminates air-speed indicator errors which result from such icing. The control switch *(see 2, figure 40)* should be kept at *PITOT* at any time that there is any form of structural icing.

(6) POWER RECEPTACLE. *(See 1, figure 44.)* — An electrically heated flying suit, or other electrical device, can be plugged into the receptacle above the right-hand control shelf. This receptacle, protected by a screw cover, is powered at all times that the main battery switch is on, except in the rare event that an overload has caused its circuit breaker to cut out.

d. CIRCUIT BREAKERS. *(See figure 39.)* — The thirty-odd push buttons on the face of the electrical control shelf are resets for the electrical system circuit breakers. Each circuit has a protective breaker of sufficient capacity to handle all normal demands but which will open to turn the current off when there is a serious overload. In this case, the reset button pops out and must be pushed back into place before the circuit is usable again. Since these are thermally operated devices, a few seconds are required for the breaker unit to cool before it can be reset. Always reduce the load on the circuit as much as possible, or disconnect any particular part of the circuit suspected of being faulty, before attempting to reset the breaker.

Note

Bear in mind that an open circuit breaker is usually indicative of malfunctioning of some appliance or of a "short" in the wiring, and that resetting the breaker does not correct the trouble. It is possible that resetting will permit the use of the circuit but unless the current demand has been reduced, the breaker will quickly open again.

5. HYDRAULIC SYSTEM. *(See figure 46.)*

a. GENERAL. — An engine driven hydraulic pump maintains pressures of from 900 to 1150 lb/sq in. in the accumulator whenever the engine is running. A pressure gauge on the auxiliary instrument panel indicates the system pressure available at any time. *(See 5, figure 33.)*

The following devices are hydraulically operated:

(1) Alternate air doors.

(2) Landing gear extension and retraction mechanism.

(3) Wing flaps.

(4) Gun chargers.

(5) Wing folding (F2G-2 only).

(6) Arresting hook (F2G-2 only).

Nomenclature — Figure 46

1 Reservoir
2 Engine Driven Pump
3 Self-Sealing Coupling
4 Hand Pump
5 Accumulator
6 Relief Valve
7 Filter
8 Vent Filter
9 Regulator
10 Hand Pump Emergency Valve
11 Pressure Gauge Assembly
12 Snubber
13 Alternate Air Control Door Strut
14 Two-Way Restrictor
15 Alternate Air Control Valve and Fittings
16 Check Valve
17 Wing Flap Control Valve
18 Wing Flap Strut
19 Wing Flap By-Pass Valve
20 Gun Charger Valve
21 Gun Charger Strut
22 Fuse
23 Tail Wheel Valve
24 Landing Gear Valve
25 Shuttle Valve
26 Sequence Valve
27 Landing Gear Door Strut
28 Landing Gear Strut — Right-Hand
29 Landing Gear Strut — Left-Hand
30 One-Way Restrictor
31 Emergency By-Pass Valve
32 Two-Way Restrictor
33 Fuse
34 Tail Wheel Strut
35 Needle Valve
36 CO_2 Bottle
37 Vent Check Valve
38 Overboard Fitting
39 Wing Folding Control Valve
40 Load and Fire Valve
41 Hinge-Pin Pulling Strut
42 Wing Folding Strut
43 Two-Way Restrictor
44 Fuse
45 Arresting Hook Valve
46 Arresting Hook Strut

Note — Items 39 to 46 inclusive not installed on F2G-1

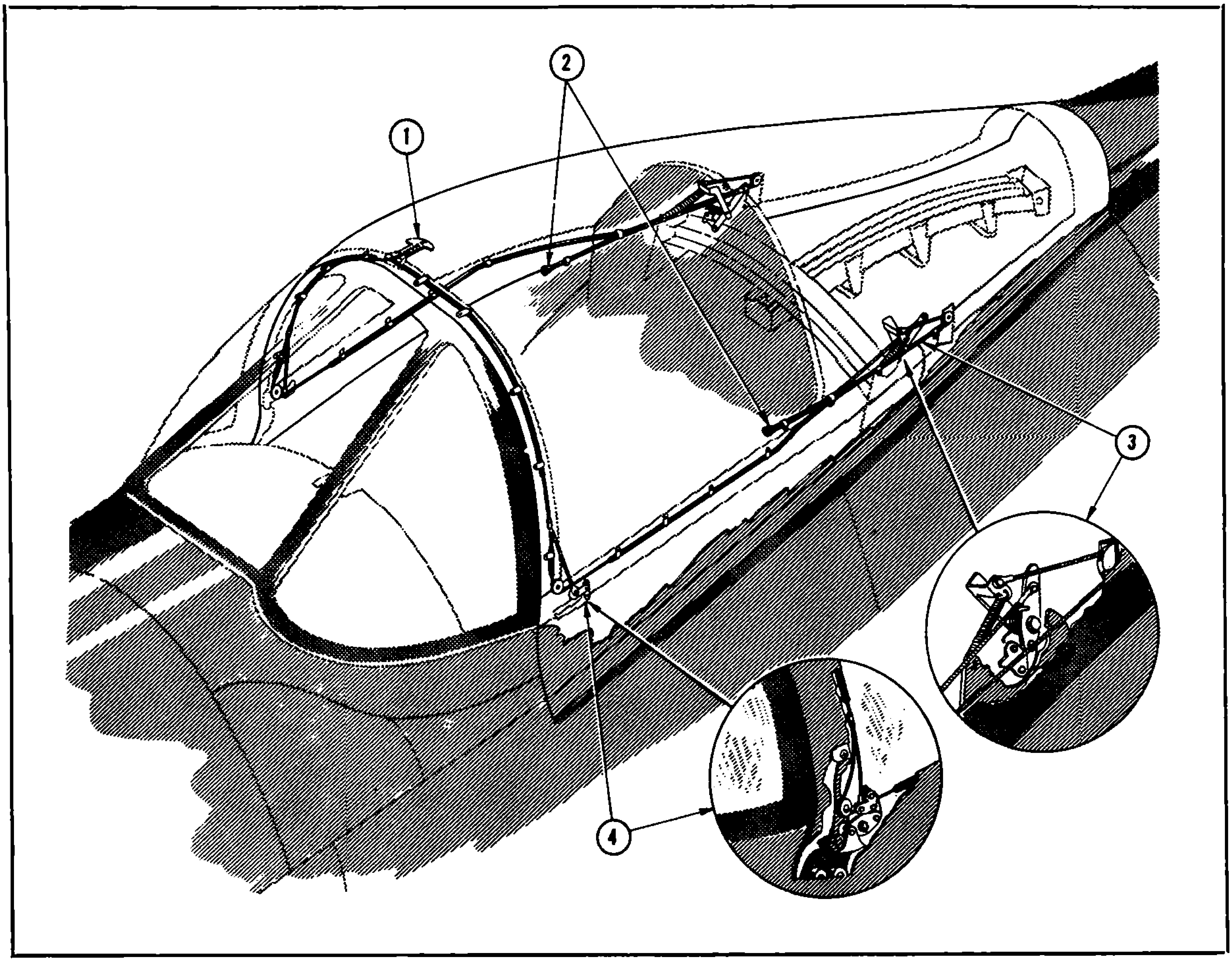


Figure 47 — Canopy Jettison Mechanism

1 Canopy Jettison Handle
2 Reset Knobs
3 Rear Release Mechanism
4 Forward Release Mechanism

These units are described and their operation detailed in connection with the operational equipment concerned.

Note

The brakes and propeller pitch mechanism are both hydraulically operated, but are entirely independent of the plane's hydraulic system.

b. HYDRAULIC HAND PUMP. *(See 3, figure 23.)* — A hand pump with a telescoping handle serves to develop hydraulic pressure for ground use or for emergency operation of the system. The engine driven pump draws its fluid from a standpipe inside the hydraulic reservoir rather than from the bottom. This provision guarantees that the engine driven pump will not pump all of the fluid overboard through a ruptured line; approximately a quarter of a gallon of fluid will remain for emergency use of the hand pump which is connected to the lowest point of the reservoir. Since, in the normal operation of any hydraulic unit, approximately the same amount of fluid will be returned to the reservoir as is drawn from it, this supply should be adequate for system operation provided that none of the unit lines are broken. However, since emergency operation of the flaps is more important than that of any other hydraulic device (the landing gear having its own emergency provision) a valve is installed in the cockpit which assigns the entire hand pump output to the wing flaps. (Refer to section I, paragraph 2,*f*, (5))

6. VENTILATING SYSTEM. — A duct from the left-hand wing scoop carries fresh air to the ventilator valve on the auxiliary instrument panel. *(See 4, figure 33.)* This is a cone-type modulator valve which is opened by unscrewing the valve body (turning it counterclockwise) and closed by turning it clockwise to its limit. The diluter-demand oxygen regulator is ventilated by air brought through a tube branching from the ventilating duct. No control is provided on this branch tube; as long as there is rammed pressure in the wing scoop the oxygen regulator valve will be bathed in fresh air.

7. ANTI-BLACKOUT SYSTEM.

The air supply connection for the pilot's anti-blackout suit is on the bulkhead at the left of the seat, above the shoulder harness lock. The control valve is in the floor at the left of the stick. (See figure 3.)

8. CANOPY CONTROLS.

a. GENERAL. — The canopy is mounted on four trucks which ride in channel rails at the sides of the cockpit. A crank operated sprocket and chain system serves to open and close the canopy. *(See figure 28.)* The canopy may be locked at intervals of about ¼-inch between full open and full closed by means of a pawl which engages openings in the disk behind the crank. This pawl is lifted either by gripping the latch on the control crank or by pressing the outside canopy release button. In its full aft position the canopy is positively locked by latch hooks on the forward trucks which engage lugs on the track. These latches (which are automatically released when the control crank is turned) insure against the canopy being thrown shut in the event of a crash landing. To take advantage of this provision the pilot should be careful to have the canopy ***fully opened*** on landing.

b. EMERGENCY RELEASE. *(See figure 47.)* — The canopy may be detached from its trucks and jettisoned by pulling the emergency release handle (1). The release mechanisms, (3) and (4), are safetied with shearable wire to prevent accidental operation, so it is necessary to pull the emergency handle with a positive motion to fully release the canopy.

9. MISCELLANEOUS EQUIPMENT.

a. SHOULDER HARNESS. — The shoulder harness straps are anchored to a cable which is paid out from a spring reel behind the head armor. A locking lever by the pilot's left elbow *(see figure 26)* controls this reel. To unlock the reel, push the knob rearward (to release the lever catch) and move the lever to the ***FREE*** position; this allows the harness cable to run in and out, controlled only by the spring tension of the reel. The pilot may lock the harness at any half inch position within its 18 inches of freedom, by moving the control lever to ***LOCK***.

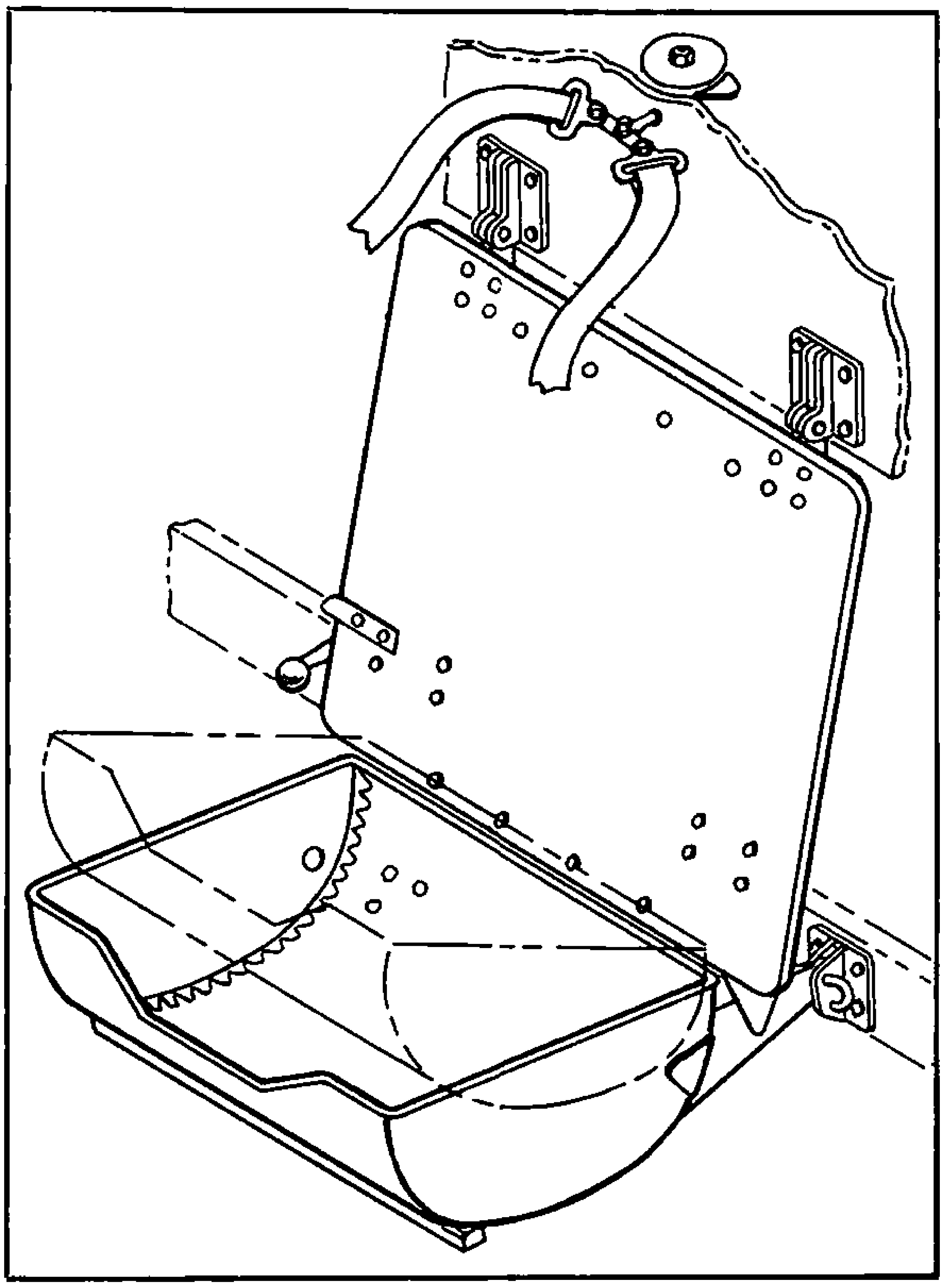


Figure 48 — Pilot's Seat

b. PILOT'S SEAT. *(See figure 48.)* — The pilot's seat serves as both seat and armor. The back plate is of three-eighths inch armor steel while the bucket is of the same material, one-quarter inch thick. The rear edge of the bucket is hinged to a transverse fuselage member; the forward edge swings up or down through an adjustment range of six inches. A spring-loaded lever on the seat back at the pilot's right elbow locks the seat or frees it for adjustment.

c. PILOT'S RELIEF TUBE. — The relief tube is mounted on the forward side of the control stick. The drain leads to an overboard fitting on the underside of the fuselage. This fitting is so designed that airflow over it assures the complete emptying of the drain tube.

d. MAP CASE. — A metal map case with a snap lid is fastened to the left-hand control shelf at the left of the pilot's seat. *(See 10, figure 3.)*

e. CHART BOARD. — A standard navy chart board is stowed in a floor socket at the right of the

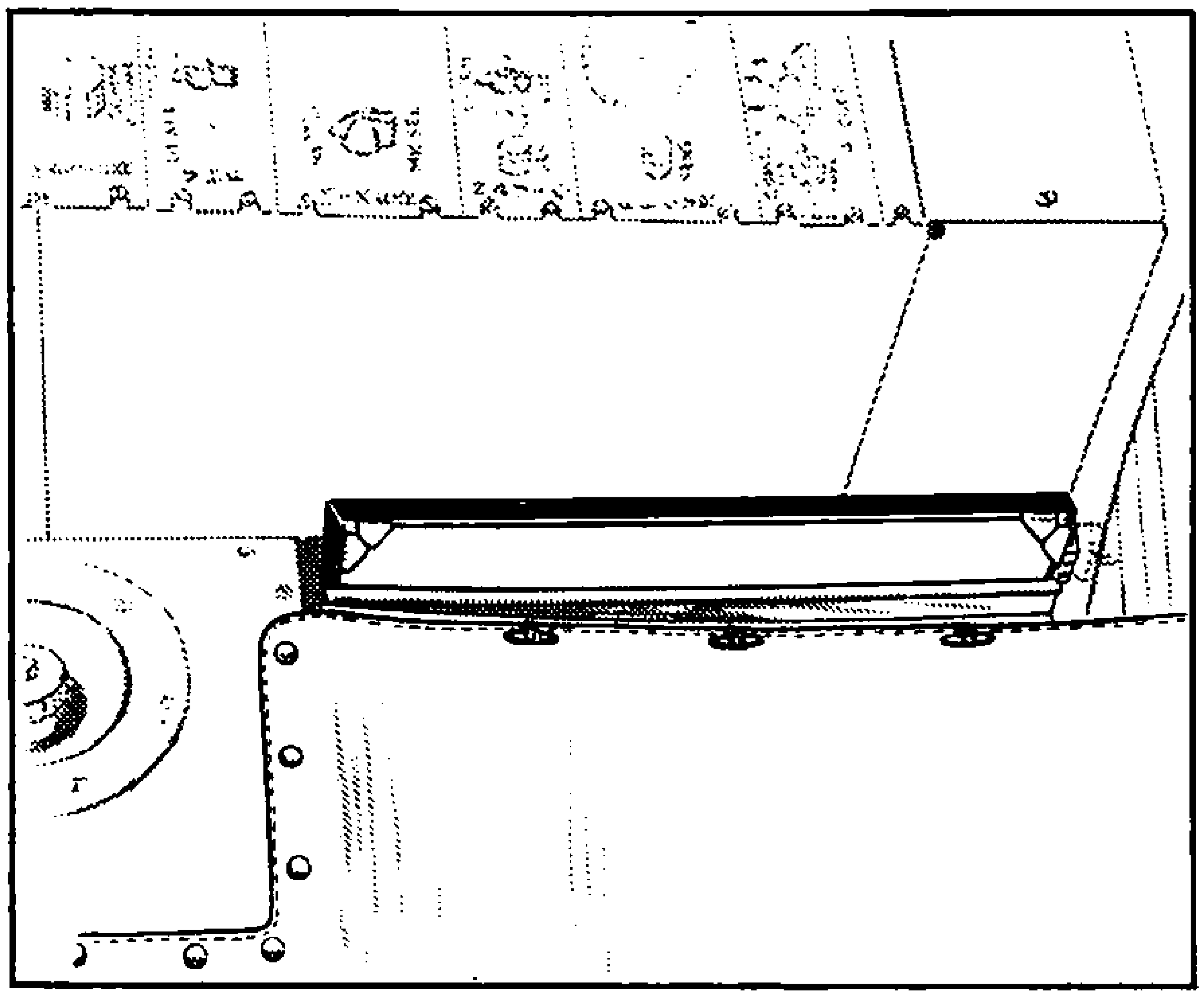


Figure 49 — Chartboard Stowed

pilot's seat. *(See figure 49.)* The chart board has a hinged cover under which there is space for instruments and file cards. To use the board, free the retaining catch, lift the board out of its stowage rack, and slip its legs into the sockets on the instrument panel. *(See figure 50.)* The mounting sockets have spring catches to hold the chart board securely while it is in use.

f. COCKPIT LOCKER. — A small utility locker is installed at the after end of the radio control shelf at the pilot's right. This is intended for stowage of personal effects, and miscellaneous small parts. Do not carry heavy objects in this box since they will be thrown against the friction-held lid when the plane is in inverted flight, and conceivably might fall out into the cockpit.

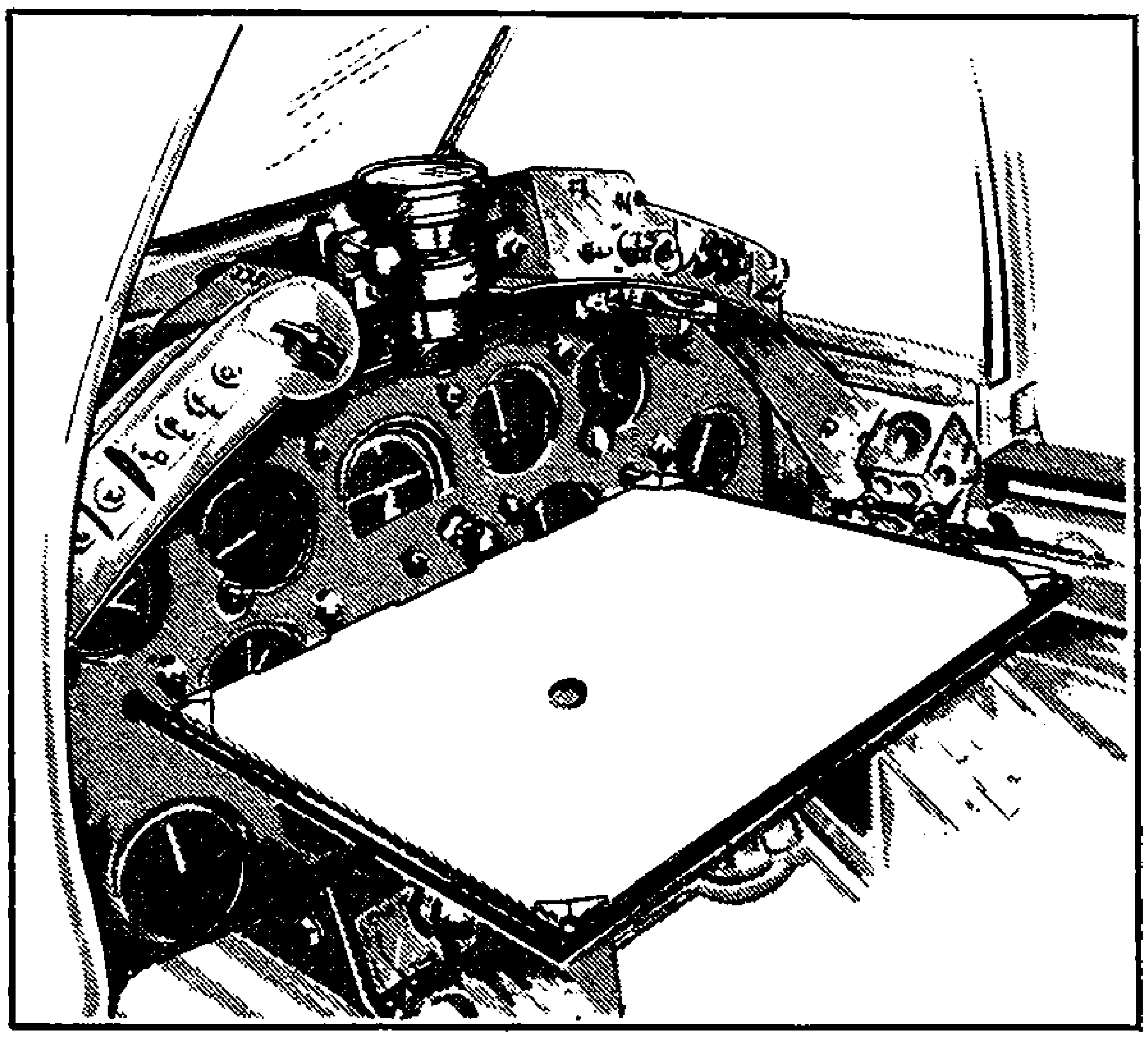


Figure 50 — Chartboard in Use

g. STOWAGE BAG. — Facilities for carrying heavier baggage are provided in the fuselage mid-section. A canvas case, approximately 17 inches wide by 12 inches deep by 28 inches high is slung on the left side of the radio compartment. This bag, accessible through the bottom mid section door *(see 9, figure 21)* will carry up to 100 pounds of equipment.

Note

The slide fasteners should be lock-wired together and the supporting straps well tightened after loading the bag.

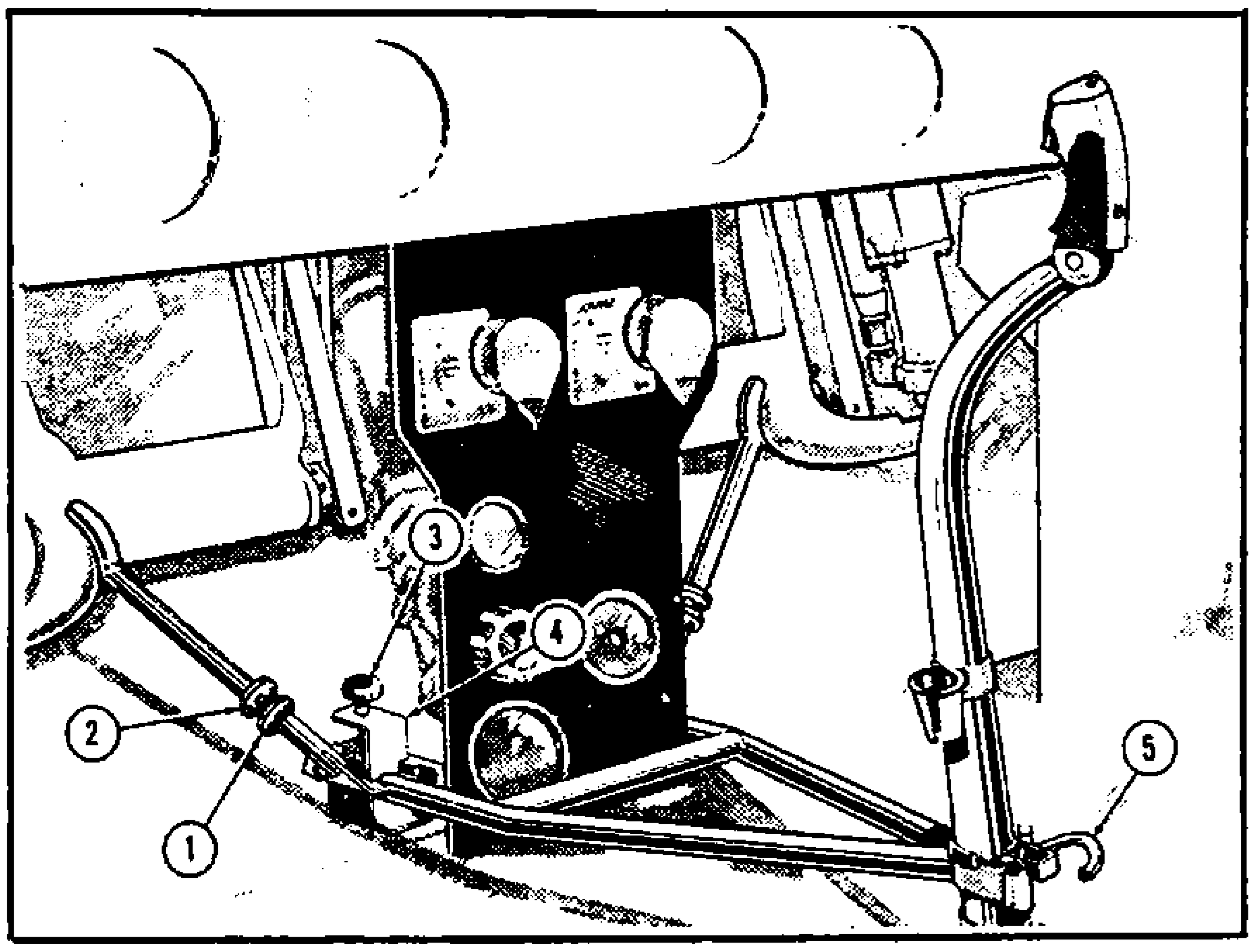


Figure 51 — Surface Control Lock

1 Adjusting Screw
2 Lock Nut
3 Engaging Pin
4 Mounting Lug
5 Control Stick Clamp

h. SURFACE CONTROL LOCK. — Whenever the plane is to be moored out, the elevators, rudder and ailerons should be fixed in position to avoid wind damage to these surfaces and their controls. The Y-shaped control lock shown in figure 51 serves this purpose by holding both the stick and the rudder pedals rigidly.

The lock is installed as follows:

(1) Pull the rudder pedals back to their after-most adjustment position.

(2) Slip the ears of the lock into the slots of the lugs at the base of the auxiliary instrument panel.

(3) Press the engaging pins (3) down to secure the lock.

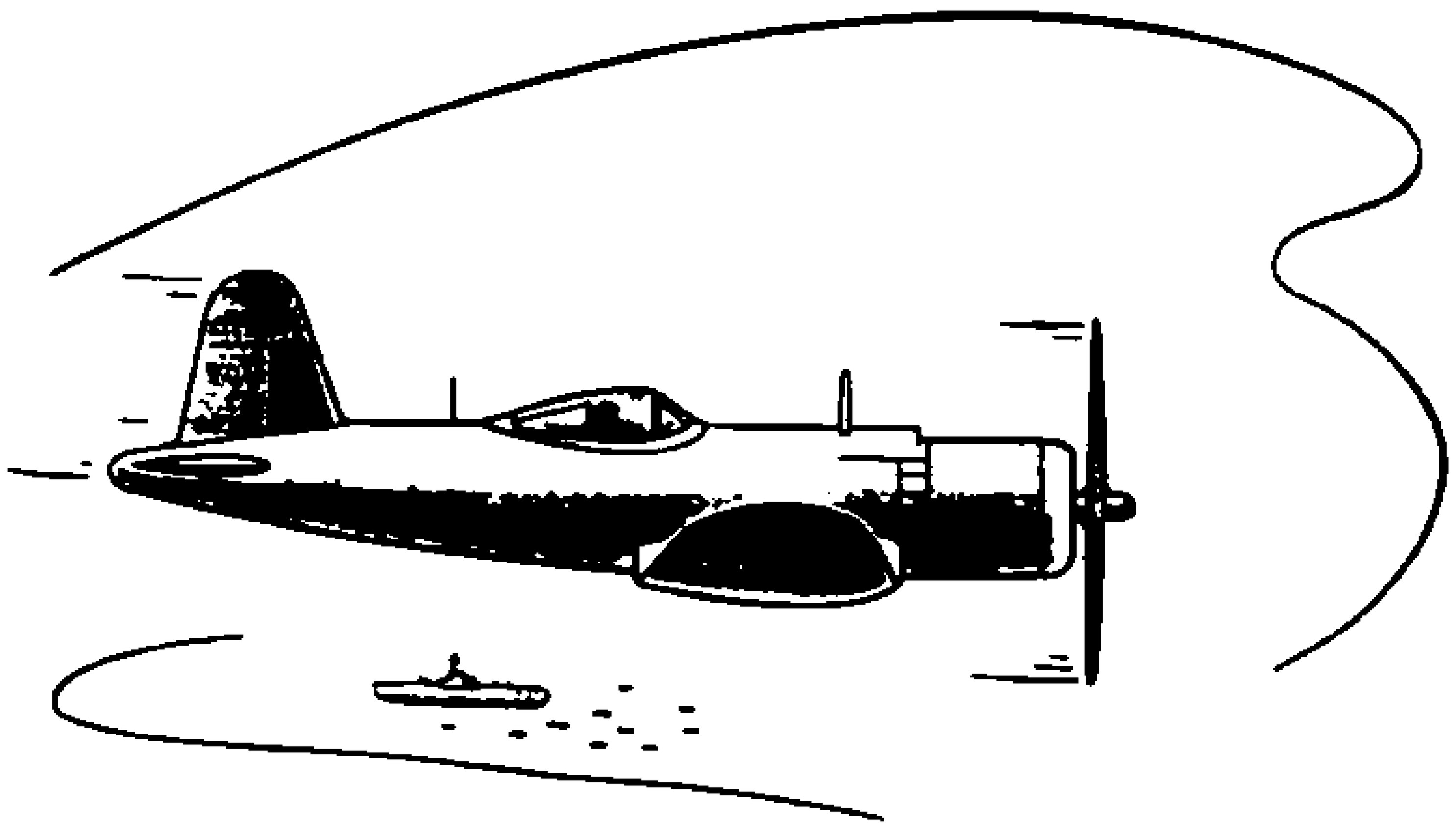
(4) Close the clamp at the after end of the lock (5).

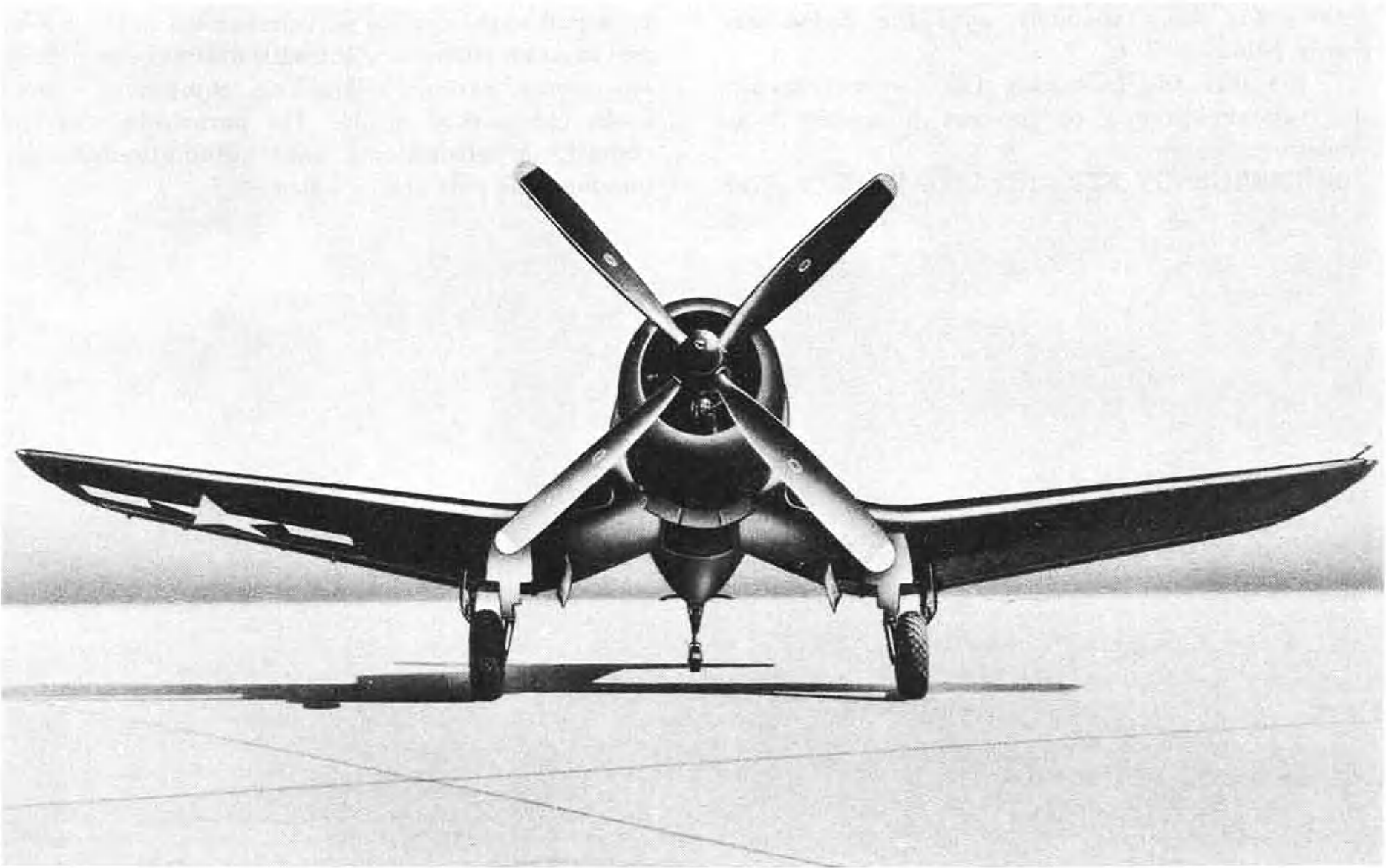
(5) Swing the rudder pedal stirrups into place and extend them by turning the knurled adjusting

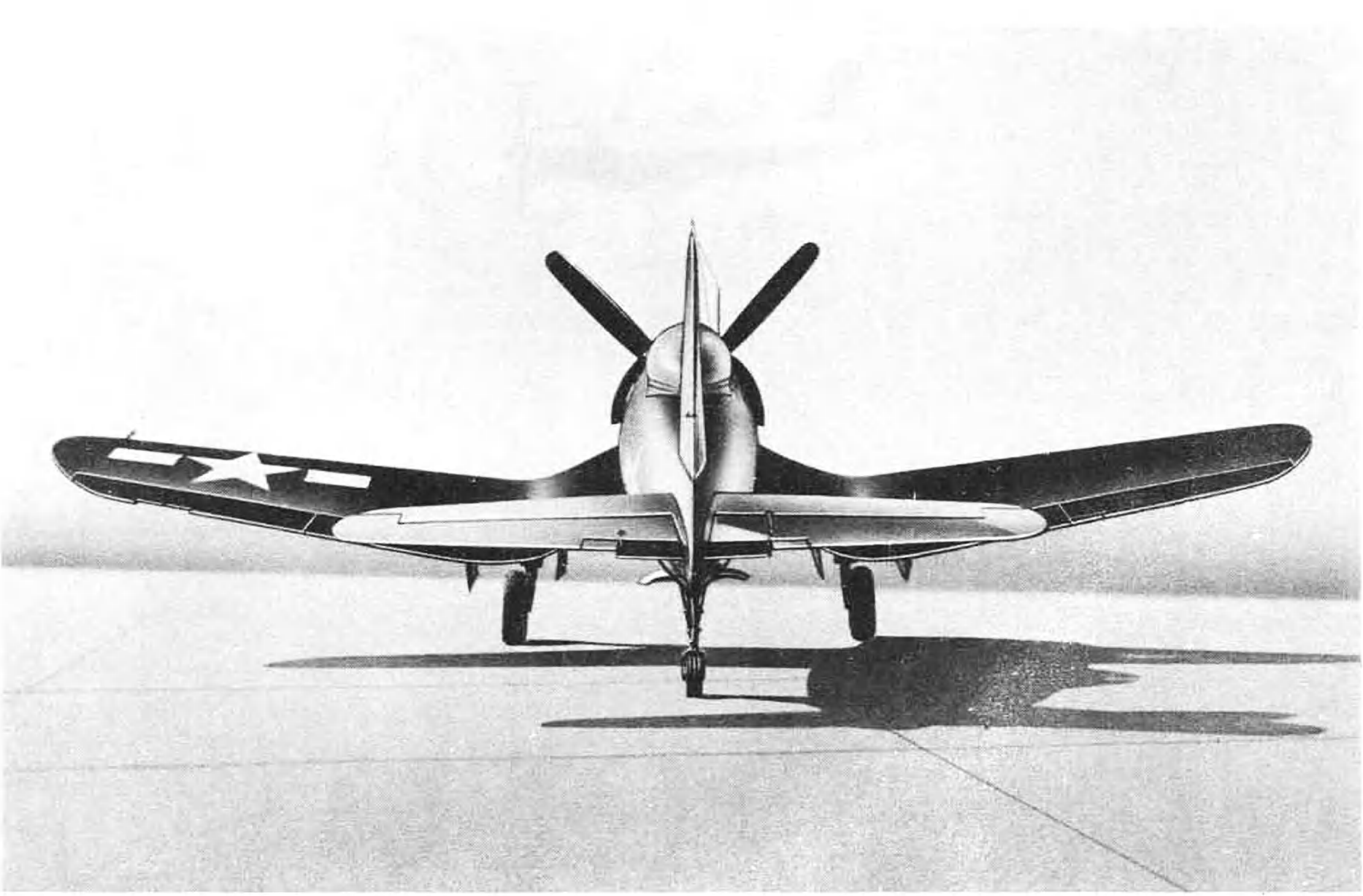
screws (1) simultaneously until the pedals are firmly held.

(6) Run the lock nuts (2) forward against the rudder stirrups to prevent loosening from vibration.

i. EMERGENCY KIT AND LIFE RAFT. — The back pad of the service parachute used in the F2G-1 serves as an emergency kit with first aid equipment, emergency rations, signalling equipment, small tools, etc. packed inside. The parachute seat pad contains a self-inflating (not automatic-inflating) one-man life raft and accessories.







APPENDIX I

CONTENTS

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.

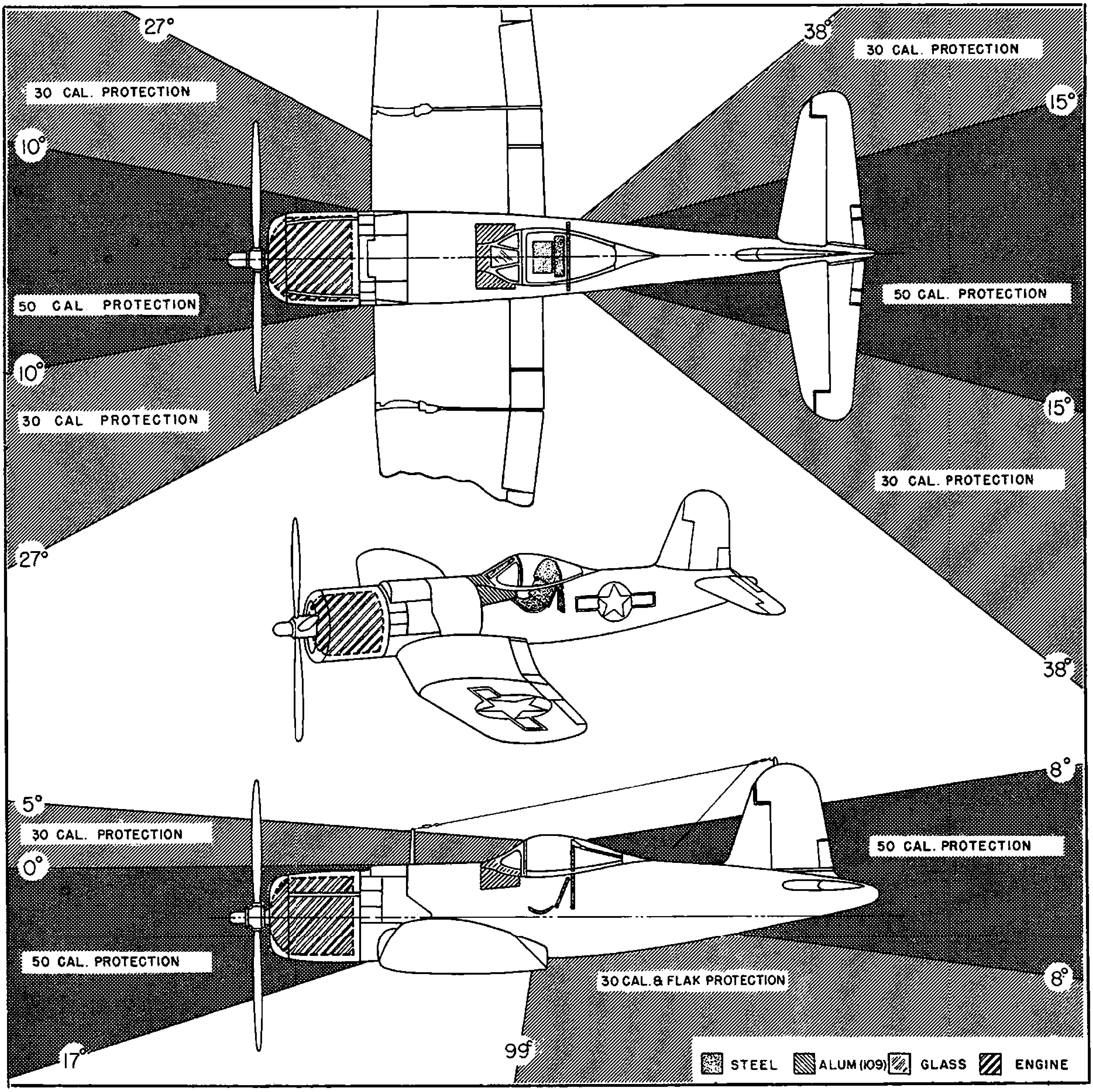


Figure 52 — Protection Against Gunfire

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.

AIRCRAFT MODEL(S): F2G-1, F2G-2

TAKE-OFF, CLIMB & LANDING CHART

ENGINE MODEL(S): R-4360-4

TAKE-OFF DISTANCE FEET

HARD SURFACE RUNWAY

GROSS WEIGHT LB.	HEAD WIND M.P.H.	HEAD WIND KTS.	AT SEA LEVEL GROUND RUN	AT SEA LEVEL TO CLEAR 50' OBJ.	AT 3000 FEET GROUND RUN	AT 3000 FEET TO CLEAR 50' OBJ.	AT 6000 FEET GROUND RUN	AT 6000 FEET TO CLEAR 50' OBJ.
12800	0	0	620	980	780	1220	1000	1570
	17	15	400	650	520	620	670	1050
	34	30	230	410	310	530	420	700
	51	45	110	250	160	330	230	440
13800	0	0	750	1170	920	1420	1120	1770
	17	15	490	790	610	910	770	1210
	34	30	290	500	370	630	480	790
	51	45	150	310	200	390	270	500
15400	0	0	960	1490	1220	1880	1550	2430
	17	15	640	1010	830	1390	1070	1750
	34	30	390	660	530	920	700	1120
	51	45	210	400	300	540	420	720

SOD-TURF RUNWAY

GROSS WEIGHT LB.	HEAD WIND M.P.H.	HEAD WIND KTS.	AT SEA LEVEL GROUND RUN	AT SEA LEVEL TO CLEAR 50' OBJ.	AT 3000 FEET GROUND RUN	AT 3000 FEET TO CLEAR 50' OBJ.	AT 6000 FEET GROUND RUN	AT 6000 FEET TO CLEAR 50' OBJ.
12800	0	0	660	1020	840	1280	1070	1640
	17	15	420	680	550	860	720	1410
	34	30	240	420	330	550	450	730
	51	45	120	250	170	330	250	450
13800	0	0	800	1220	990	1490	1200	1840
	17	15	520	820	650	1000	820	1270
	34	30	310	520	400	660	510	830
	51	45	160	320	210	400	290	510
15400	0	0	1040	1560	1330	1990	1690	2560
	17	15	690	1060	900	1450	1170	1770
	34	30	420	690	580	960	760	1180
	51	45	220	110	330	570	460	750

SOFT SURFACE RUNWAY

GROSS WEIGHT LB.	HEAD WIND M.P.H.	HEAD WIND KTS.	AT SEA LEVEL GROUND RUN	AT SEA LEVEL TO CLEAR 50' OBJ.	AT 3000 FEET GROUND RUN	AT 3000 FEET TO CLEAR 50' OBJ.	AT 6000 FEET GROUND RUN	AT 6000 FEET TO CLEAR 50' OBJ.
12800	0	0	760	1120	980	1420	1290	1860
	17	15	480	740	640	950	850	1250
	34	30	270	450	380	600	530	810
	51	45	130	270	200	360	290	490
13800	0	0	940	1360	1180	1680	1460	2100
	17	15	600	902	770	1120	990	1430
	34	30	350	570	470	720	620	930
	51	45	170	330	250	470	340	570
15400	0	0	1270	1790	1650	2210	2170	3050
	17	15	810	1180	1100	1650	1460	2060
	34	30	490	750	690	1080	930	1350
	51	45	260	450	390	630	550	850

NOTE: INCREASE CHART DISTANCES AS FOLLOWS: 75°F + 10%; 100°F + 20%; 125°F + 30%; 150°F + 40%

OPTIMUM TAKE-OFF WITH 2700 RPM, 52 IN.HG. & 50 DEG.FLAP IS 80% OF CHART VALUES

DATA AS OF 6-26-45 BASED ON: Calculations

CLIMB DATA

GROSS WEIGHT LB.	AT SEA LEVEL BEST I.A.S. MPH	AT SEA LEVEL BEST I.A.S. KTS	AT SEA LEVEL RATE OF CLIMB F.P.M.	AT SEA LEVEL GAL. OF FUEL USED	AT 5000 FEET BEST I.A.S. MPH	AT 5000 FEET BEST I.A.S. KTS	AT 5000 FEET RATE OF CLIMB F.P.M.	AT 5000 FEET FROM SEA LEVEL TIME MIN.	AT 5000 FEET FROM SEA LEVEL FUEL USED	AT 10,000 FEET BEST I.A.S. MPH	AT 10,000 FEET BEST I.A.S. KTS	AT 10,000 FEET RATE OF CLIMB F.P.M.	AT 10,000 FEET FROM SEA LEVEL TIME MIN.	AT 10,000 FEET FROM SEA LEVEL FUEL USED
12800	190	165	4020	50	185	161	3900	1	57	180	156	3480	3	63
13800	190	165	3630	50	185	161	3530	1	57	180	156	3120	3	64
15400	190	165	3040	50	185	161	2920	2	59	180	156	2540	4	67

GROSS WEIGHT LB.	AT 15,000 FEET BEST I.A.S. MPH	AT 15,000 FEET BEST I.A.S. KTS	AT 15,000 FEET RATE OF CLIMB F.P.M.	AT 15,000 FEET FROM SEA LEVEL TIME MIN.	AT 15,000 FEET FROM SEA LEVEL FUEL USED	AT 20,000 FEET BEST I.A.S. MPH	AT 20,000 FEET BEST I.A.S. KTS	AT 20,000 FEET RATE OF CLIMB F.P.M.	AT 20,000 FEET FROM SEA LEVEL TIME MIN.	AT 20,000 FEET FROM SEA LEVEL FUEL USED	AT 30,000 FEET BEST I.A.S. MPH	AT 30,000 FEET BEST I.A.S. KTS	AT 30,000 FEET RATE OF CLIMB F.P.M.	AT 30,000 FEET FROM SEA LEVEL TIME MIN.	AT 30,000 FEET FROM SEA LEVEL FUEL USED
12800	175	152	3080	4	70	170	148	2230	6	77	150	130	843	13	96
13800	175	152	2740	5	72	170	148	1965	7	80	145	126	625	14	102
15400	175	152	2210	6	77	170	148	1470	8	87	145	126	210	20	122

POWER PLANT SETTINGS: (DETAILS ON FIG. 30 SECTION III):

DATA AS OF 6-26-45 BASED ON: Calculations

FUEL USED (U.S.GAL.) INCLUDES WARM-UP & TAKE-OFF ALLOWANCE

LANDING DISTANCE FEET

GROSS WEIGHT LB.	BEST IAS APPROACH POWER OFF MPH	POWER OFF KTS	POWER ON MPH	POWER ON KTS	HARD DRY SURFACE AT SEA LEVEL GROUND ROLL	AT SEA LEVEL TO CLEAR 50' OBJ.	AT 3000 FEET GROUND ROLL	AT 3000 FEET TO CLEAR 50' OBJ.	AT 6000 FEET GROUND ROLL	AT 6000 FEET TO CLEAR 50' OBJ.
11200	110	95	100	85	1310	2430	1440	2560	1570	2690
12200	115	100	110	95	1400	2640	1530	2770	1680	2920

GROSS WEIGHT LB.	FIRM DRY SOD AT SEA LEVEL GROUND ROLL	AT SEA LEVEL TO CLEAR 50' OBJ.	AT 3000 FEET GROUND ROLL	AT 3000 FEET TO CLEAR 50' OBJ.	AT 6000 FEET GROUND ROLL	AT 6000 FEET TO CLEAR 50' OBJ.	WET OR SLIPPERY AT SEA LEVEL GROUND ROLL	AT SEA LEVEL TO CLEAR 50' OBJ.	AT 3000 FEET GROUND ROLL	AT 3000 FEET TO CLEAR 50' OBJ.	AT 6000 FEET GROUND ROLL	AT 6000 FEET TO CLEAR 50' OBJ.
11200	1460	2580	1590	2710	1740	2860	2280	3400	2490	3610	2730	3850
12200	1570	2810	1710	2950	1870	3110	3520	4760	3850	5090	4210	5450

DATA AS OF BASED ON:

OPTIMUM LANDING IS 80% OF CHART VALUES

REMARKS: Take-Off and Climb Data Include the Effect of Drag Increment of Two 1000 lb. Bombs or two 160 U.S. Gal. (133 Imp. Gal.) Drop Tanks in the 15,400 lb. condition.

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

LEGEND

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

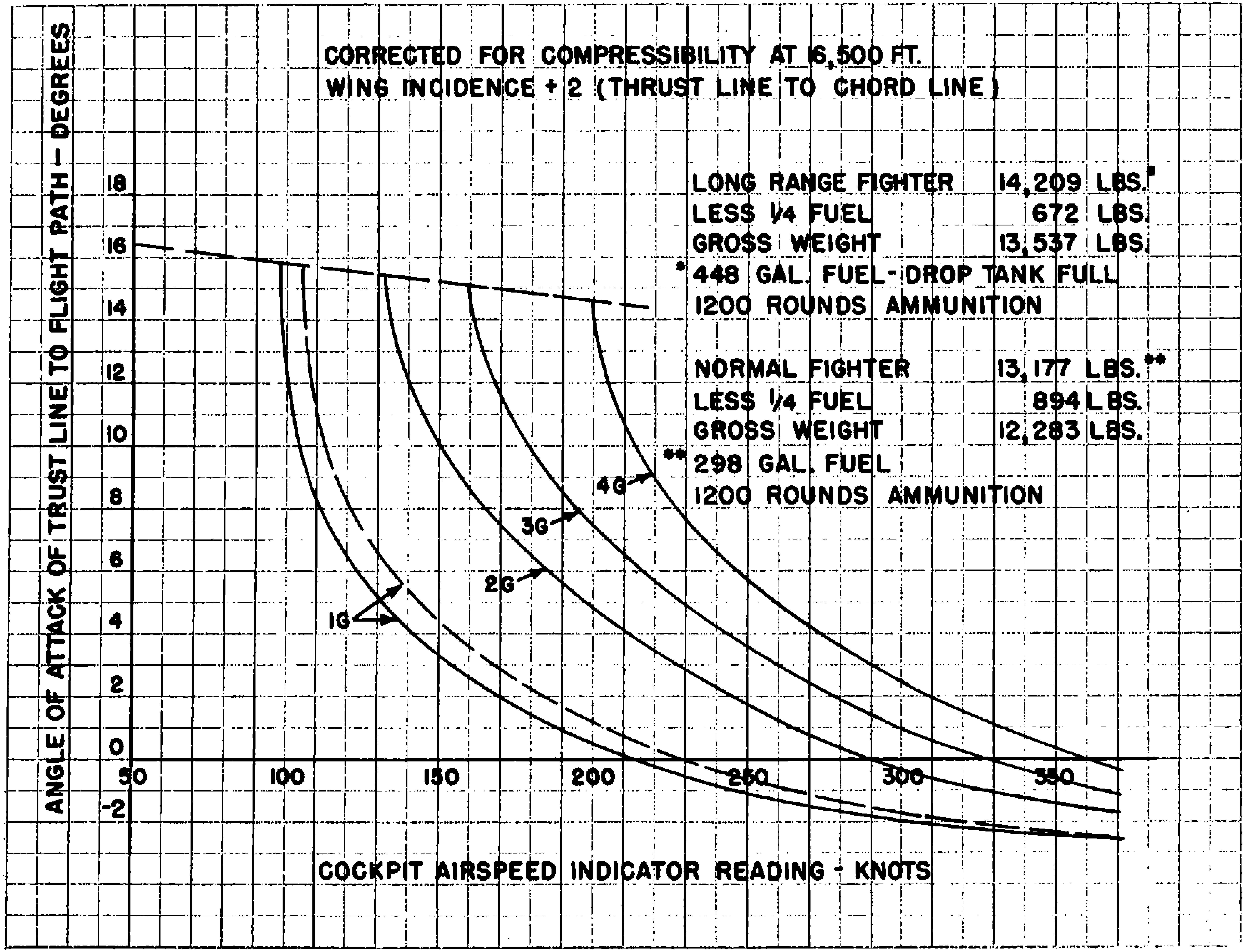


Figure 54 — Relation of Angle of Attack to Airspeed

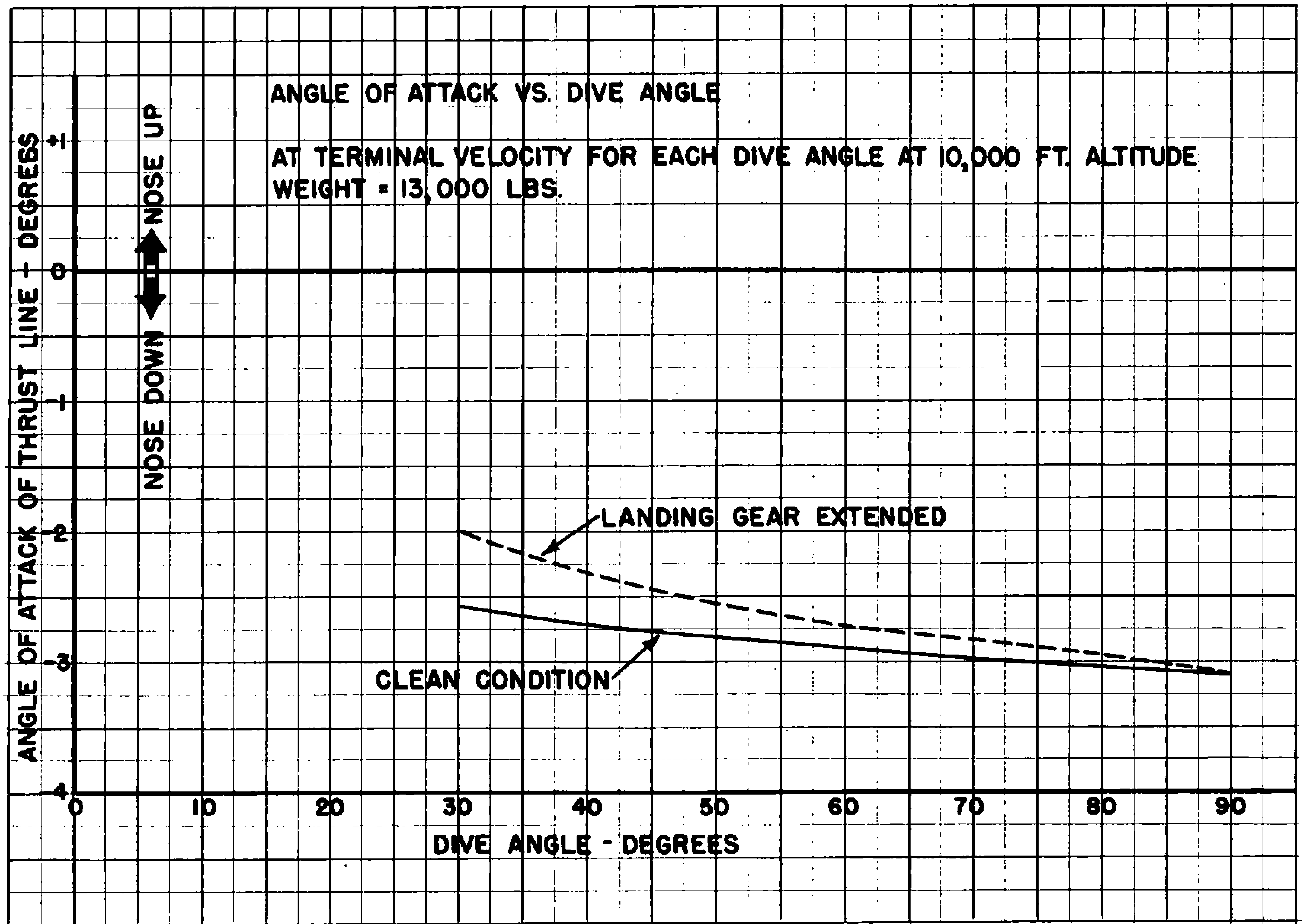


Figure 55 — Relation of Angle of Attack to Dive Angle

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