30 SEPTEMBER 1946

PRELIMINARY PILOT'S HANDBOOK

CHANCE VOUGHT XF5U-1 AIRPLANE

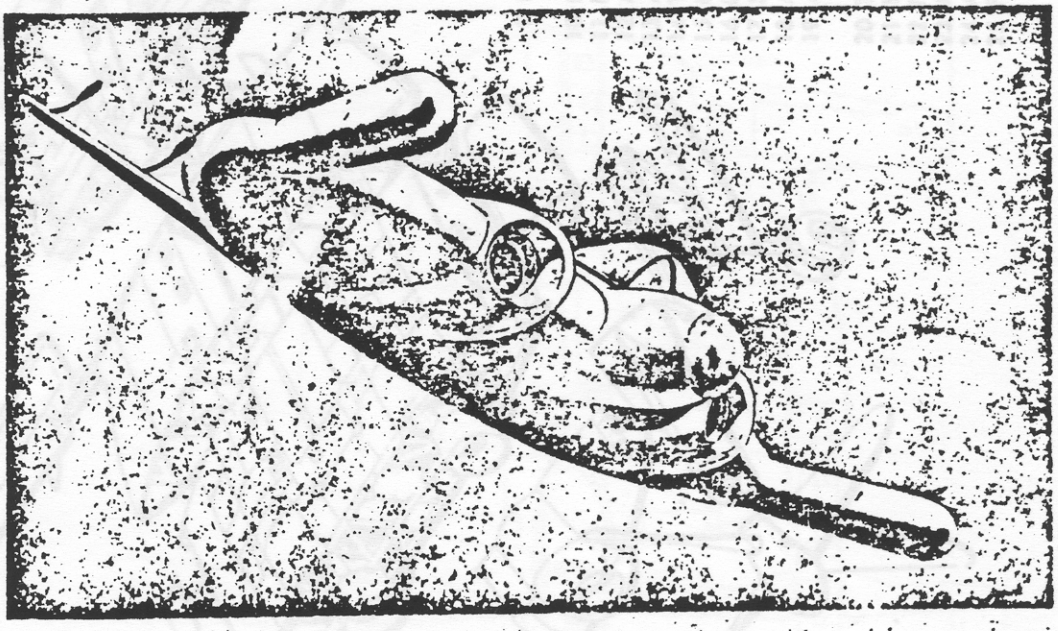
CHANCE VOUGHT AIRCRAFT
DIVISION OF
UNITED AIRCRAFT CORP.
STRATFORD, CONN

CONFIDENTIAL

30 SEPTEMBER 1946

PRELIMINARY

PILOT'S HANDBOOK



NAVY MODEL

XF5U-1

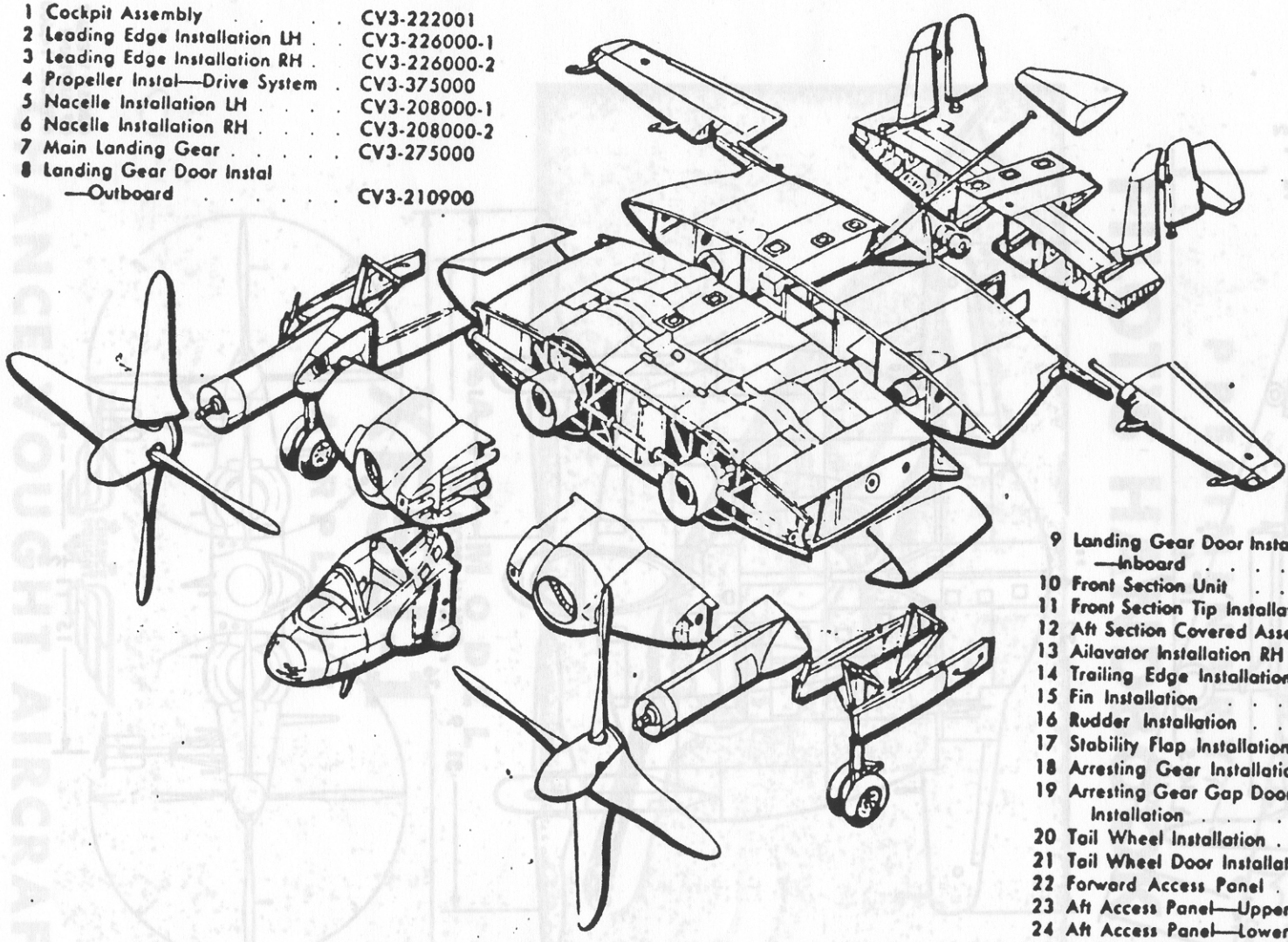
AIRPLANE

CHANCE VOUGHT

CHANCE VOUGHT AIRCRAFT

DIVISION OF UNITED AIRCRAFT • STRATFORD, CONN.

EXPLODED VIEW



1	Cockpit Assembly	CV3-222001
2	Leading Edge Installation LH	CV3-226000-1
3	Leading Edge Installation RH	CV3-226000-2
4	Propeller Instal—Drive System	CV3-375000
5	Nacelle Installation LH	CV3-208000-1
6	Nacelle Installation RH	CV3-208000-2
7	Main Landing Gear	CV3-275000
8	Landing Gear Door Instal —Outboard	CV3-210900
9	Landing Gear Door Instal —Inboard	CV3-210950
10	Front Section Unit	CV3-201001
11	Front Section Tip Installation	CV3-207000
12	Aft Section Covered Assembly	CV3-232001
13	Ailavator Installation RH	CV3-109001-2
14	Trailing Edge Installation	CV3-236000
15	Fin Installation	CV3-105001
16	Rudder Installation	CV3-107001
17	Stability Flap Installation	CV3-238001
18	Arresting Gear Installation	CV3-420000
19	Arresting Gear Gap Door Installation	CV3-235170
20	Tail Wheel Installation	CV3-276000
21	Tail Wheel Door Installation	CV3-239100
22	Forward Access Panel	CV3-208900
23	Aft Access Panel—Upper	CV3-208550
24	Aft Access Panel—Lower	CV3-208570
25	Forward Fairing Installation	CV3-208250

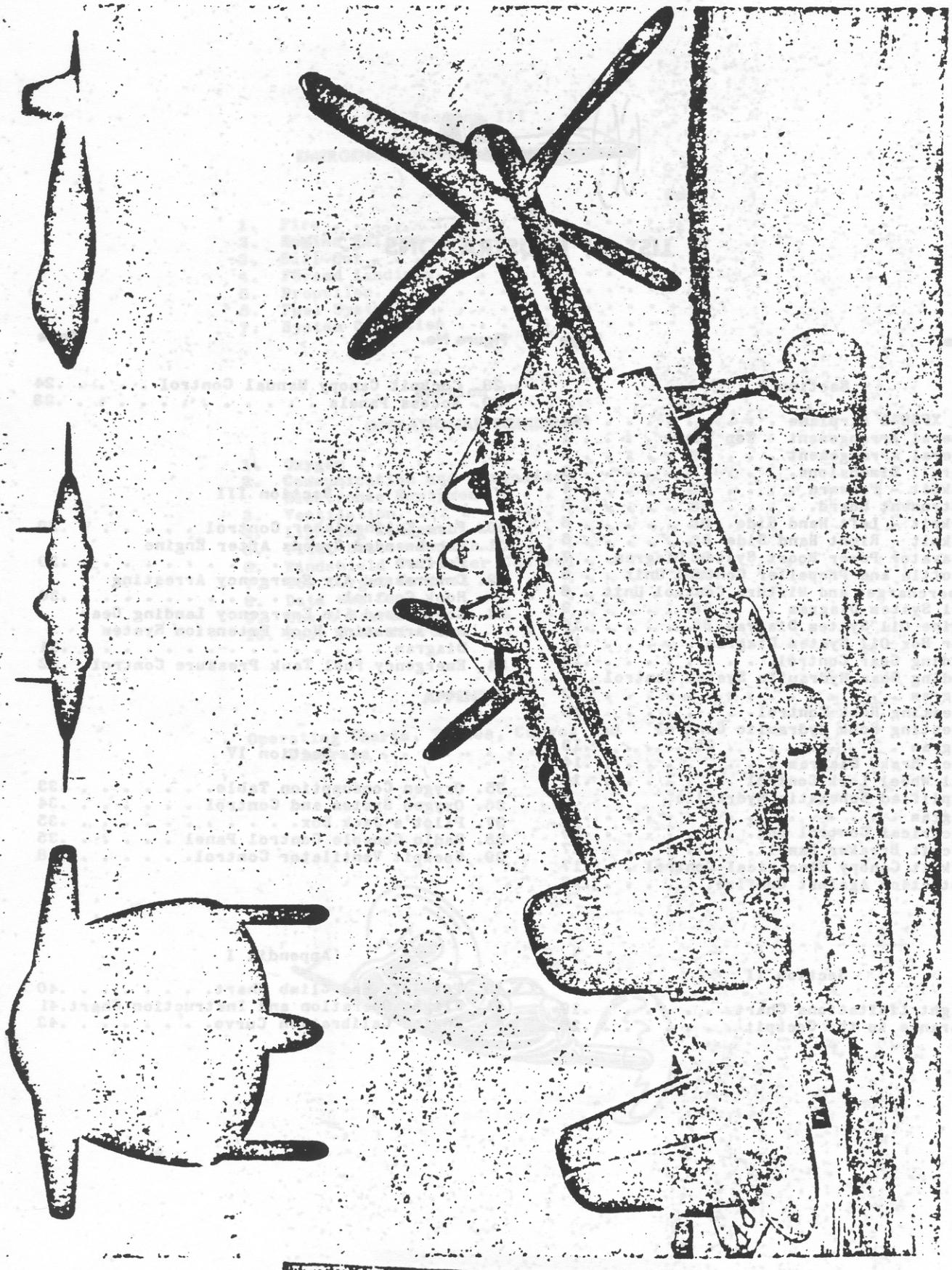
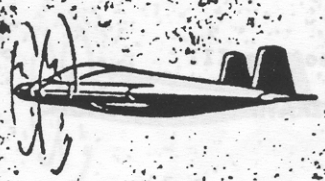


Figure 1— The XF5U-1 Airplane



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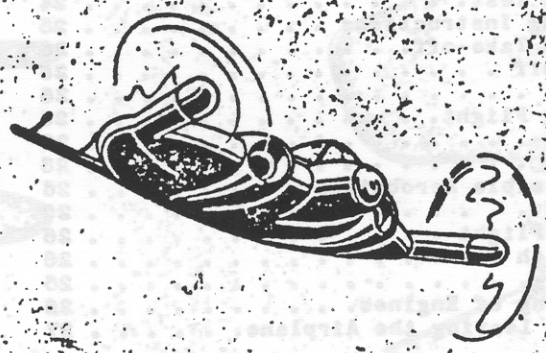
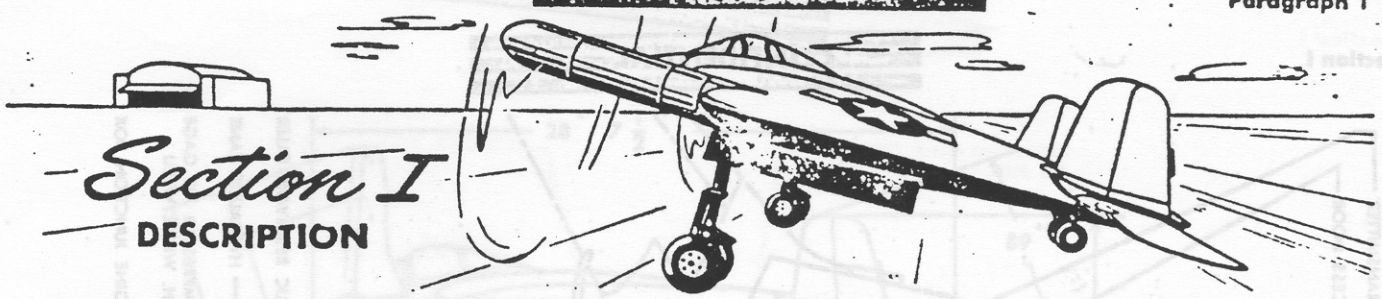


LIST OF ILLUSTRATIONS



Section I
DESCRIPTION

1. THE AIRPLANE.

1. The XF5U-1 is a twin-engine, single-seat, low aspect ratio flying wing type of airplane, manufactured by the Chance Vought Division, United Aircraft Corporation, Stratford, Connecticut. Designed as a fighter, land-based, or carrier-based to be used with or without a catapult and with an arresting gear, the airplane incorporates certain unusual design and structural features.

The wing, the basic outline of which is defined by two ellipses, so arranged that the major axis of one coincides with the minor of the other, comprises the main structure of the airplane, with the exception of the pilot's cockpit and the horizontal and vertical tail surfaces. The greater part of the wing surfaces and internal structure is composed of Metalite, a "sandwich" material providing a particularly strong and light type of construction.

The four-bladed propellers, rotating in opposite directions with inboard blades moving upward, are carried on nacelles located near the wing tips outboard of the two engines and are driven simultaneously by means of a single drive shaft extending through the pilot's cockpit. Circular air intake sections in the leading edge provide carburetor, engine and oil cooling air. Two vertical tails with rudders and fins provide directional control. Two Metalite ailavators, with trim tabs for over 70% of their trailing edge and with balance weights on the portion beyond the wing tips, provide lateral and longitudinal control. The pilot's cockpit is a complete monocoque shell with a formed plexiglas canopy. No provision is made for carrying armament in this airplane. Refer to figure 4 for overall dimensions.

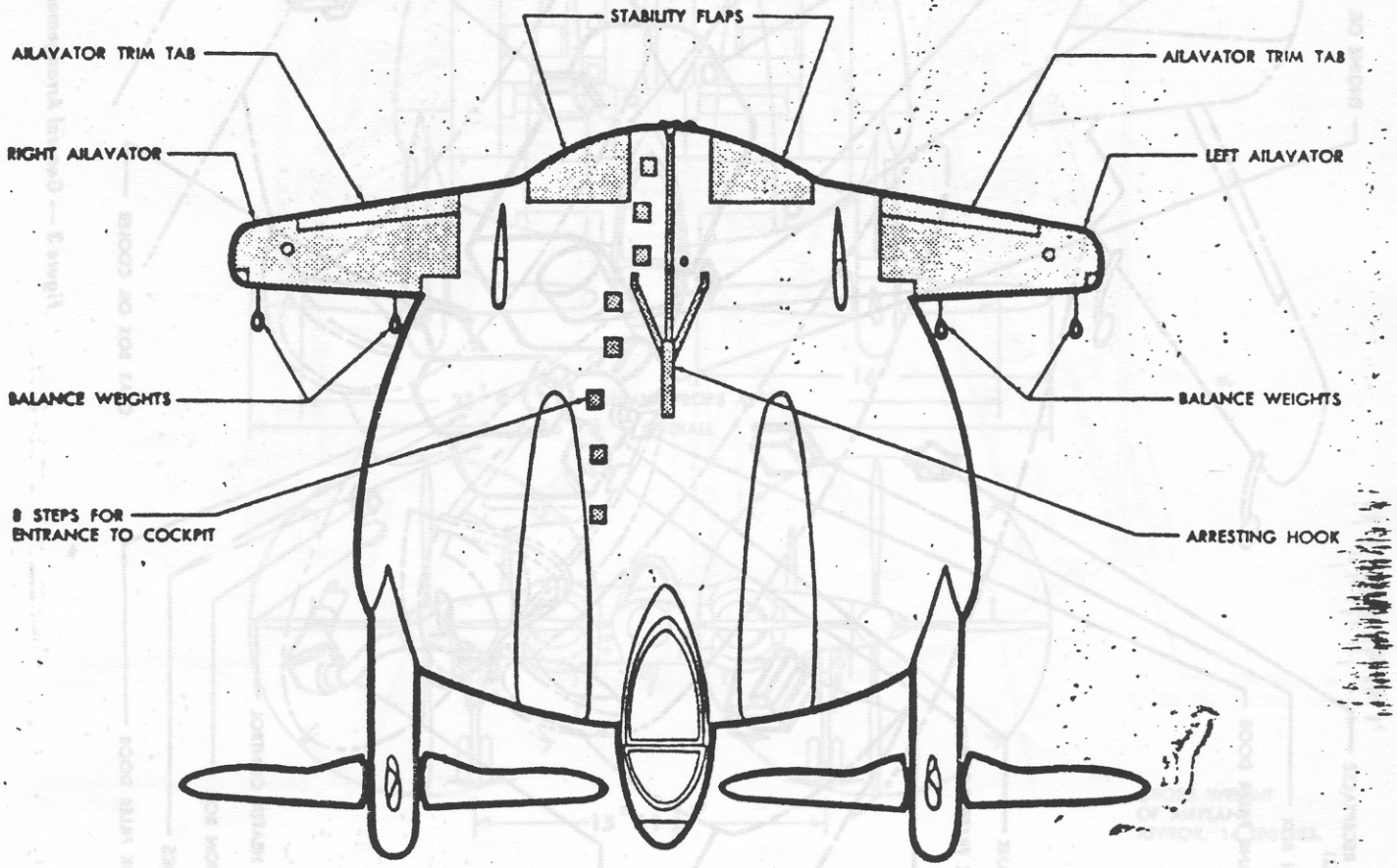


Figure 2 — General Arrangement — Top View

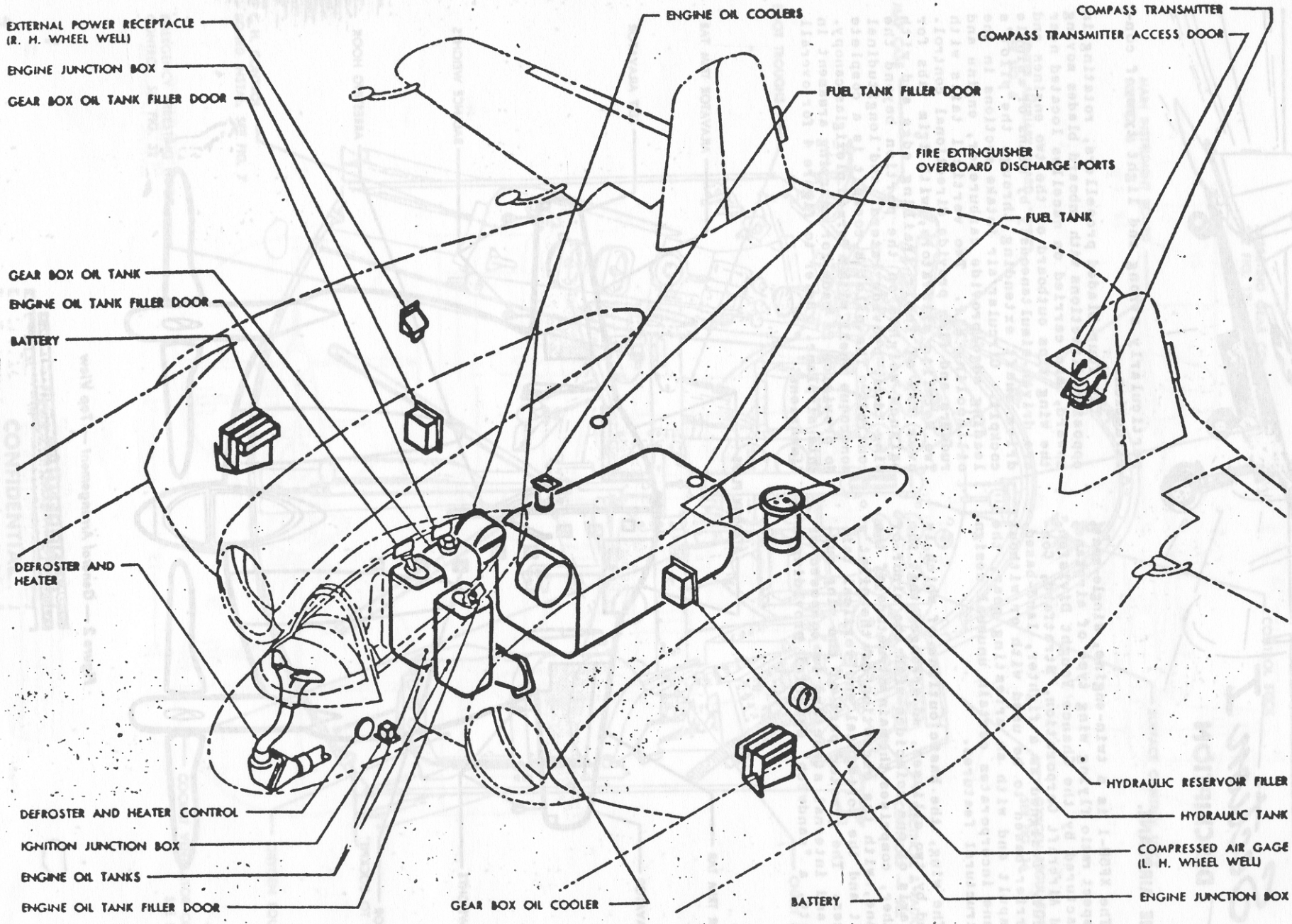
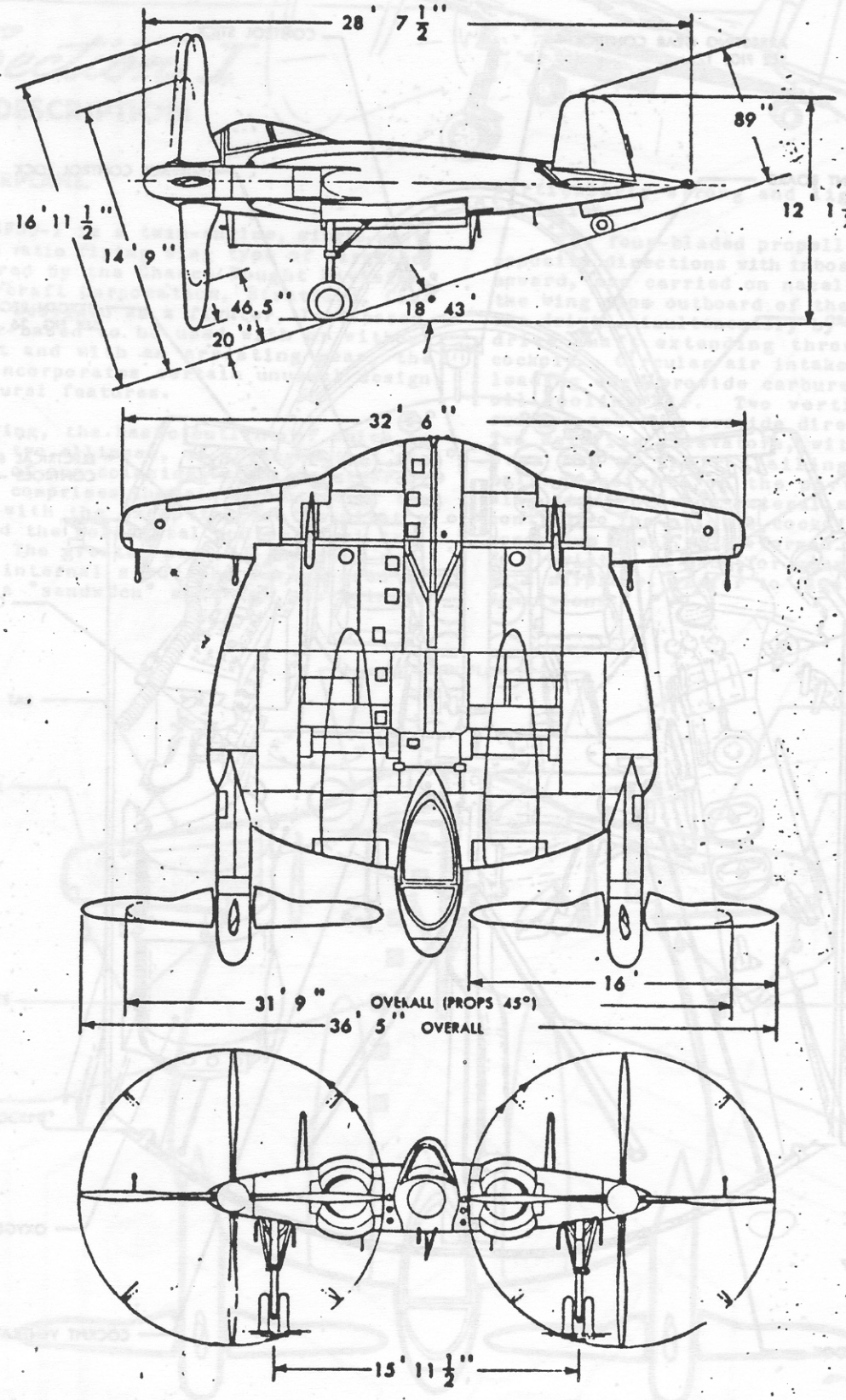


Figure 3 — General Arrangement



GROSS WEIGHT
OF AIRPLANE
APPROX. 14,500 LBS.

Figure 4 — Overall Dimensions

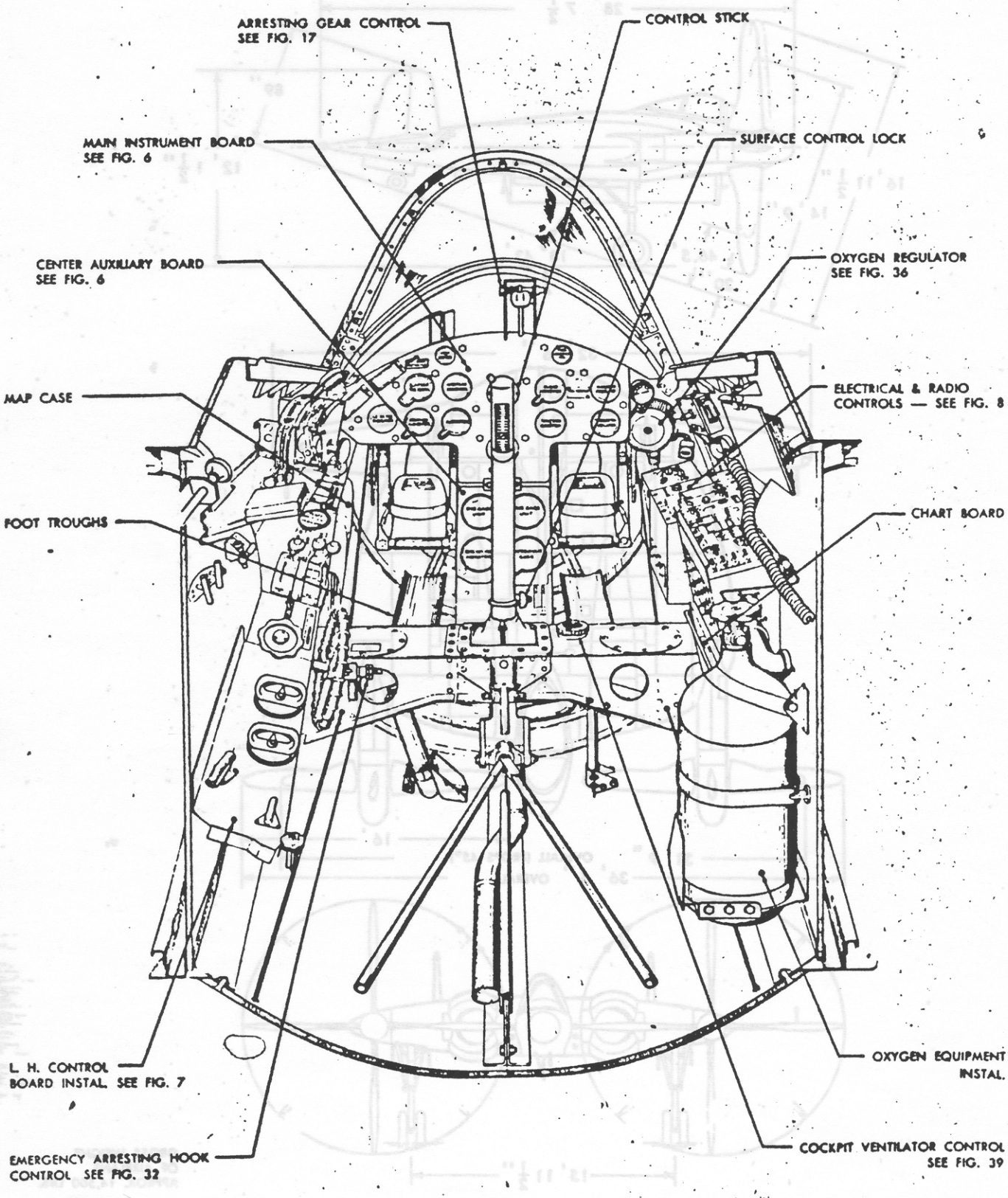


Figure 5 — Cockpit — Forward

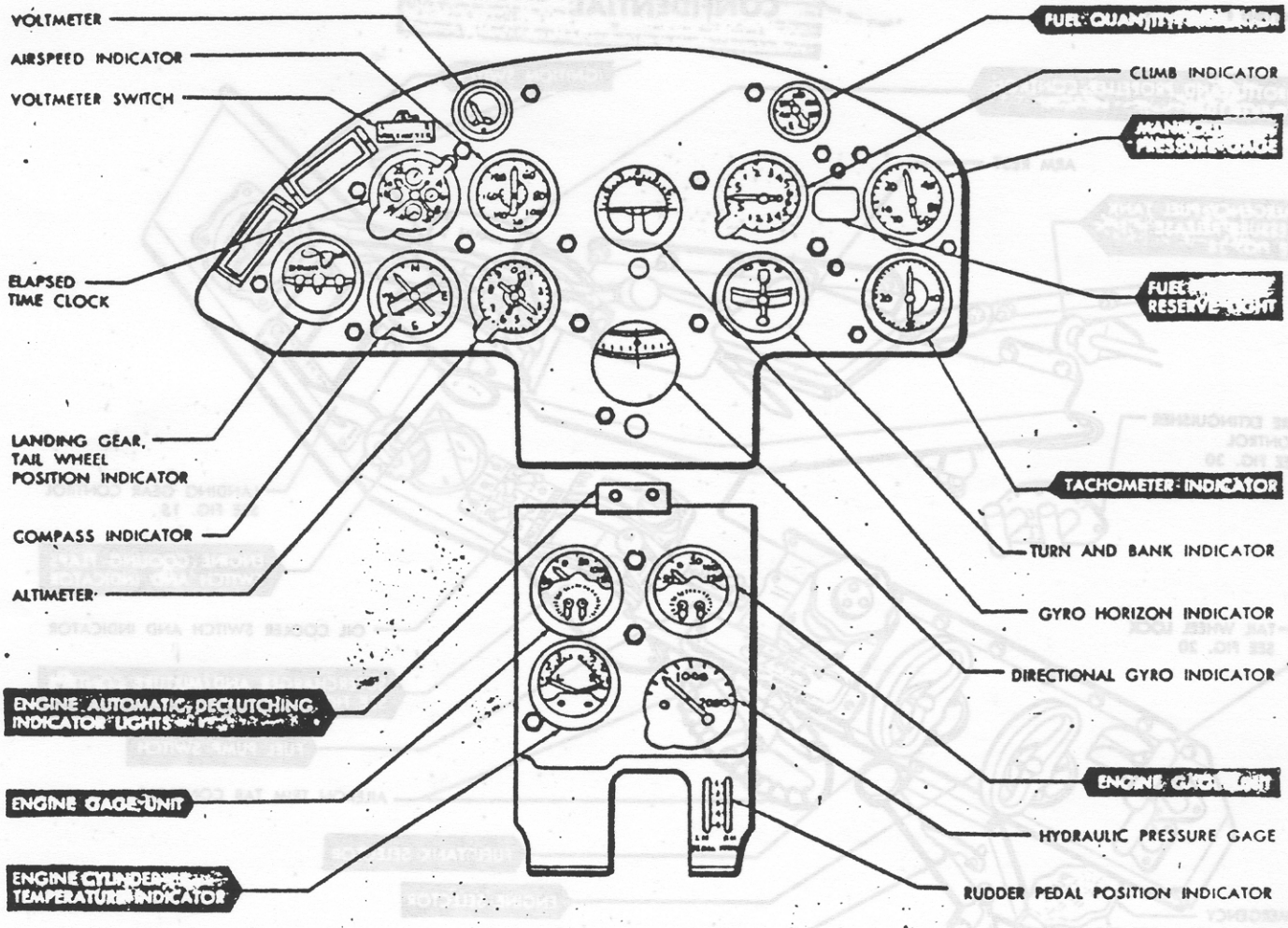


Figure 6 — Instrument Board

2. FLIGHT CONTROLS.

a. GENERAL. - The flight controls of the XF5U-1 consist of two rudders on the outboard trailing edge of the wing, ailavators, and ailavator trim tabs extending horizontally out from the trailing edge of the wing. (See figure 2.) Stability flaps, located symmetrically about the centerline of the trailing edge of the airplane, provide automatic change in trim resulting from attitude change. Although the flight controls are different in form and location from those on conventional airplanes, they are basically the same in operation.

b. RUDDER CONTROL. - The two wood and plywood rudders are controlled conventionally by foot pedals and cables.

c. RUDDER TRIM TAB CONTROL. - Rudder trim tabs must be adjusted on the ground as they cannot be controlled in flight.

d. STABILITY FLAPS. - Stability flaps, located symmetrically about the centerline of the airplane at the trailing edge require no pilot control but automatically provide for change in airplane trim with change in attitude. (See figure 2.) The air loads upon the flaps adjust deflection against a spring-loaded strut. The stability flaps are linked to the tail wheel to insure locking in an "up" position when the tail wheel is extended.

e. SURFACE CONTROL LOCKS. - Locking provision for the rudder and ailavator control systems is located at the base of the stick. (See figure 5.)

f. AILAVATOR CONTROLS. - The Metalite ailavators, located at the outboard trailing edge of the wing and extending outboard from the wing, are controlled by the stick, combining the characteristics of the conventional ailerons and elevators. (See figure 2.) The ailavators are moved together to provide "elevator" control and differentially to provide "aileron" control. A hydraulic power boost system lightens excessive stick loads developed during maneuvers. (See figure 9.) Balance weights on booms extending from the inboard and outboard leading edge of the ailavators insure full static balance.

g. AILAVATOR TRIM TAB CONTROL. - A sheet metal trim tab, extending over 70% of the trailing edge of the ailavator provides lat-

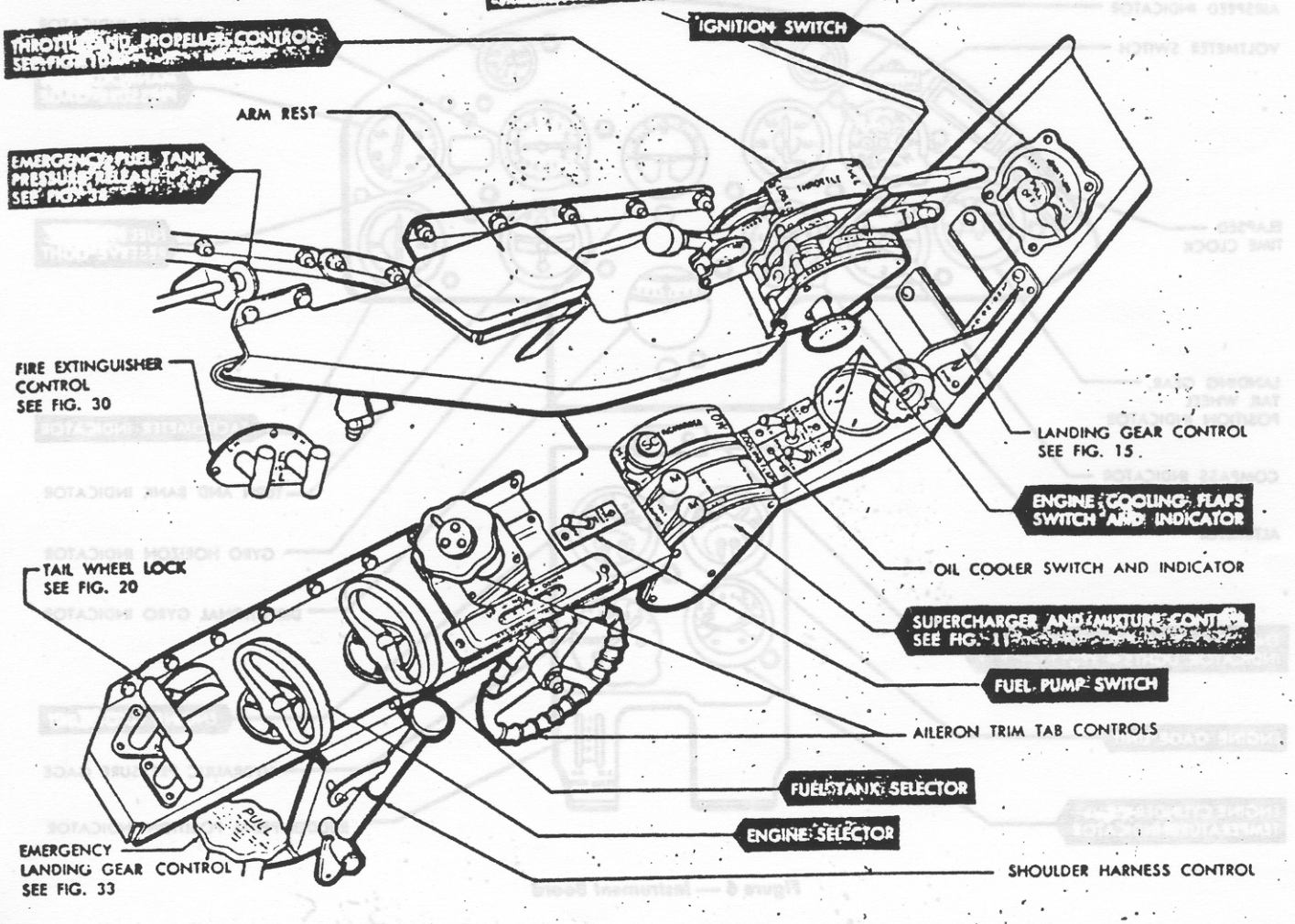


Figure 7 — Cockpit — Left Hand Side

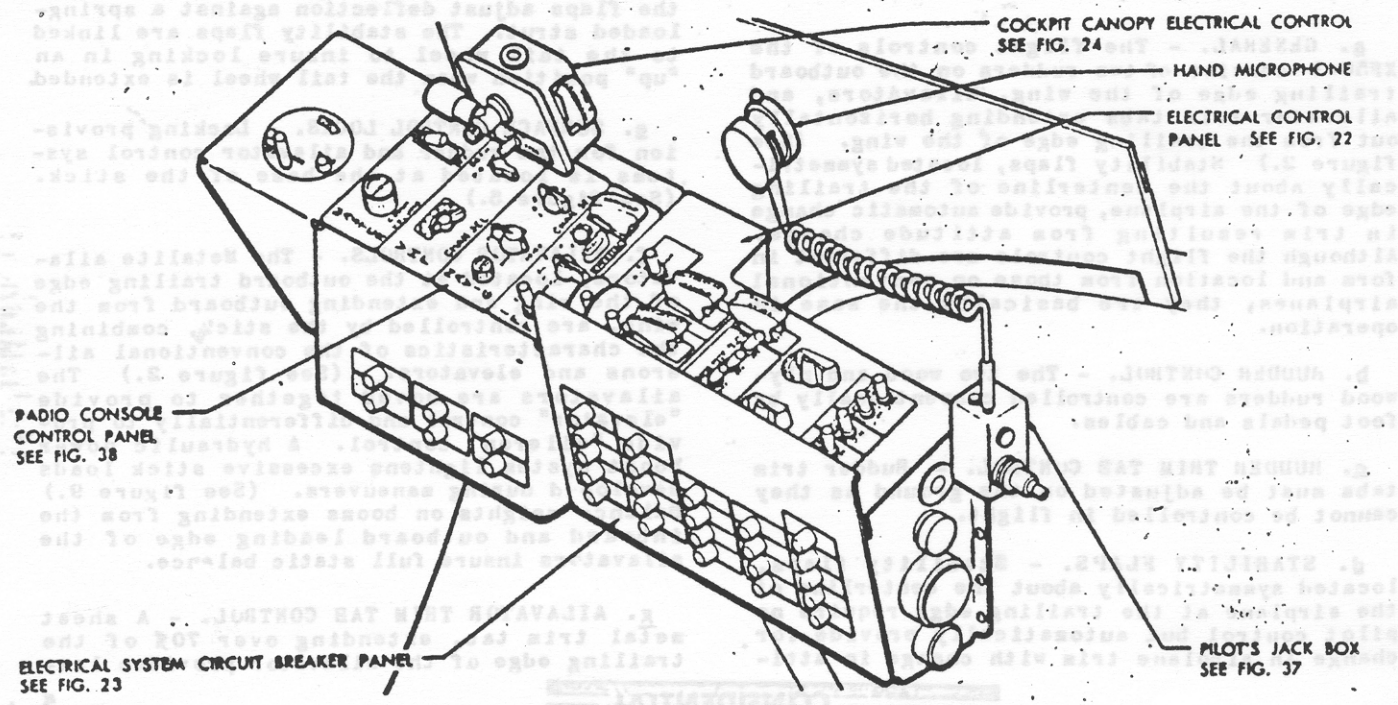


Figure 8 — Cockpit Right Hand Side

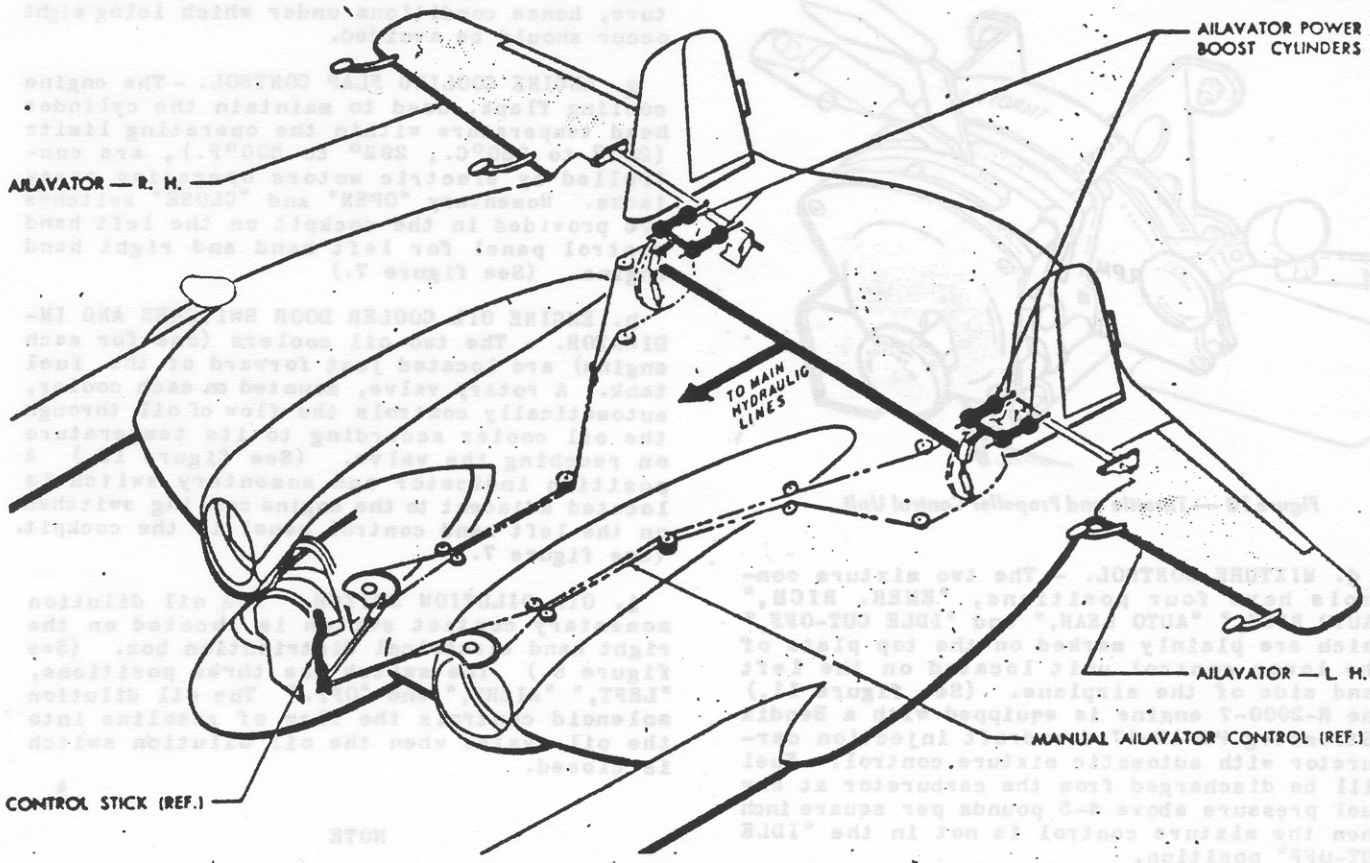


Figure 9 — Ailavator Power Boost System Diagram

eral and longitudinal trim of the airplane as well as satisfactory stick force characteristics, by moving automatically when the surfaces deflect. (See figure 2.) Adjust the tab by means of the wheel control in the cockpit. (See figure 7.) Head tab settings on the indicator, mechanically connected to the hand wheel.

3. POWER PLANT CONTROLS.

a. GENERAL. - The XF5U-1 is powered by two single stage, two speed Pratt and Whitney Twin Wasp (Model R-2000-7) engines. The propeller reduction gearing is .403:1 for take-off; .177:1 for cruising and high speed.

The two hydraulically operated, fast acting, electro-mechanically governed propellers are manufactured by the Chance Vought Division of the United Aircraft Corporation. The propellers have four Pregwood blades and load-relieving hubs which differ from the conventional four-way hub in that the blades are free to "flap" in pairs about the shaft axis. Blade diameter is 16 feet; low pitch stop, 15°, high pitch stop, 70°. The throttle, mixture, supercharger, and propeller pitch controls are arranged in two units, installed on the left hand side of the cockpit and actuated by teleflex control cables. The upper unit (See figure 10) houses the throttle controls and the propeller pitch control; the lower unit (see figure 11) houses the supercharger control and mixture controls. There are separate mixture and throttle controls for each engine. Both control units are plainly marked with the name and various settings of the control levers. A friction adjustment knob is provided on the inboard side of the throttle and propeller control unit.

b. THROTTLE CONTROL. - The throttle controls are located on the upper engine control unit on the left hand side of the cockpit. (See figure 10.) The throttle levers operate in three slots, "WARM-UP," "TAKE-OFF," and "FLIGHT."

c. PROPELLER CONTROL. - The pitch of both propellers is controlled by a single lever on the aft end of the throttle control unit on the upper left hand side of the cockpit. (See figure 10.) The propeller pitch control sets the left hand propeller governor mechanism which controls the right hand propeller governor mechanism electronically and adjusts the propeller blade angle. Movement of the lever upward decreases pitch, and downward increases the pitch. Full forward position governs take-off rpm (2700); full aft position gives approximately 1300 rpm in the take-off slot and approximately 800 rpm for flight.

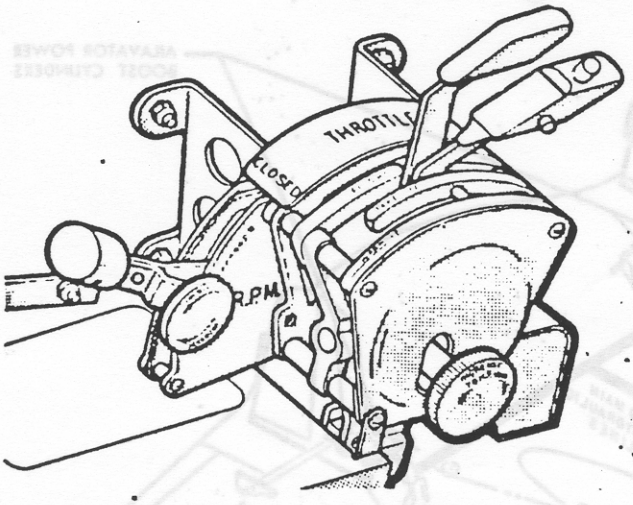


Figure 10 — Throttle and Propeller Control Unit

d. MIXTURE CONTROL. - The two mixture controls have four positions, "EMER. RICH," "AUTO RICH," "AUTO LEAN," and "IDLE CUT-OFF," which are plainly marked on the top plate of the lower control unit located on the left hand side of the airplane. (See figure 11.) The R-2000-7 engine is equipped with a Bendix-Stromberg PD-12-17 downdraft injection carburetor with automatic mixture control. Fuel will be discharged from the carburetor at any fuel pressure above 4-5 pounds per square inch when the mixture control is not in the "IDLE CUT-OFF" position.

e. SUPERCHARGER CONTROL. - The control for the single-stage, two-speed superchargers is located just outboard of the mixture levers on the lower control unit on the left hand side of the airplane. (See figure 11.) The impeller is driven directly by the crankshaft. By means of two sets of gear ratios, it can be engaged in either of the two fixed gear ratios, high or low, when the control is in the "LOW" or "HIGH" position.

f. CARBURETOR AIR TEMPERATURE. - There is no provision for control over carburetor air temperature which is close to ambient temperature, hence conditions under which icing might occur should be avoided.

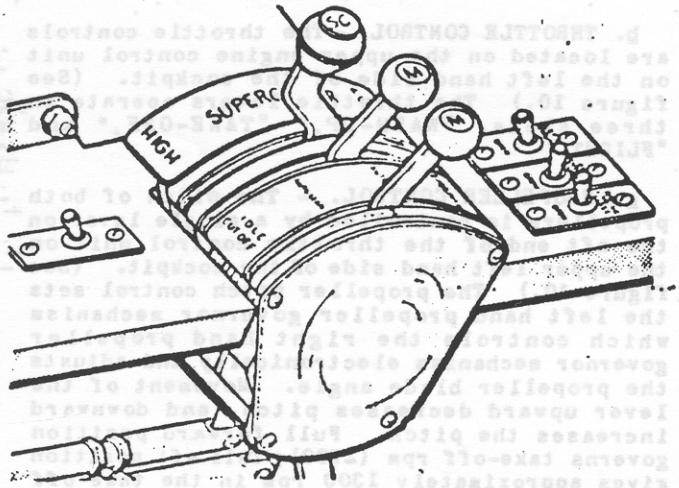


Figure 11 — Supercharger and Mixture Control Unit

g. ENGINE COOLING FLAP CONTROL. - The engine cooling flaps, used to maintain the cylinder head temperature within the operating limits (200° to 260°C., 292° to 500°F.), are controlled by electric motors operating screw jacks. Momentary "OPEN" and "CLOSE" switches are provided in the cockpit on the left hand control panel for left hand and right hand engine. (See figure 7.)

h. ENGINE OIL COOLER DOOR SWITCHES AND INDICATOR. - The two oil coolers (one for each engine) are located just forward of the fuel tank. A rotary valve, mounted on each cooler, automatically controls the flow of oil through the oil cooler according to its temperature on reaching the valve. (See figure 13.) A position indicator and momentary switch is located adjacent to the engine cooling switches on the left hand control panel in the cockpit. (See figure 7.)

i. OIL DILUTION SWITCH. The oil dilution momentary contact switch is located on the right hand electrical distribution box. (See figure 8.) The switch has three positions, "LEFT," "RIGHT," and "OFF." The oil dilution solenoid controls the flow of gasoline into the oil system when the oil dilution switch is closed.

NOTE

SINCE THE OIL DILUTION SYSTEM IS USED ONLY IN COLD WEATHER OPERATION, THE COMPLETE SYSTEM HAS NOT BEEN INSTALLED IN THE AIRPLANE, BUT MAY BE INSTALLED AT ANY TIME.

j. AUTOMATIC DECLUTCHING SWITCH. - AN automatic declutching switch on each engine will close, should the engine freeze or fail to put out power for any other reason. The switch acts to disengage the engine from the propeller drive system and stop the engine by cutting off the fuel supply. In the event of failure of either engine, a warning light on main instrument panel indicates which engine has failed. (See figure 6.)

k. GEAR BOX OIL SYSTEM MANUAL SHUT-OFF VALVES. - Left and right hand gear box oil system manual shut-off valves are located in the engine compartment in the line between the gear box oil tank and engine gear box oil pump. (See figure 14.)

l. PRIMER SWITCH. - The primer switch is located on the pilot's right hand electrical control box in the cockpit. (See figure 8.) This is a momentary toggle switch having three positions, "LEFT," "RIGHT," and "OFF."

m. STARTER SWITCH. - The switch for the electric starter is located on the electrical control panel on the right hand shelf. (See figure 8.) This is a momentary control switch having three positions, "LEFT," "RIGHT," and "OFF." A shield holds the switch in the "OFF"

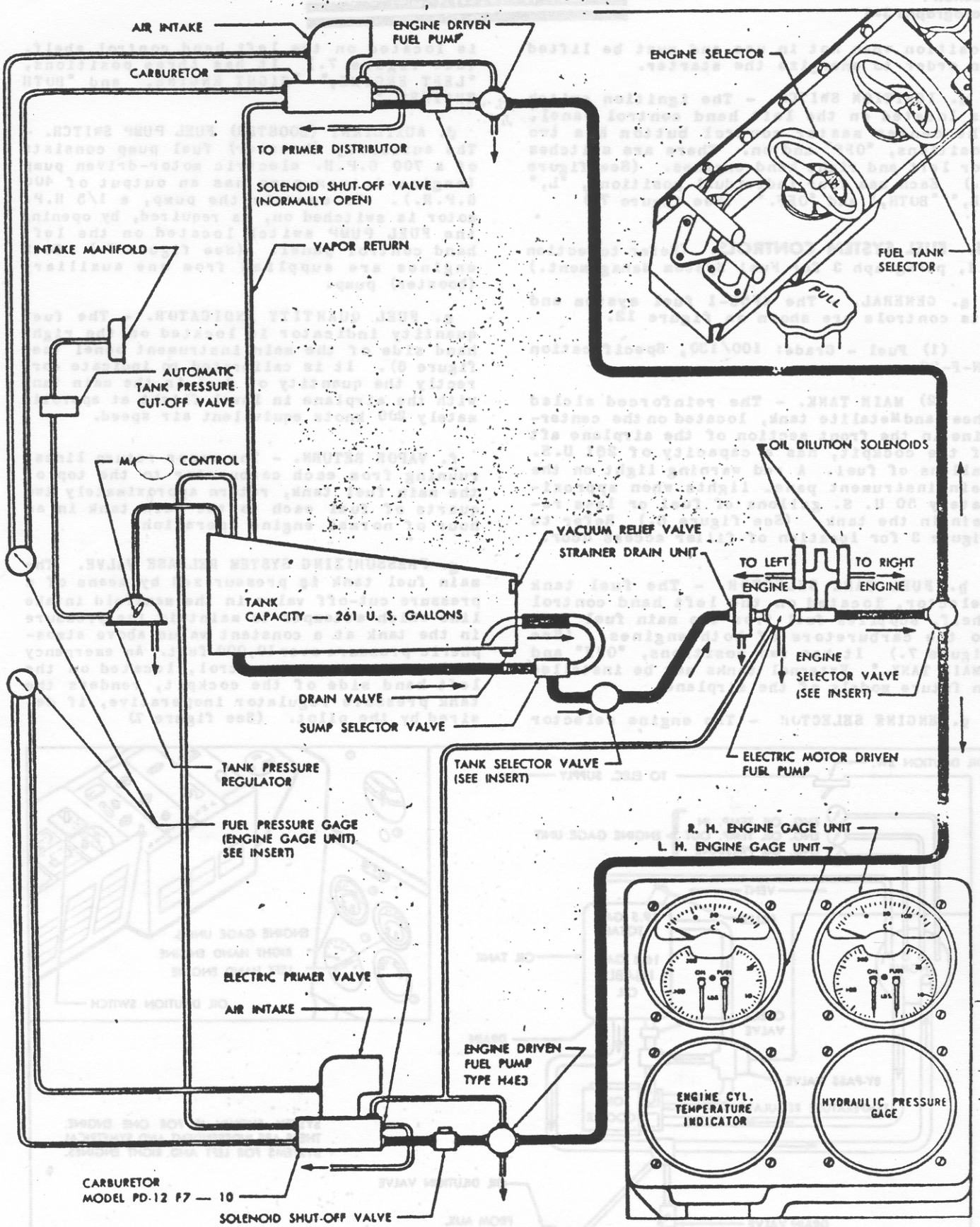


Figure 12 — Fuel System Diagram

position when not in use and must be lifted in order to energize the starter.

n. IGNITION SWITCH. - The ignition switch is located on the left hand control panel. The center master control button has two positions, "OFF" and on. There are switches for left and right hand engines. (See figure 7.) Each has four individual positions, "L," "R," "BOTH," and "OFF." (See figure 7.)

4. FUEL SYSTEM CONTROLS. (Refer to Section II, paragraph 3 for Fuel System Management.)

a. GENERAL. - The XF5U-1 fuel system and its controls are shown on figure 12.

(1) Fuel - Grade: 100/130, Specification AN-F-28.

(2) MAIN TANK. - The reinforced alclad sheet and Metalite tank, located on the centerline in the front section of the airplane aft of the cockpit, has a capacity of 261 U.S. gallons of fuel. A red warning light on the main instrument panel lights when approximately 50 U. S. gallons of fuel or less remain in the tank. (See figure 6.) Refer to figure 3 for location of filler access door.

b. FUEL TANK SELECTOR. - The fuel tank selector, located on the left hand control shelf, supplies fuel from the main fuel tank to the carburetors of both engines. (See figure 7.) It has two positions, "OFF" and "MAIN TANK." External tanks may be installed on future models of the airplane.

c. ENGINE SELECTOR - The engine selector is located on the left hand control shelf. (See figure 7.) It has three positions, "LEFT ENGINE," "RIGHT ENGINE," and "BOTH ENGINES."

d. AUXILIARY (BOOSTER) FUEL PUMP SWITCH. - The auxiliary (booster) fuel pump consists of a 700 G.P.H. electric motor-driven pump (engine-driven pump has an output of 400 G.P.H.). To operate the pump, a 1/5 H.P. motor is switched on, as required, by opening the FUEL PUMP switch located on the left hand control panel. (See figure 7.) Both engines are supplied from one auxiliary (booster) pump.

e. FUEL QUANTITY INDICATOR. - The fuel quantity indicator is located on the right hand side of the main instrument panel (see figure 6). It is calibrated to indicate correctly the quantity of fuel in the main tank with the airplane in level flight at approximately 200 knots equivalent air speed.

f. VAPOR RETURN. - The vapor return lines, running from each carburetor to the top of the main fuel tank, return approximately two quarts of fuel each to the main tank in an hour of normal engine operation.

g. PRESSURIZING SYSTEM RELEASE VALVE. The main fuel tank is pressurized by means of a pressure cut-off valve in the manifold intake line which attempts to maintain the pressure in the tank at a constant value above atmospheric pressure over 10,000 feet. An emergency fuel tank pressure control, located on the left hand side of the cockpit, renders the tank pressure regulator inoperative, if desired by the pilot. (See figure 7.)

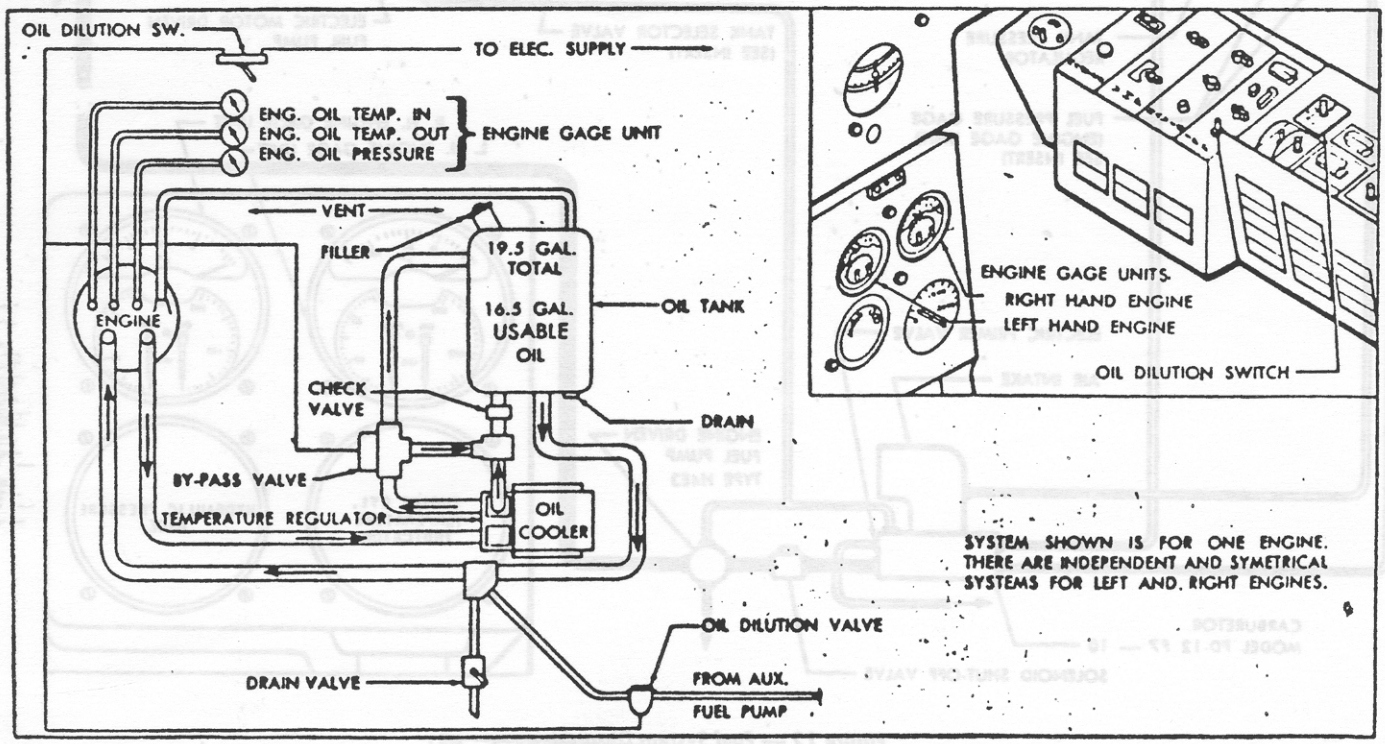


Figure 13 — Engine Oil System Diagram

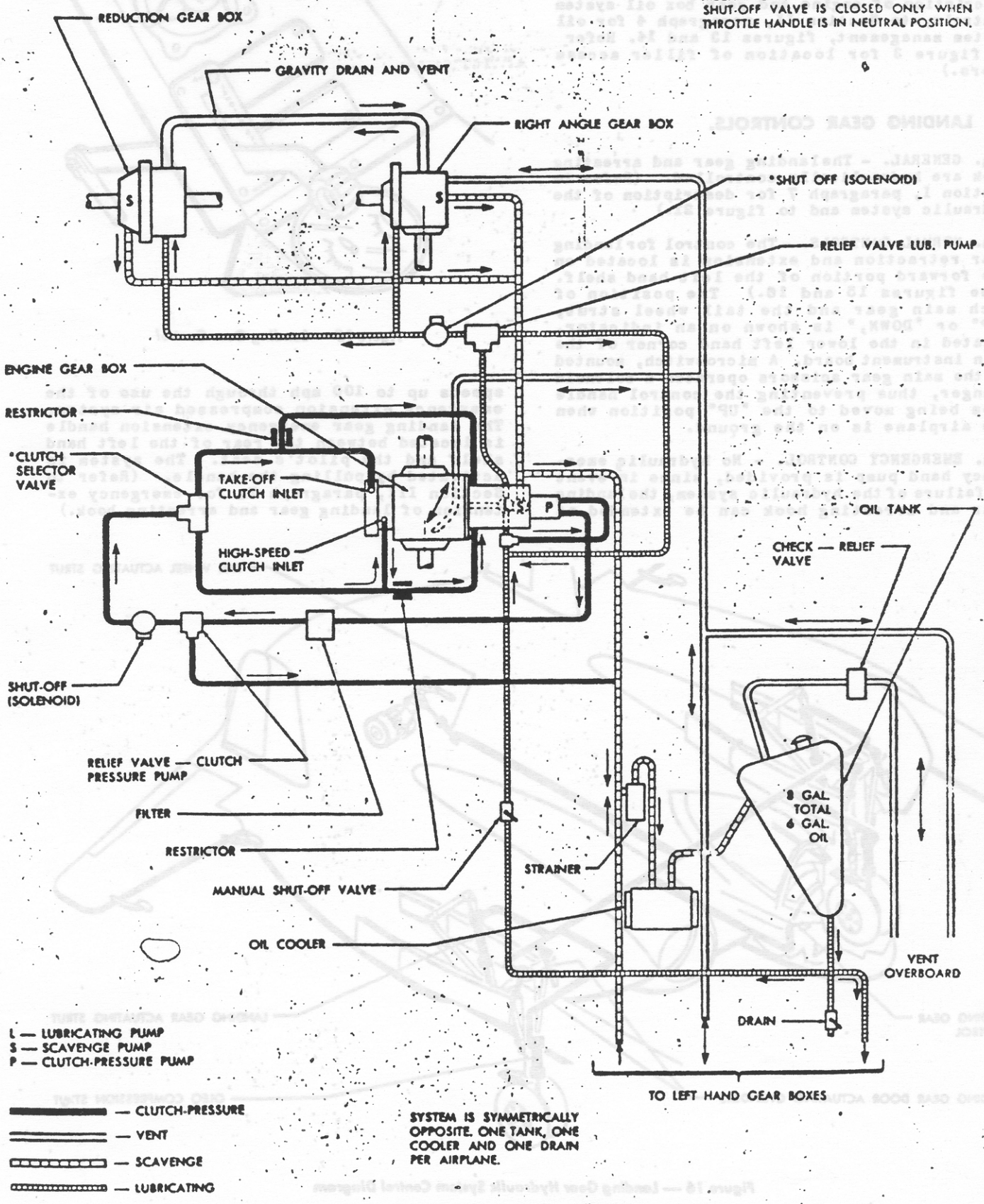


Figure 14 — Gear Box Oil System Diagram

5. OIL SYSTEM CONTROLS.

(Refer to Section I, paragraph 3h, i, k for description of engine and gear box oil system controls, to Section II, paragraph 4 for oil system management, figures 13 and 14. Refer to figure 3 for location of filler access doors.)

6. LANDING GEAR CONTROLS.

a. GENERAL. - The landing gear and arresting hook are hydraulically controlled. (Refer to Section I, paragraph 7 for description of the hydraulic system and to figure 21.)

b. NORMAL CONTROLS. - The control for landing gear retraction and extension is located on the forward portion of the left hand shelf. (See figures 15 and 16.) The position of each main gear and the tail wheel strut, "UP" or "DOWN," is shown on an indicator, located in the lower left hand corner of the main instrument board. A microswitch, mounted on the main gear scissors operates a solenoid plunger, thus preventing the control handle from being moved to the "UP" position when the airplane is on the ground.

c. EMERGENCY CONTROL. - No hydraulic emergency hand pump is provided, since in event of failure of the hydraulic system, the landing gear and arresting hook can be extended at speeds up to 100 mph through the use of the emergency extension compressed air system. The landing gear emergency extension handle is located between the rear of the left hand shelf and the pilot's seat. The system is activated by pulling the handle. (Refer to Section III, paragraph 7a for emergency extension of landing gear and arresting hook.)

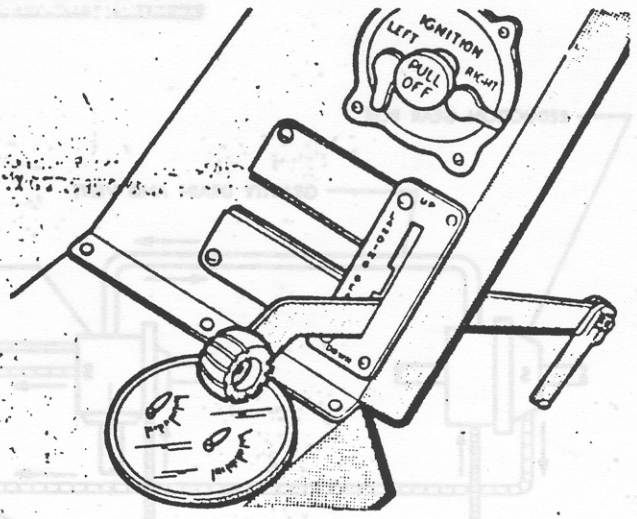


Figure 15 — Landing Gear Control

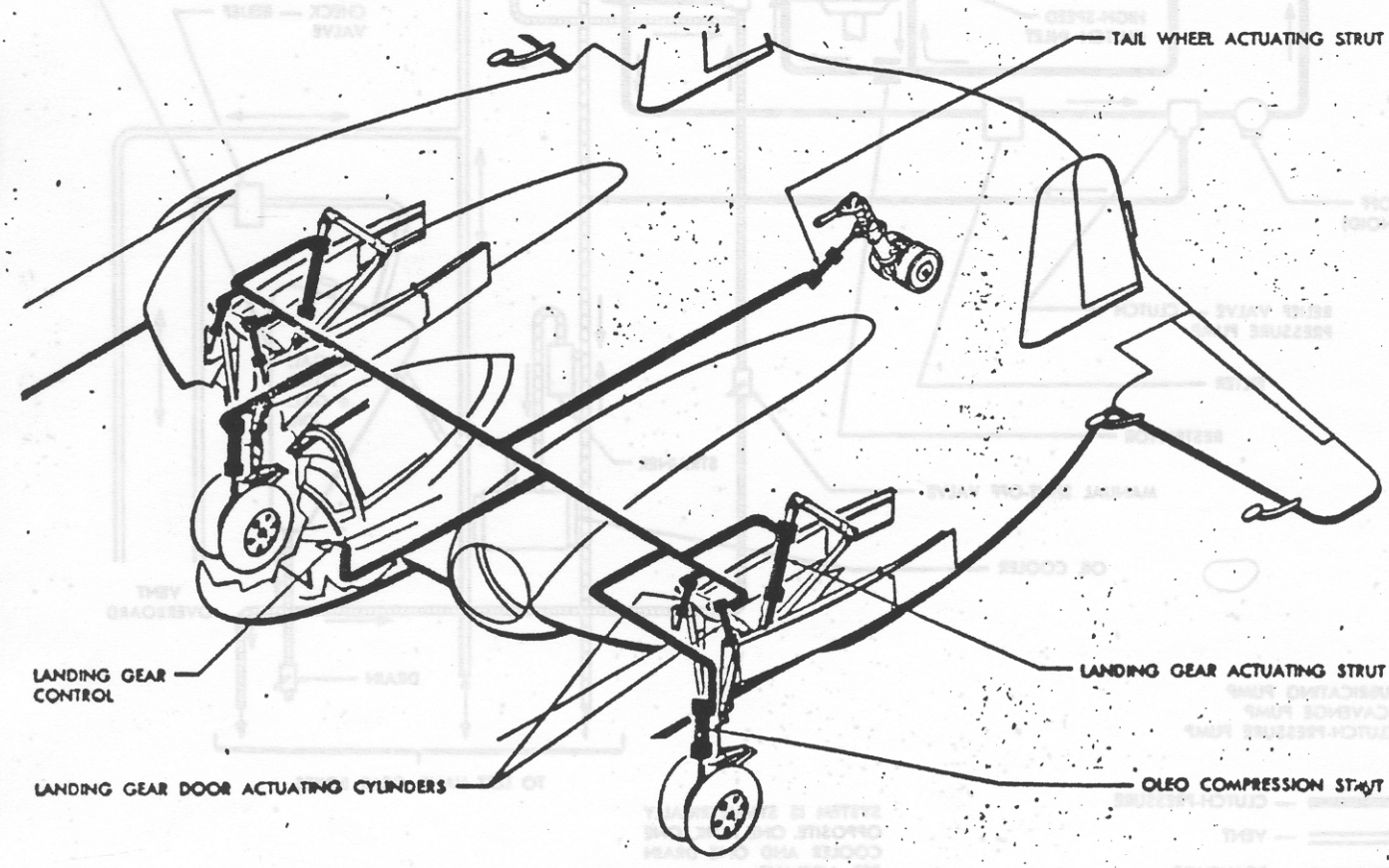


Figure 16 — Landing Gear Hydraulic System Control Diagram

d. ARRESTING HOOK CONTROL. - The arresting hook control is located on the right side of the main instrument panel just below the windshield cowl. The control has two positions, "UP" and "DOWN," and must be moved to the limit of these positions to obtain the desired effect of the arresting gear. (See figures 17, 18.) The arresting gear is mounted unconventionally on the upper aft surface of the wing structure. The hook is held in the retracted position by pressure in the hydraulically retracted strut acting on the aft side of the piston. As pressure is applied to the forward side of the piston, the strut linkage is opened and straightened, the hook shaft rising above the airplane with the hook aft and below the trailing edge. The arresting hook emergency extension handle is located on the bulkhead on the left hand side of the pilot's cockpit. The system is activated by turning the handle. (See figure 5.)

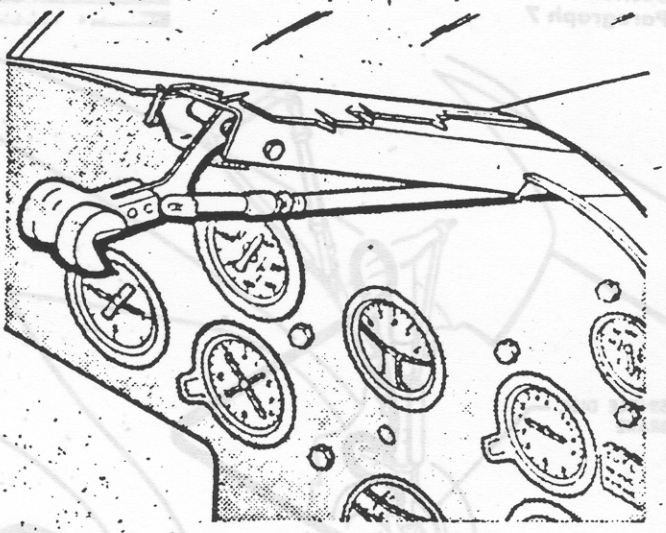


Figure 17 — Arresting Hook Control

e. BRAKES. - The wheel brakes of this airplane are of the Bendix disc type. Two independent systems actuate left and right hand wheels. The brakes are applied by depressing the brake pedals. Pressure, applied to the brake from master cylinders actuated by push-rods from the brake pedals, brings braking surfaces into contact, thus providing the braking action. The fluid used is mineral oil AN-VV-O-366 (red fluid). (See figure 19.)

f. TAIL WHEEL LOCK CONTROL. - The tail wheel lock control is located on the aft end of the left hand shelf. (See figure 20.) It has two positions, "LOCKED" and "UNLOCKED."

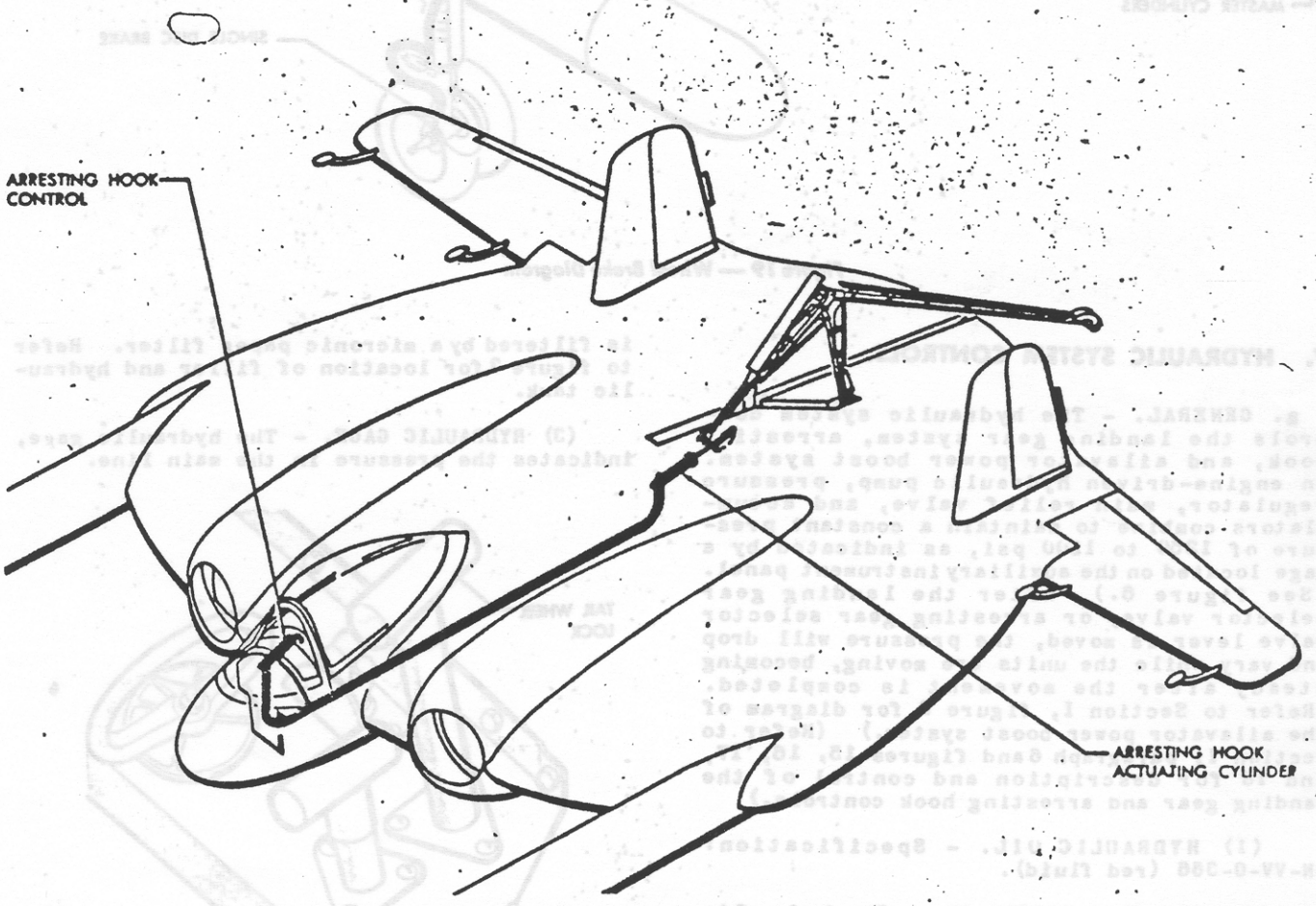


Figure 18 — Arresting Hook Hydraulic Control Diagram

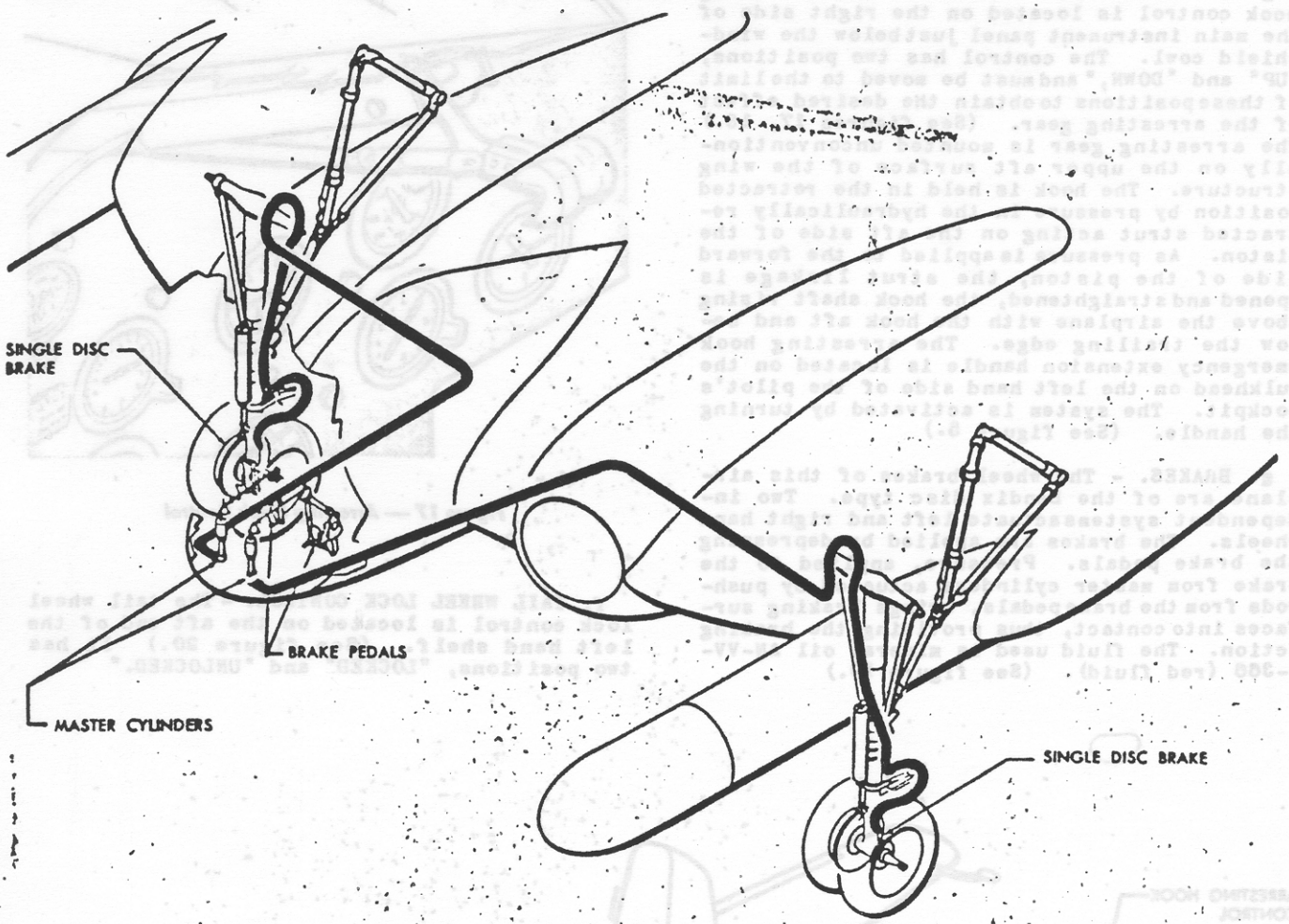


Figure 19 — Wheel Brake Diagram

7. HYDRAULIC SYSTEM CONTROLS.

a. GENERAL. - The hydraulic system controls the landing gear system, arresting hook, and ailavator power boost system. An engine-driven hydraulic pump, pressure regulator, main relief valve, and accumulators combine to maintain a constant pressure of 1250 to 1500 psi, as indicated by a gage located on the auxiliary instrument panel. (See figure 6.) After the landing gear selector valve, or arresting gear selector valve lever is moved, the pressure will drop and vary while the units are moving, becoming steady after the movement is completed. (Refer to Section I, figure 9 for diagram of the ailavator power boost system.) (Refer to Section I, paragraph 6 and figures 15, 16, 17, and 18 for description and control of the landing gear and arresting hook controls.)

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

(2) HYDRAULIC RESERVOIR. - The hydraulic reservoir is a cylindrical tank in the left hand aft section of the airplane. The capacity of the tank is 4.5 quarts hydraulic fluid. All fluid passing through the reservoir is filtered by a micronic paper filter. Refer to figure 3 for location of filler and hydraulic tank.

(3) HYDRAULIC GAGE. - The hydraulic gage, indicates the pressure in the main line.

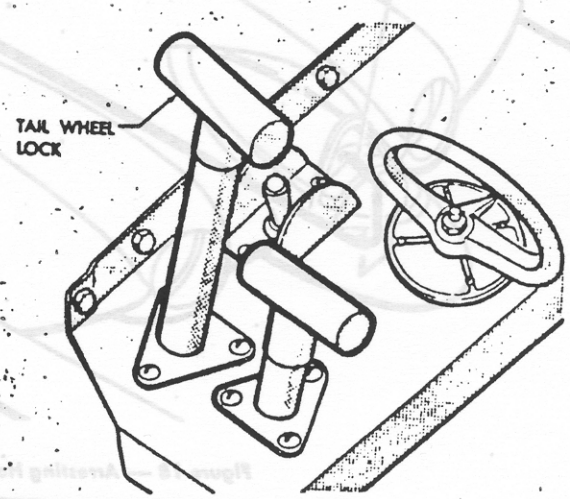


Figure 20 — Tail Wheel Lock Control

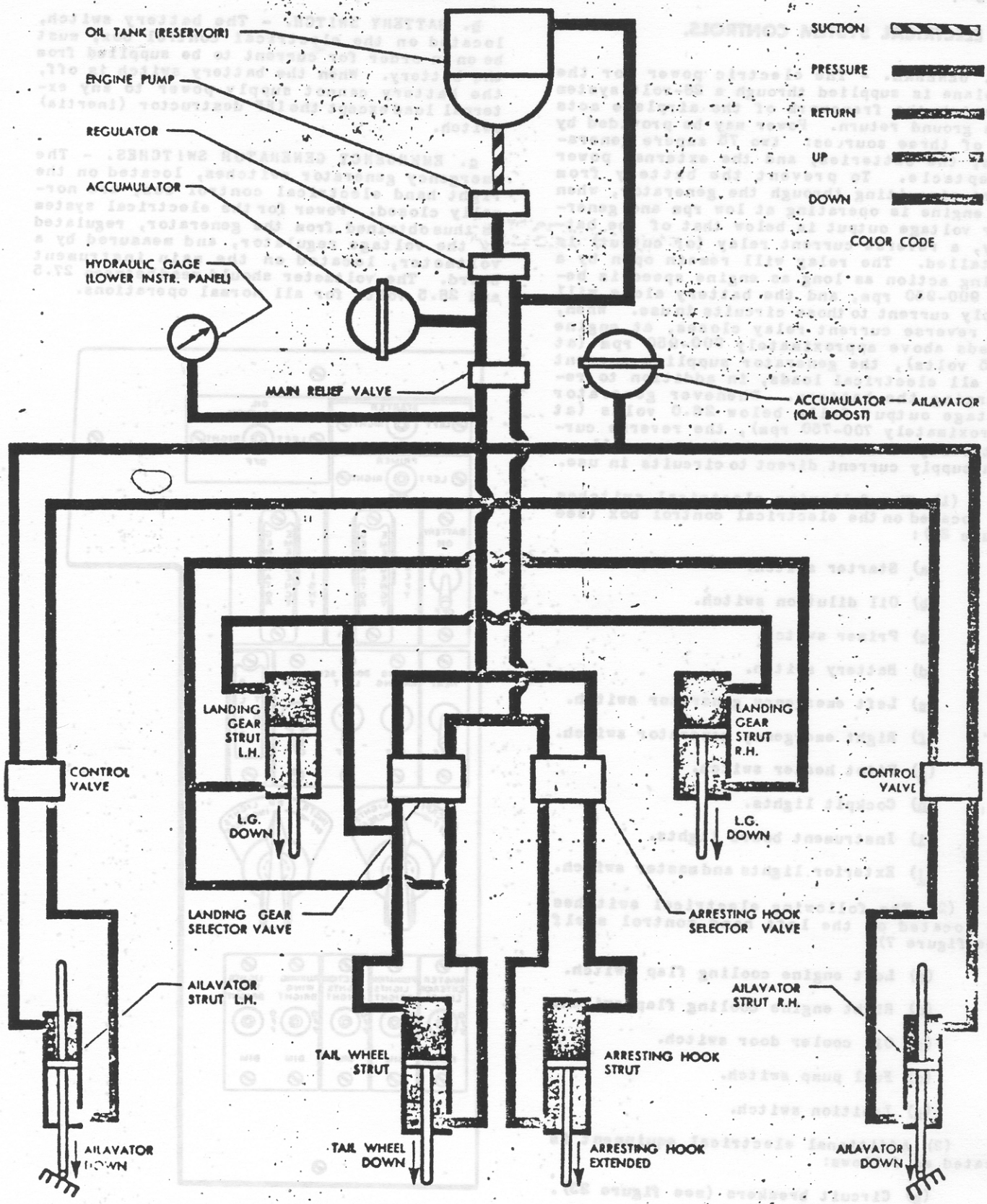


Figure 21 — Simplified Schematic Hydraulic Diagram

8. ELECTRICAL SYSTEM CONTROLS.

a. GENERAL. - The electric power for the airplane is supplied through a 28-volt system in which the framework of the airplane acts as a ground return. Power may be provided by one of three sources: two 75 ampere generators, the batteries, and the external power receptacle. To prevent the battery from short circuiting through the generator, when the engine is operating at low rpm and generator voltage output is below that of the battery, a reverse current relay (or cutout) is installed. The relay will remain open by a spring action as long as engine speed is below 900-950 rpm, and the battery alone will supply current to those circuits in use. When, the reverse current relay closes, at engine speeds above approximately 900-950 rpm (at 26.5 volts), the generator supplies current for all electrical loads, in addition to recharging the battery. Whenever generator voltage output falls below 26.0 volts (at approximately 700-750 rpm), the reverse current relay will open and the battery will again supply current direct to circuits in use.

(1) The following electrical switches are located on the electrical control box (see figure 22):

(a) Starter switch.

(b) Oil dilution switch.

(c) Primer switch.

(d) Battery switch.

(e) Left emergency generator switch.

(f) Right emergency generator switch.

(g) Pitot heater switch.

(h) Cockpit lights.

(i) Instrument board lights.

(j) Exterior lights and master switch.

(2) The following electrical switches are located on the left hand control shelf (see figure 7):

(a) Left engine cooling flap switch.

(b) Right engine cooling flap switch.

(c) Oil cooler door switch.

(d) Fuel pump switch.

(e) Ignition switch.

(3) Additional electrical equipment is located as follows:

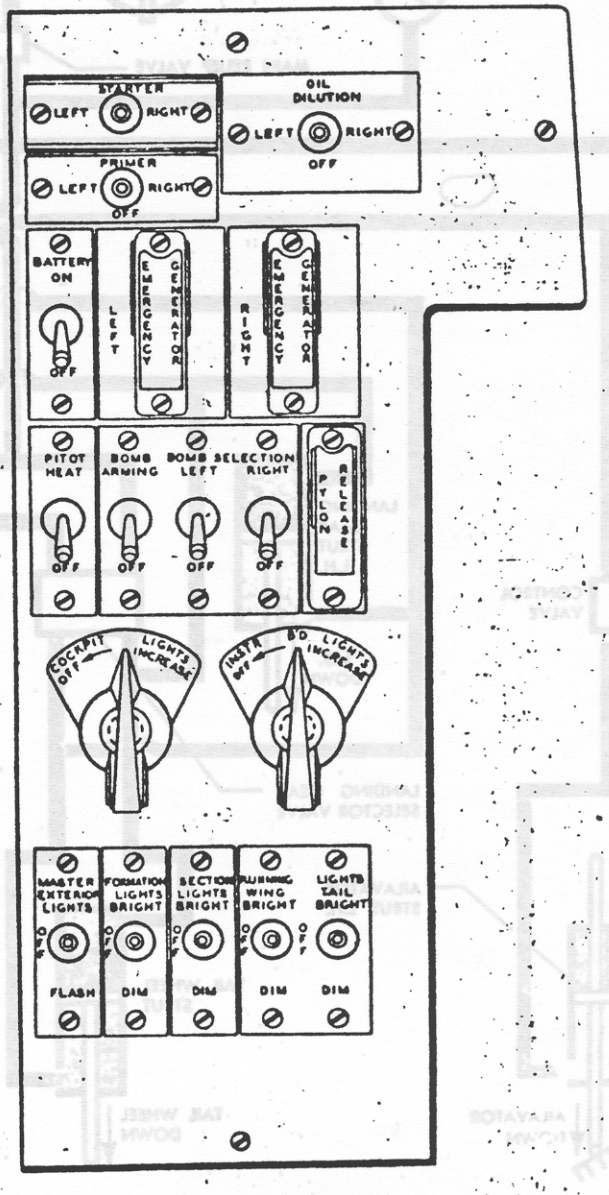
(a) Circuit breakers (see figure 23).

(b) External power receptacle (see figure 3).

(c) Radio, communication and navigation and IFF equipment (see figure 37).

b. BATTERY SWITCH. - The battery switch, located on the electrical control box, must be on in order for current to be supplied from the battery. When the battery switch is off, the battery cannot supply power to any external load except the IFF destructor (inertia) switch.

c. EMERGENCY GENERATOR SWITCHES. - The emergency generator switches, located on the right hand electrical control box, are normally closed. Power for the electrical system is thus obtained from the generator, regulated by the voltage regulator, and measured by a voltmeter, located on the main instrument board. The voltmeter should read between 27.5 and 28.5 volts for all normal operations.



NOTE: ARMAMENT PROVISIONS SHOWN ARE INOPERATIVE, SINCE NO ARMAMENT HAS BEEN INSTALLED IN THIS AIRPLANE.

Figure 22 — Electrical Control Box

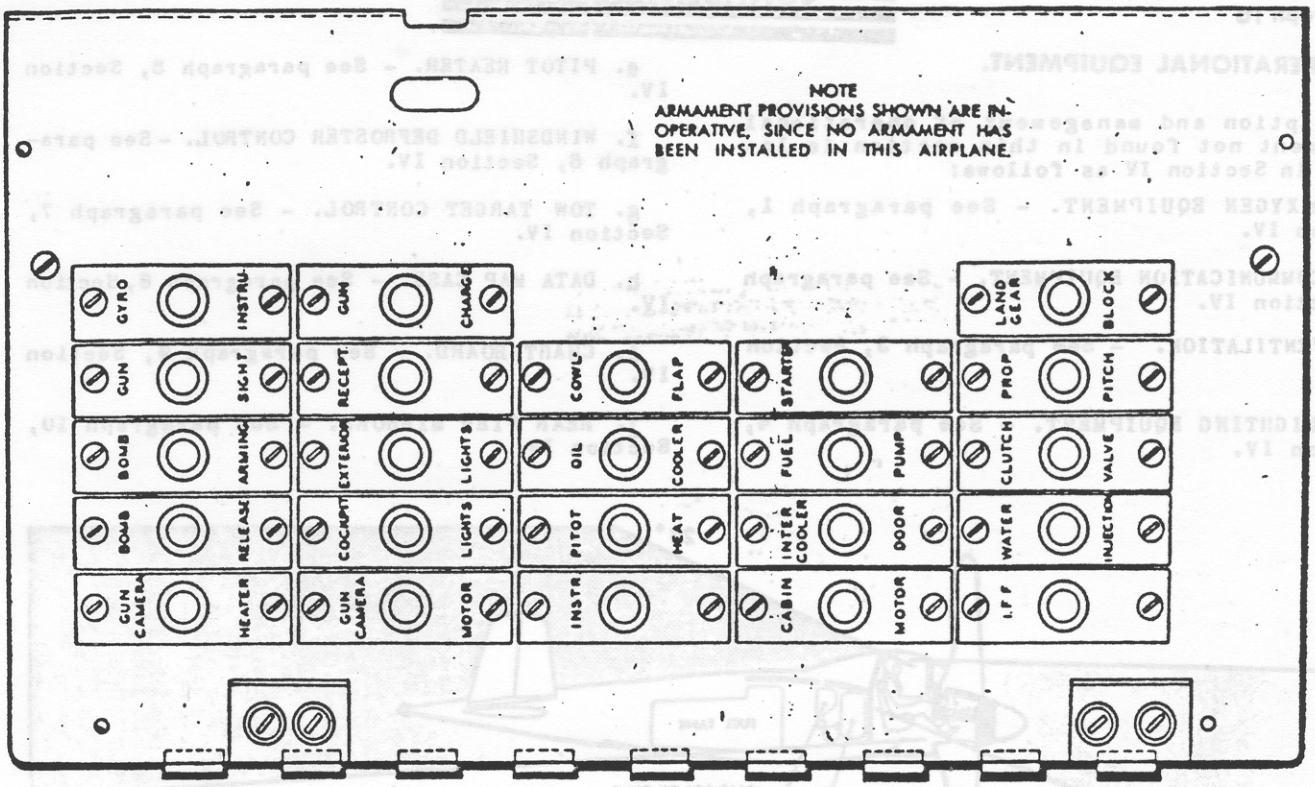


Figure 23 — Circuit Breaker Panel

d. CIRCUIT BREAKERS. - All of the circuits in the airplane are protected by circuit breakers, located on the vertical side of panel of the electrical control box. (See figure 23.) The circuit breakers are designed to maintain a closed circuit up to the rated current for the circuit. If an electrical overload of sufficient magnitude and duration occurs in a circuit, the circuit breaker button will pop out, thus breaking the circuit.

e. VOLTMETER SWITCH. - The voltmeter, mounted on the main instrument board, registers the voltage output of the generators. (See figure 6.) The switch adjacent to the gage must be turned in order to read either left or right engine voltage.

f. EXTERNAL POWER RECEPTACLE. - An external power receptacle is located in the right hand wheel well. (See figure 3.)

9. MISCELLANEOUS

a. SEAT ADJUSTMENT. - The bucket type pilot's seat is provided with a lever on the right hand side of the seat support to allow the pilot to raise or lower the seat as desired.

b. SHOULDER HARNESS.

(1) The two free ends of the shoulder harness fit into the safety belt catch and are held securely as long as the catch is closed.

(2) The shoulder harness reel mounted on the bulkhead behind the pilot's seat contains a spring-loaded cable, extending to the shoulder harness straps and holding the shoulder harness snugly against the pilot as he leans forward.

c. COCKPIT CABIN CONTROL SWITCH. - The cockpit cabin control momentary switch is located on the right hand side of the cockpit. (See figure 24.) The switch has three positions, "OPEN," "CLOSE," and neutral.

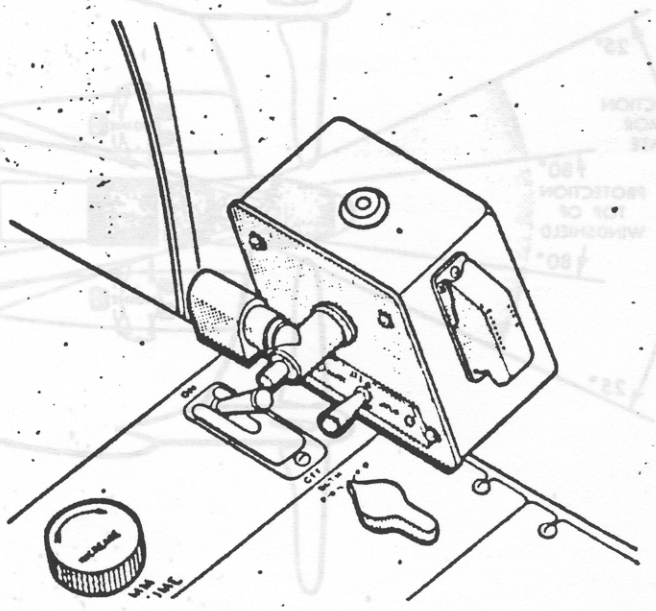


Figure 24 — Cockpit Canopy Electrical Control

10. OPERATIONAL EQUIPMENT.

Description and management of operational equipment not found in this section is located in Section IV as follows:

a. OXYGEN EQUIPMENT. - See paragraph 1, Section IV.

b. COMMUNICATION EQUIPMENT. - See paragraph 2, Section IV.

c. VENTILATION. - See paragraph 3, Section IV.

d. LIGHTING EQUIPMENT. - See paragraph 4, Section IV.

e. PITOT HEATER. - See paragraph 5, Section IV.

f. WINDSHIELD DEFROSTER CONTROL. - See paragraph 6, Section IV.

g. TOW TARGET CONTROL. - See paragraph 7, Section IV.

h. DATA MAP CASE. - See paragraph 8, Section IV.

i. CHART BOARD. - See paragraph 9, Section IV.

j. REAR VIEW MIRRORS. - See paragraph 10, Section IV.

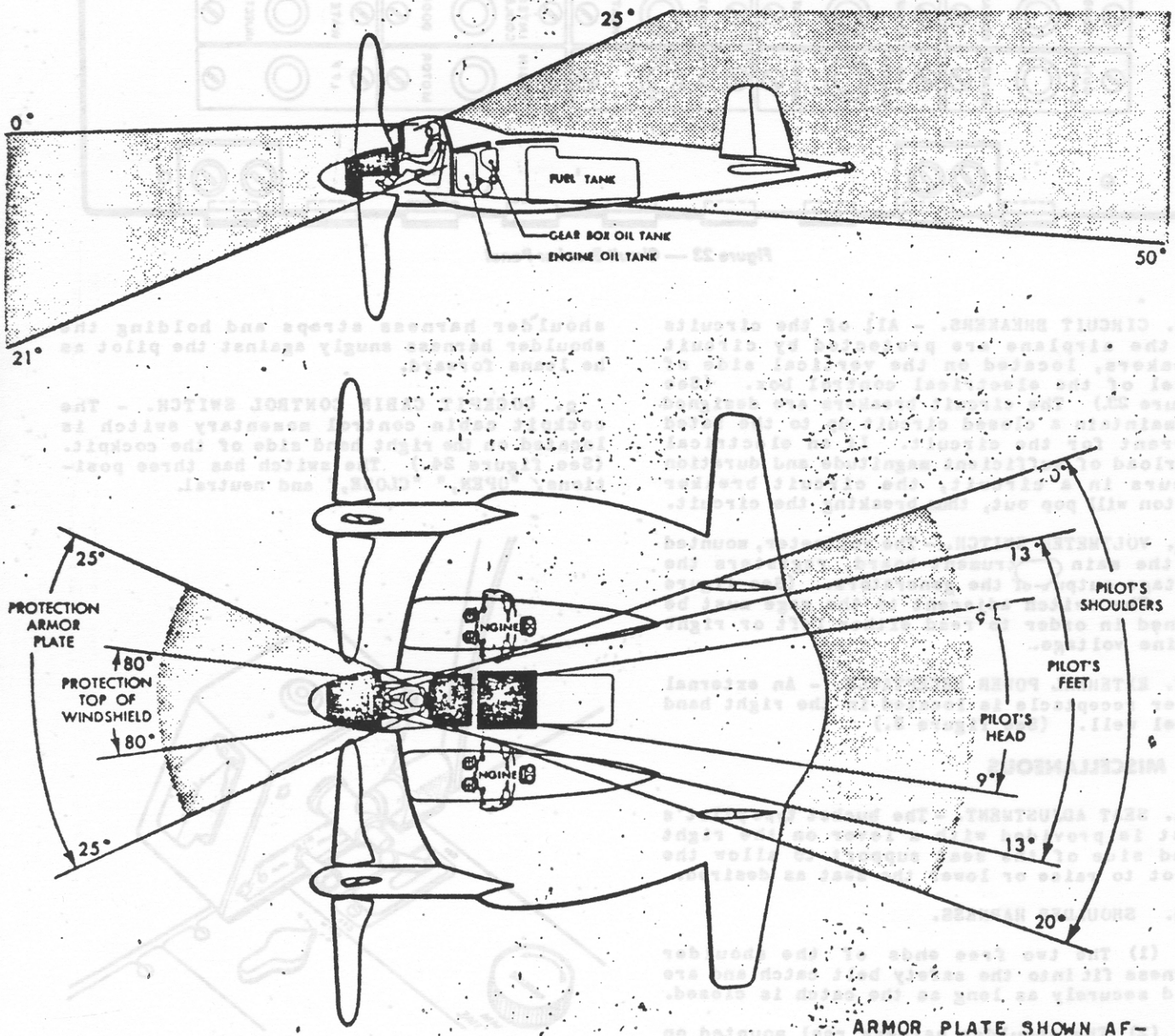
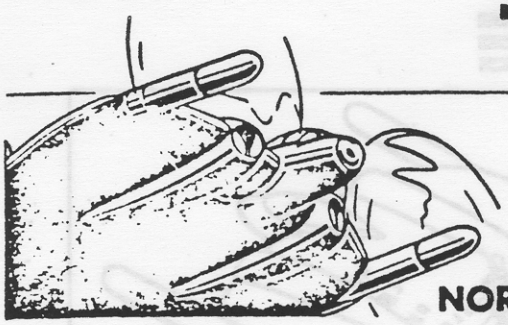
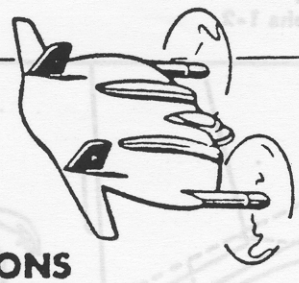


Figure 25 — Protection Against Gunfire





Section II

NORMAL OPERATING INSTRUCTIONS

1. BEFORE ENTERING THE COCKPIT.

a. Note the following flight limitations:

FLIGHT LIMITATIONS

The airplane shall be restricted to normal flight until the completion of the preliminary demonstration of the airplane.

Normal flight shall be interpreted to consist of the following:

a. Take-off and landing.

b. Flying in normal attitude with the following limitations:

(1) The speed at any altitude shall not exceed 1.1 times the maximum speed attainable in sustained level flight at that altitude using normal rated power or thrust.

(2) The acceleration shall not exceed 2g.

(3) The angle of bank shall not exceed 45°.

(4) The flight controls shall not be moved abruptly.

(5) Slipping or skidding shall be avoided.

These limitations and restrictions are subject to change, and latest service directives and orders must be consulted.

Figure 26 — Flight Limitations Chart

b. INITIAL GROSS WEIGHT AND LANDING DATA. Check gross weight and center of gravity location for take-off, and check anticipated loading for landing. Loading data are furnished in Handbook of Weight and Balance Data, AN 01-1B-40.

c. BEFORE ENTERING THE COCKPIT, MAKE THE FOLLOWING PRE-FLIGHT CHECK:

(1) Pitot head cover, blower opening cover, and any other temporary protective coverings-removed.

(2) All removable cowling and access doors-securely fastened.

(3) Check with ground service crew to see that proper fuel, lubricating and hydraulic oil quantities are aboard. Fuel and oil quantities should be checked by means of a dip stick calibrated to record accurately when the airplane is in three-point position.

(4) Battens and surface control lock-removed from movable control surfaces.

(5) Wheel chocks-in place.

(6) Compressed air pressure - check gage.

(7) Fire extinguisher - check red disk.

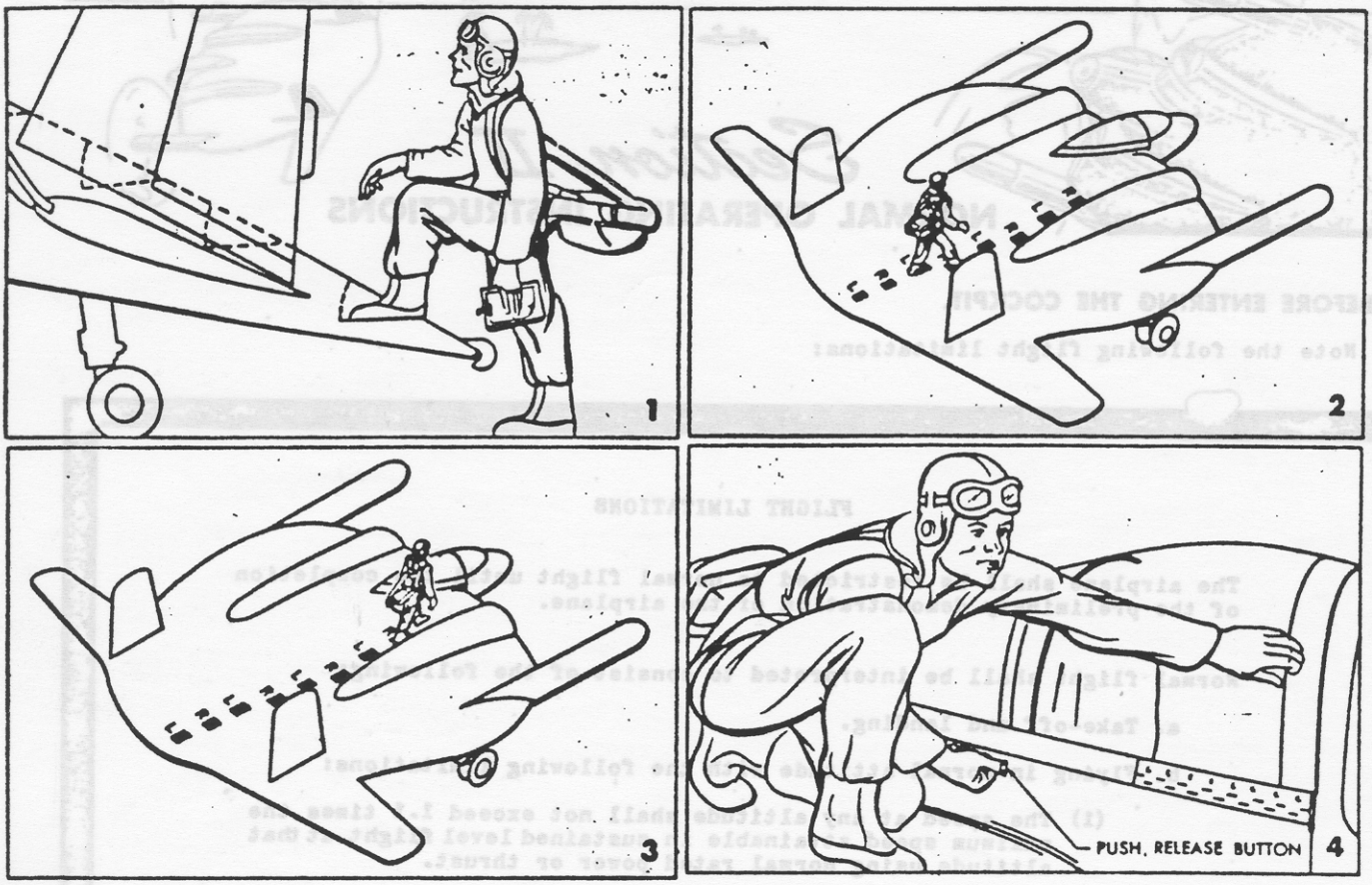


Figure 27 — Entrance to the Cockpit

d. ENTRANCE TO CLOSED AIRPLANE.

(1) Enter the cockpit by walking up the back of the airplane from the trailing edge forward. Steps, which depress to a horizontal position under foot pressure, are provided to the right of the airplane centerline. Whether going up or down the airplane, always start with the left foot. (See figure 27.)

(2) Open the canopy from the right hand side by pressing the push point on the side of the cockpit, thereby disengaging the gear train which operates the sliding section. Pull the canopy aft.

2. ON ENTERING THE COCKPIT.

a. COCKPIT CANOPY CONTROL. - The canopy may be stopped at any position between "OPEN" and "CLOSE" by throwing the canopy control switch to a neutral position. Since the motor and gear train form an irreversible mechanism, the canopy is locked if stopped in any neutral position. Disengage the gears to break the connection between the electric motor and the canopy by pulling the cable, running along the right hand side of the canopy, inboard. Then grasp the handle in the forward rollers and pull aft to open the canopy. (See figure 28.) Hold or push the internal cable and the external button during the entire motion of the canopy, since releasing these permits the gears to re-engage and lock the canopy.

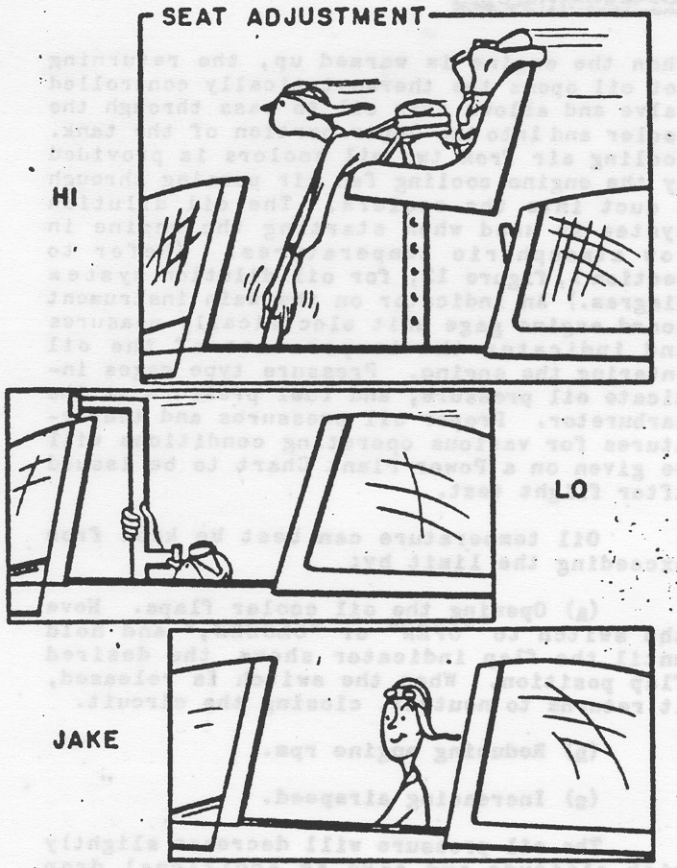
b. STANDARD CHECK FOR ALL FLIGHTS. - On entering the cockpit, check the following:

(1) Ignition switch, "OFF." This check should be made immediately upon entering the cockpit as a safety precaution to prevent accidents to any of the ground personnel who may handle the propellers prior to starting the engines.

(2) Adjust rudder pedals for individual comfort by pushing forward on the pawls located on the outboard side of each pedal and swinging the pedal to the desired position. Approximately five and one half inches adjustment is provided.

(3) Adjust seat height, if necessary, as follows: Lift slightly on the seat lever, pushing the button on the end of the lever with the thumb, and moving the lever in the direction that it is desired to have the seat move. A maximum adjustment of two and one half inches is provided.

(4) Adjust shoulder harness and lock the reel by means of the control handle plunger on the left hand control panel, slipping the plunger into the hole nearest desired harness position in the series of holes in the reel drum. Adjust the cable by means of a turn-



buckle. Depress the handle to the "LOCK" position to lock the reel; pull it up to "FREE" position to unlock it.

WARNING

Under no circumstances should the shoulder harness be omitted, using the seat belt only.

(5) Check the controls for freedom of motion, direction and secureness.

(6) Make sure that the mixture control is in "IDLE CUT-OFF," then turn battery switch on or connect external source of electric power.

NOTE

If an external source of power is used, turn the battery switch off.

(7) Check auxiliary (booster fuel) pump operation as follows:

(a) Mixture control - "IDLE CUT-OFF."

(b) Battery switch - turned on.

(c) Auxiliary (booster) fuel pump switch - "ON." The fuel pressure, read on the engine gage unit, should be from 8 to 15 psi (with fresh battery).

(8) Test operate the oxygen system as outlined in Section IV, paragraph 1, if the flight is an oxygen flight.

(9) Arresting hook control - Full "UP" position.

(10) Landing gear control - "DOWN" and locked.

(11) Set the altimeter with correct altimeter setting.

(12) Gyro-horizon and directional gyro-uncaged.

(13) Push the fuel reserve warning light to test the bulb. The battery switch must be on when testing the light unless an external power source is used.

(14) Check the fuel quantity gage to see that it is registering.

(15) Wind the eight-day clock.

(16) Emergency generator switch - "ON."

(17) Check operation of radio controls. Refer to Section IV, paragraph 2. If external power source is not available, radio equipment should not be checked until engine is running.

b. NIGHT FLIGHT CHECK LIST. In addition to the standard check in subparagraph a above, for night flights, turn the battery switch on and check the following items:

(1) INTERIOR LIGHTS.

(a) COCKPIT LIGHTS. - Check the cockpit lights by turning on the rheostat, located on the electrical control box, and then switch on each light.

(b) INSTRUMENT BOARD LIGHTS. - Check the instrument board lights by turning on the rheostat, located on the electrical control box. Spare bulbs are carried in a receptacle on the instrument board.

(2) EXTERIOR LIGHTS. - Check the formation, section, wing, and tail lights by turning on the respective switches and the exterior light master switch. These switches are located on the electrical control box.

3. FUEL SYSTEM MANAGEMENT.

a. GENERAL. - Refer to Section I, paragraph 4 for description of fuel system controls.

b. MANAGEMENT. - Refer to the Fuel System Diagram, figure 12, for fuel flow. The fuel system is managed by means of the fuel tank selector, engine selector, primer switch and the auxiliary (booster) fuel pump switch, shown on figure 12.

(1) FUEL TANK SELECTION. - (See figure 7.) Turn the fuel tank selector loop handgrip to "OFF" or "MAIN TANK," as desired.

(2) ENGINE SELECTION. - (See figure 7.) Turn the handgrip to "LEFT ENGINE," "RIGHT ENGINE," or "BOTH ENGINES," as desired. For normal flight, keep the selector in the "BOTH ENGINES" position. When moving from one en-

gine selection position to another, feel for the notch which indicates correct positioning.

(3) PRIMER SWITCH. - (See figure 22.) Refer to paragraph 5 of this section for the use of the primer switch in starting the engine.

(4) AUXILIARY (BOOSTER) FUEL PUMP. (See figure 7.) Open the electric auxiliary (booster) fuel pump switch under the following conditions:

(a) Starting - to provide pressure. See paragraph 5 below.

(b) Take-off and landing.

(c) If fuel pressure drops below 16 psi.

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

(e) High-altitude operation - to maintain fuel pressure. Loss of pressure is most likely to occur in summer operation and is caused by vapor formation in the fuel lines.

(5) FUEL FLOW. - From the auxiliary (booster) fuel pump, the gasoline flows through the oil dilution valve, the engine selector valve, the engine-driven fuel pumps, and the solenoid shut-off valves to the carburetors. To effect this flow, the control switches should be set as follows:

(a) Tank Selector - "MAIN TANK."

(b) Auxiliary (booster) fuel pump switch - "ON."

(c) Engine Selector - "BOTH ENGINES," "LEFT ENGINE," or "RIGHT ENGINE," as desired.

NOTE.

The recommended fuel pressure limit is 17 plus or minus 1 psi.

(6) MAIN TANK PRESSURE. - Leave the main tank pressure release control on at all times, except as an additional safeguard in the event of forced landing.

4. ENGINE AND GEAR BOX OIL SYSTEM MANAGEMENT.

a. GENERAL. - Refer to figure 13 for engine oil system management diagram and to figure 14 for gear box oil system management. Refer to Section I, paragraph 5 for description of oil system controls. The engine and gear box lubricating systems are symmetrical and independent of each other.

(1) Oil - Grade: 1100; Specification AN-O-8.

b. ENGINE OIL SYSTEM MANAGEMENT.

(1) OIL PRESSURES AND TEMPERATURES. - When the engine is started, cold oil returning from the engine is by-passed at the valve through the cold oil return line to the warm-up compartment in the lower portion of the tank. When the engine is warmed up, the returning hot oil opens the thermostatically controlled valve and allows this oil to pass through the cooler and into the upper portion of the tank. Cooling air from two oil coolers is provided by the engine cooling fan air passing through a duct into the coolers. The oil dilution system is used when starting the engine in low atmospheric temperatures. (Refer to Section 1, figure 13, for oil dilution system diagram.) An indicator on the main instrument board engine gage unit electrically measures and indicates the temperature of the oil entering the engine. Pressure type gages indicate oil pressure, and fuel pressure at the carburetor. Proper oil pressures and temperatures for various operating conditions will be given on a Power Plant Chart to be issued after flight test.

Oil temperature can best be kept from exceeding the limit by:

(a) Opening the oil cooler flaps. Move the switch to "OPEN" or "CLOSED," and hold until the flap indicator shows the desired flap position. When the switch is released, it returns to neutral, closing the circuit.

(b) Reducing engine rpm.

(c) Increasing airspeed.

The oil pressure will decrease slightly with altitude and take an additional drop when shifting from "LOW" to "HIGH." Oil pressures may drop as low as 70 pounds psi at 25,000 feet, rated rpm, full throttle. These drops are normal.

5. STARTING ENGINES.

a. GENERAL. - The two engines are not started simultaneously. Either the left hand or right hand engine shall be started first and idled with the throttle in the warm-up slot while the second engine is started.

b. CHECK-OFF LIST.

(1) Ignition switches - "OFF."

(2) Mixture controls - "IDLE CUT-OFF."

(3) Remove bottom engine cowl panel for access and open drain valves on lower intake pipes in order to bleed air and prevent hydraulicing of push rods. Remove spark plugs from bottom rear cylinder.

(4) Clear engine by turning hand crank on starter 25-50 revolutions in normal direction in order to turn the engine one or two revolutions.

WARNING

Never turn over a hot engine by hand.

(5) Close drain valves on lower intake pipe. Replace spark plugs.

(6) Open manual shut-off valve in gear box lubricating system. Replace bottom cowl panel, removed for access in step (3).

(7) Fuel tank selector - "MAIN TANK."

(8) Engine selector - "BOTH ENGINES."

(9) Propeller control - full "INCREASE."

(10) Cowl flaps - "FULL OPEN."

(11) Oil cooler door - open.

(12) Supercharger control - "LOW."

(13) Battery switch - "ON."

NOTE

If external power source is available, turn battery switch "OFF" and plug into external power receptacle located in the right hand wheel well.

WARNING

Do not turn the battery switch on while the engine is not running unless the mixture control is in "IDLE CUT-OFF." If the booster fuel pump is turned to "EMERGENCY" while the mixture control is in any position except "IDLE CUT-OFF" and the battery switch is on, the lower cylinders may become flooded, resulting in damage to the engine when it is subsequently started.

(14) Auxiliary (booster) fuel pump switch - "ON."

(15) Primer switch turned on 2 to 12 seconds (depending upon temperature and condition of the engine) immediately prior to operating the starter.

(16) Throttle - approximately one half distance to "WARM-UP" stop.

(17) Ignition switch.

(a) Master button - push in.

(b) Turn left hand or right hand switch to "BOTH," depending on which engine is to be started.

(18) Starter switch - "ON."

(19) Move mixture control from "IDLE CUT-OFF" to "AUTO RICH" as soon as engine fires smoothly. Prime as necessary to keep the engine running. Do not pump or move the throttle abruptly until the engine is running smoothly.

(20) If engine should fail to continue running, return mixture control to "IDLE CUT-OFF" IMMEDIATELY to prevent flooding.

(21) Idle at 600 to 800 rpm until both normal gear box and engine oil pressure are built up. (See figures 13, 14.) If oil pressures are not indicated in 30 seconds, stop the engine and investigate.

(22) Auxiliary (booster) fuel pump - "OFF."

NOTE

Normally it should not be necessary to operate the starter more than 30 seconds to start the engine. If the starter switch is held on for one minute and the engine does not start, allow the starter to cool for one minute before making another attempt. After the second and succeeding cranking cycles, allow five minutes for cooling.

(23) When one engine is idling smoothly at 1000 rpm with the throttle in the "WARM—UP" slot, repeat procedure outlined in steps 7 through 21 in order to start second engine.

c. FAILURE TO START ON FIRST ATTEMPT. If the engine does not start, wait a few minutes to allow any spilled fuel to drain out of the blower drain.

(1) IMPROPER PRIMING. - Inspection of the exhaust pipe outlets should indicate whether the engine has been over or under-primed.

(a) UNDER-PRIMING. - No trace of smoke indicates under-priming. The use of the primer switch should be governed accordingly.

(b) OVER-PRIMING. - Excessive black smoke indicates over-priming. If the engine is over-primed, clear the cylinders and induction system of excess fuel as follows:

1. Mixture control - "IDLE CUT-OFF."

2. Auxiliary (booster) pump switch - "OFF."

3. Ignition switch and master button.

a. "OFF" if the first engine is being started.

b. Master button on, switch of engine being started only, "OFF," if other engine is started and idling in the "WARM-UP" slot.

4. Battery switch - "OFF."

5. Throttle - full open.

6. Clear engine by turning starter hand crank in normal direction to turn engine over one to two times.

WARNING

Never turn over a hot engine by hand.

d. ENGINE FIRE DURING STARTING. Refer to Section III, paragraph 1 for instructions if fire breaks out in engine during starting.

6. WARM-UP.

a. GENERAL - (Both engines running.) For warm-up, the following settings should be observed:

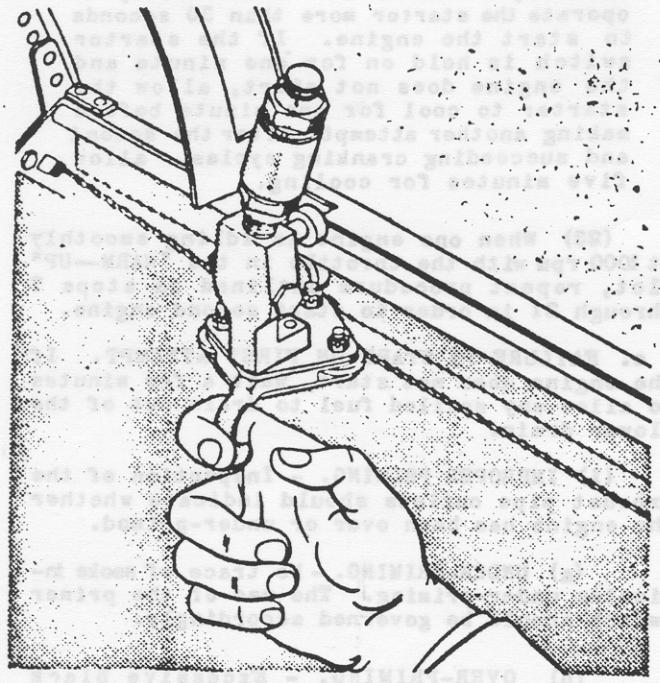


Figure 28 — Cockpit Canopy Manual Control

(1) Throttle - shift to "TAKE-OFF" slot to obtain 1000 rpm.

(2) Propeller control - full "INCREASE."

(3) Cowl flaps - full "OPEN."

(4) Oil cooler doors - "CLOSED" or as required.

(5) Mixture control - "AUTO RICH."

(6) MAXIMUM RECOMMENDED CYLINDER HEAD TEMPERATURE. - 232°C. (450°F.). If cylinder head temperatures approach 232°C. (450°F.), the engine should be cooled at 1000 rpm before continuing with the warm-up.

b. WARM-UP.

(1) Check oil pressures. With cold oil, engine oil pressure may be above 200 psi until oil-in temperature is approximately 40°C. (104°F.).

(2) Idle at 1000 rpm, with the propeller control in low pitch, until oil temperature is 40°C. (104°F.).

CAUTION

DO NOT OPERATE THE ENGINES AT SPEEDS OVER 1500 RPM FOR EXTENDED PERIODS WHEN THE PROPELLERS ARE NOT ENGAGED. AT SPEEDS OVER 1500 RPM, INERTIA FORCES GREATLY EXCEED GAS FORCES WHEN THE PROPELLERS ARE NOT ENGAGED, AND MAY CAUSE DAMAGE.

7. GROUND TEST.

a. GENERAL. - Observe the conditions described in paragraph 6 of this section. Throttle should be in "TAKE-OFF" slot, except for ignition safety check.

b. GROUND TEST.

(1) IGNITION SAFETY CHECK. - With engine idling at approximately 1000 rpm, throttle in "WARM-UP" slot, turn ignition switch to "OFF" (momentarily), and back to "BOTH." Engines should cut-out completely when ignition switch is in the "OFF" position.

(2) Open throttle briefly in "TAKE-OFF" slot to at least 2200 rpm or 30 inches Hg and check the following:

CAUTION

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

(a) Oil pressure - 90 to 95 psi.

(b) Fuel pressure - 16 to 18 psi.

(c) Magnetos - Check magnetos at 2200 rpm. There should be no more than 75-100 rpm drop when operating on either magneto. This check should always be made prior to the IDLE MIXTURE CHECK (refer to sub-paragraph (4) below).

(3) PROPELLER GOVERNOR CHECK.

(a) Place propeller governor control in full "INCREASE."

(b) Adjust the throttle to engine speed of 2000 rpm.

(c) Move the propeller control from full "INCREASE" to "DECREASE." The engine speed should drop to about 1200 rpm. Check propellers visually to see that both have come out of low pitch.

(d) Return the propeller control to full "INCREASE." Rpm should return to 2000.

(4) IDLE MIXTURE CHECK

(a) Set throttle for 600 rpm.

(b) Auxiliary (booster) fuel pump - "OFF."

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

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

peratures should be normal, 150° to 160°C. (302° to 320°F.), when making this check.

(5) SUPERCHARGER CHECK AND DESLUDGING PROCEDURE. - The supercharger check should never be made or the couplings desludged until the oil temperature has reached 60°C. (140°F.). If a regular supercharger check is not made, the couplings should be desludged as directed in paragraph (d) below, since the prevention of an excessive accumulation of sludge in the supercharger clutch mechanism is dependent upon frequent shifting of the clutches.

CAUTION

When shifting from one blower ratio to another, be sure to shift quickly, without hesitation between positions in order to avoid dragging and slipping the clutches.

(a) Adjust the throttle to 1200-1400 rpm; then shift the supercharger control from "LOW" to "HIGH." Oil pressure will change 5-10 psi while "HIGH" blower is engaging.

(b) After a minimum of 30 seconds in "HIGH," open the throttle to obtain 30 inches manifold pressure. Note the rpm.

(c) Shift back to the "LOW" position and, after the manifold pressure has stabilized, readjust the throttle to obtain 30 inches of manifold pressure. Note the rpm. An increase in engine rpm when shifting to a lower blower ratio, while maintaining a constant manifold pressure, indicates that the couplings are operating correctly. Fluctuations in oil pressure during the shifts indicate that the blowers and clutches are operating properly.

(d) Desludge the couplings by shifting as directed in paragraphs (a), (b) and (c) above. This shifting can best be performed on the ground, and, where possible, several shifts into each ratio should be made before and after each flight.

(6) ELECTRICAL CHECK WITH ENGINES RUNNING.

(a) Disconnect external power source, if used.

(b) Make sure the battery switch is on.

(c) Run the engine rpm up, select left or right voltmeter alternately, and watch the needle for a dip which should occur at approximately 26.5 volts, to indicate the closing of the reverse current cut-out.

(d) Increase the engine rpm and watch the voltmeter. The voltage should increase to about 28 volts and stay there, regardless of any further increase in engine rpm.

(e) If the reverse current cutout does not close, or if the voltmeter reading does not lie between 27.5 and 28.5 volts, corrective steps should be taken before take-off.

(7) HYDRAULIC PRESSURE CHECK. - Check the hydraulic pressure gage. It should indicate 1250 to 1500 pounds per square inch.

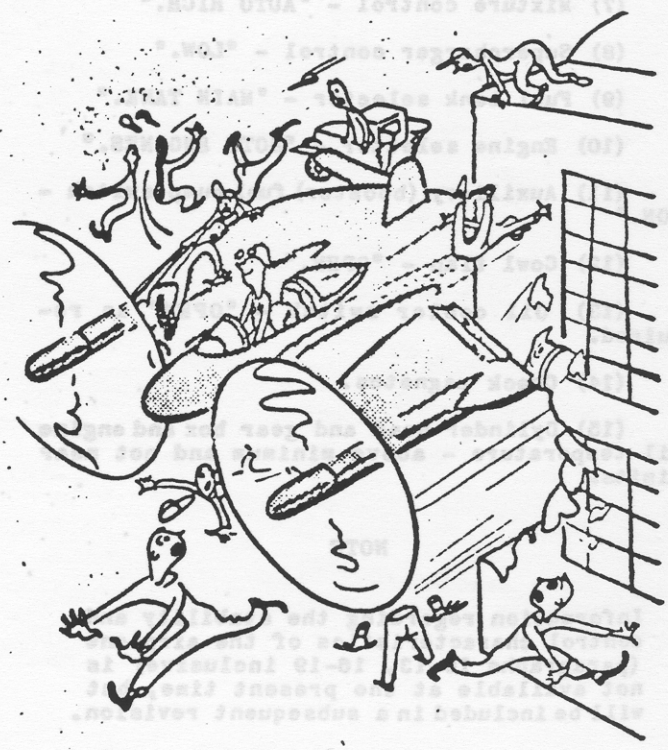
(8) RADIO CHECK. - Test radio operation (refer to Section IV, paragraph 2).

8. TAXIING INSTRUCTIONS.

a. Use take-off slot for taxiing. Don't rev up the engine and then ride the brakes. Badly over-heated brakes are not fully effective and can fuse the brake discs to the extent of leaving them frozen for landing.

b. Let the airplane roll freely when possible, using the brakes as an aid in steering, stopping and holding only. The throttle cannot be used for directional control, since the two engines cannot be operated at different speeds and propeller pitch cannot be independently varied.

c. The forward location of the cockpit provides excellent visibility. Use the S-turn procedure for best forward vision on the taxi strips.



CAUTION

When taxiing close to other aircraft, obstructions, or personnel, and particularly when making turns, carefully estimate clearance of the propeller arcs and ailavators.

d. Lock the tail wheel when taxiing cross-wind to relieve excessive braking action.

e. Keep electrical load at a minimum to prevent battery discharge.

9. BEFORE TAKE-OFF.

a. Full-power check and an engine power check table will be included in a subsequent revision when the information is available.

b. CHECK LIST.

(1) Shoulder harness and safety belt - secure and locked.

(2) Cabin - fully open.

(3) Tail wheel - "LOCKED."

(4) Arresting hook control - "UP."

(5) Throttle control - "TAKE-OFF."

(6) Propeller control - maximum rpm ("INCREASE").

(7) Mixture control - "AUTO RICH."

(8) Supercharger control - "LOW."

(9) Fuel tank selector - "MAIN TANK."

(10) Engine selector - "BOTH ENGINES."

(11) Auxiliary (booster) fuel pump switch - "ON."

(12) Cowl flap - "OPEN."

(13) Oil cooler switch - "OPEN" as required.

(14) Check magnetos.

(15) Cylinder head and gear box and engine oil temperature - above minimum and not near limits.

NOTE

Information regarding the stability and control characteristics of the airplane (paragraphs 10-13, 16-19 inclusive) is not available at the present time, but will be included in a subsequent revision.

10. TAKE-OFF.

11. CLIMB.

12. DURING FLIGHT.

13. STALLS.

14. SPINS.

- Refer to figure 26, Flight Limitations Table.

15. PERMISSIBLE ACROBATICS.

Refer to figure 26, Flight Limitations Table.

16. DIVING.

17. NIGHT FLIGHT.

18. APPROACH.

19. LANDING.

20. STOPPING OF ENGINES.

a. Desludge the supercharger clutch in accordance with paragraph 7b(5) of this section.

b. Before shutting down the engines, use the following procedure for cooling:

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

(2) Oil cooler door - "OPEN."

(3) Propeller control - maximum rpm ("INCREASE").

(4) Throttle - "WARM-UP"-set to 800-1000 rpm to cool cylinder head temperature to approximately 200°C. (392°F.) or below.

c. OIL DILUTION. - (Refer to Section I, paragraph 31 for description of oil dilution switch and to figure 13 for oil dilution system diagram.) In the event of temperature forecast of below 1°C. (+ 30°F.), the oil in the warm-up circuit shall be diluted in the following manner:

(1) Open the manual shut-off valve in the oil dilution line.

(2) Engine speed constant - 1000 rpm.

(3) Oil dilution switch - "ON" (approximately five minutes, depending on expected temperatures).

(4) Stop engines by moving mixture control to "IDLE CUT-OFF" position; then cut ignition.

(5) Hold oil dilution switch "ON" until engine stops.

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

(7) When oil pressure remains steady, close the manual shut-off valve in the oil dilution line.

(8) PRECAUTIONS.

(a) Do not over dilute.

(b) Guard against fire.

(c) Dilute only when justified by a forecast of low temperature, below 1°C. (+ 30° F.).

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

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

(f) Check position of manual shut-off valve in the oil dilution system.

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

d. TO STOP THE ENGINE.

(1) Auxiliary (booster) fuel pump - "OFF."

(2) Mixture control - "IDLE CUT-OFF."

NOTE

THE MIXTURE CONTROL SHALL ALWAYS BE LEFT IN "IDLE CUT-OFF" WHENEVER THE ENGINE IS NOT RUNNING, TO PREVENT FLOODING OF THE ENGINE THROUGH INADVERTANT USE OF THE AUXILIARY FUEL PUMP.

(3) Ignition switches when engine stops turning - "OFF."

NOTE

As soon as the engine begins to cut-out, move the throttle forward slowly to prevent backfiring.

(4) Battery switch - "OFF."

(5) Fuel selector - "OFF."

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

(7) Cowl flaps and oil cooler doors - close as soon as engine is cool.

(8) Cockpit cabin - close.

21. BEFORE LEAVING THE AIRPLANE.

a. Park the airplane with its nose into the wind, if possible where it will not be affected by the "propwash" of other airplanes.

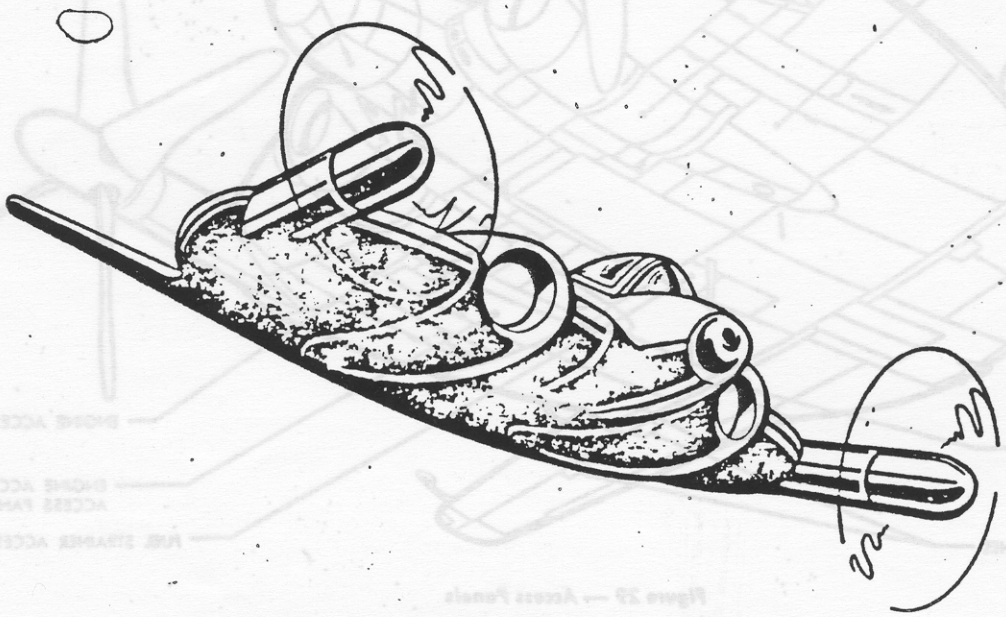
b. Pull and turn handle to lock tail wheel.

c. Lock rudder and ailavator control systems in neutral by means of the lock located at the base of the stick.

d. Check to see that the battery switch is "OFF."

e. Check to see that the airplane is grounded, that chocks have been placed fore and aft of the front wheels and that the airplane is tied down, if necessary.

f. Check to see that pitot head cover, blower opening cover, and other temporary protective coverings are in place.



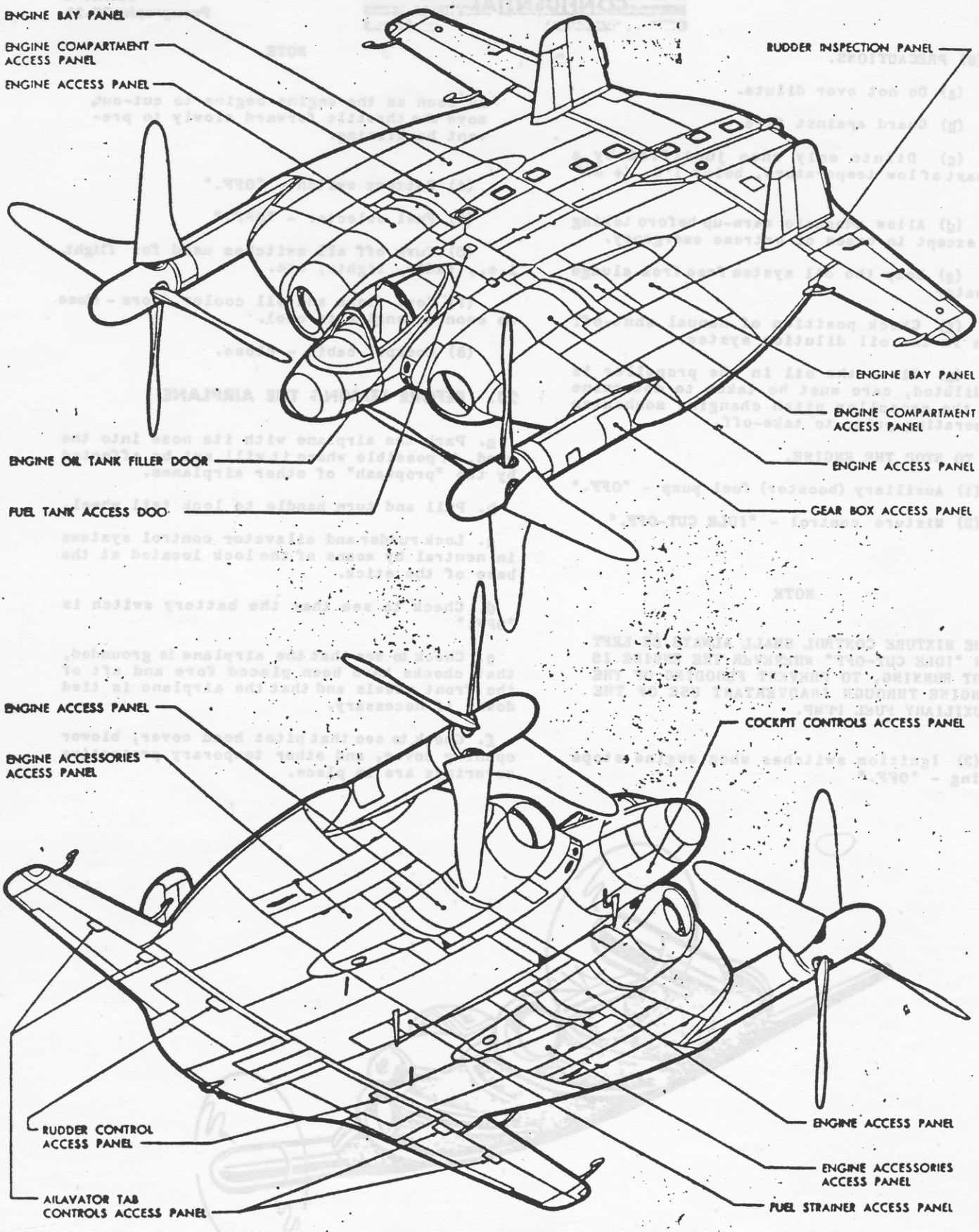


Figure 29 — Access Panels

Section III

EMERGENCY OPERATING INSTRUCTIONS

1. FIRE.

a. FIRE ON STARTING THE ENGINE.

(1) Master ignition switch button - "OFF."

(2) CO_2 fire extinguisher - "L.H. on or "R.H. on, whichever engine is affected. The fire extinguisher control is located on the left hand side of the cockpit. (See figure 30.)

(3) Stand-by captain shall apply CO_2 to the source of the flame.

b. FIRE DURING TAKE-OFF.

(1) CO_2 fire extinguisher control - "L.H. on or "R.H. on, whichever engine is affected.

(2) Land immediately.

c. FIRE DURING FLIGHT.

(1) Engine selector - turn to "L.H. Engine" or "R.H. Engine," whichever engine is NOT on fire.

(2) Ignition switch of burning engine - "OFF."

(3) CO_2 fire extinguisher control - "L.H. on or "R.H. on, whichever engine is affected.

(4) Do not attempt to start affected engine again.

(5) Land as soon as possible.

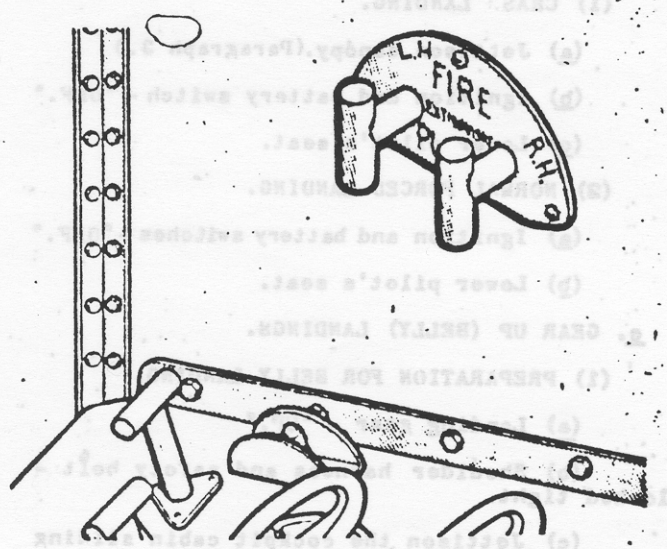


Figure 30 — Fire Extinguisher Control

d. ELECTRICAL FIRE. - In the event of a fire in the electrical system, observe the following:

(1) Turn off the emergency generator and battery switches.

(2) Turn off all other electrical switches.

(3) If the fire is extinguished, turn the circuits on, one at a time, starting with the emergency generator and battery switches and watching for the circuit which caused the fire.

(4) If cause is undetermined, land as soon as possible.

2. ENGINE FAILURES.

a. GENERAL. - Engine failure may be indicated by either of the following:

(1) Lighting of the declutching switch light on the instrument board.

(2) Freezing of the engine.

(3) Drop in altitude and loss of speed.

b. DURING TAKE-OFF.

(1) If one engine fails after a speed of 95 mph has been reached, level flight may be maintained at that speed in order to make a normal forced landing. Refer to paragraph 4 of this section.

(2) In the event of complete engine failure during take-off, LAND STRAIGHT AHEAD, if sufficient runway is available for a normal (wheels down) landing.

(a) Perform as many as possible of the operations listed below in the order given:

1. Landing gear - "UP", if sufficient runway is not available STRAIGHT AHEAD for a landing in the normal (wheels down) landing condition.

2. Lower seat several notches.

3. Switches (battery and ignition) - "OFF."

c. DURING FLIGHT.

(1) Ignition switch of affected engine - "OFF."

(2) Engine selector - "LEFT ENGINE" or "RIGHT ENGINE," whichever is operating normally.

CONDITION	POWER	WEIGHT	Vm M.P.H.	MIN. R/D F.P.M.	Vg M.P.H.	R/D F.P.M.	θ
NORMAL	OFF	14550	190	2330	255	2655	-7°
LANDING	OFF	13350	140	3080	180	3560	-13°

Vm - SPEED FOR MINIMUM RATE OF DESCENT
Vg - SPEED FOR FLATTEST GLIDE
θ - APPROXIMATE FLIGHT PATH ANGLE TO HORIZON

ALL VALUES ARE GIVEN FOR SEA LEVEL

Figure 31 — Recommended Speeds After Engine Failure

d. RECOMMENDED SPEEDS AFTER ENGINE FAILURE. In case of complete power failure, with the engines declutched from the system but with the propellers free to rotate, the pilot may use the above recommended speeds:

3. BAIL-OUT.

a. The entire canopy may be jettisoned for bail-out. Throw the switch located adjacent to the normal operating switch. (See figure 24.) This action explodes the main attaching bolt in each of the three rollers supporting the canopy which will fly off under the influence of air loads.

CAUTION

Crouch as low as possible in the cockpit, head well down, before jettisoning the canopy in order to prevent the possibility of the canopy striking the head as it leaves the airplane.

4. FORCED LANDINGS.

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

(1) Landings in terrain such as golf courses, ploughed fields, swamps, mud or sand should be made with landing gear up. Most nose-overs occur as a result of landing in such terrain, with the landing gear down, and nearly all serious injuries and fatalities result from nosing over.

(2) Landings in rough, rocky or tree stump terrain should be made with wheels down, so that the undercarriage and not the fuselage will make the initial contact.

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

(4) All forced landings should be made well above the stalling speed into the wind. There will be little or no control of the airplane if an attempt is made to land at or slightly above stalling speed.

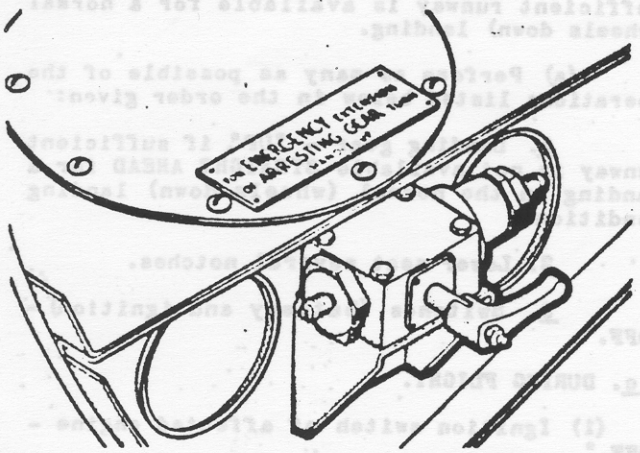


Figure 32 — Compressed Air Emergency Arresting Hook Control

b. GEAR DOWN LANDING.

(1) CRASH LANDING.

(a) Jettison canopy.(Paragraph 3.)

(b) Ignition and battery switch - "OFF."

(c) Lower pilot's seat.

(2) NORMAL FORCED LANDING.

(a) Ignition and battery switches - "OFF."

(b) Lower pilot's seat.

c. GEAR UP (BELLY) LANDINGS.

(1) PREPARATION FOR BELLY LANDING.

(a) Landing gear - "UP."

(b) Shoulder harness and safety belt - locked tight.

(c) Jettison the cockpit cabin sliding

section. (See paragraph 3 of this section.)

(d) Fuel tank pressure release - "OFF."

(2) PRIOR TO CONTACT WITH THE GROUND.

(a) Lower pilot's seat.

(b) Switches (battery, generator, ignition) - "OFF."

(c) Fuel tank selector - "OFF."

d. DITCHING.

(1) The procedure outlined for GEAR UP (BELLY) LANDINGS is applicable to ditching.

5. PROPELLER.

A dead engine may be positively identified by loss of rpm. The automatic declutching switch will immediately declutch the affected engine and light the instrument board indicator, hence there is no provision for feathering and unfeathering the propeller or for control of malfunctioning propellers. Should both engines fail, the propellers will return to the full feathered condition.

6. FUEL SYSTEM.

a. FAILURE OF ENGINE-DRIVEN FUEL PUMP. - In the event of engine-driven fuel pump failure, proceed immediately with the following:

(1) Booster fuel pump - "EMERGENCY."

(2) Fuel selector - "MAIN TANK."

(3) Shift to low blower. Note that with the emergency (booster) fuel pump on "EMERGENCY," the fuel pressure will not come up all the way until the supercharger control is shifted to "LOW."

7. SYSTEM OPERATION.

a. LANDING GEAR AND ARRESTING HOOK EMERGENCY EXTENSION. - In case of failure of the hydraulic system or power failure, the landing gear can be extended by means of the compressed air system. (See figure 33.)

(1) For emergency extension of the landing gear, proceed as follows:

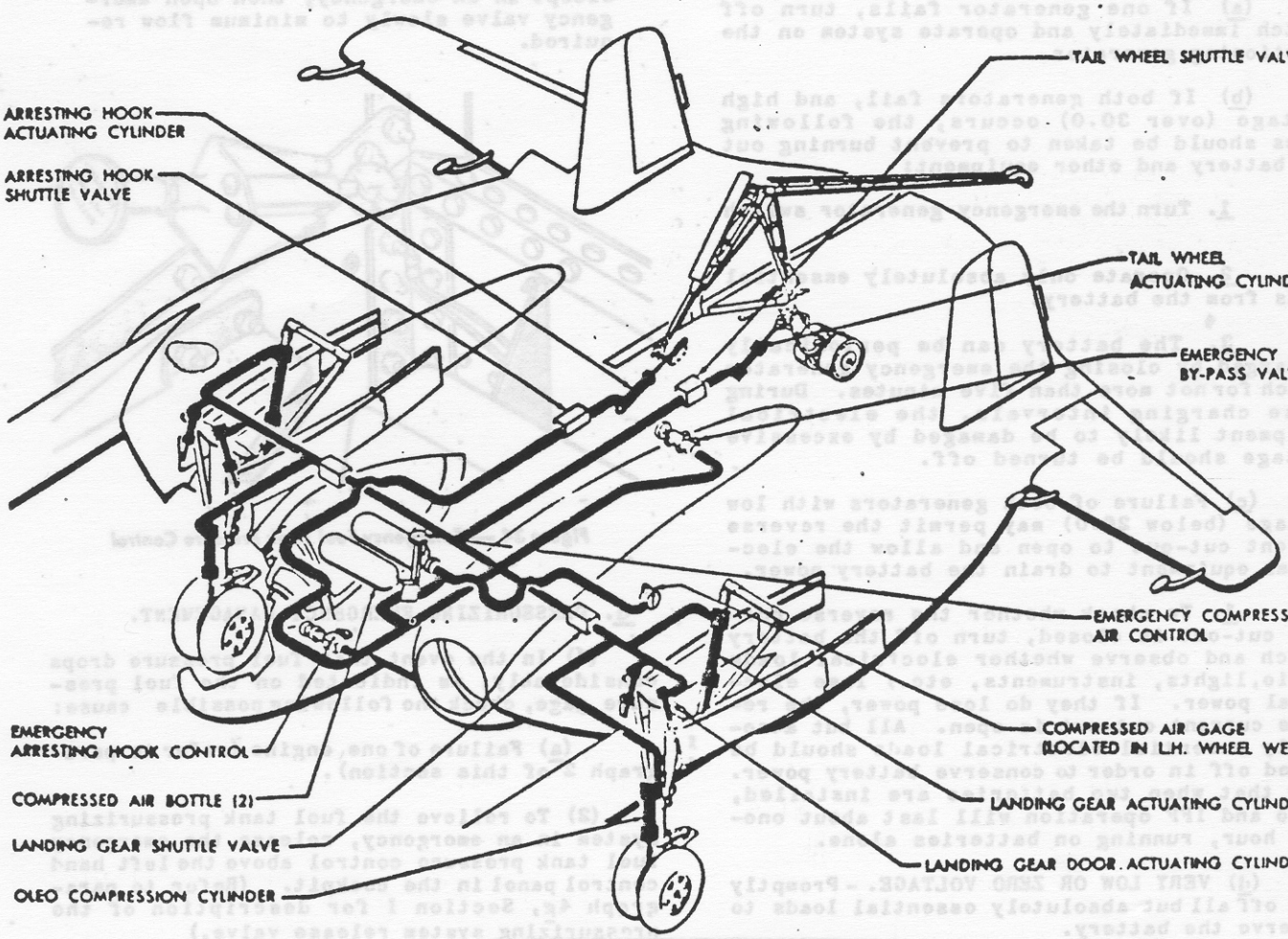


Figure 33 — Compressed Air Emergency Landing Gear and Arresting Hook Extension System Diagram

(a) Reduce speed to approximately 80 knots.

(b) Pull the landing gear emergency extension handle, located between the rear of the left hand shelf and the pilot's seat. This action opens the compressed air bottles.

NOTE

The compressed air system will extend the landing gear regardless of the position of the landing gear control handle. However, if time permits, it is recommended that the landing gear control handle be placed in the "DOWN" position.

(2) For emergency extension of the arresting hook, proceed as follows:

(a) Reduce speed to approximately 80 knots and pull landing gear emergency extension handle. See preceeding paragraph 7a(1).

(b) Turn the arresting hook emergency extension handle up. The handle is located on the left hand side of the bulkhead in the pilot's cockpit.

b. ELECTRICAL.

(1) GENERATOR SYSTEM.

(a) If one generator fails, turn off switch immediately and operate system on the functioning generator.

(b) If both generators fail, and high voltage (over 30.0) occurs, the following steps should be taken to prevent burning out the battery and other equipment:

1. Turn the emergency generator switch off.

2. Operate only absolutely essential loads from the battery.

3. The battery can be periodically recharged by closing the emergency generator switch for not more than five minutes. During these charging intervals, the electrical equipment likely to be damaged by excessive voltage should be turned off.

(c) Failure of both generators with low voltage (below 26.0) may permit the reverse current cut-out to open and allow the electrical equipment to drain the battery power.

1. To check whether the reverse current cut-out is closed, turn off the battery switch and observe whether electrical loads (radio, lights, instruments, etc.) lose electrical power. If they do lose power, the reverse current cut-out is open. All but absolutely essential electrical loads should be turned off in order to conserve battery power. Note that when two batteries are installed, radio and IFF operation will last about one-half hour, running on batteries alone.

(d) VERY LOW OR ZERO VOLTAGE. - Promptly turn off all but absolutely essential loads to conserve the battery.

(2) CIRCUIT BREAKERS. - If an electrical overload of sufficient magnitude and duration occurs in a circuit, the circuit breaker button will pop out, thus breaking the circuit. Push the button back in; if the circuit has been seriously disturbed, as by a "short," the button will pop out again, breaking the circuit.

c. OXYGEN.

(1) Should symptoms occur suggestive of oxygen deficiency (anoxia) such as drowsiness, dizziness, dimming of vision, awkward performance of routine tasks or nausea, or should the regulator become inoperative, immediately turn on emergency valve and descend below 10,000 feet.

(2) Should excessive carbon monoxide or other noxious or irritating gas be present or suspected, regardless of altitude, set the air valve at "OFF" or "100% OXYGEN" position and use undiluted oxygen until danger is past or flight completed.

NOTE

The emergency valve (small red knob on regulator) shall be closed at all times, except in an emergency; then open emergency valve slowly to minimum flow required.

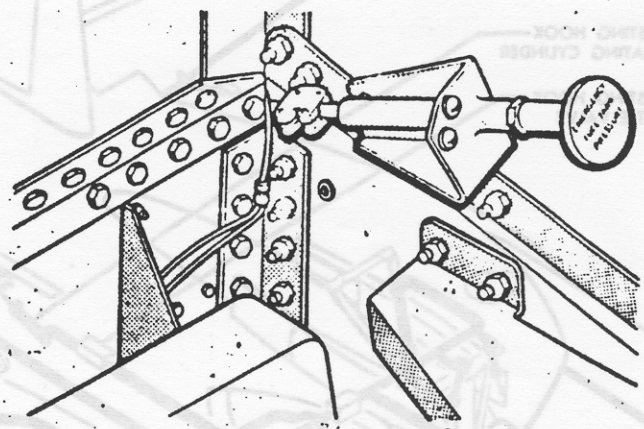


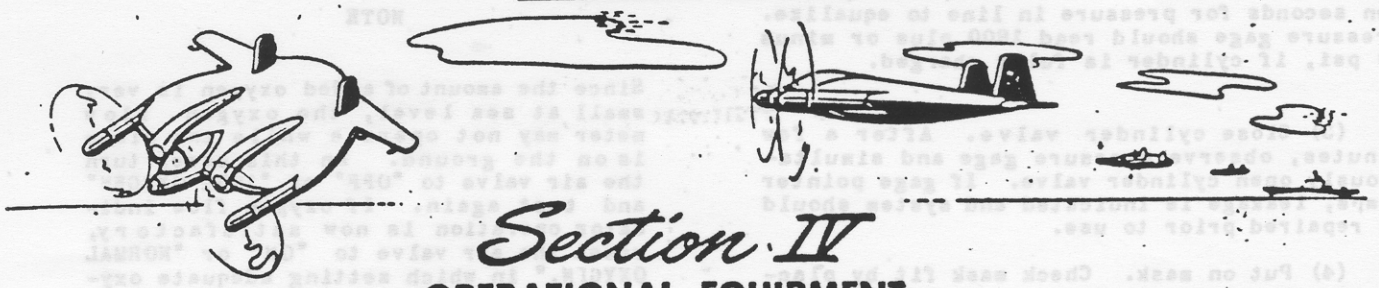
Figure 34 — Emergency Fuel Tank Pressure Control

d. PRESSURIZING EMERGENCY MANAGEMENT.

(1) In the event that fuel pressure drops considerably, as indicated on the fuel pressure gage, check the following possible cause:

(a) Failure of one engine (refer to paragraph 2 of this section).

(2) To relieve the fuel tank pressurizing system in an emergency, release the emergency fuel tank pressure control above the left hand control panel in the cockpit. (Refer to paragraph 4g, Section I for description of the pressurizing system release valve.)



Section IV

OPERATIONAL EQUIPMENT

1. OXYGEN.

a. GENERAL. - A diluter-demand type oxygen system is provided (See figure 35). The oxygen cylinder is located just forward of the seat bulkhead in the cockpit. The flow indicator is mounted below the cockpit cowl and to the right of the instrument board. The diluter demand regulator is mounted forward of the flow indicator and is similar in operation to the demand regulator, except that an air admission valve is incorporated which allows air from the outside to enter the breathing system. The dilution of pure oxygen with air, dependent upon altitude up to approximately 30,000 feet, is controlled by means of a small lever on the regulator. When the air valve is set to "ON," air is automatically mixed with oxygen from the supply cylinder. Above approximately 30,000 feet, 100 per cent oxygen is automatically delivered.

b. WHEN TO USE OXYGEN.

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

NOTE

If symptoms suggestive of oxygen deficiency (anoxia) 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 system in accordance with paragraph 7c of Section III.

(2) The regulator is equipped with an oxygen flow indicator which varies with the pilot's breathing, thereby indicating proper operation of the system. If the blinking action ceases, immediately turn on the emergency valve in accordance with paragraph 7c of Section III.

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

(4) Use oxygen on night flights above 5,000 feet, on combat missions, and training missions simulating combat.

c. PREFLIGHT CHECK. - It is recommended that the following shall be checked at 20 hour intervals when the airplane is on the ground, and whenever possible before flights in which oxygen is likely to be used, in order to assure proper functioning of the system:

(1) Emergency valve - "OFF."

(2) Open cylinder valve. Allow at least

OXYGEN CONSUMPTION TABLE
APPROXIMATE HOURS OF OXYGEN. ONE MAN AIR VALVE "ON" OR NORMAL OXYGEN

CYLINDER PRESSURE	ALTITUDE IN THOUSAND FEET							
	5	10	15	20	25	30	35	40
1800	8.0	9.0	8.5	6.9	4.1	3.1	4.2	6.9
1500	6.4	7.2	6.8	5.5	3.3	2.5	3.4	5.5
1200	4.8	5.4	5.1	4.1	2.4	1.9	2.5	4.1
900	3.2	3.6	3.4	2.8	1.6	1.2	1.7	2.8
600	1.6	1.8	1.7	1.4	.8	.6	.6	1.4
300	DESCEND BELOW 10,000 FEET							
ONE 514 CUBIC INCH CYLINDER DILUTER-DEMAND REGULATOR								

Figure 35 — Oxygen Consumption Table

ten seconds for pressure in line to equalize. Pressure gage should read 1800 plus or minus 50 psi, if cylinder is fully charged.

(3) Close cylinder valve. After a few minutes, observe pressure gage and simultaneously open cylinder valve. If gage pointer jumps, leakage is indicated and system should be repaired prior to use.

(4) Put on mask. Check mask fit by placing thumb over disconnect at end of mask tube and inhaling lightly. If there is no leakage, the mask will adhere tightly to the face and a definite resistance to inhalation will be encountered. If mask leaks, tighten mask suspension straps and/or adjust nose wire. DO NOT USE A MASK THAT LEAKS. Never check mask fit with EMERGENCY FLOW "ON."

(5) Couple mask securely to breathing tube by means of quick-disconnect coupling.

NOTE

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

(6) Open cylinder valve. Breathe several times to see that regulator is functioning properly.

NOTE

Since the amount of added oxygen is very small at sea level, the oxygen flow meter may not operate while the plane is on the ground. In this case, turn the air valve to "OFF" or "100% OXYGEN" and test again. If oxygen flow indicator operation is now satisfactory, reset the air valve to "ON" or "NORMAL OXYGEN," in which setting adequate oxygen flow and blinker operation will be assured at oxygen - use altitudes.

(7) Check the emergency valve by turning the handle toward the "ON" position until oxygen flows into the mask. Close the emergency valve.

d. OPERATING INSTRUCTIONS. - The following procedures shall be followed when oxygen is used during flight:

(1) Open oxygen cylinder valve if not already opened. Pressure gage should read approximately 1800 psi if cylinder is fully charged.

(2) Set air valve to "NORMAL OXYGEN" for all normal flight conditions.

(3) Put on mask. Fully engage mating portions of disconnect coupling to oxygen system

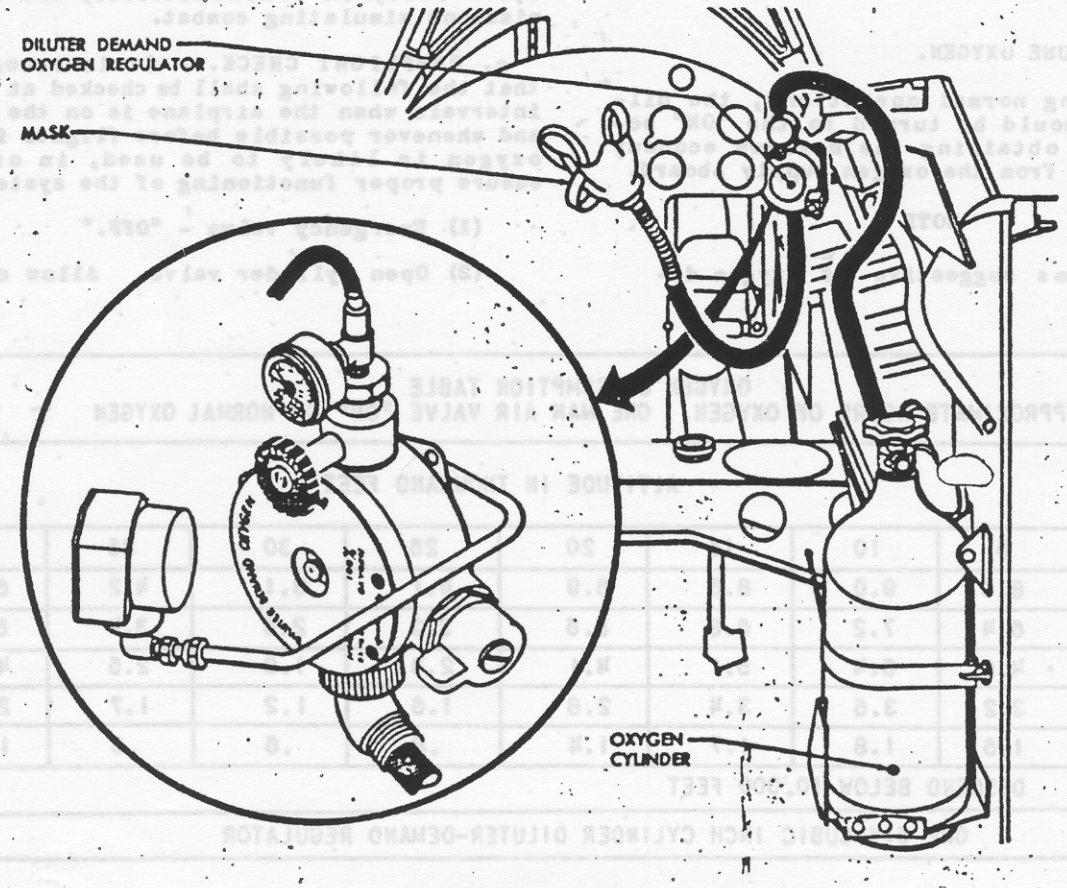


Figure 36 — Oxygen System and Control

breathing tube and attach clip to parachute harness (or clothing) sufficiently high on the chest to permit free movement of head.

(4) Check mask fit by squeezing mask tube and inhaling lightly. If there is no leakage, mask adheres tightly to face and there is a definite resistance to inhalation. If mask leaks, tighten mask suspension straps.

g. While oxygen is on, frequently check:

(1) Cylinder pressure gage for oxygen supply.

(2) Oxygen flow indicator for flow of oxygen through the regulator.

(3) Mask fit for leak tightness.

(4) Disconnect coupling to insure that it is fully engaged.

(5) Upon completing flight, turn off oxygen supply.

NOTE

Do not exhaust oxygen cylinder below 300 psi, except in an emergency.

f. EMERGENCY CONDITIONS. - Refer to Section III, paragraph 7c for emergency conditions resulting from failure of the oxygen system.

2. COMMUNICATION AND ASSOCIATED ELECTRONIC EQUIPMENT.

a. GENERAL. - The radio console panel containing the controls for operating the communication, navigation, and identification radio equipment is located in the cockpit on the right hand control shelf. (See figure 38.) This airplane is furnished with the following equipment:

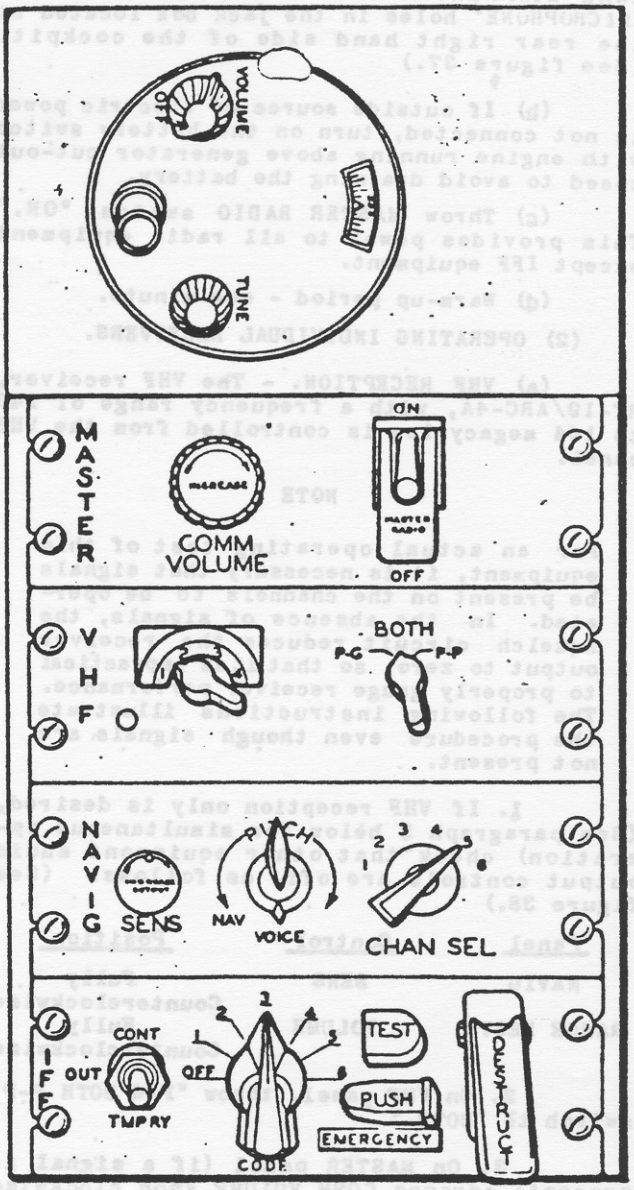


Figure 38 — Radio Console Control Panel

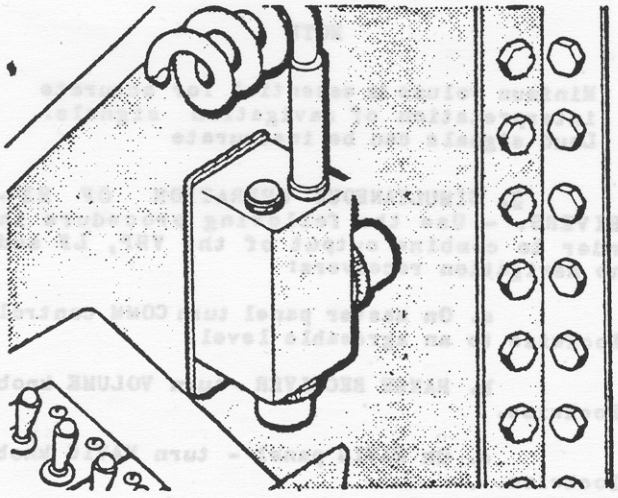


Figure 37 — Pilot's Jack Box

COMMUNICATION EQUIPMENT

AN/ARC-4 VHF Transmitting and Receiving
BC-1206-C LF Range Receiving

NAVIGATION EQUIPMENT

AN/ARR-2A Receiving

IDENTIFICATION EQUIPMENT

AN/APX-1 IFF Transmitting and Receiving

b. OPERATION OF COMMUNICATION, NAVIGATION, AND IDENTIFICATION EQUIPMENT.

(1) UPON ENTRANCE INTO THE COCKPIT.

(a) Plug headphone extension cord and hand microphone into the "TELEPHONE" and "MICROPHONE" holes in the jack box located at the rear right hand side of the cockpit. (See figure 37.)

(b) If outside source of electric power is not connected, turn on the battery switch with engine running above generator cut-out speed to avoid draining the battery.

(c) Throw MASTER RADIO switch "ON." This provides power to all radio equipment except IFF equipment.

(d) Warm-up period - one minute.

(2) OPERATING INDIVIDUAL RECEIVERS.

(a) VHF RECEPTION. - The VHF receiver, RT-19/ARC-4A, with a frequency range of 140 to 144 megacycles is controlled from the VHF panel.

NOTE

For an actual operating test of this equipment, it is necessary that signals be present on the channels to be operated. In the absence of signals, the squelch circuit reduces the receiver output to zero, so that it is impractical to properly gauge receiver performance. The following instructions illustrate the procedure even though signals are not present.

1. If VHF reception only is desired, (See paragraph 3 below for simultaneous operation) check that other equipment audio output controls are off, as follows: (See figure 38.)

Panel	Control	Position
NAVIG	SENS	Fully Counterclockwise
RANGE RECVR	VOLUME	Fully Counterclockwise

2. On VHF panel, throw "P-G BOTH P-P" switch to "BOTH."

3. On MASTER panel (if a signal is present) advance COMM VOLUME knob clockwise to obtain the greatest headset volume without aural discomfort. If a signal is not present, advance the COMM VOLUME knob fully clockwise. (A high setting of the COMM VOLUME knob is desirable to keep the output from other receivers at a satisfactory level.)

(b) LF RECEPTION. - The BC-1206-C LF range receiver with a frequency range of 200-400 kilocycles is controlled from the panel forward of MASTER panel.

1. If LF range reception only is desired (see paragraph 3 below for simultaneous operation), check to see that other equipment audio output controls are off, as follows:

Panel	Control	Position
MASTER	COMM	Fully Counterclockwise
NAVIG	SENS	Fully Counterclockwise

2. ON RANGE RECEIVER:

a. Advance VOLUME control knob clockwise until normal background is heard.

b. Turn tuning knob to the frequency of the desired radio range station.

c. Then readjust VOLUME control knob for normal operation.

NOTE

Rotate VOLUME control knob counterclockwise to minimum required for reception as high volume can produce incorrect course indications.

(c) NAVIGATION - RECEPTION. - The R-4A/ARR-2A navigation receiver, with a frequency range from 234-258 megacycles is controlled from the NAVIG panel.

1. If navigation-reception only is desired (see paragraph 3 below for simultaneous operation), check to see that other equipment audio output controls are off, as follows:

Panel	Control	Position
RANGE RECVR	VOLUME	Fully Counterclockwise
MASTER	COMM	Fully Counterclockwise

2. On NAVIG panel:

a. Set the CHAN SEL indicator to the assigned channel number.

b. Turn the VOICE-NAV indicator to "NAV."

c. Increase volume by rotating the SENS knob clockwise slowly from its extreme counterclockwise position to obtain a usable weak signal or a fairly strong background hiss.

d. Adjust PITCH control for clear tone.

e. Readjust SENS knob to minimum volume in order to receive the STRONGEST SINGLE SIGNAL.

NOTE

Minimum volume is essential for accurate interpretation of navigation signals. Loud signals can be inaccurate

3. SIMULTANEOUS OPERATION OF RECEIVERS. - Use the following procedure in order to combine output of the VHF, LF and the navigation receivers:

a. On master panel turn COMM control clockwise to an agreeable level.

b. RANGE RECEIVER - turn VOLUME knob clockwise.

c. On NAVIG panel - turn NAVIG knob clockwise.

4. TRANSMISSION.

a. EQUIPMENT.

Transmitter	Frequency
RT-19/ARC-4A (VHF transmission)	140-144 megacycles

WARNING

THESE INSTRUCTIONS ARE SUBJECT TO LOCAL LIMITATIONS REGARDING RADIO SILENCE.

b. OPERATION.

(1) Turn CHAN SEL switch to desired main channel.

(2) Turn P-G BOTH P-P switch as required.

NOTE

Normally, the P-G BOTH P-P switch should be in the "BOTH" position. However, when the reception of two signals causes interference, this switch should be turned to the position which corresponds to the channel on which clear reception is desired. (See paragraph 2b (2) (a) for VHF reception.)

(3) Proceed as outlined in paragraph below for microphone selection and operation.

c. MICROPHONE OPERATION. -

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

(2) If a lip or mask microphone is used, push the throttle switch button.

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

(4) The hand microphone, when not in use, is held by a clamp located on the right hand side of the cockpit. (See figure 8.)

5. IFF EQUIPMENT.

a. GENERAL. - The IFF equipment consists of an RT-22A/APX-1 transmitter-receiver. All IFF controls are located on the IFF control panel. The IFF equipment is operated as follows:

NOTE

Before take-off, check with service crew to see that a complete destructor circuit test has been made.

b. On IFF panel:

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

(2) Throw G BAND toggle switch to "CONT" or "TEMPRY" only when required.

(3) To destroy equipment, raise red switch guard labeled DESTRUCT and throw switch to "ON" position.

(4) To secure equipment, be certain that CODE indicator is in "OFF" position.

NOTE

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

6. PILOT'S CHECK-OFF LISTS.

a. BEFORE TAKE-OFF.

(1) Check with ground service to make sure that a complete destructor circuit test has been made for IFF equipment.

(2) Plug in headset and mask or lip microphone, if one is used.

(3) Turn battery switch and master radio switch "ON."

(4) Set up VHF receiver and adjust COMM VOLUME on MASTER panel.

(5) Set up range receiver.

(6) Set up navigation receiver.

(7) Set control for simultaneous reception of communication and navigation receivers.

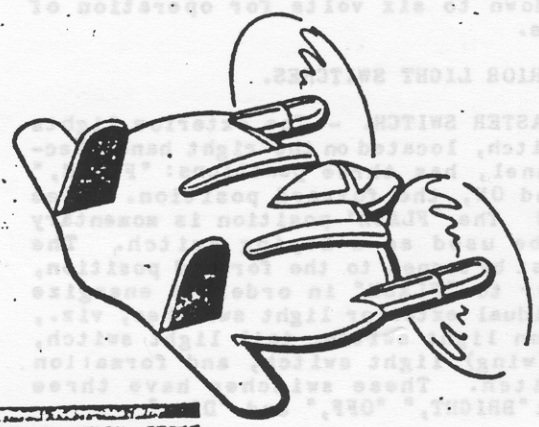
(8) If security instructions permit, select desired transmitter channel and make test transmission with base station on VHF.

b. AFTER LANDING.

(1) Turn radio master switch "OFF."

(2) Turn battery switch "OFF."

(3) On IFF panel, turn CODE indicator "OFF."



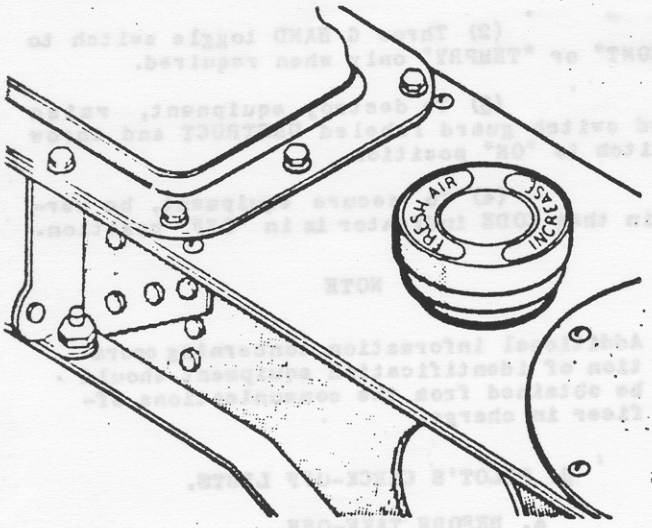


Figure 39 — Cockpit Ventilator Control

3. VENTILATION.

a. COCKPIT VENTILATOR. - The cockpit ventilator consists of a rubber tube through which blower intake air flows to the cockpit. A valve to control the air flow is attached to the control stick bulkhead.

b. The ventilator control, supplying fresh air to the cockpit, is located on the right side of the stick support beam. (See figure 39.) Turn the regulating knob counterclockwise to increase the flow of fresh air.

4. LIGHTING EQUIPMENT.

a. COCKPIT LIGHTS SWITCH. - The brilliancy of the five cockpit lights is regulated by a single rheostat located on the right hand electrical panel. (See figure 22.) The rheostat has two positions, "OFF" and "INCREASE." A built-in switch in each light provides individual selection when the rheostat has been turned to "INCREASE."

b. INSTRUMENT BOARD LIGHTS SWITCH. - The instrument board lights are regulated by a rheostat having two positions, "OFF" and "INCREASE." The rheostat is located on the right hand electrical panel. (See figure 22.) An adjustable resistor brings the normal 28-volt current down to six volts for operation of the lights.

c. EXTERIOR LIGHT SWITCHES.

(1) MASTER SWITCH. - The exterior lights master switch, located on the right hand electrical panel, has three positions: "FLASH," "OFF," and ON, the forward position. (See figure 22.) The "FLASH" position is momentary and can be used as a keying switch. The switch must be turned to the forward position, full ON or to "FLASH" in order to energize the individual exterior light switches, viz., the section light switch, tail light switch, running (wing) light switch, and formation light switch. These switches have three positions: "BRIGHT," "OFF," and "DIM."

5. PITOT HEATER SWITCH.

The pitot heater switch, located on the right hand electrical panel, has two positions, "HEAT" and "OFF." (See figure 22) Close the pitot heater switch in order to direct the current to the heater, and prevent the tube from freezing.

6. WINDSHIELD DEFROSTER CONTROL.

The defroster control is located under the windshield cowling, and has two positions, "ON" and "OFF." Regulate the quantity of hot air necessary for adequate defrosting by turning the control to the desired position between "ON" and "OFF." (See figure 3.) Heated air for the defroster is taken from the core face of the gear box oil cooler and passes through a tube to the diffuser which directs the hot air to the windshield. The valve controlling the air flow is inserted in a tube adjacent to the control stick.

7. TOW TARGET CONTROL.

The tow target control handle is located at the aft end of the pilot's left hand control panel. (See figure 7.)

8. DATA MAP CASE.

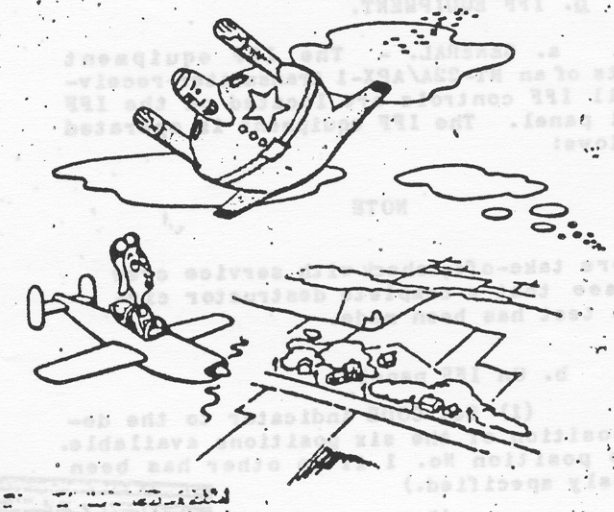
The aluminum alloy map case is located below the pilot's left hand control panel. (See figure 5.)

9. CHART BOARD.

The chart board is stowed in a holder at the lower right hand side of the cockpit. The board rests on the pilot's knees when in use. (See figure 5.)

10. REAR VIEW MIRRORS.

The two rear view mirrors are located on either side of the sliding section.



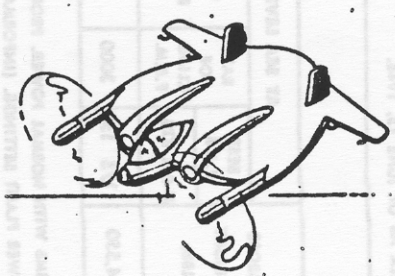
Appendix I

OPERATING CHARTS

TABLES

CURVES

INDEX



AIRCRAFT MODEL
XF5U-1

TAKE-OFF & CLIMB CHART

ENGINE MODEL
(2) R-2000-7

TAKE-OFF DISTANCE (FEET)

GROSS WEIGHT, LBS.	HEAD WIND M.P.H.	HEAD WIND KTS.	GROUND RUN AT SEA LEVEL
14,550	0	0	710
	17	15	490
	35	30	300
	52	45	160

NOTE: INCREASE CHART DISTANCES AS FOLLOWS: 80°F + 10%
DATA AS OF JUNE 15, 1946.

TAKE-OFF DISTANCE FOR HARD SURFACE RUNWAY.
TAKE-OFF PROPELLER G.R. .403
TAKE-OFF GROUND RUN IN 3 POINT ATTITUDE.

OPTIMUM TAKE-OFF WITH 2700 R.P.M., 49 IN. MG. IS 80% OF CHART VALUES.

CLIMB DATA

GROSS WEIGHT LBS.	AT SEA LEVEL: BEST E.A.S. M.P.H.	AT SEA LEVEL: BEST E.A.S. KTS.	AT SEA LEVEL: RATE OF CLIMB F.P.M.	AT SEA LEVEL: GALS. OF FUEL USED	AT 5,000 FEET: BEST E.A.S. M.P.H.	AT 5,000 FEET: BEST E.A.S. KTS.	AT 5,000 FEET: RATE OF CLIMB F.P.M.	AT 5,000 FEET: FROM SEA LEVEL TIME MIN.	AT 5,000 FEET: FROM SEA LEVEL FUEL USED	AT 10,000 FEET: BEST E.A.S. M.P.H.	AT 10,000 FEET: BEST E.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	AT 15,000 FEET: BEST E.A.S. M.P.H.	AT 15,000 FEET: BEST E.A.S. KTS.	AT 15,000 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 20,000 FEET: BEST E.A.S. M.P.H.	AT 20,000 FEET: BEST E.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
14,550	175	150	3000	20	175	150	3000	2	30	175	150	2500	4	40	170	145	1900	6	50	165	145	1000	9	60

CLIMB WITH NORMAL POWER. PROP. G.R. .1763:1.
POWER PLANT SETTINGS. (INFORMATION TO BE RELEASED FOLLOWING FLIGHT TESTS.)
DATA AS OF JUNE 15, 1946.

FUEL USED (U.S. GAL.) INCLUDES WARM-UP AND TAKE-OFF ALLOWANCE.
FUEL AVAILABLE BEFORE WARM-UP 261 GALS.

SPECIAL NOTE

ALL FUEL CONSUMPTION VALUES INCLUDE A 15% INCREASE IN ENGINE MANUFACTURER'S S.F.C.

LEGEND

E.A.S.: EQUIVALENT AIRSPEED
M.P.H.: MILES PER HOUR
KTS.: KNOTS
F.P.M.: FEET PER MINUTE
G.R.: GEAR RATIO
S.F.C.: STANDARD FUEL CONSUMPTION

RED FIGURES ARE PRELIMINARY DATA. SUBJECT TO REVISION AFTER FLIGHT CHECK

Figure 40 — Take-Off and Climb Chart