PILOT'S FLIGHT OPERATING INSTRUCTIONS

FOR

ARMY MODELS

A-20G Series, A-20J Series P-70A-2 and P-70B-2

BRITISH MODEL

BOSTON IV

AIRPLANES

This Handbook replaces T. O. No. 01-40-1 dated 5 April 1944.

This publication contains specific instructions for pilots and should be available for Transition Flying Training as contemplated in AAF Reg. 50-16.

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.

Published by authority of the Commanding General, Army Air Forces, and accepted by the Air Council of the United Kingdom.

NOTICE: This document contains information affecting the national defense of the United States within the meaning of the Espionage Act, 50 U. S. C., 31 and 32, as amended. Its transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law.

Keller-Crescent Co., Evansville, Ind.—10-27-44—12,000

10 NOVEMBER 1944

TABLE OF CONTENTS

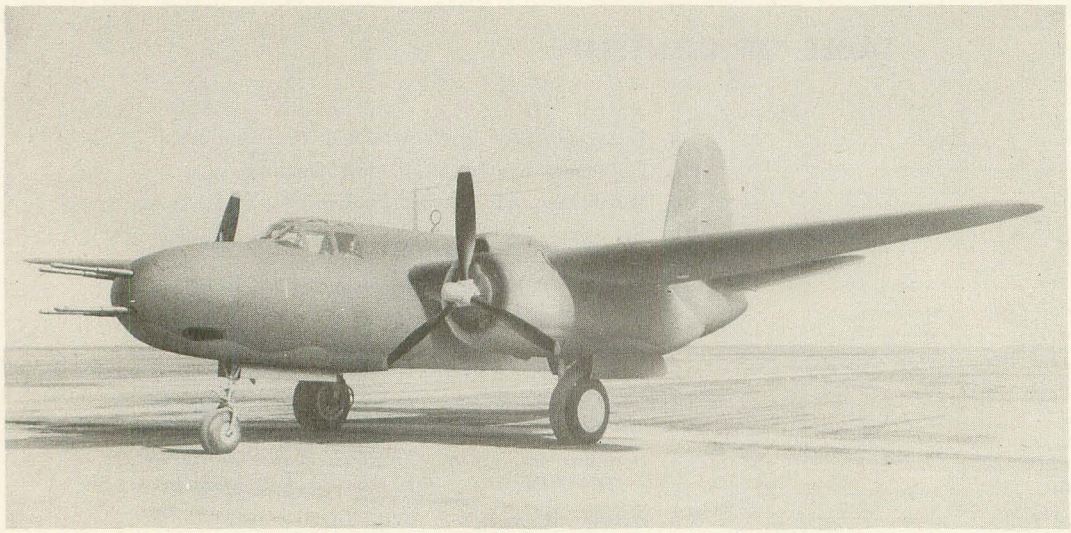


Fig 1
Left Front Quarter

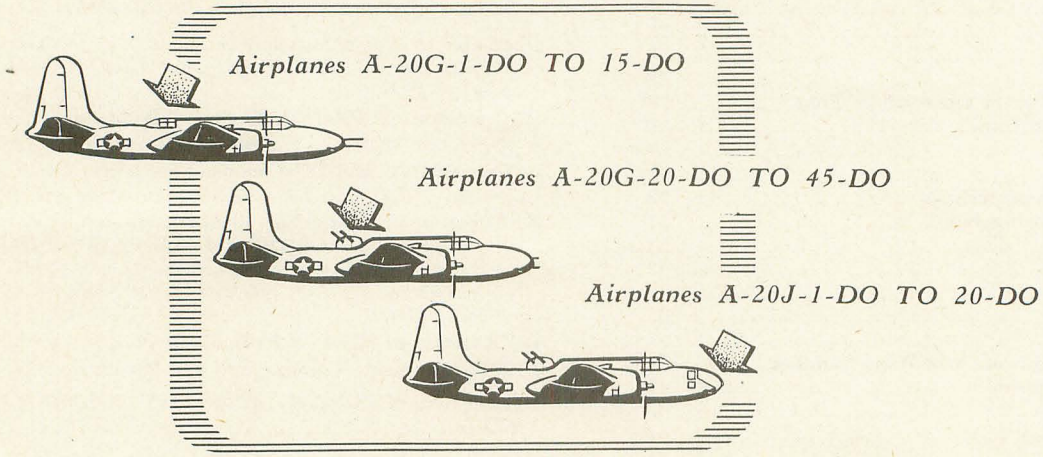


Fig. 2
Right Front Quarter

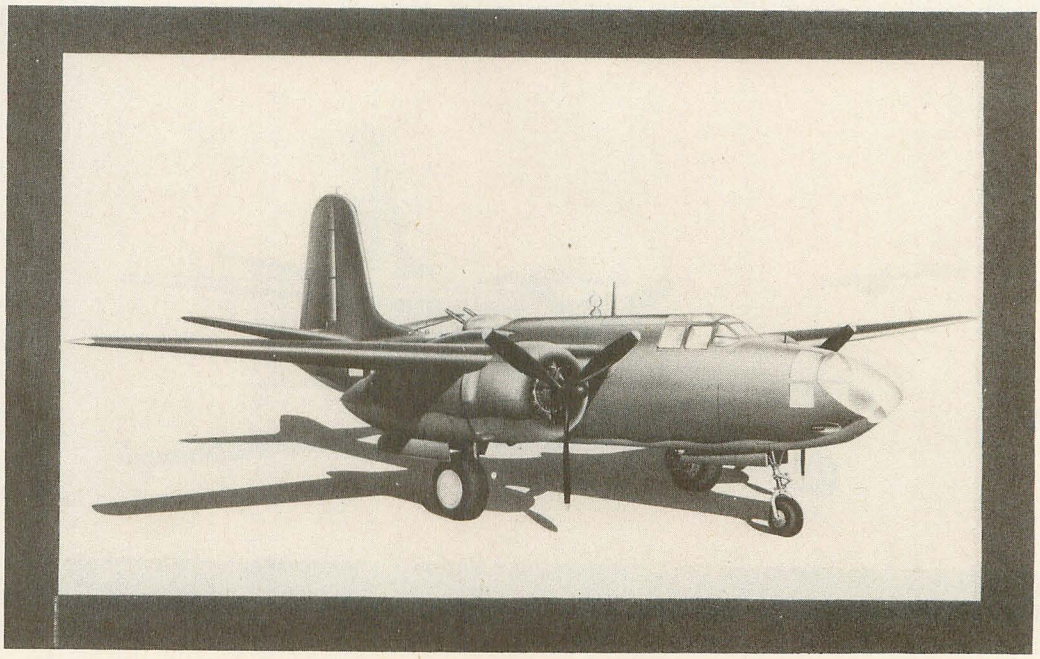


Fig. 3
Front Quarter

Section I
DESCRIPTION

1. AIRPLANE.

a. GENERAL.—The A-20G and A-20J attack bombers are twin-engined mid-wing monoplanes with tricycle landing gears, two Wright Cyclone engines, Model R-2600-23, and Hamilton Standard hydromatic propellers. On the A-20J, a bombardier nose section replaces the attack nose of the A-20G. The tactical mission of this airplane is to lend bombing support to ground forces by the destruction of ground or naval personnel and light material targets, to attack and disperse troops by gunfire, and to destroy aircraft both on the ground and in the air. Provisions are made for

Fig. 4
Rear Quarter

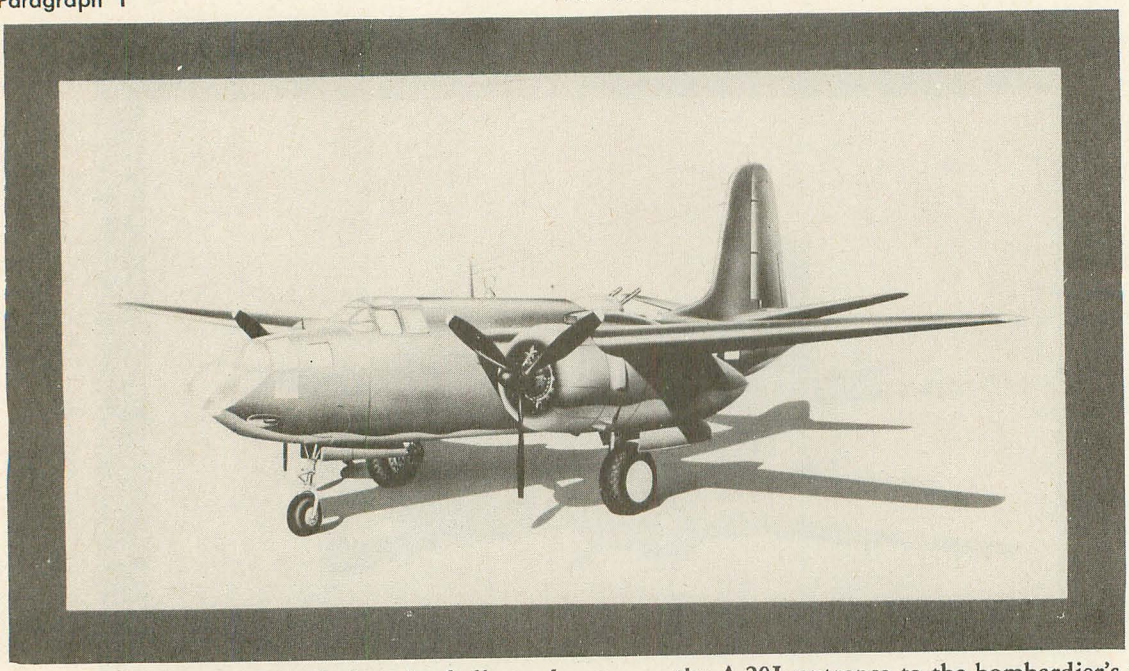


Fig. 5
Front Quarter

laying smoke screens. The airplane is of all-metal construction with approximate over-all dimensions as follows:

Length	48 ft.
Height	18 ft. 1 in.
Span	61 ft. 4 in.

b. ACCESS TO AIRPLANE.—The top of the pilot's cockpit is formed by a window-paneled enclosure door hinged on the right side. Entries and exits are made through the enclosure from the left side of the airplane. The gunners' compartment is provided with a door in the floor which is used for normal entry and exit, and when operating the lower flexible machine gun. On the A-20J, entrance to the bombardier's nose section is made through a door in the bottom of the compartment.

c. FUEL AND OIL.

(1) Fuel:	Specification:	AN-F-28. Grade: 100/130
(2) Oil:	Specification:	AN-VV-O-446. Grade: 1120

d. PROTECTIVE ARMOR.—Armor is provided to protect the crew. Enemy fire, originating from within the areas graphically illustrated in Figure 7, will not reach the crew members.

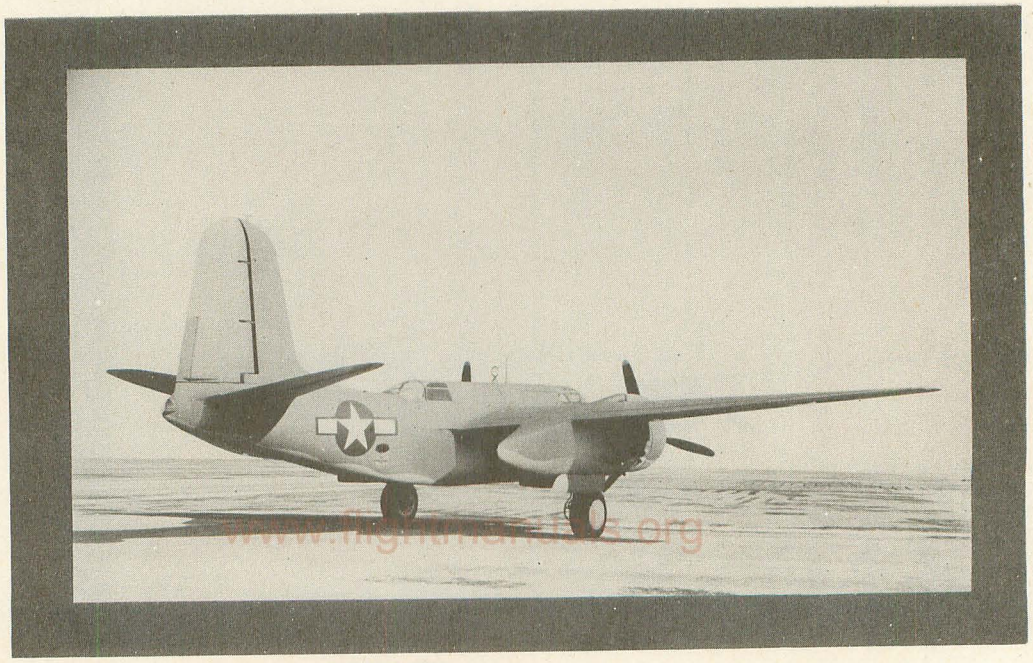


Fig. 6
Rear Quarter

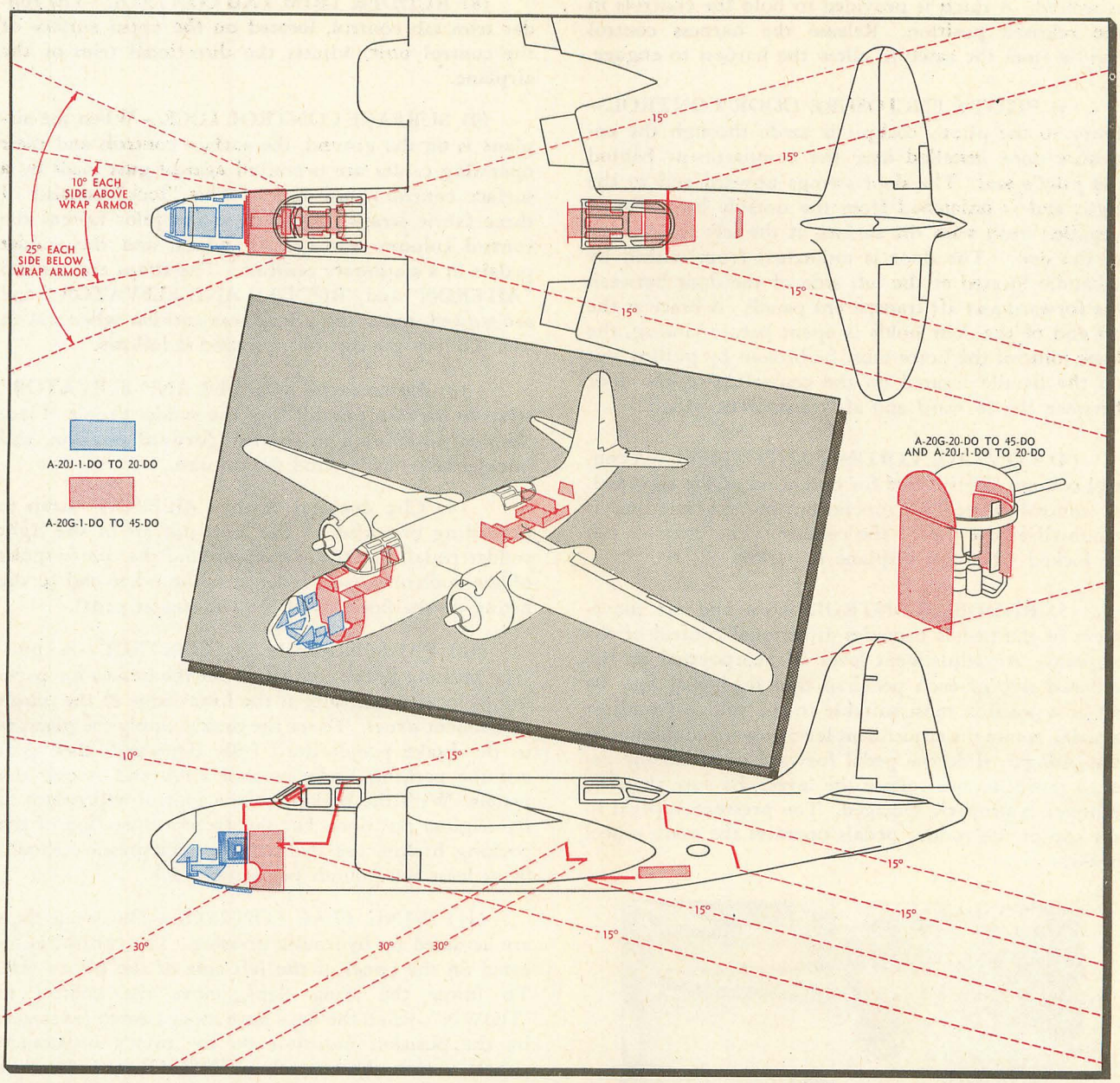


Fig. 7 — Angles of Armor Protection

2. POWER PLANT.

a. The R-2600-23 engine is a 14-cylinder double row radial aircraft engine, equipped with a two-speed supercharger.

3. AIRPLANE CONTROLS.

a. OPERATIONAL CONTROLS.

(1) SEAT ADJUSTMENT CONTROL.—To raise the pilot's seat, pull back on the handle located on the right side of the seat. This will release the retaining pins. At the same time ease body weight upward, allowing the shock and cord bungee to raise the seat. At the desired position, release the handle and make sure that the retaining pins are properly engaged. To lower the seat, pull back on the handle and allow body weight to move the seat down. Release the handle and be certain that the retaining pins are properly engaged.

(2) SAFETY HARNESS RELEASE CONTROL.—A control is provided on the right side of the seat to allow the pilot to lean forward without undoing his safety harness. This control releases the spring-loaded drum on which a cable attached to the shoulder straps,

is wound. A catch is provided to hold the controls in the released position. Release the harness control handle from the catch to allow the harness to engage.

(3) PILOT'S ENCLOSURE DOOR CONTROL.—Entry to the pilot's cockpit is made through the enclosure door installed over the compartment behind the pilot's seat. The door swings upward and to the right and is unlatched from the outside by a handle installed flush with the surface at the left rear corner of the door. The door is unlatched from within by a handle located at the left side of the door between the forward and aft transparent panels. A brace at the aft end of the door holds it open; before closing, the knee joint of the brace must be broken by pulling out on the handle located on the centerline of the door between the forward and aft transparent panels.

(4) CONTROL COLUMN AND WHEEL.—A control column is furnished for operation of the elevators. A control wheel for operation of the ailerons is mounted at the top of the column. The controls can be locked when the airplane is parked.

(5) RUDDER CONTROL.—Fore and aft movement of the pedals provides directional control of the airplane. An adjustment lever is incorporated on the inboard side of each pedal so that the pedal may be set at a position most suitable to the pilot. To adjust a pedal, rotate the adjustment lever inward to disengage the plunger, slide the pedal forward or aft to the desired position, and release the lever. Be sure that the plunger is properly engaged. Toe pressure applied to the top of the rudder pedals operates the main wheel brakes.

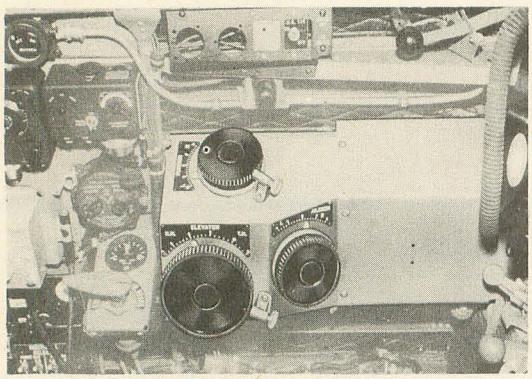


Fig. 8 — Trim Tab Control Box

(6) ELEVATOR TRIM TAB CONTROL.—The elevator trim tab control, located on the inboard face of the trim tab control unit, adjusts the longitudinal trim of the airplane.

(7) AILERON TRIM TAB CONTROL. — The aileron trim tab control, located on the aft end of the control unit, adjusts the lateral trim of the airplane.

(8) RUDDER TRIM TAB CONTROL.—The rudder trim tab control, located on the upper surface of the control unit, adjusts the directional trim of the airplane.

(9) SURFACE CONTROL LOCK.—When the airplane is on the ground, the surface controls and their operating cables are protected against gust loads by a surface control "gust lock." This "lock" consists of three fabric straps. With these the pilot fastens the control column, the control wheel, and the rudder pedals in a stationary position. The straps are marked "AILERON" and "RUDDER AND ELEVATOR," and are stowed under the pilot's seat cushion when not in use. To lock the controls, proceed as follows:

(a) Fasten each "RUDDER AND ELEVATOR" strap to the clip provided on the rudder pedals. Place the control column in the full forward position, and buckle the straps around the column.

(b) Clip one end of the "AILERON" strap to the fitting provided on the floor just aft of the right rudder pedal. Loop the strap around the center spoke of the control wheel, and fasten the other end to the fitting on the floor aft of the left rudder pedal.

(10) PARKING BRAKE CONTROL.—A pull-type parking brake control, to set the brakes for parking, is located centrally at the lower edge of the pilot's instrument panel. To set the brakes, apply toe pressure to the brake pedals until fully depressed, then pull out the parking brake control knob and release the pedals. With the brakes set, the control will return to its original position. For satisfactory operation of the parking brakes, the hydraulic system pressure should be at least 500 pounds per square inch.

(11) WING FLAP CONTROL.—The wing flaps are actuated by hydraulic pressure. The control is located on the panel at the left side of the pilot's seat. To lower the wing flaps, move the control to "DOWN"; when the flaps have moved down (as shown by the position indicator on the pilot's instrument panel), return the control to "NEUTRAL." To raise the wing flaps, move the control to "UP" until the flaps are raised, then return control to "NEUTRAL." When the airplane is standing idle, the wing flap control should be left in the "NEUTRAL" position.

(12) LANDING GEAR CONTROL.—The landing gear is actuated hydraulically and controlled by a handle at the left side of the pilot's seat. To retract the landing gear, move the control to "UP." When the gear is fully retracted (as shown by the position indicator on the pilot's instrument panel), return the control to "NEUTRAL." To extend the landing gear, move the control to "DOWN." When the landing gear is down completely (as shown by the position indicator), leave the control in the "DOWN" position. The control incorporates a latch to prevent inadvertent

movement of the control to the "UP" position when the airplane is on the ground.

Note

The landing gear is provided with a warning system incorporating a horn and red and green signal lights. Should the throttles be closed to less than one-quarter segment with the landing gear not latched in the "DOWN" position, the warning horn will sound and the red light will be on. With the landing gear latched in the "UP" position and the throttles closed to less than one-quarter segment, the horn and warning light will still be on. With the landing gear latched in "DOWN" position, the green light is on, the red light is off, and the warning horn is silent, regardless of throttle position.

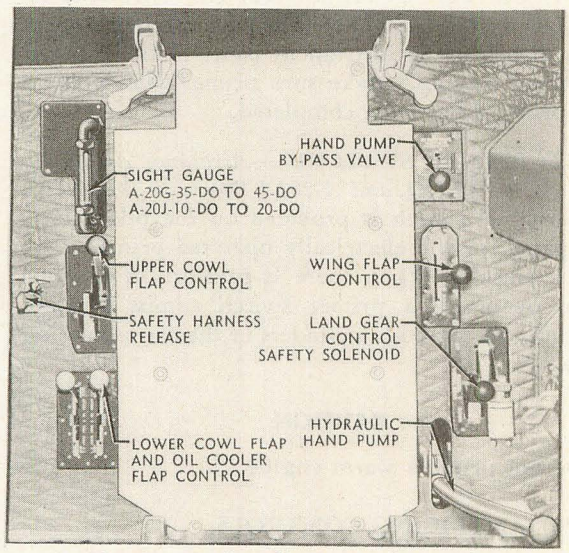


Fig. 9 — Hydraulic Control Panel Looking Aft

(13) COWL FLAP CONTROLS.—The engine cowl flaps are actuated by hydraulic pressure and controlled by handles located on the panel at the right side of the pilot's seat. The upper cowl flaps for each engine are controlled in unison by a single handle; the lower cowl flaps for each engine are controlled by individual handles. The oil cooler flaps are connected by cables to the lower cowl flap mechanism, and operate simultaneously with the lower cowl flaps. To open the cowl flaps move the corresponding controls to "OPEN." When the flaps are opened as desired, return control to "NEUTRAL." To close the cowl flaps, move the control to the "CLOSED" position. When the flaps are closed or partly closed as desired, return the control to "NEUTRAL."

(14) HYDRAULIC HAND PUMP. — The hydraulic hand pump is an auxiliary pump used to furnish hydraulic pressure when the engine-driven pumps are inoperative. The hand-pump handle extends from the panel at the left side of the pilot's seat. Any hydraulically controlled unit may be operated by the use of the hand pump. To operate, set the control of the unit in the desired position. Work the hand-pump handle until the unit has moved to the desired position, then return the control to "NEUTRAL." The hand pump may be used to charge the pressure accumulator by setting the hand pump by-pass valve control, located on the panel at the left side of the pilot's seat, to "HAND PUMP TO PRESSURE TANK" position. Operate the hand pump until the normal system operating pressure of 850 ± 25 pounds per square inch is indicated on the pressure gauge. The by-pass valve control must be returned to "HAND PUMP TO SYSTEM" position when the operation is completed.

WARNING

In the event of hydraulic failure, use the hand pump for braking only, unless the failure has been located and the control valve for the inoperative system has been set to "NEUTRAL" and left there. Do not attempt to position any hydraulic unit with the hand pump unless the failure is isolated in this manner.

(15) BRAKE CONTROL—HYDRAULIC.—The main gear wheels incorporate brakes actuated by hydraulic pressure. The brakes are operated by toe pressure applied to the top of the pilot's rudder pedals. Each brake may be independently operated.

(16) CARBURETOR AIR FILTER CONTROL.—*Airplanes A-20G-10-DO to A-20G-45-DO, and A-20J-1-DO to A-20J-20-DO.*—An hydraulic control is provided for the door in the air induction system. The door permits carburetor air intake through either the ramming air scoop or the non-ramming air scoop and filter. The control is located on the left side of the pilot's seat aft of the bomb door control handle. It has two positions: "RAM" and "FILTER."

CAUTION

On *airplanes A-20G-30-DO to A-20G-45-DO and A-20J-5-DO to A-20J-10-DO,* the air scoop control must be in the "RAM" position before setting the "CARB. AIR" control to "HOT." The "CARB. AIR" control must then be set to "COLD" before the alternate "FILTER" air scoop position may again be used.

(17) FUEL TANK SELECTOR CONTROLS.—Two fuel tank selector controls are located on the fuel valve control panel installed on the left side of the pilot's cockpit. In normal operation, each engine has an individual fuel system whereby the left fuel tanks supply the left engine, and the right fuel tanks supply the right engine. However, if the need arises, any tank

may be used to supply both engines by using the fuel tank selectors in conjunction with the cross-feed system.

(18) CROSS-FEED CONTROLS. – *Airplanes A-20G-1-DO to A-20G-15-DO.*—Two cross-feed controls are located on the fuel valve control panel. The "ENGINE CROSS-FEED" control operates the pressure cross-feed system and the "TANK CROSS-FEED" control operates the suction cross-feed system. The engine cross-feed should be "ON" for take-off; otherwise, both cross-feed controls are normally set in the "OFF" position.

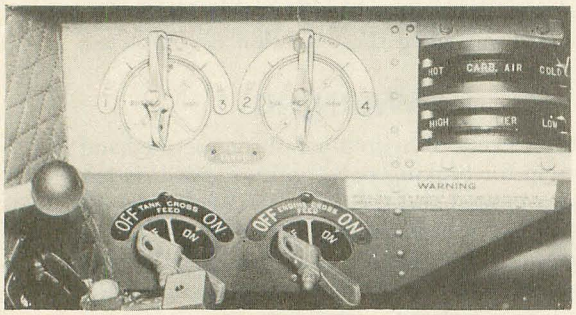


Fig. 10 — Fuel Valve Control Panel
(A-20G-1-DO to A-20G-15-DO Incl.)

(19) CROSS-FEED CONTROL.—*Airplanes A-20G-20-DO to A-20G-45-DO, and A-20J-1-DO to A-20J-20-DO.*—The "TANK CROSS-FEED" control is located on the fuel valve control panel and operates the suction cross-feed system. In normal operation, the cross-feed control is set in the "OFF" position.

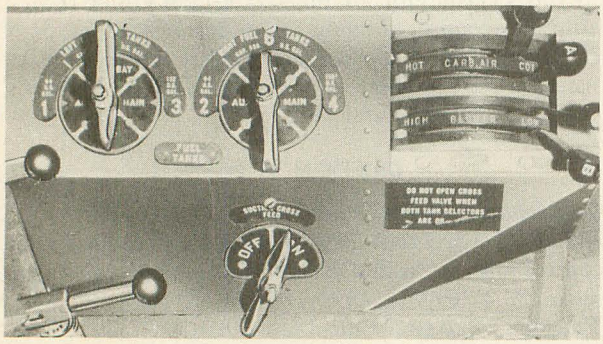


Fig. 11 — Fuel Valve Control Panel
(Airplanes A-20G-20-DO to A-20G-45-DO and A-20J-1-DO to A-20J-20-DO, Incl.)

(20) WOBBLE PUMP CONTROL.—*Airplanes A-20G-1-DO to A-20G-15-DO.*—The wobble pump is a manually operated auxiliary fuel pump. The wobble pump control handle extends up from the floor at the left side of the pilot's seat.

CAUTION

If the fuel pressure of either the left or right system drops, operate the wobble pump. If pressure comes up, failure of the corresponding engine-driven fuel pump is indicated. In this event, fuel may be supplied to both engines through the operative engine-driven fuel pump by turning the engine cross-feed "ON." All fuel tanks may be used by the operation of the tank cross-feed. If pressure fails to come up with the use of the wobble pump, fuel line failure is indicated. This failure necessitates single engine operation; therefore, the propeller on the affected engine should be feathered. Do not use fuel from a tank in the system in which the failure occurred.

(21) PRIMER PUMP CONTROL.—*Airplanes A-20G-1-DO to A-20G-15-DO.*—The primer pump control is located below the instrument panel to the right of the control column. Make sure primer control is off when priming has been completed.

(22) PRIMER SWITCHES.—*Airplanes A-20G-20-DO to A-20G-45-DO, and A-20J-1-DO to A-20J-20-DO.* An individual switch is provided on the pilot's electrical panel for the electrically operated primer valve on each engine. When there is pressure in the fuel system, operating a primer switch admits fuel directly into the top eight cylinders of the corresponding engine.

CAUTION

Do not prime a warm engine.

(23) ANTI-ICING CONTROLS.

(a) PROPELLER ANTI-ICING CONTROLS.—The propeller anti-icer is controlled by a rheostat located on the left of the pilot's upper electrical panel. The rheostat turns on and regulates the anti-icer fluid pump so that the fluid may be supplied to both propellers. A flow of 2 to 4 quarts per hour is considered satisfactory under normal icing conditions to keep ice from forming. When propeller ice is indicated by engine roughness, use full flow until ice is removed. The anti-icer tank has a capacity of 3.6 U.S. gallons.

(b) CARBURETOR ANTI-ICING SELECTOR CONTROL—On *airplanes A-20G-1-DO to A-20G-25-DO and A-20J-1-DO,* the carburetor anti-icing selector control, located on the left side of the pilot's cockpit, permits the selection of the left or right carburetor. The switch to operate the electric anti-icing pump is located on the pilot's lower electrical control panels. On *airplanes A-20G-30-DO to A-20G-45-DO, and A-20J-5-DO to A-20J-20-DO,* a hot air system replaces the liquid anti-icer. To heat the carburetor by this system, the air scoop control must be in the "RAM" position before

setting the "CARB. AIR" control to "HOT." When sufficient carburetor heating has been accomplished, return the "CARB. AIR" control to "COLD" before setting the air scoop control to "FILTER."

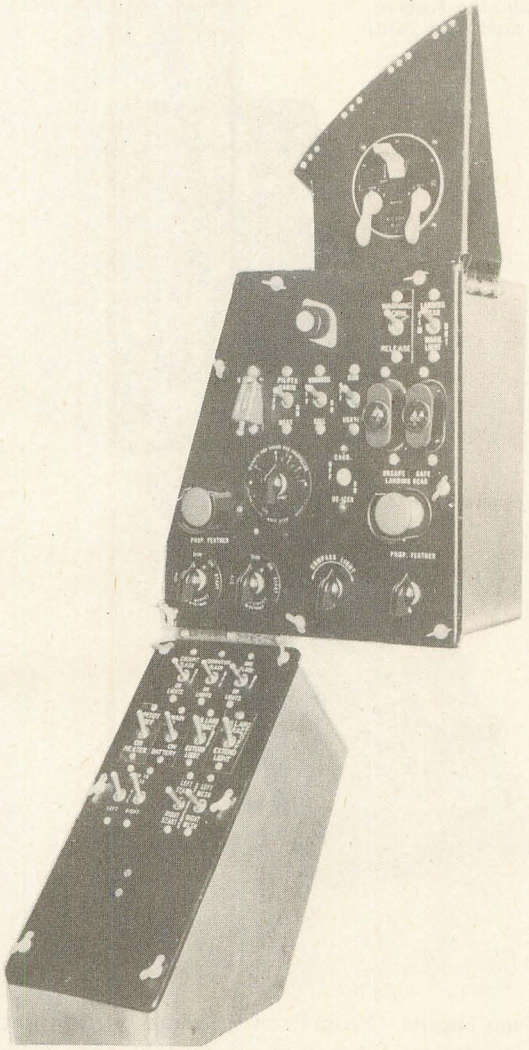


Fig. 12 — Pilot's Electrical Controls
(Airplanes A-20G-1-DO to A-20G-15-DO Incl.)

(24) ELECTRICAL CONTROLS.

(a) IGNITION SWITCH.—The ignition switch is located in the upper left corner of the pilot's instrument panel. The ignition switch incorporates a master ignition switch and two individual engine switches as follows:

1. MASTER IGNITION SWITCH.—The master ignition switch has two positions:

"OFF"—Magnetos and all electrically controlled units are inoperative.

"ON"—Magnetos and all electrically controlled units are operative.

2. INDIVIDUAL ENGINE SWITCHES.—Each individual engine switch controls the ignition of one engine. The switch has four positions that control circuits as follows:

"OFF"—Both magnetos inoperative with the master switch "ON" or "OFF."

"L"—Left magneto operative; right magneto inoperative.

"R"—Right magneto operative; left magneto inoperative.

"BOTH"—Both magnetos operative.

(b) WARNING HORN RELEASE SWITCH. The warning horn release switch silences the horn if it is desired to close the throttles when the landing gear is not latched in the landing position. The horn circuit is automatically reset after operation of the release switch by opening the throttles; if the throttles are again closed, the horn will sound until the horn release switch is operated.

Note

If only one throttle is closed when the landing gear is not latched in the landing position, the warning horn release switch will silence the horn for only an instant. To quiet the horn, the throttle must be opened beyond the horn operating position.

(c) LANDING GEAR WARNING LIGHTS.—On *airplanes A-20G-1-DO to A-20G-20-DO,* a red signal light on the pilot's upper electrical panel indicates that the landing gear is not latched in the "DOWN" position. A green light indicates that the gear is latched in "DOWN" position. These lights may be brightened or dimmed by the operation of the warning lights switch. On *airplanes A-20G-25-DO to A-20G-45-DO, and A-20J-1-DO to A-20J-20-DO,* the landing gear warning lights are located on the pilot's instrument panel. These warning lights may be dimmed by turning individual shutters on each light.

(d) PROPELLER FEATHERING SWITCHES. Remote control switches provided for each propeller are operated by pushing the relay switch button for the propeller to be feathered. The relay switch will automatically release when the propeller blades reach the full feathered position. To unfeather the propeller, push in the relay switch and hold until the propeller windmills at 600 to 800 rpm; then release it. The action of the governor will control the pitch when rpm reaches governing range.

(e) MAIN BATTERY SWITCH.—Operation of this switch controls the circuit for the airplane batteries. If the batteries are used as the source of power supply, both the main battery switch and the master

ignition switch must be on before any electrically controlled units in the airplane can be operated.

Note

An external source of power supply may be used while the airplane is on the ground, and may be plugged into the socket on the left side of the nose wheel well. If this is done, all electrically controlled units in the airplane may be operated with the main battery switch and master ignition switch "OFF." To start the engines on the external source of power supply, the master ignition switch must be "ON." When changing over from the external source of power supply to the airplane batteries with the engines running, the main battery switch must be "ON" before the external power supply plug is disconnected. Engines must be idled to insure satisfactory relay action in cutting in the battery to the electrical circuit.

(f) LANDING LIGHT SWITCHES. – These switches control the extension and retraction of the landing lights installed on the lower surface of the inner wings. On *airplanes A-20G-1-DO to A-20G-20-DO* the switches have two positions—"EXTEND" and "RETRACT." The lights go on automatically when they extend. On *airplanes A-20G-25-DO, A-20J-1-DO* and subesequent, an "OFF" position is incorporated on the switch which enables the lights to be turned off either when extended or retracted.

(g) CIRCUIT BREAKER SWITCHES AND FUSE PANEL.—*Airplanes A-20G-20-DO to A-20G-45-DO, and A-20J-1-DO to A-20J-20-DO.*—The circuit breaker switches are located on the pilot's lower electrical panel. These switches are normally in the down position but will "trip-up" if a respective electrical circuit becomes overloaded. In case of an emergency, the circuit may be maintained by resetting the switch in the down position and holding until the operation is completed.

Note

These switches are for emergencies. Do not attempt to reset for normal operation.

A fuse panel is installed on the top outboard side of the electrical panel. The fuses are located inside a transparent case. A spare fuse is provided at the top of each fuse-holding block. To replace a blown fuse, open the transparent case and detach the blown fuse from the two attaching end clips. Turn the fuse block over and attach the spare fuse to the attaching end clips.

(h) OIL DILUTION SWITCHES.—An individual switch is provided to operate the oil dilution system of each engine. Propeller feathering oil dilution switches are also provided on *airplanes A-20G-20-DO to A-20G-45-DO, and A-20J-1-DO to A-20J-20-DO.* These engine and propeller feathering oil dilution switches are normally operated during the engine stopping procedure, when a subsequent cold engine start is anticipated.

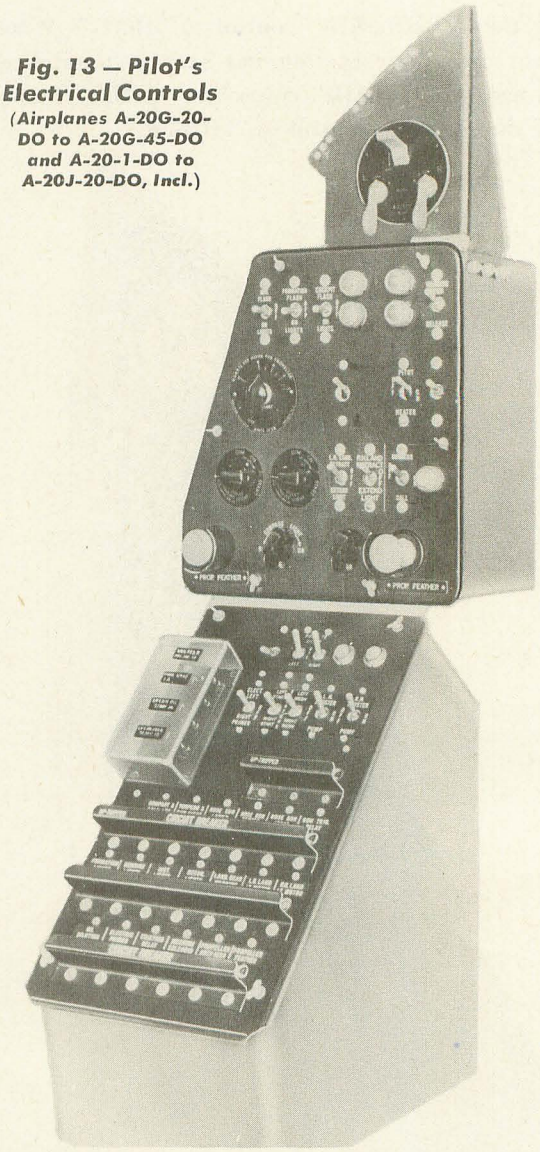


Fig. 13 – Pilot's Electrical Controls
(Airplanes A-20G-20-DO to A-20G-45-DO and A-20-1-DO to A-20J-20-DO, Incl.)

(i) ENGINE STARTER SWITCHES. – Two switches are provided to start the engine. The starter is energized by the "START" switch and engaged by the "MESH" switch. To start the right engine, push down on the "START" switch. When the inertia wheel has reached its full speed, depress the "MESH" switch, still holding down the "START" switch. To start the left engine, lift up the switches and follow procedures for starting right engine. For complete engine starting instructions, refer to Section II, Pilot's Operating Instructions.

b. ENGINE CONTROLS.

(1) MIXTURE CONTROLS.—The carburetor mixture controls are located on the engine control unit installed on the left side of the pilot's cockpit. The controls have four settings from the forward to aft position: "IDLE CUT-OFF," "AUTO LEAN," "AUTO RICH," and "EMERGENCY." When the controls are in the "IDLE CUT-OFF" position, the automatic mixture control units of the carburetors are inoperative and the fuel flow is insufficient to run the engines. This position is used when starting and stopping the engines. The mixture controls should be left in the "IDLE CUT-OFF" position when the engines are not running. When the mixture controls are set to "AUTO LEAN" or "AUTO RICH," the fuel mixture control unit of each carburetor automatically maintains the correct fuel-air ratio through changes of altitude and temperature. The desired mixture ratio is not disturbed by change of throttle position or propeller control. The "AUTO LEAN" position should be used only during level cruising conditions at powers equal to and below maximum cruising power. It should not be used for cruising climb. "AUTO RICH" is the normal position for all operations, including take-offs. With the automatic mixture control units of the carburetors inoperative, the "EMERGENCY" position provides a full rich fuel-air mixture ratio. This setting may be used when full rich mixture is required for emergency operation.

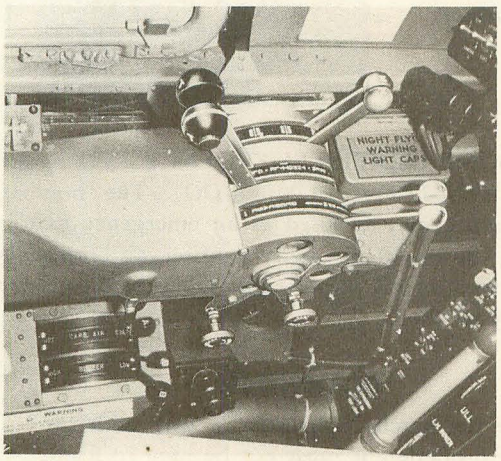


Fig. 14 — Engine Control Pedestal

(2) THROTTLE CONTROLS.—The throttle controls are mounted on the engine control unit installed on the left side of the pilot's cockpit.

(3) PROPELLER CONTROLS. — Forward movement of the controls toward "INCREASE RPM" increases engine rpm and decreases propeller pitch. Aft movement toward "DECREASE RPM" reduces engine rpm and increases propeller pitch.

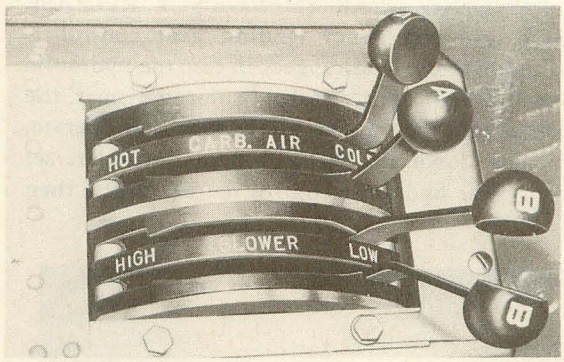


Fig. 15 — Carburetor Air and Superchager Controls

(4) CARBURETOR AIR TEMPERATURE CONTROLS.—A carburetor air temperature control is provided for each engine. Move controls forward for "COLD" and aft for "HOT."

CAUTION

On *airplanes A-20G-30-DO to A-20G-45-DO, and A-20J-1-DO to A-20J-20-DO,* the air scoop control must be in the "RAM" position before the "CARB. AIR." control is set to "HOT." Return the "CARB. AIR" control to "COLD" before setting the air scoop control to "FILTER.

(5) SUPERCHARGER CONTROLS.—Each engine incorporates a two-speed supercharger. Movement of the controls to "LOW" gives a 7.14:1 blower gear ratio, to "HIGH" a 10:1 ratio. When changing from one blower to the other, the engine should be half throttled and the supercharger control moved without pause to avoid rough operation during clutch engagement. Move the control as far as possible in either gear ratio to prevent clutch slippage. Normally, the supercharger gear ratios should not be changed at intervals of less than five minutes to provide opportunity for dissipation of heat generated during clutch engagements. During a change in gear ratio, a slight hesitation of the engine may be observed. This is normal for this engine.

c. EMERGENCY CONTROLS AND EXITS.

(1) FUEL DUMP VALVE CONTROL.—A fuel dump valve control is located on the right side of the pilot's seat. The fuel dump system is provided for the emergency destruction of the airplane. To operate, pull up on the control. This will cause fuel to be dumped from each inboard wing fuel container where it can be ignited outside the airplane, by means of a signal pistol, a match, or an incendiary grenade. On *airplanes A-20G-40-DO to A-20G-45-DO and A-20J-15-DO to A-20J-20-DO* this handle is covered by a snap-fastened web safety strap.

(2). LANDING GEAR EMERGENCY RELEASE CONTROL.—An emergency landing gear control is provided to lower the landing gear in case the hydraulic system should fail. The control is located near the floor on the right side of the pilot's seat. To operate, slow airplane down to 130 mph IAS or under, set the landing gear hydraulic control to "DOWN," then

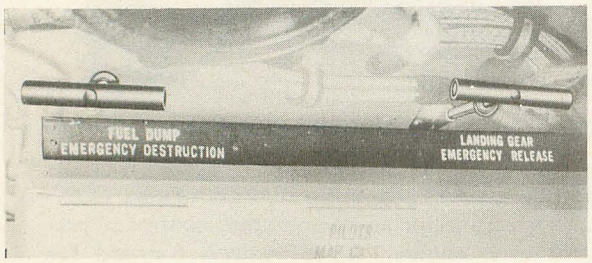


Fig. 16 — Emergency Landing Gear and Fuel Dump Valve Controls

pull up on the emergency release. The emergency control releases the latches holding the main gear up, allowing the gear to swing down to the landing position. The latch on the nose wheel gear is operated by a cable attached to the hydraulic control handle and is released when the hydraulic control is moved to the "DOWN" position.

(3) EMERGENCY AIR BRAKE CONTROL.—The emergency air brake control is an on-off type valve, located on the right side of the pilot's cockpit. To open the valve, push down on the handle and rotate it clockwise.

Note

Use the emergency air brakes by turning the control full "ON" and leaving it on until the airplane has come to a complete stop. Do not attempt to apply the air brakes gradually.

(4) PILOT'S EMERGENCY EXIT.—The pilot's enclosure door is provided with an emergency release handle. When the handle is pulled, it unlatches the door, at the same time pulling the pins from the brace at the aft end of the door. Push the door up slightly to allow the airstream to carry it away.

WARNING

Before abandoning the airplane, both engine propellers should be feathered prior to pulling the emergency release.

(5) GUNNERS' EMERGENCY EXIT.—An emergency exit can be made through the lower door. The upper enclosure is used for ditching. The lower door may be opened by a latching handle located in the approximate center of the door, or by operating the crank mechanism on the right side of the compartment. To open the upper enclosure *(airplanes A-20G-1-DO to A-20G-15-DO)*, release the two latches at the upper forward end of the sliding section, allowing the forward end to drop down; then slide it forward under the fixed section as far as it will go. The enclosure may be opened externally by tearing a fabric patch covering the upper latch access hole.

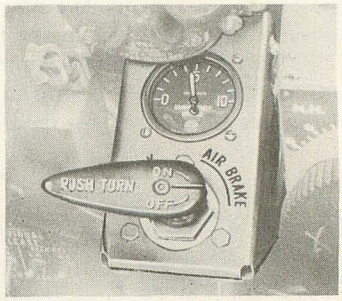


Fig. 17 Emergency Air Brake Control

(6) BOMBARDIER'S EMERGENCY EXIT.—*(Airplanes A-20J-1-DO to A-20J-20-DO).*—The bombardier's entrance may be used as an emergency exit in flight. In the event of a belly landing, an emergency hatch, located on the upper right side of the compartment, may be used.

WARNING

Since the hatch is directly in line with the right propeller, it must not be used in flight or at any time the right engine is running.

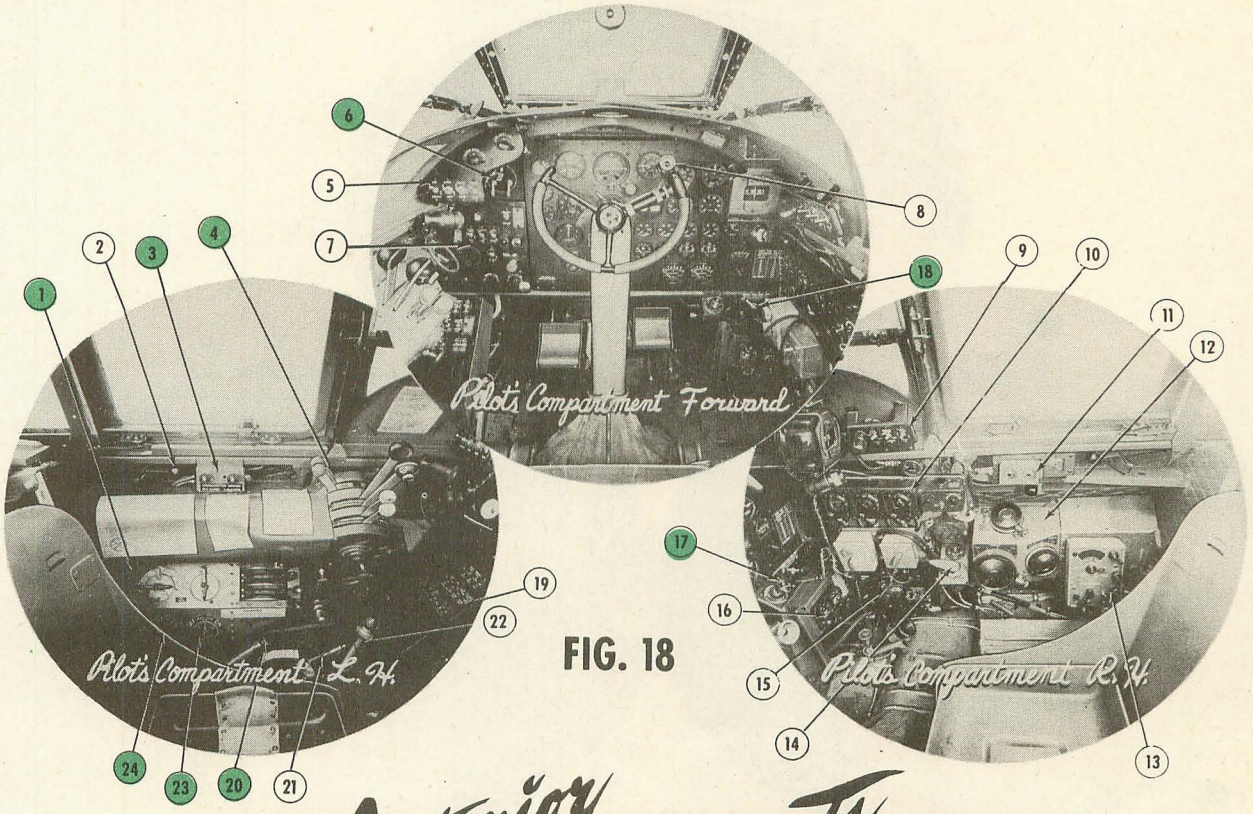


FIG. 18

Interior Arrangements

A-20G-1-DO TO A-20G-15-DO

1. FUEL TANK SELECTOR CONTROLS
2. WINDOW RELEASE
3. CARBURETOR ANTI-ICER CONTROL
4. ENGINE AND PROPELLER CONTROLS
5. GUN SELECTOR SWITCH PANEL
6. IGNITION SWITCH
7. UPPER ELECTRICAL PANEL
8. BOMB RELEASE SWITCH
9. RECOGNITION LIGHTS SWITCH PANEL
10. COMMAND RADIO SET CONTROL BOX
11. RADIO RECEIVER DESTROYER PUSH BUTTON
12. TRIM TAB CONTROL BOX
13. RADIO COMPASS CONTROL BOX
14. EMERGENCY AIR BRAKE CONTROL
15. BOMB CONTROL PANEL
16. OXYGEN REGULATOR
17. ENGINE PRIMER
18. MANIFOLD PRESSURE GAUGE DRAIN COCK
19. LOWER ELECTRICAL PANEL
20. WOBBLE PUMP
21. BOMB DOOR CONTROL
22. HYDRAULIC HAND PUMP
23. ENGINE CROSS FEED CONTROL
24. TANK CROSS FEED CONTROL

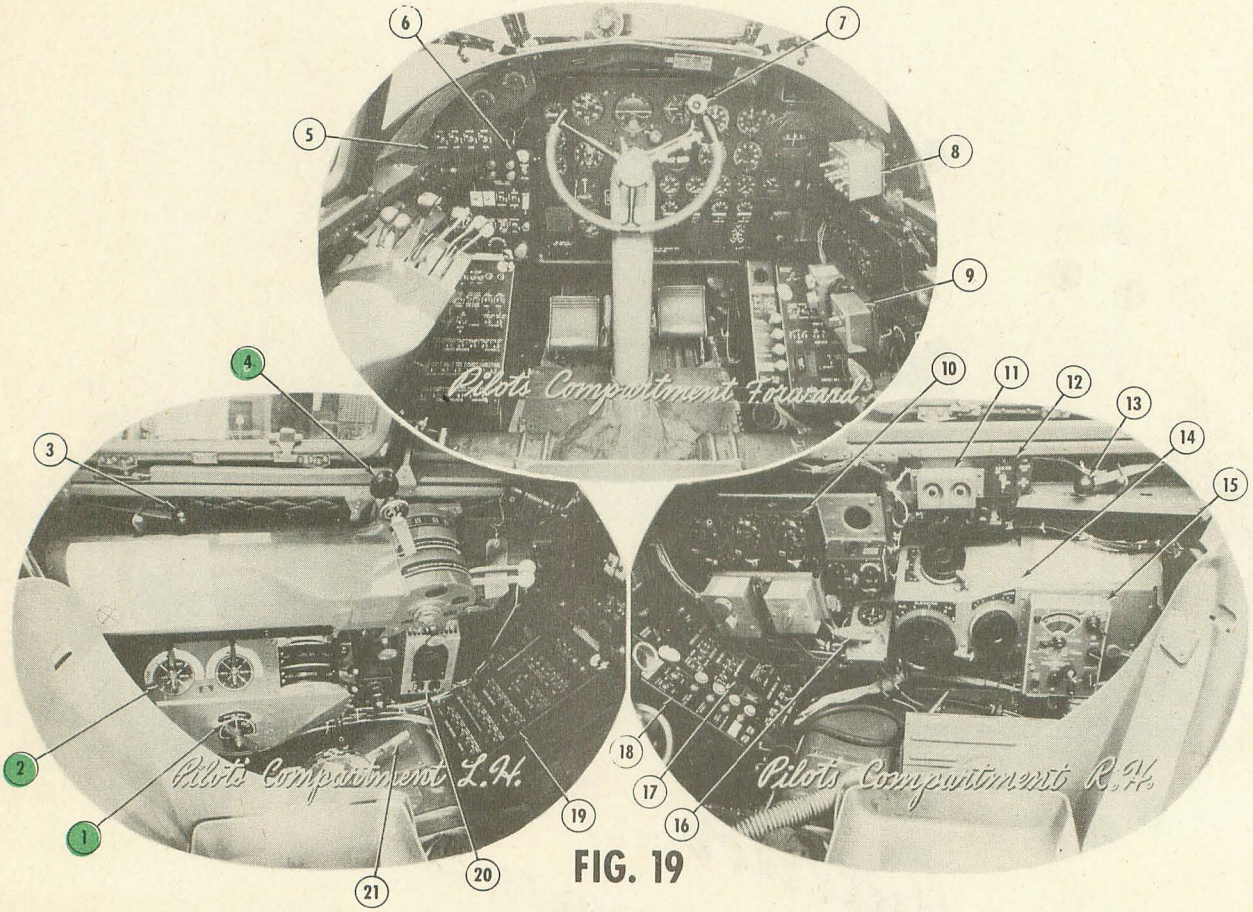


FIG. 19

Interior Arrangements

A-20G-20-DO TO 45-DO
AND A-20J-1-DO TO 20-DO

1. SUCTION CROSS FEED CONTROL
2. FUEL TANK SELECTOR CONTROLS
3. WINDOW RELEASE
4. ENGINE AND PROPELLER CONTROLS
5. GUN SELECTOR SWITCH PANEL
6. UPPER ELECTRICAL PANEL
7. BOMB AND CHEMICAL TANK RELEASE BUTTON
8. RECOGNITION LIGHTS SWITCH PANEL
9. INTERPHONE JACK BOX
10. COMMAND RADIO SET CONTROL BOX
11. RADIO RECEIVER DESTROYER PUSH BUTTON
12. IDENTIFICATION RECEIVER ON-OFF SWITCH
13. WINDOW RELEASE
14. TRIM TAB CONTROL BOX
15. RADIO COMPASS CONTROL BOX
16. EMERGENCY AIR BRAKE CONTROL
17. BOMB CONTROL PANEL
18. HEATER CONTROL PANEL
19. LOWER ELECTRICAL PANEL
20. SUIT HEATER OUTLET
21. BOMB DOOR CONTROL

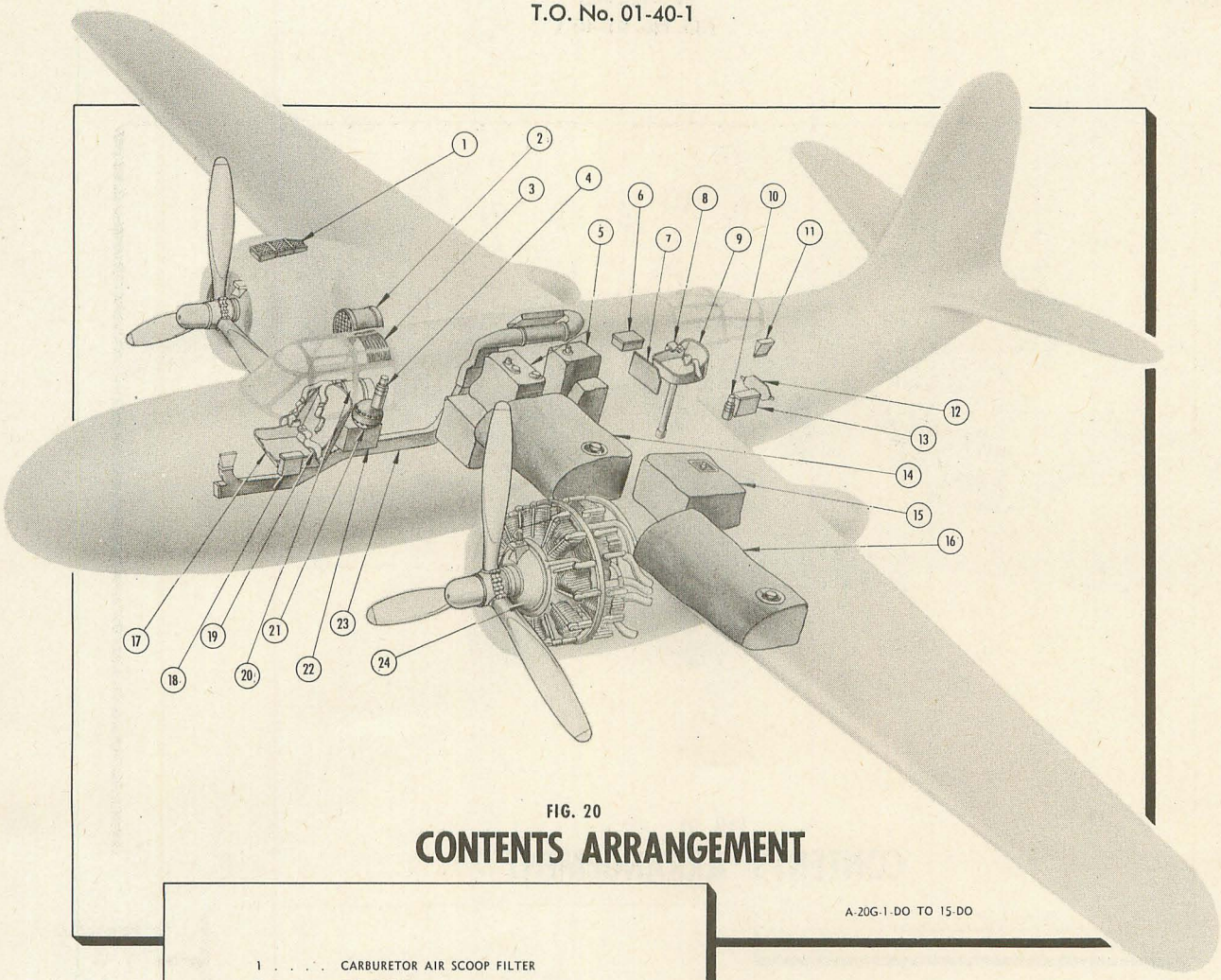


FIG. 20

CONTENTS ARRANGEMENT

A-20G-1-DO TO 15-DO

1 . . . . CARBURETOR AIR SCOOP FILTER
2 . . . . OIL COOLER
3 . . . . PILOT'S SUN BLIND
4 . . . . PILOT'S VACUUM BOTTLE
5 . . . . FUSELAGE FUEL TANKS
6 . . . . UPPER GUNNER'S DRAWER
7 . . . . UPPER GUNNER'S SHELF
8 . . . . UPPER GUNNER'S BELT ASSEMBLY
9 . . . . UPPER GUNNER'S SEAT
10 . . . . UPPER GUNNER'S VACUUM BOTTLE
11 . . . . CONTAINER ASSEMBLY
12 . . . . LOWER GUNNER'S BACK REST BELT ASSEMBLY
13 . . . . GUNNER'S MAP CASE
14 . . . . INBOARD WING FUEL TANKS
15 . . . . WING OIL TANK
16 . . . . OUTBOARD WING FUEL TANK
17 . . . . PILOT'S SEAT
18 . . . . MAP CASE AND GLOVE COMPARTMENT
19 . . . . PILOT'S SAFETY BELT
20 . . . . HYDRAULIC RESERVOIR
21 . . . . HYDRAULIC ACCUMULATOR
22 . . . . BATTERIES
23 . . . . HEAT AND VENT SYSTEM
24 . . . . WRIGHT CYCLONE ENGINE MODEL R-2600-23

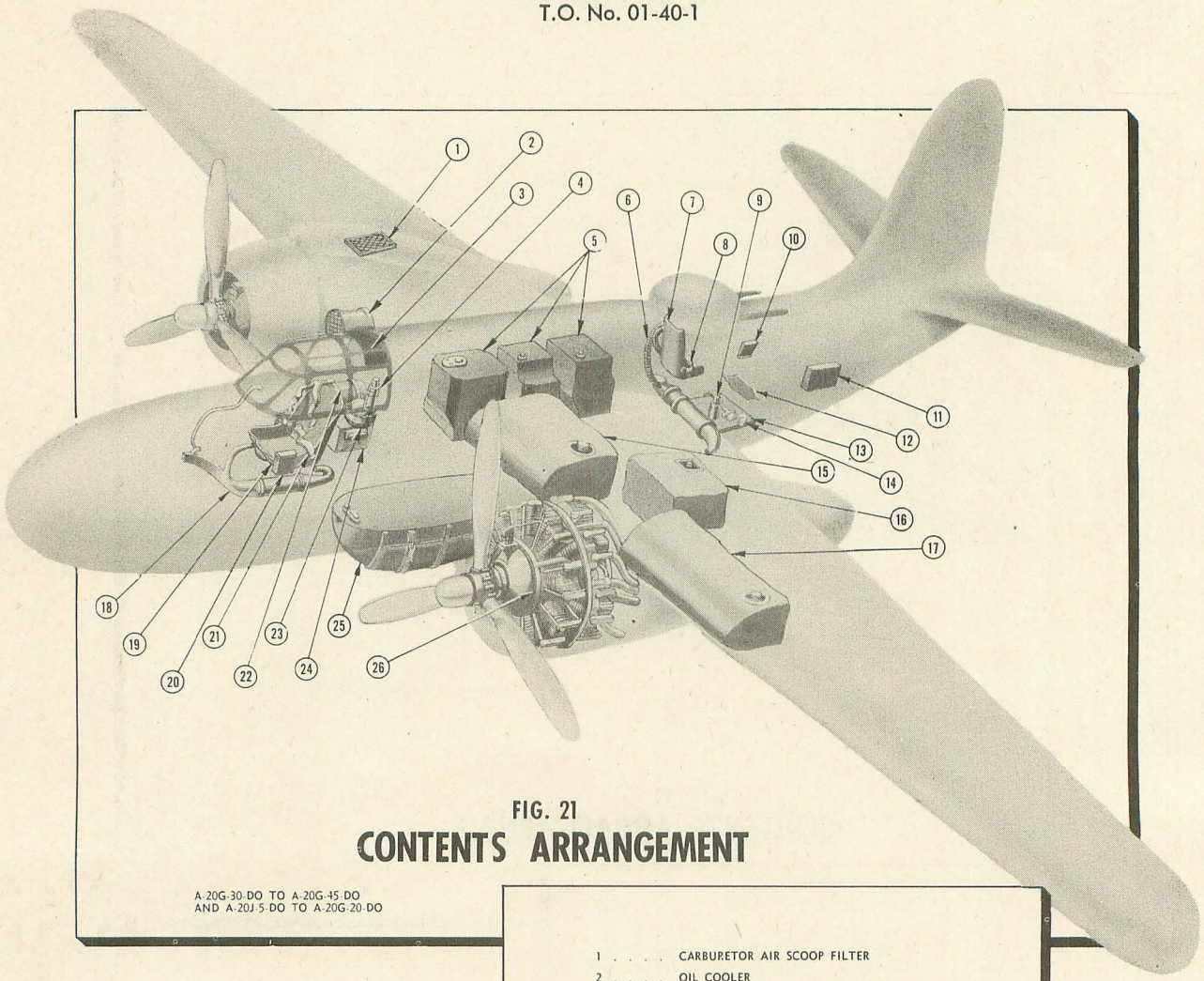


FIG. 21

CONTENTS ARRANGEMENT

A-20G-30-DO TO A-20G-45-DO
AND A-20J-5-DO TO A-20G-20-DO

1 . . . . CARBURETOR AIR SCOOP FILTER
2 . . . . OIL COOLER
3 . . . . PILOT'S SUN BLIND
4 . . . . PILOT'S VACUUM BOTTLE
5 . . . . FUSELAGE FUEL TANKS
6 . . . . GUNNER'S HEAT AND VENT UNIT
7 . . . . TURRET GUNNER'S SEAT
8 . . . . TURRET GUNNER'S BELT ASSEMBLY
9 . . . . TURRET GUNNER'S VACUUM BOTTLE
10 . . . . CONTAINER ASSEMBLY
11 . . . . GUNNER'S DATA CASE
12 . . . . LOWER GUNNER'S BACK REST BELT ASSEMBLY
13 . . . . LOWER GUNNER'S KNEE PAD
14 . . . . LOWER GUNNER'S BELT ASSEMBLY
15 . . . . INBOARD WING FUEL TANK
16 . . . . WING OIL TANK
17 . . . . OUTBOARD WING FUEL TANK
18 . . . . PILOT'S HEAT AND VENT UNIT
19 . . . . PILOT'S SEAT
20 . . . . MAP CASE AND GLOVE COMPARTMENT
21 . . . . PILOT'S SAFETY BELT
22 . . . . HYDRAULIC RESERVOIR
23 . . . . HYDRAULIC ACCUMULATOR
24 . . . . BATTERIES
25 . . . . DROPPABLE BELLY FUEL TANK
26 . . . . WRIGHT CYCLONE ENGINE MODEL R-2600-23

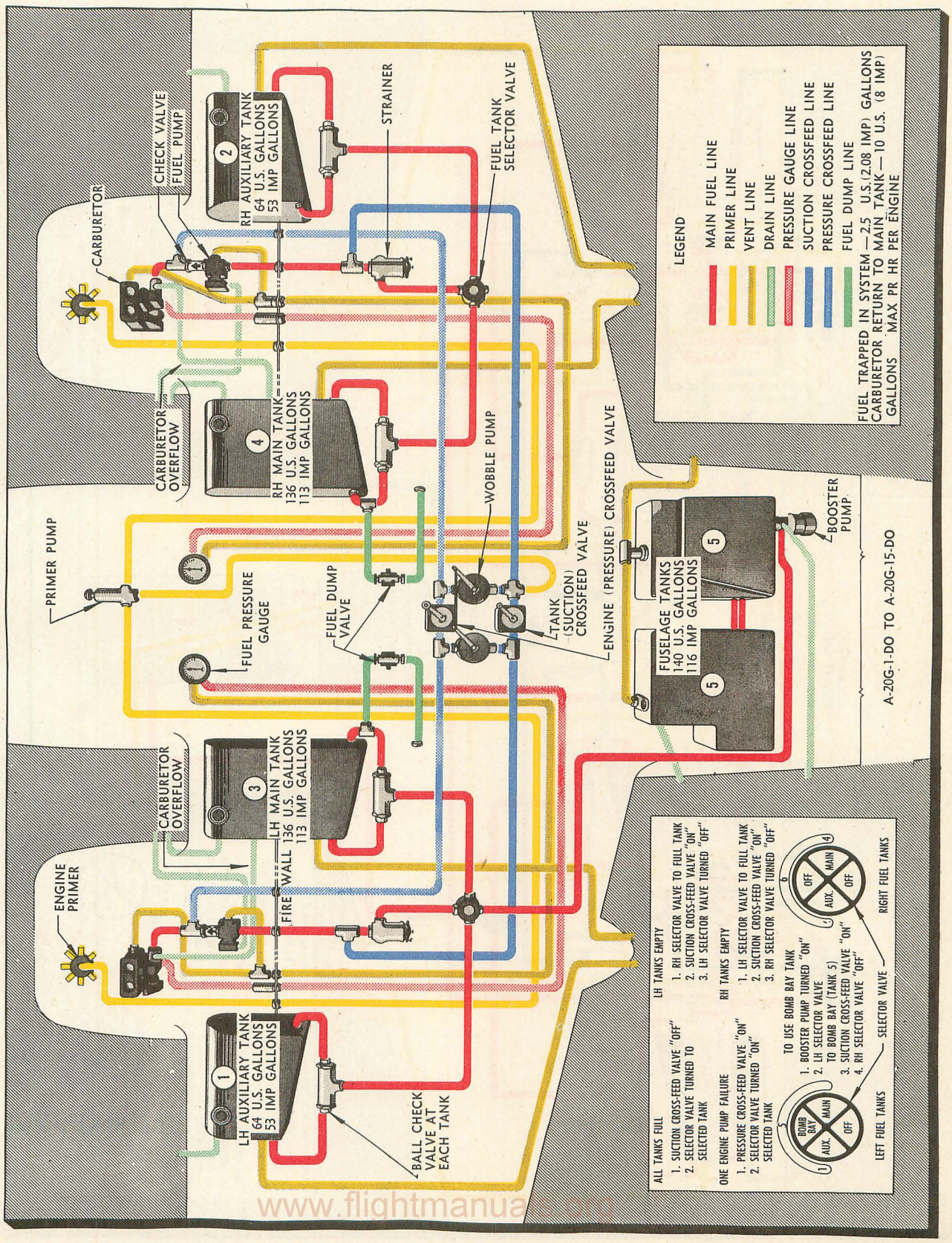


Fig. 22 — Fuel System

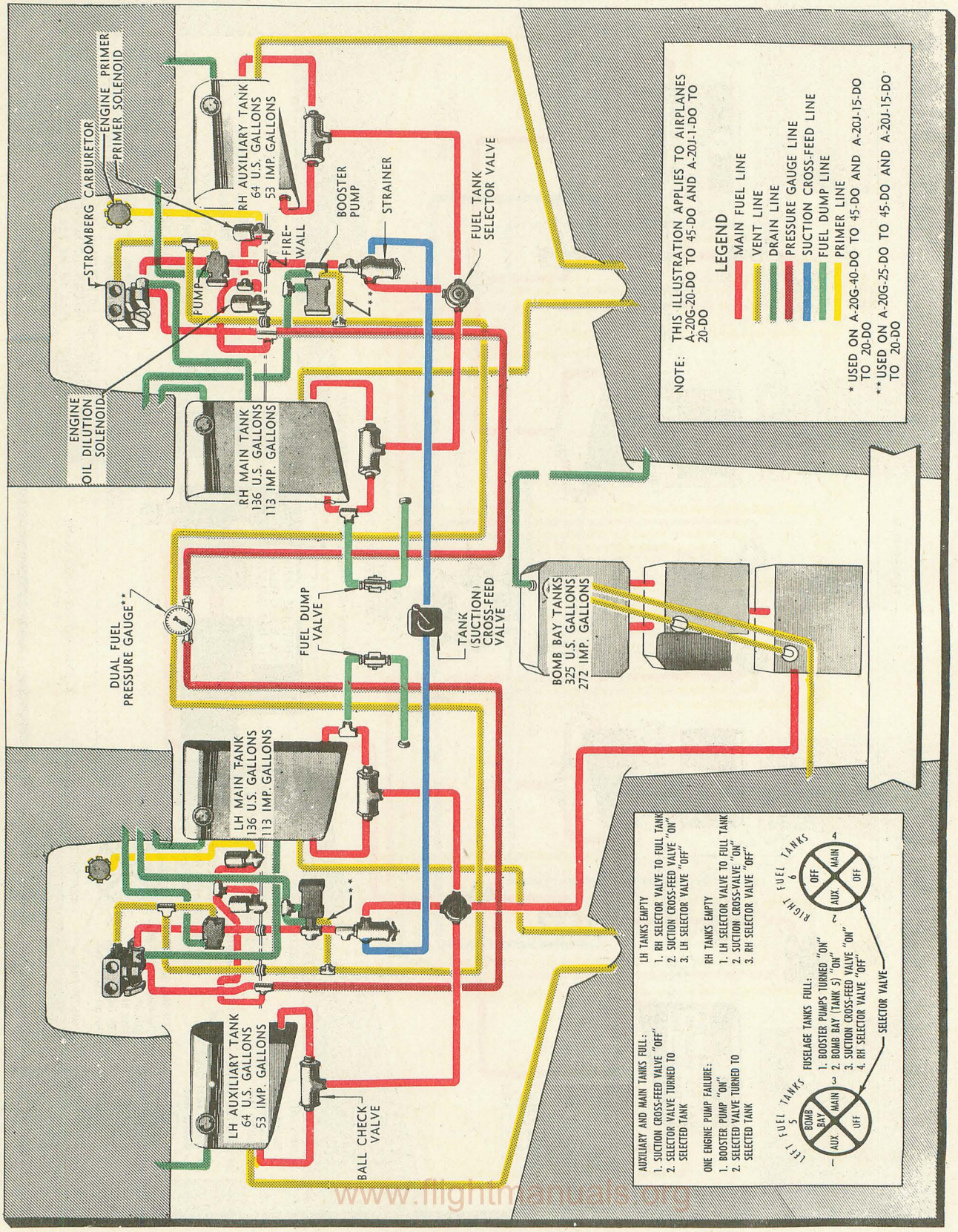


Fig. 23 — Fuel System

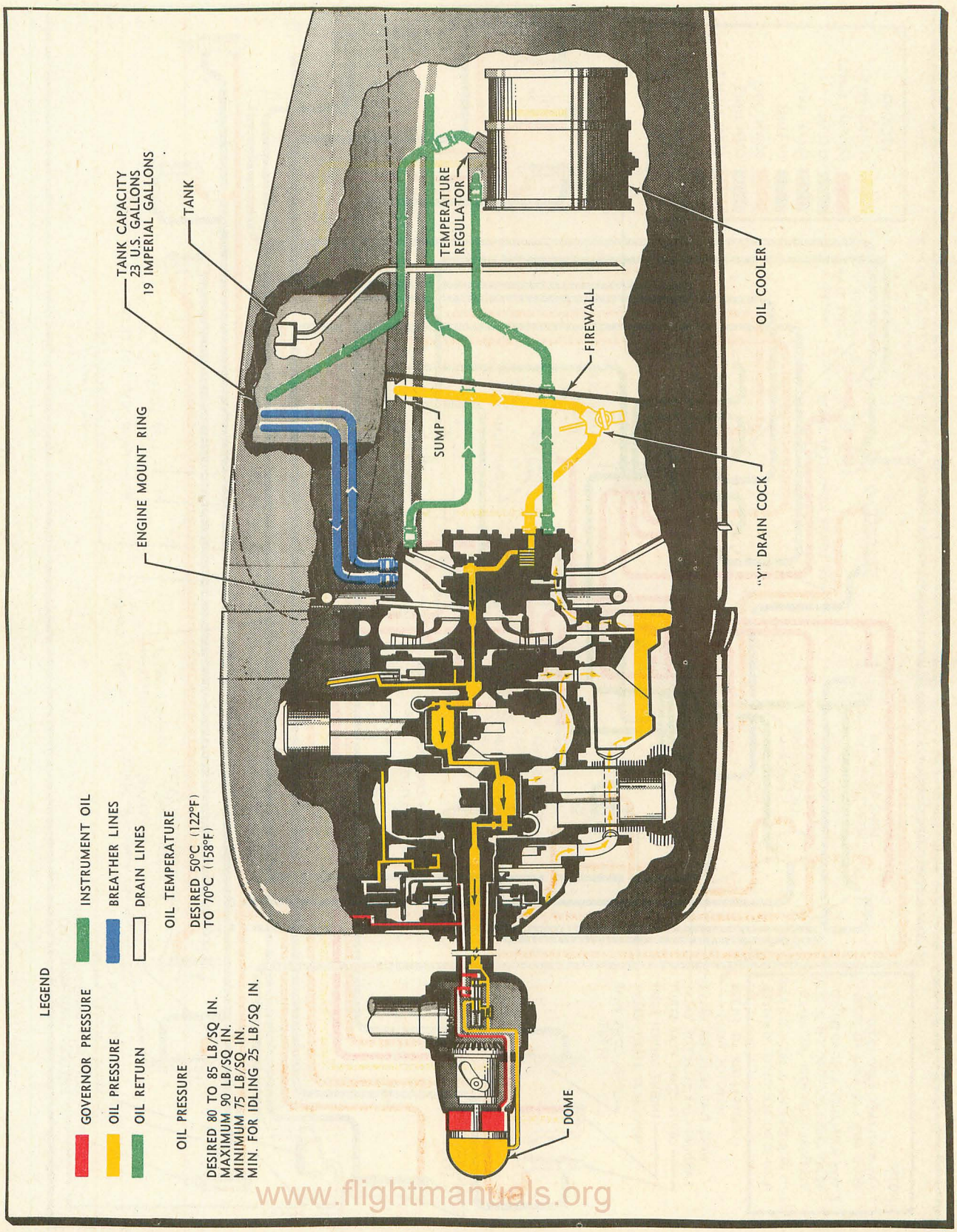


Fig. 24 — Oil System

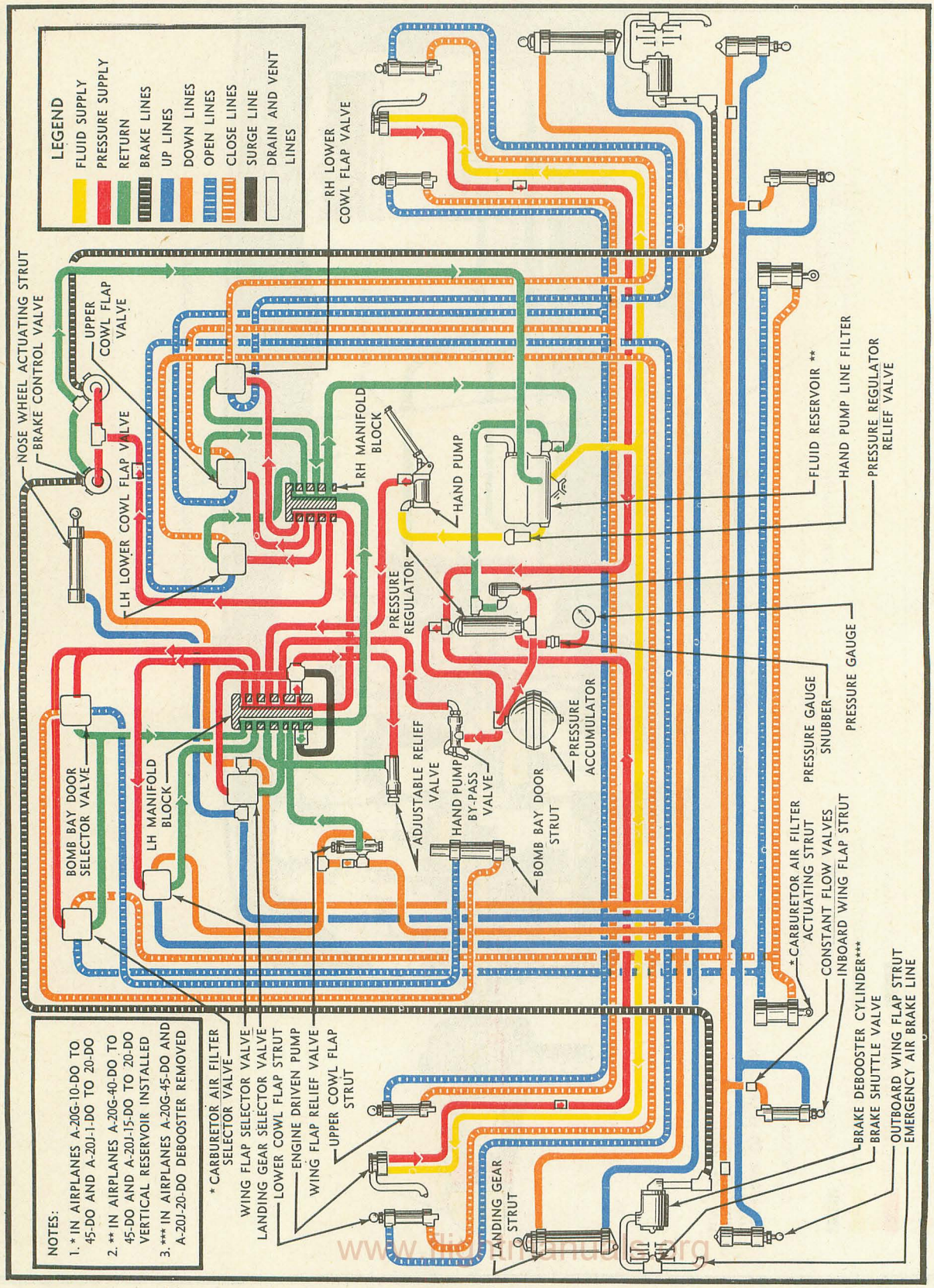


Fig. 25 — Main Hydraulic System

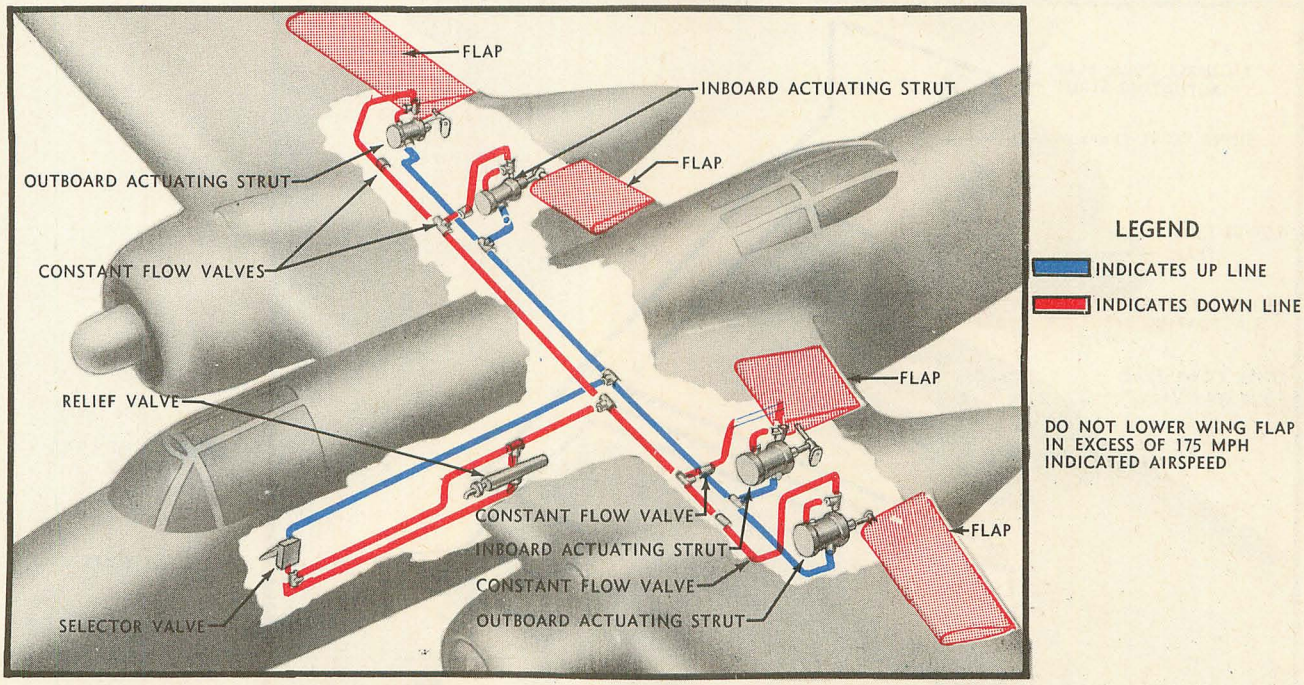


Fig. 26 — Wing Flap Hydraulic System

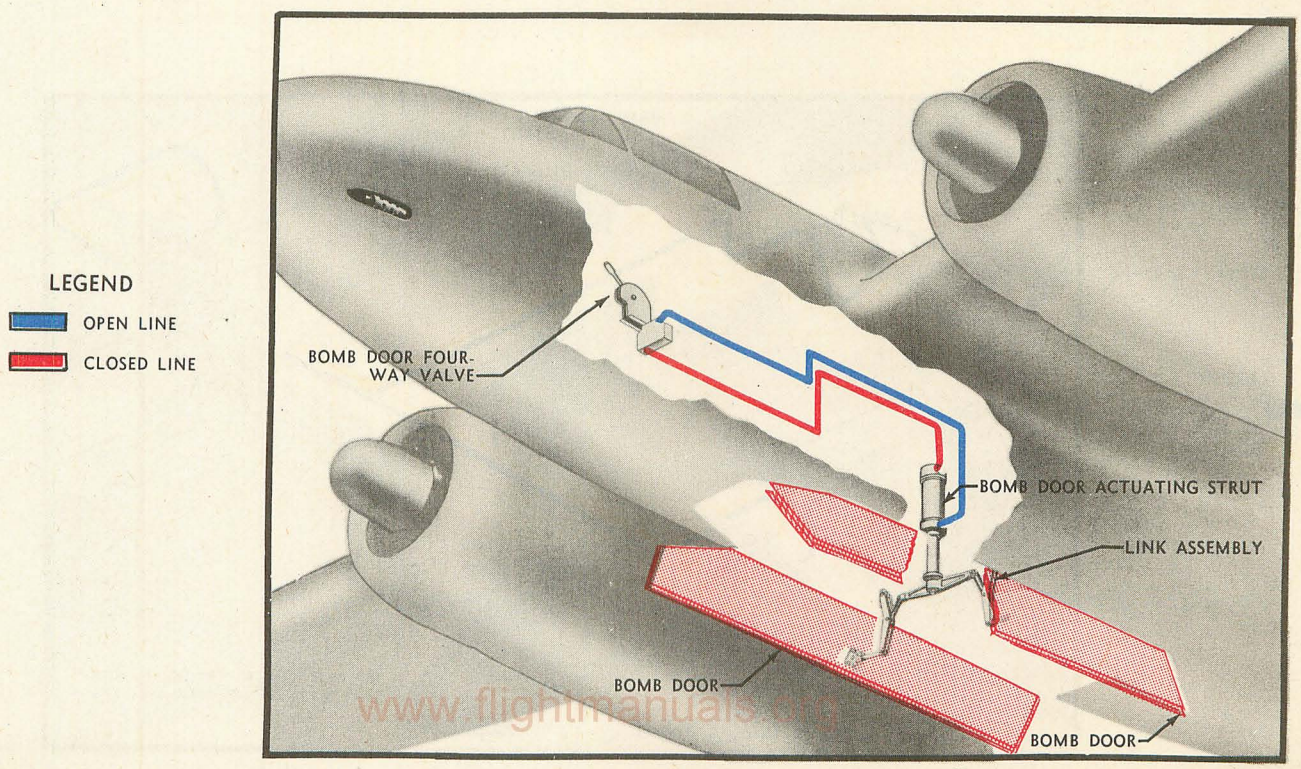


Fig. 27 — Bomb Door Hydraulic System

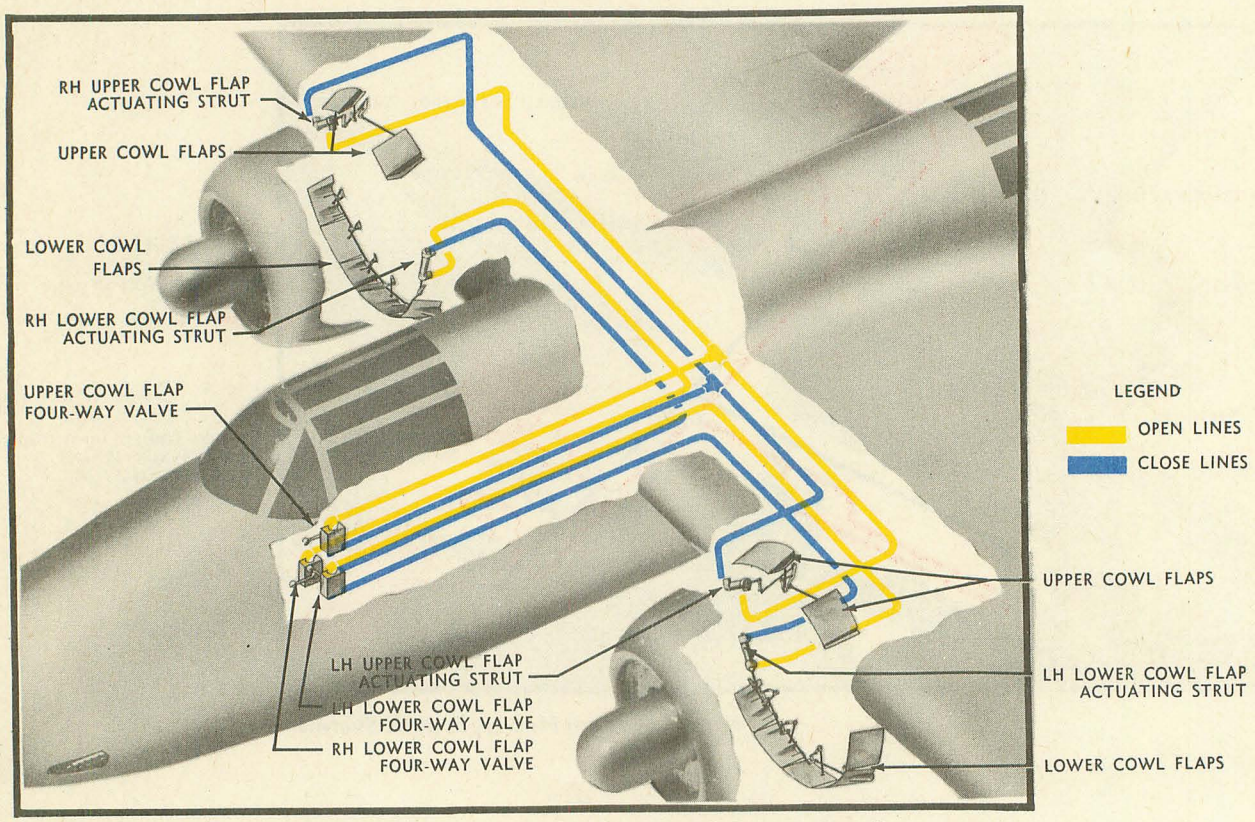


Fig. 28 — Cowl Flap Hydraulic System

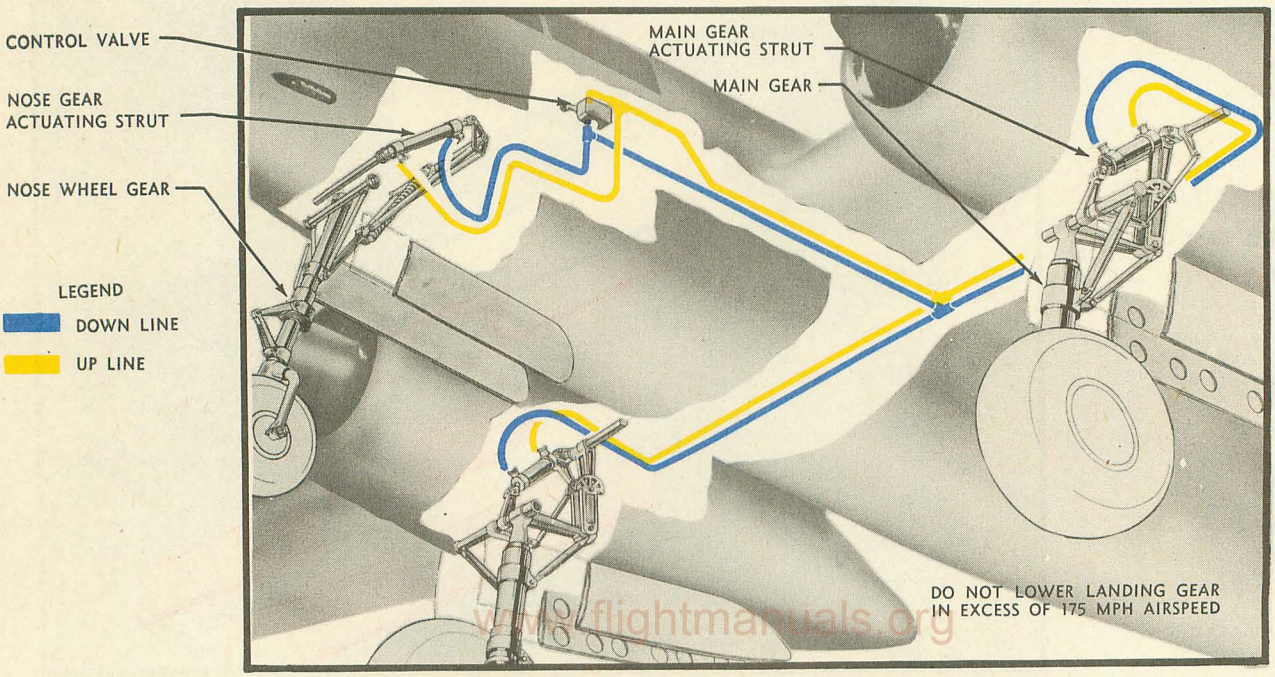


Fig. 29 — Landing Gear Hydraulic System

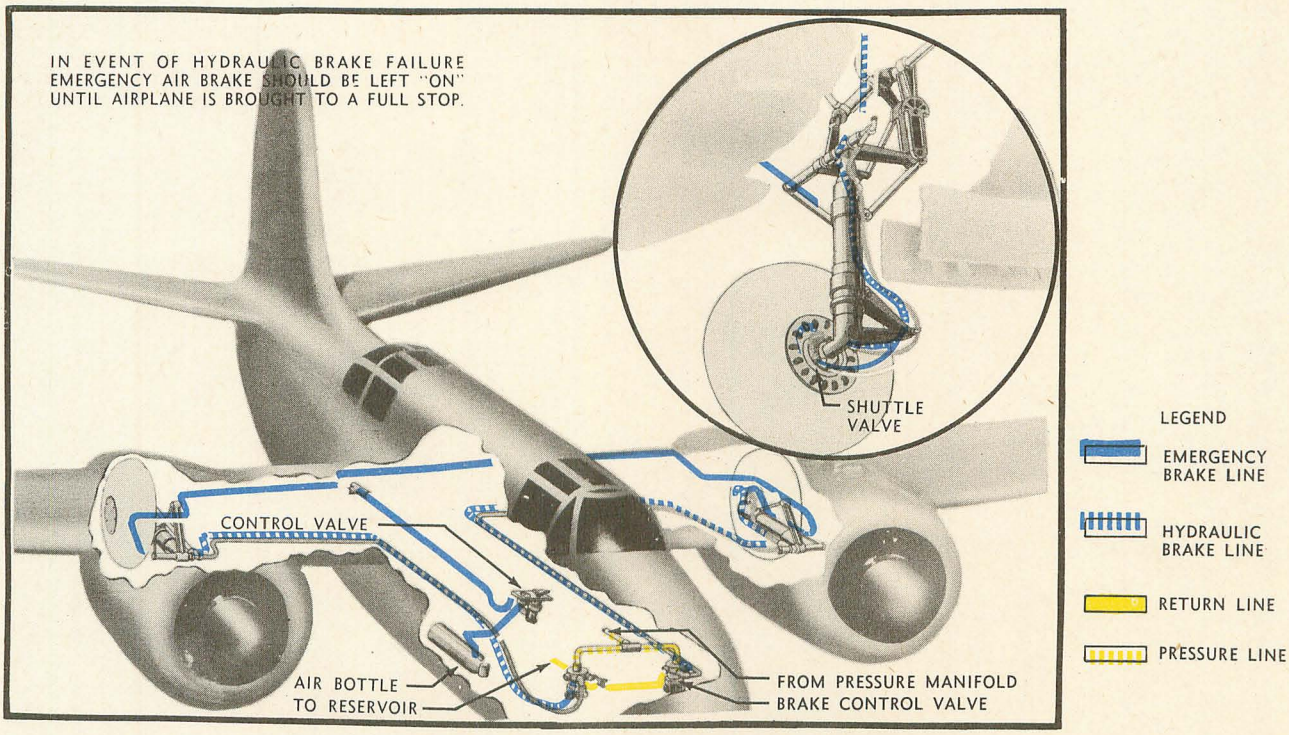


Fig. 30 — Hydraulic and Emergency Air Brake System

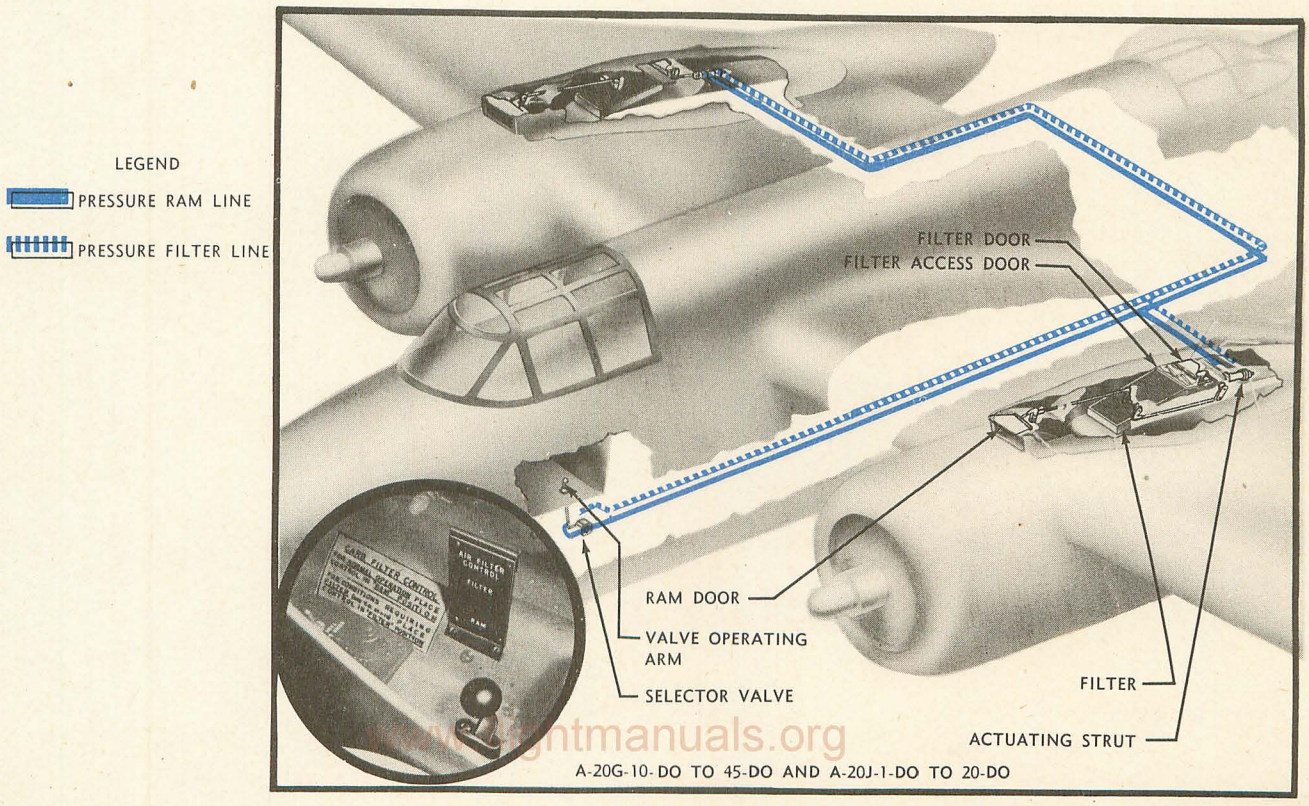
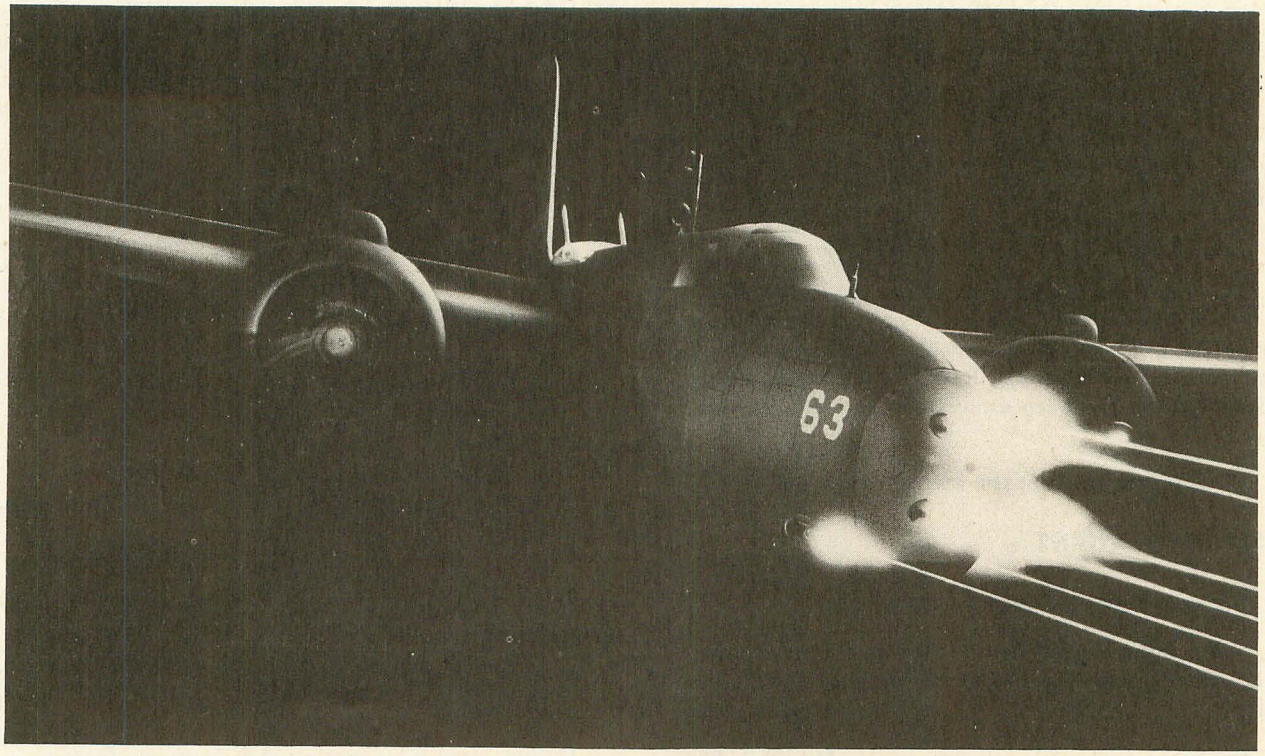


Fig. 31 — Carburetor Air Filter Hydraulic System



Section II

PILOT'S OPERATING INSTRUCTIONS

1. FLIGHT RESTRICTIONS.

a. All acrobatics are strictly prohibited.

b. Intentional spins are prohibited.

2. BEFORE ENTERING PILOT'S COCKPIT.

a. Check the following:

(1) Nose wheel snubbing pin—engaged.

(2) See that nose wheel mechanical release cable is attached to mechanism with clevis pin.

(3) Wheels—chocked.

(4) Visually check contents of fuel and oil tanks.

(5) Visually inspect nacelle engine section for fuel leaks.

3. ON ENTERING PILOT'S COCKPIT.

a. STANDARD CHECK FOR ALL FLIGHTS.

(1) Surface control straps—removed.

(2) Switch on generator switch in gunner's compartment.

(3) Ignition—"OFF."

(4) Landing gear hydraulic control "DOWN."

(5) Master battery switch—"ON."

(6) Landing gear indicator (green) light "ON." If the green indicator light is on, and hydraulic pressure is assured, have the main landing gear safety pins and the nose wheel safety clamp removed.

(7) Parking brake—engaged.

(8) Carburetor air filter—"RAM" *(airplanes A-20G-10-DO to A-20G-45-DO and A-20J-1-DO to A-20J-20-DO).*

(9) Check controls for free and full movement.

(10) Wing flaps—"UP."

Note

Before starting engine, make sure that ground fire extinguisher is available.

(11) Check rudder pedal adjustments.

b. SPECIAL CHECKS FOR NIGHT FLYING.

(1) Compass light switch—"ON."

(2) Cockpit light switch—"ON."

(3) Adjust rheostats for compass light, engine instrument lights, and flight instrument lights so that all instruments can be easily read.

(4) Navigation lights switch—"ON."

(5) Extend landing lights and test their operation. Use landing lights only as necessary, to conserve bulb life and to avoid heavy current load on the battery when the engines are not running. Retract the landing lights as soon as climb has been established and ground contact is lost.

(6) Test operation of the identification lights.

4. STARTING ENGINE.

a. Cockpit hood and enclosures—secured.

b. Start right engine first. With ignition switches "OFF," have propeller pulled through at least nine blades.

c. Set right fuel tank selector to "4—MAIN." Set left fuel tank selector to "3—MAIN" when starting left engine.

Note

To avoid overpriming while starting the first engine, keep the fuel tank selector for the other engine in the "OFF" position.

d. Cross-feed—"OFF."
e. Supercharger—"LOW."
f. Carburetor air temperature—"COLD."

Note

The engine should never be started with the carburetor air temperature controls in the "HOT" position. Serious damage and fire may result from a backfire. During icing conditions, start the engine in the "COLD" position, then move the control to "HOT."

CAUTION

On *airplanes A-20G-30-DO to A-20G-45-DO and A-20J-5-DO to A-02J-20-DO*, see that air scoop control is in the "RAM" position.

g. Upper and lower cowl flaps—"OPEN." If there is no hydraulic system pressure, operate the hydraulic hand pump until cowl flaps are open, then return control to "NEUTRAL." Before operating the hand pump, make certain that all other hydraulic controls are in "NEUTRAL," except the landing gear control which should be left in the "DOWN" position. Oil cooler flaps will open with the lower cowl flaps.

h. Propeller—"INCREASE RPM."

i. Throttle—¼ "OPEN."

j. Mixture—"IDLE CUT-OFF."

k. Ignition—"BOTH."

l. Booster pump—"ON" *(airplanes A-20G-20-DO to A-20G-45-DO and A-20J-1-DO to A-20J-20-DO)*

or

Maintain fuel pressure at 8 to 10 pounds per square inch with wobble pump *(airplanes A-20G-1-DO to A-20G-15-DO).*

m. If engine is cold, pump primer three to five strokes and lock primer "OFF" *(airplanes A-20G-1-DO A-20G-15-DO)*

or

If engine is cold, use electric primer. Hold down momentarily to avoid flooding *(airplanes A-20G-20-DO to A-20G-45-DO and A-20J-1-DO to A-20J-20-DO).*

CAUTION

Do not prime an engine that is warm from previous running (15°C [60°F], or above).

n. Starter energizing switch – "ON." (Approximately 30 seconds; or until starter flywheel is brought up to full speed.)

o. When starter comes up to speed, mesh switch "ON." (Do not depress mesh switch longer than 45 seconds.)

p. Mixture—"AUTO RICH."

q. If engine does not fire after 30 seconds, discontinue fuel pressure and return mixture control to "IDLE CUT-OFF." If flooding is indicated by a discharge of fuel from the blower drain, clear engine out by turning it through several revolutions (throttle open). If engine starts during clearing, immediately move the mixture control to "AUTO RICH," closing the throttle to ¼ "OPEN." If engine does not start, repeat the original procedure.

Note

If the engine does not start within the above time, shut down and allow starter to cool for three minutes.

r. Idle engine at 800 rpm. If oil pressure does not come up to at least 40 pounds per square inch within one-half minute after starting, stop engine and investigate.

s. After oil pressure comes up, increase engine speed to 1100-1200 rpm.

t. Note hydraulice pressure, lower and raise wing flaps, and return control lever to "NEUTRAL." After operation, the hydraulic pressure should recover to 850 ± 25 pounds per square inch, indicating that the right engine hydraulic pump is operating properly.

u. Follow the same procedure to start the LH engine.

v. Booster pump—"OFF" *(airplanes A-20G-20-DO to A-20G-45-DO and A-20J-1-DO to A-20J-20-DO).* The above operation will check satisfactory operation of engine-driven fuel pump during engine check.

w. Set altimeter (Kollsman number) for field.

x. Gyro horizon—"UNCAGED."

y. Set directional gyro, and uncage.

5. ENGINE WARM-UP.

a. Run engine at 1100-1200 rpm until the oil temperature is at least 55°C (131°F).

6. ENGINE AND ACCESSORIES GROUND TEST.

a. Check propeller controls. With engine speed at 1500 rpm, move propeller controls toward "DECREASE RPM" until a drop in rpm is shown, then return control to "INCREASE RPM." Minimum governing rpm is 1200.

b. Check supercharger. With propeller controls in "INCREASE RPM," open throttle to 1700 rpm, move supercharger control to "HIGH" position, then open the throttle sufficiently to obtain not over 30 inches Hg manifold pressure. When the engine speed has stabilized, observe the manifold pressure and shift the supercharger to "LOW" without moving throttle. A sudden decrease in manifold pressure is an indication that the two-speed supercharger is operating properly. When changing the supercharger ratios, the control should be moved quickly without pausing, between one extreme of the control position and the other.

c. Check magnetos by momentarily switching from "BOTH" magnetos to one. The normal drop-off is 50 to 70 rpm and should not exceed 100 rpm.

CAUTION

Do not run at high manifold pressures longer than is necessary. Cooling of the cylinder heads, barrels, and ignition harness is insufficient for prolonged periods on the ground above 1400 rpm and should be avoided. Stationary engine running should be made with the airplane headed into the wind to aid cooling. Do not exceed 232°C (450°F) cylinder head temperatures.

d. Open throttle to 30 inches Hg manifold pressure; check all engine instruments:

Oil pressure—80 to 85 pounds per square inch.

Oil temperature—50° to 70°C (122° to 158° F).

Note

A drop in oil pressure when the throttle is open indicates that further warming up is required.

Fuel pressures:
Desired—15 to 16 pounds per square inch.
Maximum—16 pounds per square inch.
Idling—12 to 16 pounds per square inch.
Minimum—12 pounds per square inch.

e. Pitot head heater—"ON" (if icing conditions prevail).

f. Make sure that cockpit hood and enclosures are secured.

g. Fuselage step—retracted.

7. TAXIING INSTRUCTIONS.

a. Before taxiing out, remove landing gear safety clamps. Make sure that the snubbing pin on the nose wheel is seated.

CAUTION

Destructive nose wheel shimmy will result if snubbing pin is not seated.

b. Rolling motion is an absolute necessity before the nose wheel will caster. With even power applied to both engines, the brakes are released and the roll begun. Changing direction may then be done by differential braking. Abrupt and sharp turns will cause uneven tire wear if the turn is attempted beyond the limitations of the nose wheel turning limits. Do not attempt sharp turns.

c. Once the airplane has begun to roll on level ground, it can be stopped only by wheel braking. The thrust of the idling propeller is sufficient to overcome rolling friction. Proper and adequate braking is necessary. A pilot should have a thorough understanding of the hydraulic system and emergency air brakes in case line and pump fail.

d. Forward speed should be held to a minimum over soft, rough terrain. With the sinking of the nose wheel, the nose wheel digs in, tending to increase the nose load and subject the nose wheel strut to undue loads. Avoid field obstructions such as rocks, boards, or ditches. Forward loads may be minimized by full-up elevators and minimum braking. The pilot's attention, therefore, should be focused on the terrain to be traversed by the nose wheel.

e. The taxiing speed is limited only to the precautions noted above. When the speed is increased, nose wheel action and control are stabilized, and ground looping is impossible. After the forward roll has been started, normal methods of directional control are present, and the taxiing direction is left open for the use of the rudder, differential engines, brakes, or a combination of the three. Use the first two wherever possible to minimize wear on the brakes and tires.

f. To stop rolling, apply the brakes evenly. The slower the rolling speed, the greater the turning ability of the airplane. As the airplane approaches a standstill, reduce braking gradually to lessen nose pitching.

8. TAKE-OFF.

a. PREFLIGHT.

(1) Trim tabs—"ZERO," or as a center of gravity position and experience warrant.

(2) Mixture—"AUTO RICH."

(3) Propellers—"INCREASE RPM."

(4) Supercharger—"LOW."

(5) Carburetor air—"COLD."

(6) Cross-feed valves: Engine pressure cross-feed—"ON" *(airplanes A-20G-1-DO to A-20G-15-DO);* tank suction cross-feed—"OFF" *(airplanes A-20G-1-DO to A-20G-45-DO and A-20J-1-DO to A-20J-20-DO).*

(7) Booster pump—"ON" *(airplanes A-20G-20-DO to A-20G-45-DO and A-20J-1-DO to A-20J-20-DO).*

(8) Fuel tank selectors—"MAIN" (tanks 3 and 4).

(9) Upper cowl flaps—"CLOSED" (return control to "NEUTRAL").

Note

If upper cowl flaps are left "OPEN," take-off run will be increased and severe buffeting will be experienced.

(10) Lower cowl flaps—oil cooler flaps—"OPEN" (return control to "NEUTRAL").

(11) Wing flaps—half "DOWN" (22½ degrees).

Note

Under all conditions, it is advisable to take off with wing flaps in the half "DOWN" position (22½ degrees).

b. TAKE-OFF. – Refer to Take-Off, Climb, and Landing Charts, Appendix II, for take-off distances at various gross weights and conditions.

c. TAKE-OFF—NOTES TO BE OBSERVED BY PILOT.

(1) Taxi the airplane to take-off position and stop. Allow the airplane to roll forward a few feet in the direction of the take-off, to insure that the nose wheel is also headed in this direction. If this is not done, braking will be necessary when the take-off roll is commenced, and the take-off distance will be increased. As the airplane increases speed (100 to 110 miles per hour), raise the nose wheel clear of the ground by pulling back on control column. On rough terrain, lessen loads on nose wheel with "up" elevator.

Note

For the first part of the roll, direction of elevator movement is exactly opposite to that of airplanes equipped with a tail wheel. Considerable "up" elevator is required during the first part of the roll if the nose wheel is to be cleared of the ground and if the angle of attack of the wings is to be increased. The airplane is normally rolling with its wings at nearly zero angle. Center of gravity and center of lift are ahead of the main wheels. Therefore, smaller elevator angles are necessary as the main wheel ground load is reduced and the wing load increased with speed. When the wheels are raised after take-off, some "down" elevator movement is required to overcome change in center of gravity as the wheels move aft to "RETRACT" position.

(2) At an indicated airspeed of 100 to 110 mph, ease the control column back and raise the nose wheel. Allow the airplane to accelerate before starting the climb. This will insure control if one of the engines fails. An indicated airspeed of 165 mph is suggested to obtain satisfactory cooling (under extreme heat conditions) and rate of climb for all conditions. Under optimum conditions, the A-20G airplane may be controlled on single engine at 135 mph (military rated power)—128 mph (minimum power).

(3) To improve the take-off distance, hold the airplane against the brakes until 30 inches Hg manifold pressure has been reached. Open the throttles as the brakes are released.

(4) Take-off manifold pressure should be 45 inches Hg (5 minutes only).

(5) Take-off rpm should not exceed 2400 rpm (5 minutes only).

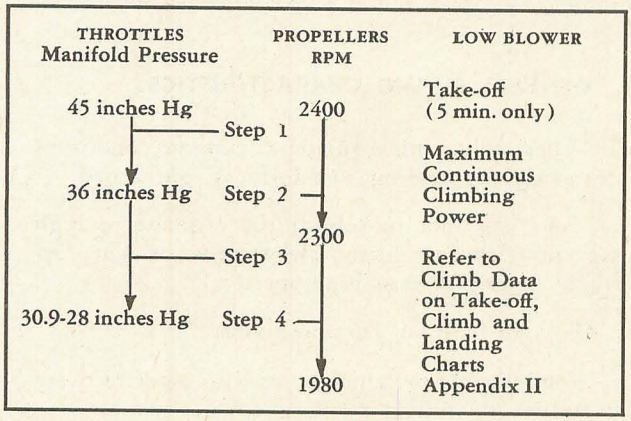
(6) As soon as the airplane has left the ground and attained climbing speed, do the following:

(a) Raise landing gear. (When up, return control to "NEUTRAL.")

Note

As the landing gear retracts, the airplane becomes tail heavy.

(b) Reduce power as follows and in accordance with the arrows:



(c) Check cylinder head temperatures, oil pressure, oil temperature, and fuel pressure by the Specific Engine Flight Chart, Section III. With the control in the "COLD" position, the carburetor air temperature should be slightly above outside air temperatures.

(d) Adjust lower cowl flaps—oil cooler flaps to obtain desired cylinder head and oil temperatures.

(e) Hydraulic controls should be in "NEUTRAL," except when operation is necessary.

(f) Engine pressure cross-feed—"OFF" *(airplanes A-20G-1-DO to A-20G-15-DO).*

(g) Booster pumps—"OFF" *(airplanes A-20G-20-DO to A-20G-45-DO and A-20J-1-DO to A-20J-20-DO).*

Note

Shut booster pumps "OFF" one at a time. During climbs and in flight, use booster pumps (wobble pump) whenever the engine-driven pumps fail to supply adequate fuel pressure.

9. ONE-ENGINE FAILURE DURING TAKE-OFF.

a. If an engine fails during take-off, and the field can no longer be used, proceed as follows:

b. Refer to Flight Operations Charts, Appendix II, for single-engine operating speed.

c. Insure that the landing gear is up or coming up.

d. Apply sufficient rudder tab to hold airplane straight.

e. Adjust throttle setting of good engine. On attaining safe altitude, "milk up" flaps.

Note

At normal loads, this airplane will climb satisfactorily on one engine at 36 inches Hg manifold pressure at approximately 140 mph indicated airspeed at 2300 rpm.

f. Determine cause of failure. If no longer usable, feather propeller of dead engine by emergency procedure as follows:

(1) Push feathering switch button and close throttle. (Closing throttle sounds landing gear warning horn.)

(2) Fuel tank selector—"OFF" for failing engine.

(3) Mixture—"IDLE CUT-OFF."

(4) Engine cross-feed—"OFF."

(5) Booster pump—"OFF" *(airplanes A-20G-20-DO to A-20G-45-DO and A-20J-1-DO to A-20J-20-DO).*

(6) Ignition switch—"BOTH" until engine stops; then turn "OFF."

(7) Close cowl flap. (Return control to "NEUTRAL.")

(8) Move throttle of dead engine past ¼ segment to quiet the landing gear warning horn.

g. Landing circuit maybe made toward either engine. Trim airplane and circle field at 165 IAS; carry out engine assisted approach at not less than 130 IAS.

Note

It is recommended that during single engine landings the propeller of the failing engine be feathered *only* if the engine is *entirely* useless. If the engine can be operated at reduced power—even though a drop in oil pressure or engine roughness is present—operate the engine at reduced power during landing.

h. To avoid excessive rudder pedal load, reduce rudder tab offset as speed decreases during final approach.

i. A normal final approach and landing may be made with the assistance of the good engine. The three-wheeled landing gear enables the airplane to be flown onto the ground at a higher speed than one with the standard two-wheeled landing gear. Conservative

speeds may thus be maintained during the final approach.

WARNING

Do not lower gear until airplane is on final approach. Do not lower wing flaps until certain the field can be reached.

j. If an engine should fail due to loss of fuel pressure on a take-off, or while in flight, operate the wobble pump *(airplanes A-20G-1-DO to A-20G-15-DO)*—turn booster pump—"ON" *(airplanesA-20G-20-DO to A-20G-45-DO and A-20J-1-DO to A-20J-20-DO).* If the wobble pump (booster pump) fails to bring up the pressure, a broken fuel line is indicated. In this event, be sure that the cross-feed controls are "OFF" and the respective fuel tank selector valve is "OFF" to avoid loss of fuel.

CAUTION

Do not use fuel from the system in which the failure occurred. If the wobble pump (booster pump) brings up the pressure, failure of the engine-driven fuel pump is indicated. To supply the failing engine with fuel, turn the engine cross-feed control "ON" *(airplanes A-20G-1-DO to A-20G-15-DO)*—booster pump control "ON" *(airplanes A-20G-20-DO to A-20G-45-DO and A-20J-1-DO to A-20J-20-DO).* At take-off power, however and with throttles full open, the single operating pump may be insufficient to supply both engines. When the cross-feed is used under these conditions, hold the rpm at 2300 to maintain maximum pump outlet, and reduce the throttles (until fuel pressure rises to a minimum of 12 pounds-per-square-inch).

10. CLIMB.

a. For the best climbing airspeed under various gross weights, refer to Appendix II.

b. Cylinder head temperature limits:

(1) Military power climb (5 minutes only)—248°C (478°F).

(2) Rated power climb—232°C (450°F).

c. Oil temperature limits:

(1) Take-off and climb (5 minutes only)—95°C (203°F).

(2) Continuous operation—85°C (185°F).

d. See Specific Engine Flight Chart, Section III, for critical altitudes for low blower.

e. When critical altitudes for low blower have been reached, partially close the throttle to reduce manifold pressure 3 to 4 inches Hg, and shift supercharger controls rapidly, without pausing, to the limit of the "HIGH" position. Do not use high blower when desired power is available in low blower, as fuel economy is inferior to that obtained in low blower and tendency to denotate is greater.

11. FLIGHT OPERATION.

a. Refer to Flight Operation Instruction Charts, Appendix II, for ranges and recommended power settings.

12. GENERAL FLYING CHARACTERISTICS.

a. When flying this airplane at extreme conditions of center gravity loading, instability is approached.

b. Take care not to subject the airplane to high acceleration loading during steep turns, or when recovering from a dive at high speed.

c. Tighten trim tab friction knobs.

d. Tab controls must not be used to assist recovery from a dive.

e. As the airplane is not designed to exceed 6G (6 × the force of gravity) at 19,750 lbs. gross weight, and correspondingly less as weight is increased, avoid rapid pull-outs.

f. The raising of the landing gear causes tail heaviness and vice versa. Do not lower wheels at an indicated airspeed over 175 mph.

g. The lowering of the wing flaps does not produce any appreciable change in trim. Do not lower wing flaps over 175 mph indicated airspeed.

h. When the lower engine cowl flaps are closed, the airplane becomes nose heavy, and vice versa.

i. Do not open the upper cowl flaps when taking off or during flight. If they are opened, buffeting will occur, and the airplane becomes nose heavy.

j. Use fuel from the "AUXILIARY" tanks when in flight to reserve the "MAIN" tanks for final operation and landing. Normally, the cross-feed controls should be "OFF" during flight. If a tank runs dry, shift to full tank and use wobble pump *(airplanes A-20G-1-DO to A-20G-15-DO)*—booster pump *(airplanes A-20G-20-DO to A-20G-45-DO and A-20J-1-DO to A-20J-20-DO)* —to help displace any air that might have entered the system. By using the wobble pump (booster pump), only a short interval will elapse before normal engine operation is resumed.

Note

Return fuel flow through the carburetor vent line to the main fuel tanks will reach a maximum of ten gallons per hour.

k. The cylinder head and oil temperatures should not exceed the maximum permissible. For continuous cruising level flight, maximum temperatures are as follows:

Cylinder head temperature—205°C (401°F) maximum (level flight).

Oil temperature—85°C (185°F) continuous operation.

l. Emergency maximum temperatures, to be used for five minutes only, are as follows:

Cylinder head temperature—248°C (478°F).
Oil temperature—95°C (203°F).

13. ENGINE FAILURE DURING FLIGHT.

a. If one engine fails during flight and it is imperative that the propeller be feathered as quickly as possible, proceed as noted in paragraph **9.**, *f.*, preceding. Otherwise proceed as follows:

b. PROPELLER FEATHERING.

(1) Throttle—"CLOSED."

(2) Propeller—"DECREASE RPM."

(3) Booster pump "OFF" *(airplanes A-20G-20-DO to A-20G-45-DO and A-20J-1-DO to A-20J-20-DO).*

(4) Cross-feed (engine)—"OFF."

(5) Mixture—"IDLE CUT-OFF."

(6) Dead engine ignition—"OFF."

(7) Cowl flaps—"CLOSED."

(8) Push feathering switch button (release button after feathering action starts). When blades are fully feathered, the button will "kick out" automatically.

c. Operate fuel tank selectors and cross-feed, depending on circumstances and cause of failure, as follows:

Note

Pressure cross-feed control is installed on *airplanes A-20G-1-DO to A-20G-15-DO* only.

CONDITION	REMARKS	SELECTOR VALVE	PRES.	SUCTION
LH Engine Failure	RH tank supplies RH engine.	LH—"OFF" RH on tank desired.	"OFF"	"OFF"
	L H tank supplies RH Engine	LH—tank desired RH "OFF."	"OFF"	"ON"
RH Engine Failure	LH tank supplies RH engine.	RH—"OFF" LH on tank desired.	"OFF"	"OFF"
	RH tank supplies LH engine	RH—tank desired LH "OFF."	"OFF"	"ON"

d. Regulate the cylinder head temperature of the good engine by the lower cowl flaps. Head temperatures, which are sensitive to mixture, should not exceed 248°C (478°F) for military power climb, 232°C (450°F) for rated continuous power, and 205°C (401°F) for cruising powers.

e. Adjust rudder tab to suit speed and horsepower output conditions.

f. Final single-engine approach and landing should be made as noted in paragraph **9.**, preceding.

g. If it is desired to stop an engine during flight, and then restart, adhere to the following procedures:

(1) PROPELLER FEATHERING.

(a) Throttle—"CLOSED."

(b) Propeller—"DECREASE RPM."

(c) Mixture—"IDLE CUT-OFF."

(d) Ignition switch—"ON."

(e) Fuel—"OFF."

(f) Press feathering button.

Note

If considered necessary, ignition switch may be turned "OFF" if propeller windmills; otherwise, switch may be left "ON."

(2) PROPELLER UNFEATHERING AND STARTING ENGINE.

(a) Ignition switch—"ON."

(b) Propeller—"DECREASE RPM."

(c) Press button to unfeather, hold down until 800 rpm is reached, then release.

(d) Fuel supply—"ON."

(e) Booster pump—"ON" *(airplanes A-20G-20-DO to A-20G-45-DO and A-20J-1-DO to A-20J-20-DO).*

(f) Mixture—"AUTO RICH."

(g) Open throttles gradually until required power is obtain. Refer to Flight Operations Charts, Appendix II.

(h) Maintain this power until satisfactory operating temperatures are obtained. Make sure engine is operating at proper fuel and oil pressures.

(i) When engine has warmed up, adjust propeller control for desired rpm.

(j) Adjust throttle for desired manifold pressure.

CAUTION

The engine must not be run on full power until oil pressure and oil temperatures are normal.

14. STALLS.

a. The stalling characteristics of this airplane are good. With the power off, the stall is straightforward and controllable. The airplane shudders before the stall, and then the nose drops. With power on, if extreme stall conditions are allowed to develop, the stall follows out the wings from the fuselage. As the ailerons stall, the control wheel will tend to whip. Grip the control wheel firmly and drop the nose of the airplane for a normal recovery.

15. SPINS.

a. Intentional spinning is prohibited. In the event of an accidental spin, standard methods of recovery are used. If an uncontrolled spin is allowed to develop below 5000 feet, abandon the airplane.

b. On abandoning the airplane, both engine propellers should be feathered prior to pulling the emergency release of the cockpit enclosure door.

16. ACROBATICS.

a. Acrobatics are strictly prohibited.

17. DIVING.

a. Do not exceed the following diving limits:

GROSS WEIGHT	MAXIMUM DIVING SPEED
18,500 to 23,500	412 mph IAS
23,500 to 25,000	403 mph IAS

b. Use cruising powers during dive.

c. Supercharger controls should be shifted to "LOW" before starting a dive.

CAUTION

Before pulling out of a dive, reduce power by partly closing throttles.

d. Airplane may be trimmed in a dive, but not changed for pullouts.

e. Tighten trim tab friction knobs to prevent creepage.

18. GLIDING.

a. This airplane is stable in a glide, and visibility is good. The application of the wing flaps does not appreciably alter the trim of the airplane, but the gliding angle is steepened for constant speed. Refer to Stalling Speed Chart for speeds at various gross weights and conditions.

19. APPROACH, LANDING, AND CROSS WIND LANDING.

a. PRELIMINARY APPROACH.—The approach to land may be made with or without power, but should always be made with the wing flaps full DOWN. The preliminary circuit of the landing field should be made at approximately 150 mph indicated airspeed and the following actions should be carried out:

(1) DURING FIRST HALF OF CIRCUIT.

(a) Fuel tank selectors set for "MAIN" tanks, or tanks with greater quantity of fuel.

(b) Cross-feed controls "OFF" unless cross-feed system is necessary.

(c) Propeller controls—2100 rpm.

(d) Carburetor air—"COLD."

(e) Supercharger—"LOW."

(f) Mixture—"AUTO RICH."

(g) Upper and lower cowl flaps "CLOSED" (return control to "NEUTRAL").

(h) Booster pump—"ON" *(airplanes A-20G-20-DO to A-20G-45-DO and A-20J-1-DO to A-20J-20-DO).*

(i) Cabin heaters: "OFF"

(2) DURING LAST HALF OF CIRCUIT.

(a) Lower landing gear and check for green light. (Leave control "DOWN.") If landing gear will not lower or latch, refer to paragraph **19.**, *e.*, following.

(b) Wing flaps—"DOWN." Return control to "NEUTRAL."

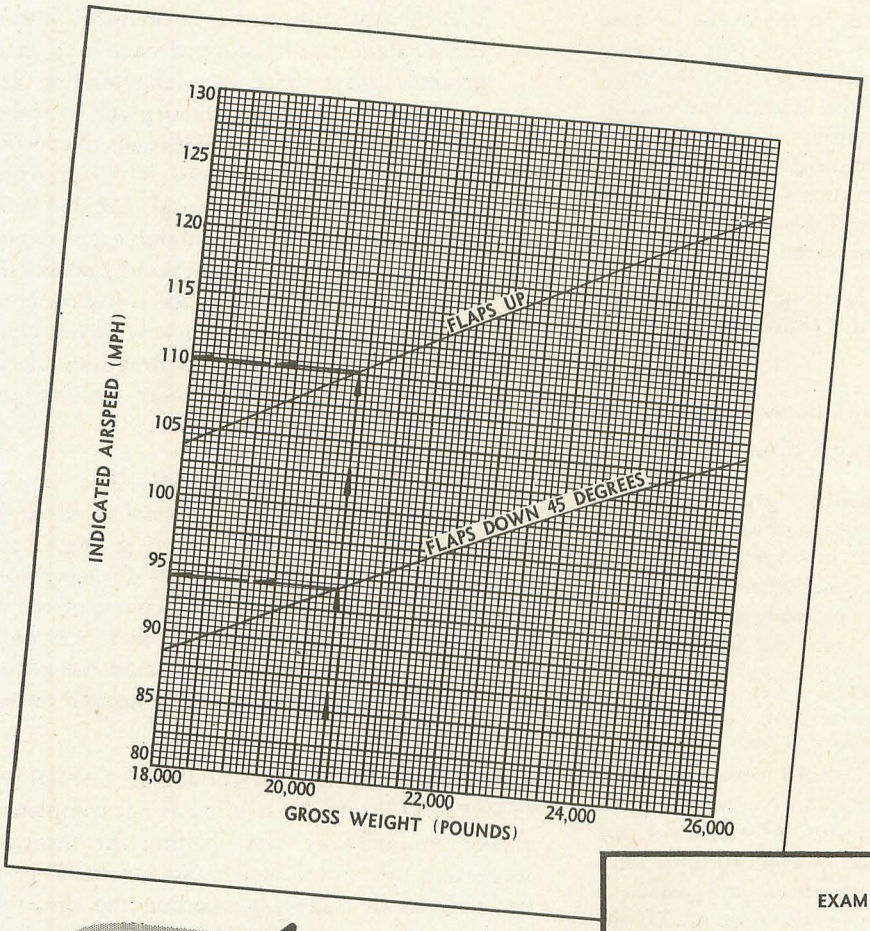
(c) Check brake pressures by depressing the rudder pedals.

b. FINAL APPROACH.—When loaded to approximately 20,000 pounds, the final approach should be carried out at an indicated airspeed of 120 to 115 mph with power off, or an indicated airspeed of 115 to 110 mph with power on. These speeds will be sufficient to give a reasonable hold-off during the landing. Refer to Stalling Speed Chart for various gross weights.

c. LANDING.

(1) Refer to Take-Off, Climb and Landing Charts, Appendix II, for the necessary landing run.

(2) As the landing gear is extended, "up" elevator forces will increase and should be neutralized by the elevator tab. Make a normal approach, so that the main wheels will touch first. Then maintain "up" elevator to hold the nose wheel off the ground until full "up" elevator forces are no longer effective if the field length



EXAMPLE

WING FLAPS UP
GROSS WEIGHT — 20,400 POUNDS

MOVE UP VERTICALLY FROM ESTABLISHED GROSS WEIGHT (20,400 POUNDS) TO INTERSECTION OF WING FLAP UP LINE AND INDICATED STALLING SPEED LINE — 110.2 MPH — CORRECT STALLING SPEED.

WING FLAPS DOWN
GROSS WEIGHT — 20,400 POUNDS

MOVE VERTICALLY FROM ESTABLISHED GROSS WEIGHT (20,400 POUNDS) TO INTERSECTION OF WING FLAP DOWN LINE AND INDICATED STALLING SPEED LINE — 94.2 MPH — CORRECT STALLING SPEED.

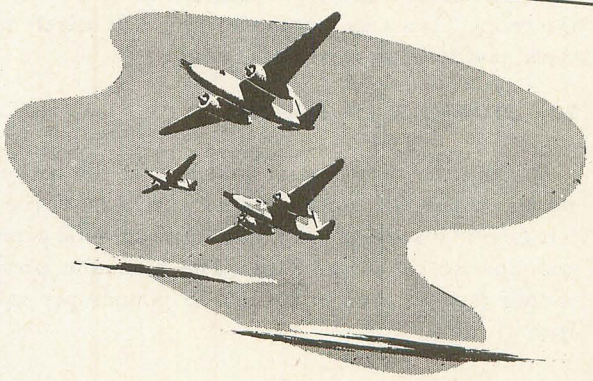


Fig. 32 — Stalling Speed Chart

permits. The airplane will then settle gently on the nose wheel. To stop roll, apply brakes evenly.

Note

Take care if brakes are applied with the nose wheel off the ground; undue bouncing of the nose wheel might occur. With elevators holding the nose wheel off the ground, a different elevator load is encountered with varying braking effort; for more effective braking on slippery fields, apply full up elevators. With elevators in the full up position, additional weight is centered on the main wheels due to the air load on the elevators. This will tend to offset the normal forward pitching movement as the brakes are applied. If one wheel should lock on a slippery runway, due to uneven brake application or uneven friction of the field surface, the airplane will turn in an opposite direction to the locked wheel. If the brake pressure is released and the brakes are applied evenly again, the airplane will immediately straighten itself out.

(3) Do not apply the brakes in the event of nose wheel shimmy. This will only increase the shimmy amplitude. If the shimmy cannot be relieved by holding back the control column, or the landing run cannot be completed in the space available, take the airplane off again and make a new landing. If nose wheel shimmy is still apparent on the new landing attempt, apply braking cautiously at the lower rolling speeds when shimmy will be less pronounced.

(4) After completing the landing run, taxi clear of the runway, and carry out the following:

(a) Wing flaps—"UP."

(b) Upper and lower cowl flaps—"OPEN."

(c) Propellers—"DECREASE RPM."

d. NIGHT LANDING.—During night landings or when visibility is poor, land faster than usual with the nose lower than normal. It is safer to strike the ground in this attitude at high speed than to drop the airplane in so that it will pitch forward, due to a stall, and allow the nose wheel to strike the ground first.

e. EMERGENCY OPERATION OF LANDING GEAR.—If the hydraulic pressure fails, immediately place all hydraulic controls in "NEUTRAL" and leave them there to conserve remaining fluid for operation of the landing gear and brakes. Place control in "DOWN" position and lower the main gear by means of the emergency release. Reduce speed to 130-140 mph indicated airspeed as the release is operated, and assist the gear to latch by sharply depressing the nose of the airplane. If the gear fails to latch, with the landing gear control "DOWN," operate the hydraulic hand pump. Return the control to "NEUTRAL." When gear is down, sufficient fluid is trapped in the reservoir, available only to the hand pump, for approximately 75 cycles. Conserve the remainder for brake operation by not attempting to lower the wing flaps. If 30 to 40 strokes of the hand pump fail to latch the gear, the entire reserve supply of fluid may be used, provided the pilot has no reason to believe the air brake system is damaged (or if there is a large enough area within range for a landing without brakes).

f. EMERGENCY OPERATION OF BRAKES.—After hydraulic pressure failure, check the hydraulic brake system before landing. Operate the hand pump. Toe pressure will be felt at the brake pedals if no serious leaks in the brake lines are present. The emergency air brake system is provided as a "last resort" method of stopping the airplane after landing. Apply the air brakes by fully opening the control valve. The rudder pedals are not connected with this system. Do not apply air brakes until ground contact is made.

Note

If the air lines as well as the hydraulic lines are punctured or damaged, no brake pressure will be available, and it is doubtful whether the airplane can be stopped once it is on the ground unless there is a long landing area. Any attempt to swing the airplane by the engines to avoid obstacles will result in considerable increase in speed and it is not recommended. The pilot should decide before landing whether or not enough space is available to make a landing without brakes. If it is felt that the landing space is insufficient to stop the roll of the airplane—even by applying the full "up" elevator and dragging the tail on the ground—do not lower landing gear. Make a belly landing.

g. CROSS-WIND LANDING.—The approach is made longer and lower than normal to allow the pilot sufficient time to establish a heading to give a ground track parallel to the runway. With wings level, no skidding is necessary. Alter the course of the airplane just prior to ground contact so that it is parallel to the runway, and place the wheels on the ground. Do not raise the nose wheel from the ground once contact has been made.

h. EMERGENCY TAKE-OFF IF LANDING NOT COMPLETED.—If the landing is not completed, apply power gradually by first opening the throttles, then increasing the engine speed. No additional power will be achieved by suddenly opening the throttles when the propellers are in low pitch. This will merely overspeed and tend to damage the engines.

20. STOPPING OF ENGINES.

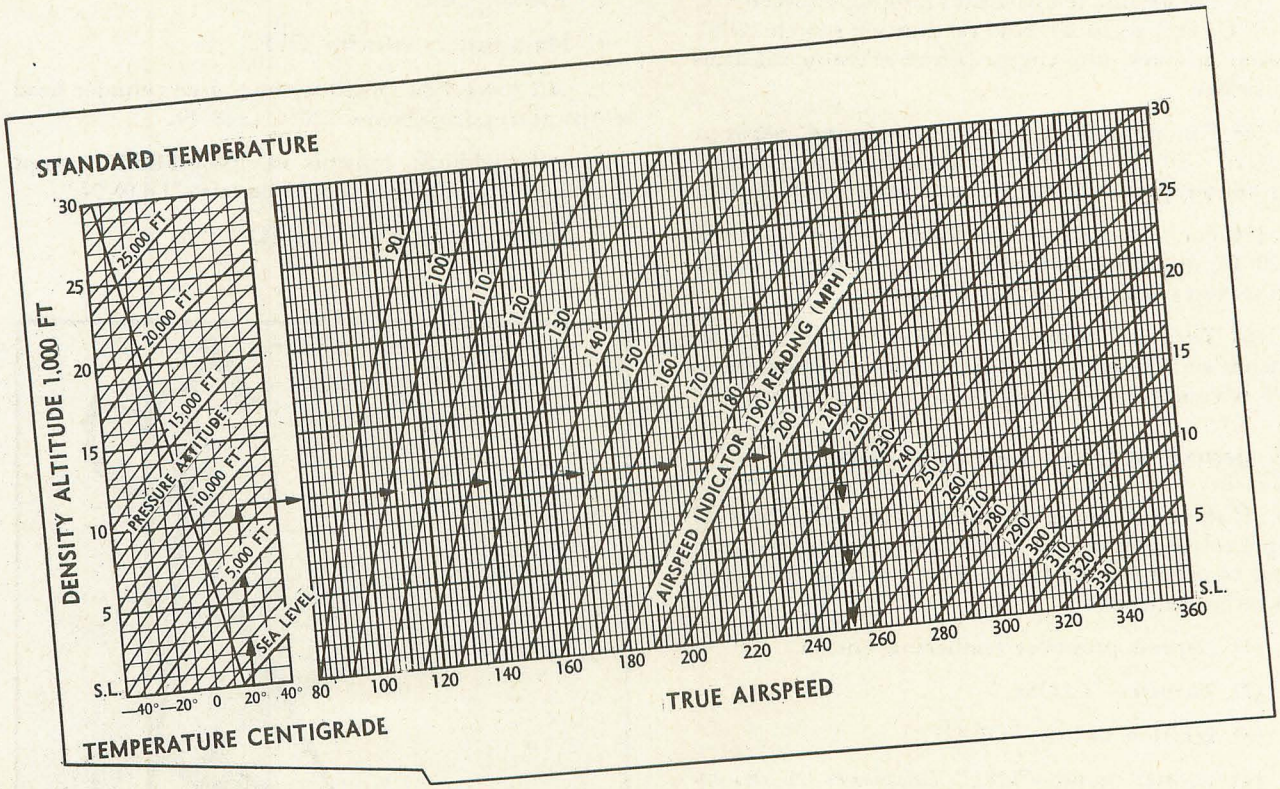
a. Stop the right engine first so that the hydraulic pump on the left engine can be checked. While the left engine is still running, note the hydraulic pressure and operate the wing flaps. The hydraulic pressure should then recover to 850 ± 25 pounds per square inch.

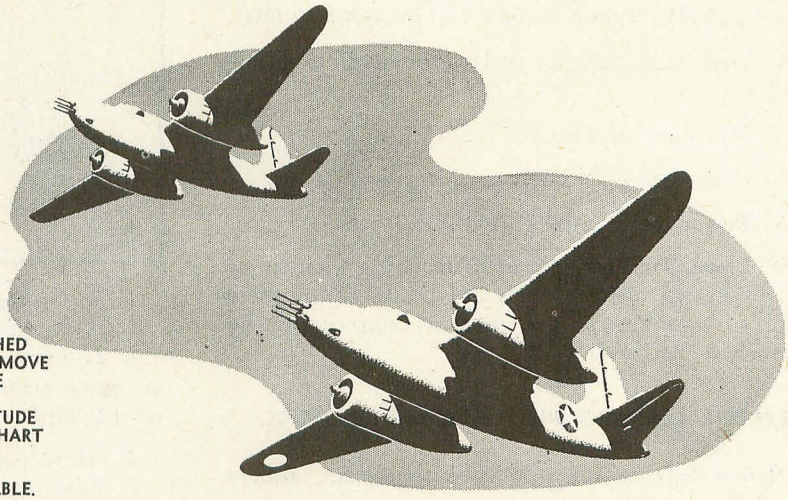
Note

The *right* engine hydraulic pump is checked during starting procedure.

b. Park the airplane by pulling out the parking brake control and depressing brake pedals *after* brake discs are allowed sufficient time to cool and so avoid seizing.

c. With propeller controls in "INCREASE RPM," idle engines at 800 to 1000 rpm for approximately five minutes. This will allow the crankcase to be properly scavenged of oil, and head temperatures to drop to 150°C (302°F).





EXAMPLE

GIVEN: PRESSURE ALTITUDE — 8,600 FT
AIR TEMPERATURE — 20°C (68°F)
INDICATED AIRSPEED — 215 MPH

FIND: TRUE AIRSPEED

METHOD: ENTER TEMPERATURE SCALE AT ESTABLISHED OUTSIDE AIR TEMPERATURE 20°C (68°F). MOVE UP VERTICALLY TO ESTABLISHED PRESSURE ALTITUDE CURVE (8,600 FT). FROM INTERSECTION OF TEMPERATURE AND ALTITUDE CURVES, MOVE HORIZONTALLY ACROSS CHART TO AIRSPEED INDICATOR READING (215 MPH). AT THIS POINT MOVE DOWN VERTICALLY TO TRUE AIRSPEED TABLE.

ANSWER: 252 MPH — TRUE AIRSPEED

Fig. 33 — Airspeed Correction Chart

d. Move mixture controls to "IDLE CUT-OFF" at any idling rpm and gradually open the throttles. This will give a clear cut-off with no backfiring.

e. When engines have stopped, turn ignition switch "OFF."

f. When a cold weather start is anticipated, dilute the engine oil as follows:

(1) Operate each engine at 800 rpm.

(2) Maintain oil temperature below 50°C (122°F).

Note

Avoid exceeding 50°C (122°F) as fuel vapor blown from the breather outlets will create a fire hazard. If temperature rises too high, fuel will vaporize so that no oil dilution will be obtained. In such a case, stop the engines until the oil cools to approximately 35°C (95°F). Restart and proceed with dilution.

(3) For ground temperatures ranging between 5°C to —7°C (41°F to 20°F), hold oil dilution switch "ON" for four minutes; stop engine before releasing oil dilution switch.

(4) For ground temperatures ranging between —7°C to —30°C (+20°F to —20°F), dilute for a second four-minute period fifteen minutes after first dilution.

(5) For ground temperatures below —30°C (—20°F), dilute for a third four-minute period of fifteen minutes after the second dilution.

(6) Turn on propeller feathering oil dilution switches and feather propellers. When the feathering cycle is completed, turn off oil dilution switches.

21. ENGINE SECTION FIRE IN FLIGHT.

a. If there is a fire in the engine section, cut off fuel supply to the engine and immediately feather the propeller to prevent more fuel and oil reaching the blaze. Proceed as follows:

(1) Depress propeller feathering button.

(2) Throttle—"CLOSE."

(3) Ignition switch—"OFF."

(4) Booster pump—"OFF" *(airplanes A-20G-20-DO to A-20G-45-DO and A-20J-1-DO to A-20J-20-DO).*

(5) Fuel tank selector valve for engine afire—"OFF."

(6) Mixture—"IDLE CUT-OFF."

(7) Cross-feed—"OFF."

(8) Engine cowl flaps—"CLOSED."

(9) Lower landing gear after reaching vicinity of field at cruising altitude. This will allow complete venting of nacelles. If fire reoccurs and cannot be extinguished—bail out.

22. BEFORE LEAVING PILOT'S COMPARTMENT.

a. Before leaving the pilot's compartment, adhere to the following instructions:

b. Have wheels chocked if possible.

c. Fuel valves—"OFF."

d. All lights—"OFF."

e. Radio—"OFF."

f. Main battery switch—"OFF."

g. All cowl flaps closed when engine cylinder head temperatures drop below 120°C (248°F).

h. All hydraulic controls in "NEUTRAL" except the landing gear. This should be left—"DOWN."

i. Surface controls—"LOCKED."

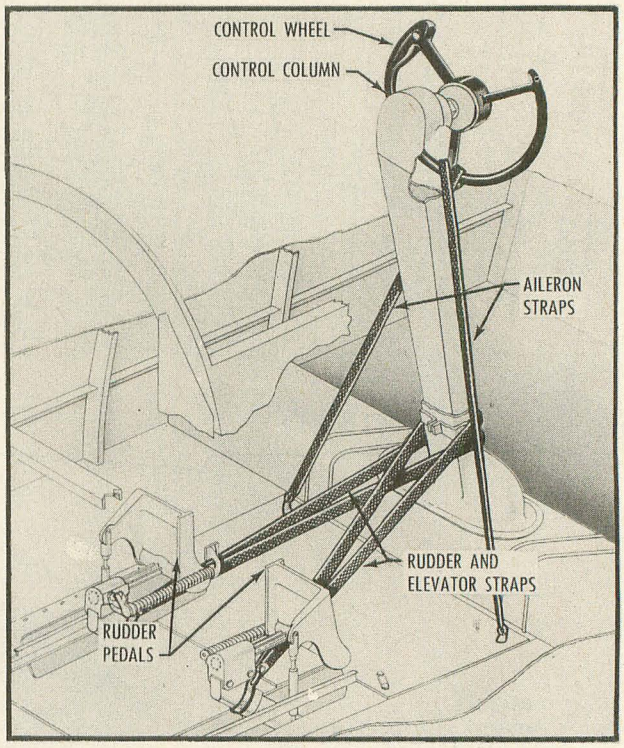


Fig. 34 — Gust Locks Installed

j. If dusty air conditions prevail, set the carburetor air temperature controls to "COLD" and filter control to "FILTER" *(airplanes A-20G-10-DO and subsequent).*

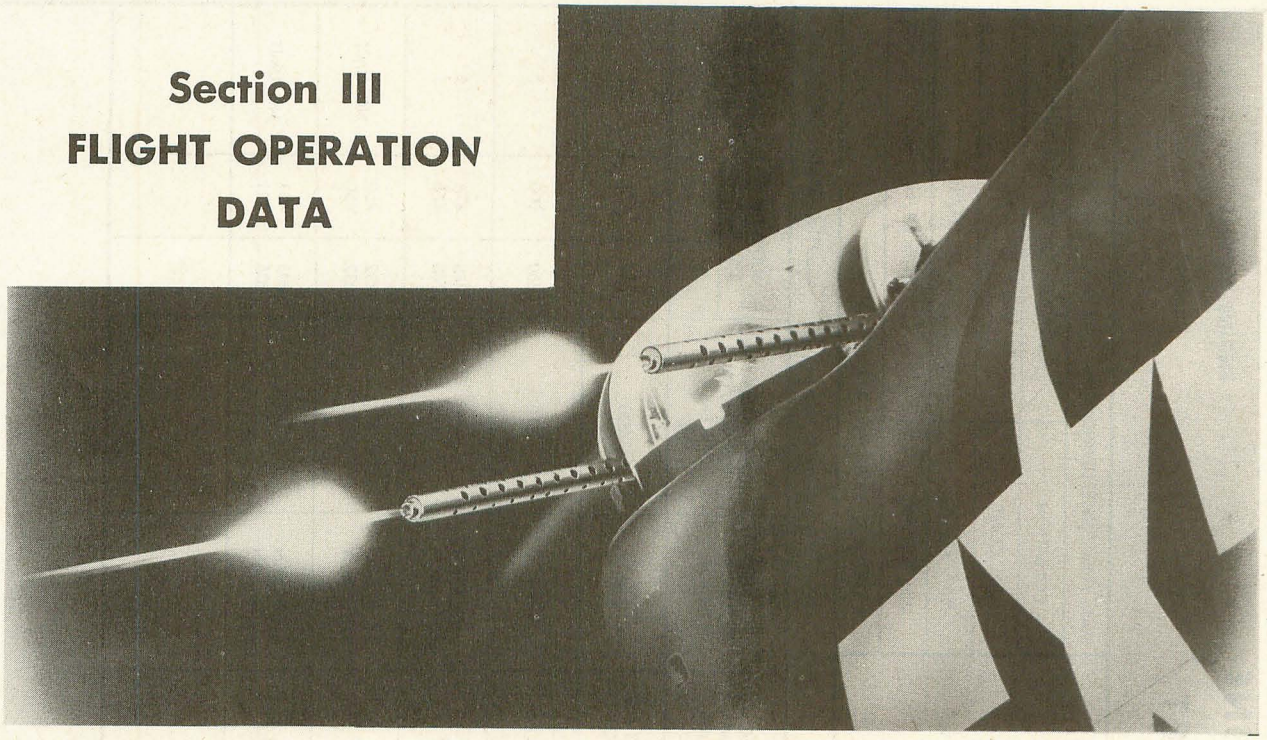
k. Have pitot head covered.

l. Entrance doors—CLOSED AND LOCKED.

23. CHARTS.

a. An airspeed correction chart and a stalling speed chart are provided in this section.

Section III
FLIGHT OPERATION DATA



1. SPECIFIC ENGINE FLIGHT CHART.

The information pertinent to the operation of the engine installed on this airplane is presented in tabular form on the following page. Reference should be made to this chart prior to operating the engines.

2. AIRSPEED AND ALTIMETER CORRECTION TABLE.

AIRSPEED INDICATOR READING* (MPH)	TRUE IAS (MPH) FLAPS AND GEAR UP	TRUE IAS (MPH) FLAPS AND GEAR DOWN	ALTIMETER CORRECTION (FEET) GEAR AND FLAPS UP		
			SEA LEVEL	10,000	20,000
100	.....	96	— 40	— 50	— 60
120	114	115	— 50	— 70	— 80
140	133	135	— 60	— 90	—110
160	152	154	— 80	—110	—140
180	171	.....	—100	—130	—170
200	191	.....	—120	—160	—210
220	210	.....	—140	—190	—240
240	230	.....	—160	—220	—280
260	249	.....	—180	—250	—320
280	269	.....	—210	—280	—360
300	288	.....	—230	—310	—400
320	308	.....	—250	—340	—440
340	328	.....	—270	—370	—480
360	347	.....	—290	—400	—520

* Corrected for Instrument Error.

— Subtract from Altimeter Reading.

SPEC. AN-H-8 DEC. 18, 1942 — FORM ASC-512

AIRPLANE MODELS

A-20G-1-DO TO A-20G-45-DO
A-20J-1-DO TO A-20J-20-DO

SPECIFIC ENGINE FLIGHT CHART

ENGINE MODELS

R-2600-23

CONDITION	FUEL PRESSURE (LB/SQ IN.)	OIL PRESSURE (LB/SQ IN.)	OIL TEMPERATURE °C	OIL TEMPERATURE °F
DESIRED	15	85	50-70	122-158
MAXIMUM	16	90	85-95	185-203
MINIMUM	14	75	..	..
IDLING	..	30	..	..

MAX. PERMISSIBLE DIVING RPM: 2750

CONDITION	ALLOWABLE OIL CONSUMPTION
MAX. CONT	17 US QT/HR
MAX. CRUISE	13 US QT/HR
MIN. SPECIFIC	5 US QT/HR

OIL GRADE(S): 1120 (W) 1120

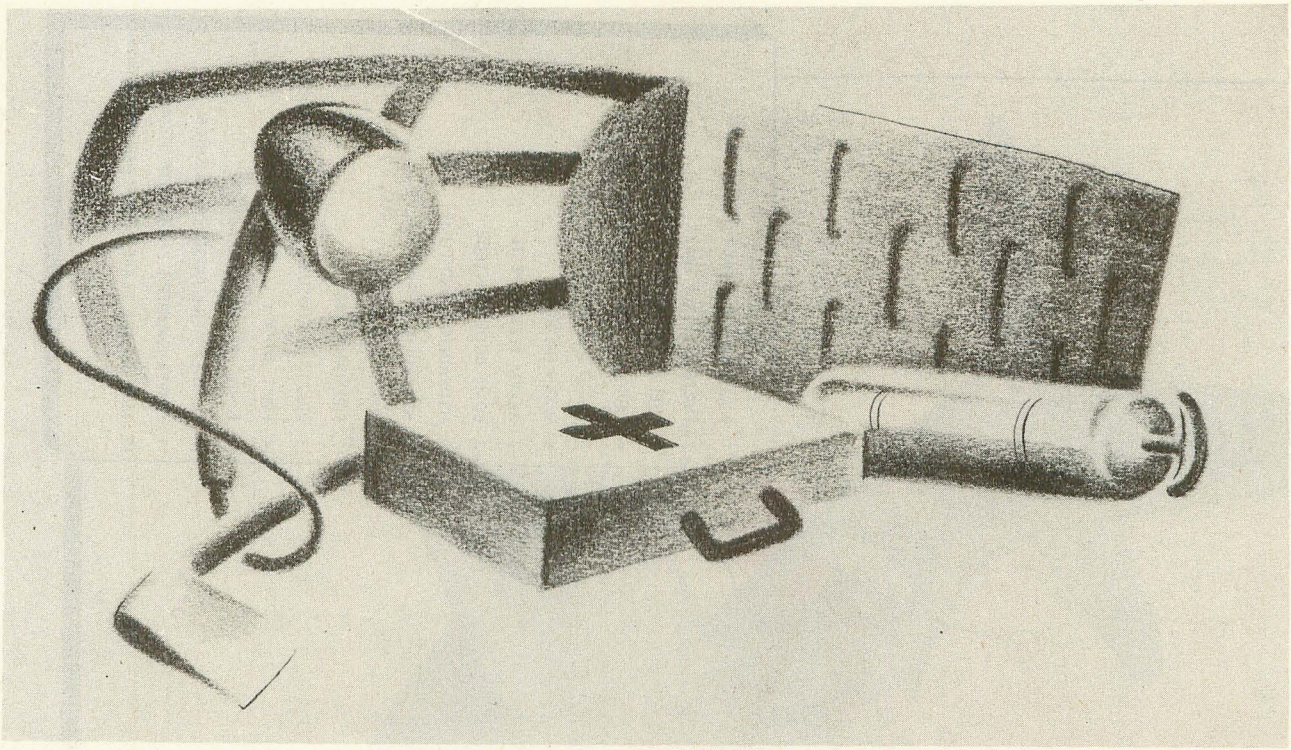
SUPERCHARGER TYPE: TWO SPEED

FUEL GRADE: GRADE 130

OPERATING CONDITION	RPM	ABSOLUTE MANIFOLD PRESSURE (IN. Hg)	HORSE-POWER PER ENGINE	CRITICAL ALTITUDE WITHOUT RAM (FEET)	BLOWER	USE LOW BLOWER BELOW	MIXTURE CONTROL POSITION	FUEL FLOW (US GAL/HR PER ENG)	MAXIMUM CYL TEMP °C	MAXIMUM CYL TEMP °F	MAXIMUM DURATION (MINUTES)
TAKE-OFF	2400	45.0 42.7	1600	400 2000	LOW	ALWAYS USE LOW BLOWER	AUTO-RICH	200	248	478	5
WAR EMERGENCY	2400	46.0		SEA LEVEL	LOW	ALWAYS	AUTO-RICH	210	260	500	5
MILITARY	2400 2400	45.0 46.0	1600 1400	400 8050	LOW HIGH	5500 FT.	AUTO-RICH AUTO-RICH	200 195	248 248	478 478	5 5
MAXIMUM CONTINUOUS	2300 2300	36.5 41.4	1350 1275	5650 10,600	LOW HIGH	7400 FT.	AUTO-RICH AUTO-RICH	155 170	232 232	450 450	NO LIMIT
MAXIMUM CRUISE	2050 2050	25.5 27.7	905 855	13,600 19,600	LOW HIGH	15,200 FT.	AUTO-LEAN AUTO-LEAN	70 70	205 205	401 401	NO LIMIT
MINIMUM SPECIFIC CONSUMPTION											

REMARKS:

Fig. 35 — Specific Engine Flight Chart



Section IV

EMERGENCY OPERATING INSTRUCTIONS

1. ENGINE FAILURE DURING FLIGHT.

a. FAILURE OF ONE ENGINE.—If one engine fails during flight and it is imperative that the propeller be feathered as quickly as possible, proceed as follows:

(1) PROPELLER FEATHERING.—Operate the controls for the failing engine as follows:

(a) Push feathering switch button (release button after feathering action starts). When blades are fully feathered, the button will "kick out" automatically.

(b) Throttle—"CLOSED."

(c) Propeller—"DECREASE RPM."

(d) Mixture—"IDLE CUT-OFF."

(e) Booster pump—"OFF." *(Airplanes A-20G-20-DO to A-20G-45-DO and A-20J-1-DO to A-20J-20-DO.)*

(f) Fuel tank selector—"OFF."

(g) Cowl flaps—"CLOSED." (Return control to "NEUTRAL.")

(h) Ignition—"OFF."

(2) SINGLE ENGINE OPERATION.

(a) Mixture—"AUTO RICH."

(b) Power as required; not to exceed the maximum allowable. Refer to Flight Operation Instruction Charts, Appendix II.

(c) Regulate the cylinder head temperature of the good engine by the lower cowl flaps. Head temperatures, which are sensitive to mixture, should, if possible, not exceed 232°C (450°F). If impossible to keep temperature below this maximum, 248°C (478°F) is permitted, not to exceed 5 minutes. This should provide time to effect a landing.

(d) Adjust rudder tab to suit the speed and horsepower output conditions.

(e) Refer to Flight Operation Instruction Charts, Appendix II, for single engine cruising data.

b. ENGINE FAILURE DUE TO LOSS OF FUEL PRESSURE.—If an engine should fail due to loss of fuel pressure on a take-off or in flight, operate the wobble pump *(airplanes A-20G-1-DO to A-20G-15-DO incl.)* or turn booster pump "ON" *(airplanes A-20G-20-DO to A-20G-45-DO and A-20J-1-DO to A-20J-20-DO)*. If the wobble pump (or booster pump) fails

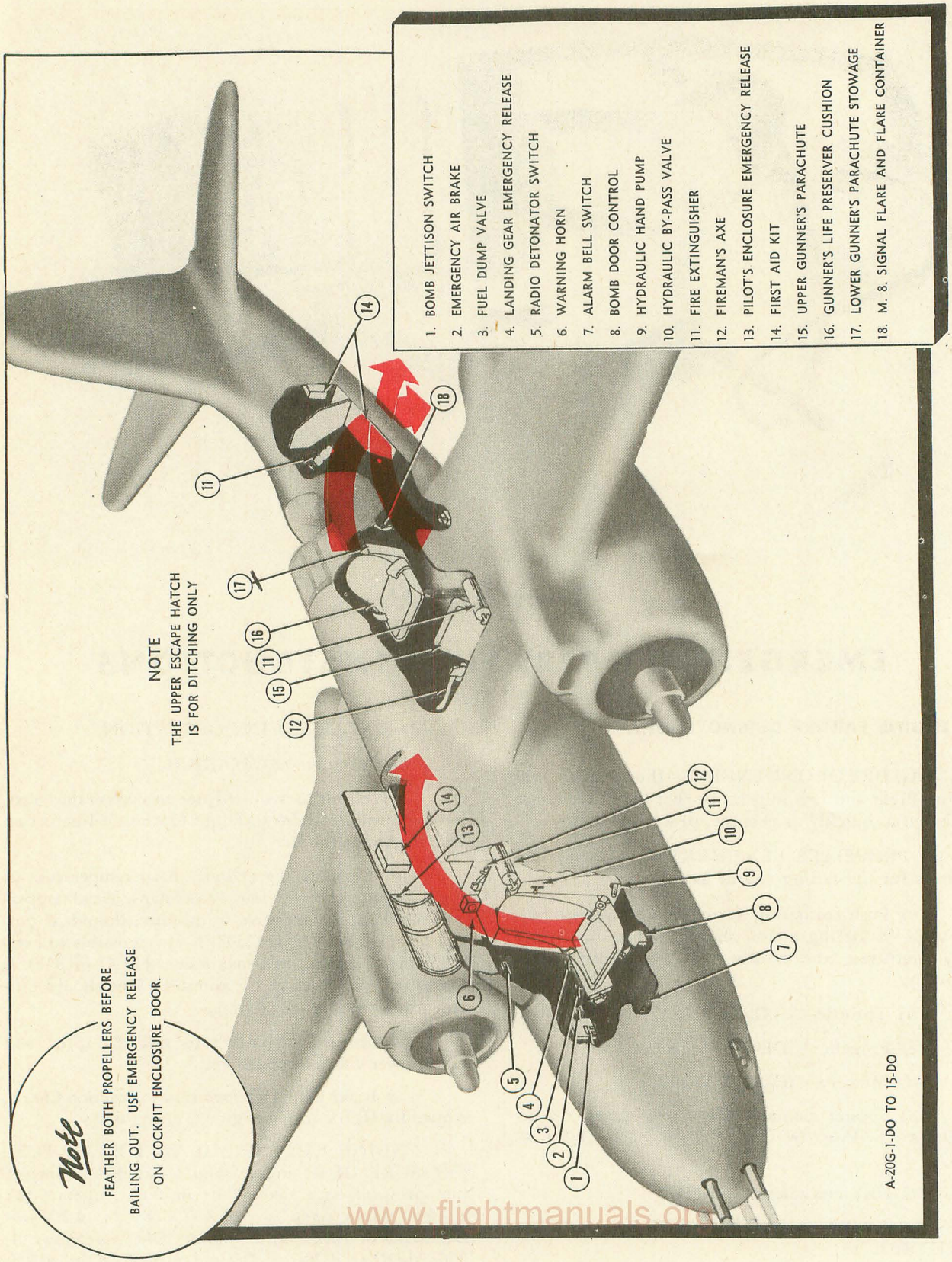


Fig. 36 — Emergency Equipment and Exits

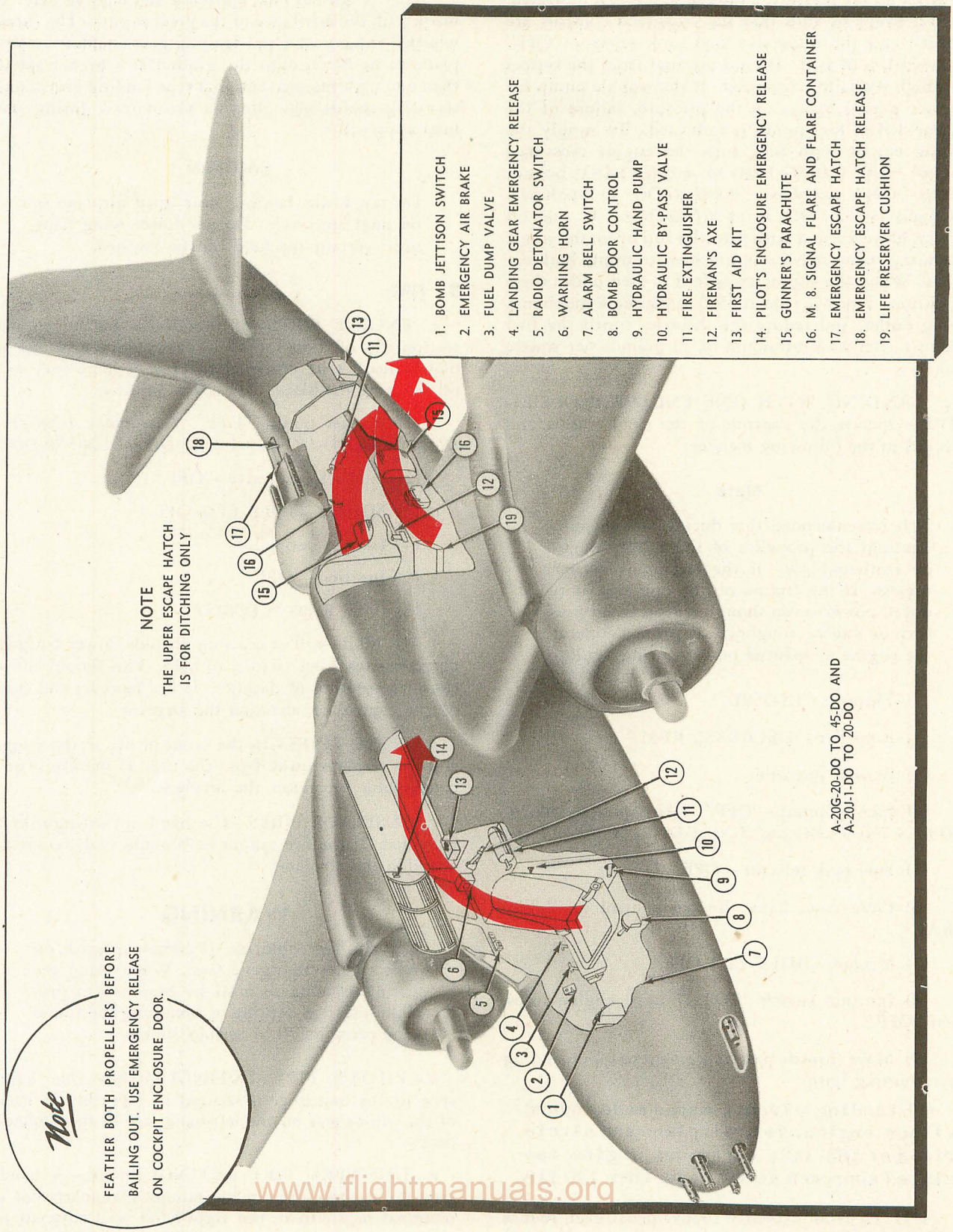


Fig. 37 — Emergency Equipment and Exits

to bring up the pressure, a broken fuel line is indicated. In this event be sure that the cross-feed controls are "OFF," and the respective fuel tank selector "OFF" to avoid loss of fuel. Do not use fuel from the system in which the failure occurred. If the wobble pump (or booster pump) brings up the pressure, failure of the engine-driven fuel pump is indicated. To supply the failing engine with fuel, turn the engine cross-feed control "ON" *(A-20G-1-DO to A-20G-15-DO)* booster pump "ON" *(airplanes A20G-20-DO to A20G-45-DO and A-20J-1-DO to A-20J-20-DO)*. At take-off power, however, and with throttles full open, the single operating pump may be insufficient to supply both engines. When the engine cross-feed is used under these conditions, hold the rpm at 2300 to maintain maximum pump outlet, and reduce the throttles (until the fuel pressure rises to a minimum of 12 pounds per square inch).

c. LANDING WITH ONE ENGINE INOPERATIVE.—Operate the controls of the dead engine and proceed in the following manner:

Note

It is recommended that during single-engine landings the propeller of the failing engine be feathered *only* if the engine is *entirely* useless. If the engine can be operated at reduced power—even though a drop in oil pressure or engine roughness is present—operate the engine at reduced power during landing.

(1) Throttle—"CLOSED."

(2) Propeller—"DECREASE RPM."

(3) Feather propeller.

(4) Booster pump—"OFF." *(Airplanes A-20G-20-DO to A-20G-45-DO and A-20J-1-DO to A-20J-20-DO.)*

(5) Fuel tank selector—"OFF."

(6) Close cowl flaps. Return control to "NEUTRAL."

(7) Mixture—"IDLE CUT-OFF."

(8) Ignition switch "BOTH" until engine stops, then "OFF."

(9) Move throttle past ¼ segment to quiet landing gear warning horn.

(10) Landing circuit maybe made toward either engine. Trim airplane and circle field at 165 IAS; carry out engine assisted approach at not less than 130 IAS.

(11) To avoid excessive rudder pedal load, reduce rudder tab offset as speed decreases during final approach.

(12) A normal final approach and landing may be made with the assistance of the good engine. The three wheeled (nose gear type) landing gear enables the airplane to be flown onto the ground at a higher speed than one with the conventional type landing gear. Conservative speeds may thus be maintained during the final approach.

CAUTION

Do not lower landing gear until airplane is on final approach. Do not lower wing flaps until certain the field can be reached.

2. FIRE.

a. ENGINE FIRES.—If fire occurs in the engine section, cut off fuel supply to that engine and immediately feather its propeller to prevent more fuel and oil reaching the blaze. Proceed as follows:

(1) Booster pump—"OFF." *(Airplanes A-20G-20-DO to A-20G-45-DO and A-20J-1-DO to A-20J-20-DO.)*

(2) Fuel selector valve—"OFF."

(3) Mixture—"IDLE CUT-OFF."

(4) Feather propeller.

(5) Ignition—"OFF."

(6) Cowl flaps—"CLOSED."

(7) While still at cruising altitude, lower landing gear after reaching vicinity of field. This should allow complete venting of nacelles. If fire reoccurs and cannot be controlled, abandon the airplane.

b. WING FIRES.—In the event of fire in the wing, slip the airplane away from the fire. If the fire is uncontrollable, abandon the airplane.

c. FUSELAGE FIRES.—Use hand fire extinguishers provided. If the fire cannot be brought under control, abandon the airplane.

WARNING

Carbon Tetrochloride (Pyrene) sprayed on fires creates Phosgene Gas. When using the extinguishers care must be exercised to provide sufficient venting as breathing the fumes may cause death or serious illness.

d. PILOT'S FIRE EXTINGUISHER.—One hand type fire extinguisher is secured in a bracket in back of the pilot's seat on the left-hand side of the fuselage deck.

e. GUNNERS' FIRE EXTINGUISHER.—A hand-type fire extinguisher in the gunner's compartment is mounted in a clip in the right-hand wall adjacent to the lower entrance door and can be reached from the ground if necessary.

3. ALARM BELLS.

a. An emergency alarm bell is installed in the gunners' compartment. The bell is controlled by a switch in the pilot's compartment.

4. EMERGENCY EXITS.

a. PILOT'S EMERGENCY EXIT.—The pilot's enclosure door is provided with an emergency release handle. When the handle is pulled, it unlatches the door, at the same time pulling the pins from the hinges and brace at the aft end of the door. Push the door up slightly to allow the airstream to carry it away.

Note

Before abandoning the airplane, both engine propellers should be feathered prior to pulling the emergency release.

b. GUNNERS' EMERGENCY EXIT.—An emergency exit can be made through the lower door or the upper enclosure. The lower door may be opened by a latching handle located in the approximate center of the door. To open the upper enclosure on *airplanes A-20G-1-DO to A-20G-15-DO incl.,* release the two latches at the upper forward end of the sliding section, allowing the forward end to drop down; then slide it forward under the fixed section as far as it will go. The enclosure may be opened externally by tearing a fabric patch covering the upper latch access hole. To open the upper escape hatch on *airplanes A-20G-20-DO to A-20G-45-DO and A-20J-1-DO to A-20J-20-DO,* turn handle and push upward. This upper hatch should not be used when the airplane is in flight.

c. BOMBARDIER'S EMERGENCY EXIT.—On *airplanes A-20J-1-DO to A-20J-20-DO* the bombardier's entrance may be used as an emergency exit in flight. In the event of a belly landing or in ditching, an emergency hatch, located on the upper right side of the compartment may be used.

CAUTION

Since the hatch is directly in line with the right propeller, it must not be used in flight or at any time the right engine is running.

5. DESTRUCTION VALVE.

a. This system provides for emergency destruction of the airplane on the ground by dumping fuel from each inboard (MAIN) fuel tank and igniting with a signal pistol. The dump valves are controlled by a single "T" type handle in the right side of the pilot's compartment floor. This handle, painted red, is marked "DESTRUCTION VALVE."

6. EMERGENCY BOMB RELEASE.

a. If belly fuel tank is being carried, release belly tank.

b. Bomb doors—"OPEN."

c. Master bomb control switch—"ON."

d. Bomb jettison switch or small bomb containers jettison switch—push in. *(Airplanes A-20G-1-DO to A-20G-30-DO and A-20J-1-DO to A-20J-5-DO incl.)*

e. On *airplanes A-20G-35-DO and A-20J-10-DO,* place bomb selector switches on and press release button on control wheel.

f. On *airplanes A-20G-40-DO to A-20G-45-DO and airplanes A-20J-15-DO to A-20J-20-DO,* turn BOMB SALVO control clockwise.

7. EMERGENCY LANDING GEAR OPERATION.

a. IF HYDRAULIC PRESSURE FAILS.

(1) Place *all* hydraulic controls in "NEUTRAL" and leave them there. This will conserve what remaining fluid there is for the operation of the landing gear and brakes.

(2) When ready to lower the gear reduce speed to 130-140 mph indicated airspeed.

(3) Place landing gear hydraulic control—"DOWN." This unlocks the nose wheel and permits it to drop into place.

(4) Unlock the main gear by pulling hard on landing gear emergency release handle. Depress nose of airplane to assist gear in locking.

b. IF LANDING GEAR FAILS TO LATCH.

(1) Landing gear hydraulic control—"DOWN."

(2) Operate hydraulic hand pump.

(3) Return landing gear hydraulic control to "NEUTRAL."

Note

Sufficient fluid is trapped in the reservoir (available only to the hand pump), for approximately 75 cycles of the pump. If 30 to 40 strokes of the hand pump fail to latch the landing gear, the entire reserve supply of fluid may be used, provided the pilot has no reason to believe the air brake system is damaged, or, if there is a large enough area within range for a landing without brakes.

c. BRAKES.—After hydraulic pressure failure, check the hydraulic brake system before landing. Operate the hydraulic hand pump. Back pressure will be felt at

the brake pedals if no serious leaks in the brake lines are present.

d. EMERGENCY AIR BRAKES.—The emergency air brakes should be used only as a "last resort" method of stopping the airplane. Apply the air brakes by fully opening the control valve. The rudder pedals are not connected with this system. Do not apply air brakes until ground contact is made.

CAUTION

If the air lines as well as the hydraulic lines are punctured or damaged, no brake pressure will be available. The airplane cannot be stopped once it is on the ground unless there is a long landing area. Do not attempt to swing the airplane by the engines to avoid obstacles as this will result in a considerable increase in speed. The pilot should decide before landing whether or not enough space is available to make a landing without brakes. If it is felt that the landing space is insufficient to stop the roll of the airplane—even by applying full up elevator and dragging the tail skid on the ground—do not lower landing gear. Make a belly landing.

8. EMERGENCY LANDING WITH WHEELS RETRACTED.

a. PREPARATORY TO LANDING.

(1) Advise bombardier and gunners to abandon the airplane.

(2) If belly fuel tank is installed, release tank.

Note

Release belly tank only when airplane is in normal level flight.

(3) Release the pilot's escape hatch.

b. LANDING.

(1) Land as nearly into the wind as possible, never over 90 degrees from the wind.

(2) If possible, lower flaps to the 40 degrees down position to reduce contacting speed.

(3) Maintain adequate air speed for full control until airplane is on the ground. Do not attempt to turn at slow speed as a stall may result.

9. EMERGENCY LANDING IN WATER—(DITCHING).

a. PREPARATION FOR DITCHING.

(1) If possible, use up most of fuel supply. This lightens the airplane and reduces stalling speed. Make sure, however, that some fuel is available, as power is of great importance to control of the airplane during approach. If the long range belly fuel tank is installed, release the tank.

(2) Jettison loose equipment through accessible auxiliary exits.

(3) Remove the pilot's and gunners' upper emergency exits.

b. DITCHING THE AIRPLANE.

(1) APPROACH.—Lower flaps to 40 degrees down position. Use a normal approach, but if symetrical power is not available, use a normal glide approach. This will insure control and permit some margin of speed after leveling off, so that the best point for ditching on a swell may be chosen. If only left or right power is available, a little power may be used to flatten approach but a margin of rudder control must remain available. Do not, on any account, apply power at final stage of ditching.

(2) MAKING CONTACT.—Hold off power until all excess speed above stalling speed is lost, and then strike sea at normal landing attitude. Just prior to and during surface contact, hold control column fully back until airplane has come to rest.

Note

If airplane lands tail down, a primary impact will occur as tail strikes, followed by a sharp impact with rapid deceleration.

10. MISCELLANEOUS EMERGENCY EQUIPMENT.

a. PILOT'S AXE.—A fireman's axe, mounted on the deck behind the pilot's head, is provided for the pilot.

b. PILOT'S FIRST AID KIT.—A first aid kit is mounted on the deck or strapped to the compartment hatch, aft of the pilot.

c. GUNNERS' AXE.—A fireman's axe is stowed at the top of the forward bulkhead of the compartment or on the right-hand wall.

d. GUNNERS' SIGNAL PISTOL.—A signal pistol is mounted on the right side of the compartment. A container for six cartridges is mounted directly below the pistol.

e. GUNNERS' FIRST AID KIT.—A first aid kit is attached to the left-hand wall of the compartment near the aft bulkhead.

f. BOMBARDIER'S AXE. *(Airplanes A-20J).*—A fireman's axe is located at the left of the bombardier's seat.

g. BOMBARDIER'S FIRST AID KIT. *(Airplanes A-20J).*—A first aid kit is located on the right side of the bombardier nose section, directly above the emergency escape hatch.

Section V
OPERATIONAL EQUIPMENT

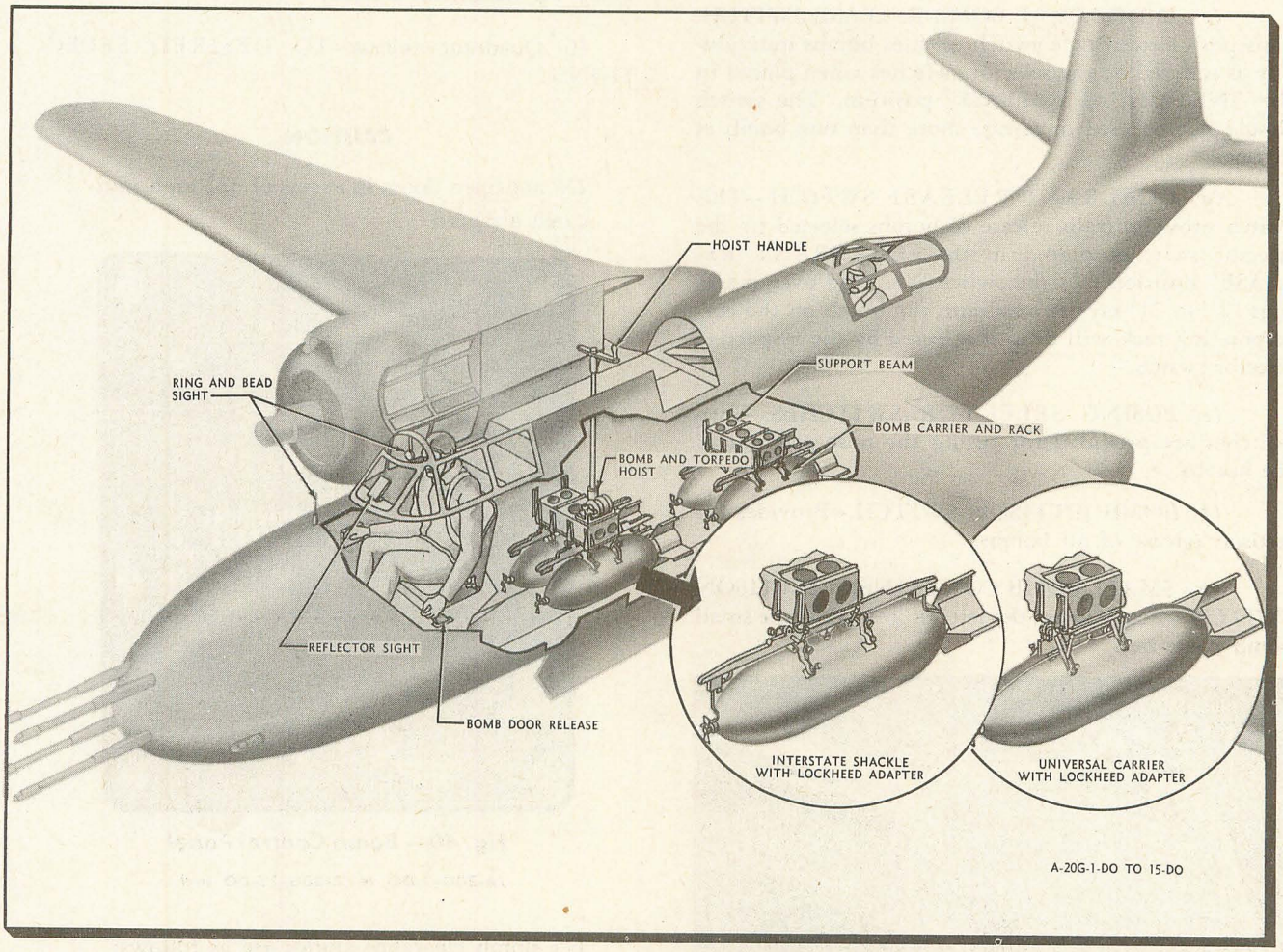


Fig. 38 — Bombing Arrangement

1. BOMBING EQUIPMENT.

(Airplanes A-20G-1-DO to A-20G-15-DO.)

a. GENERAL.—The fusing and release of bombs are controlled electrically from the pilot's compartment.

b. BOMBING CONTROLS.

(1) BOMB CONTROL PANEL.—The pilot's bomb control panel is located just forward of the trim tab control unit on the R.H. side of the cockpit. The panel contains the following controls:

(a) MASTER BOMB CONTROL SWITCH.—This switch controls the circuit to all bomb switches, and must be "ON" before any of the bomb control switches are operative. The bomb doors must be open before any bombs may be dropped.

CAUTION

Insure that the S.C.I. smoke curtain switch is "OFF." This switch overrides the bomb door electrical control, and if left "ON" would result in the dropping of bombs even if the doors are closed.

(b) BOMB SELECTOR SWITCHES.—Four switches select the bombs that are to be released. When any one is moved to the "INDIVIDUAL RELEASE" position, the bomb selected may be released by the

pilot's individual release button installed on the control column head. When any combination of the selector switches is moved to "QUADRANT RELEASE" position, the quadrant release switch will drop the selected bombs as it is moved to the corresponding rack numbers "1," "2," "3," or "4."

(c) INDIVIDUAL BOMB RELEASE SWITCH. This push button type switch releases bombs individually as selected by the selector switches when placed in the "INDIVIDUAL RELEASE" position. The switch should not be used to release more than one bomb at a time.

(d) QUADRANT RELEASE SWITCH.—This switch provides train release of bombs selected by the selector switches placed in the "QUADRANT RELEASE" position. As the switch is moved over markings "1" to "4" on the quadrant, the bomb on the corresponding rack will drop if selected by the respective selector switch.

(e) FUSING SELECTOR SWITCHES.—Two switches are provided for fusing the nose and tail of the bombs.

(f) BOMB JETTISON SWITCH.—Provides for jettison release of all bombs.

(g) SMALL BOMB CONTAINERS JETTISON SWITCH.—Provides for the jettison release of the small bomb containers.

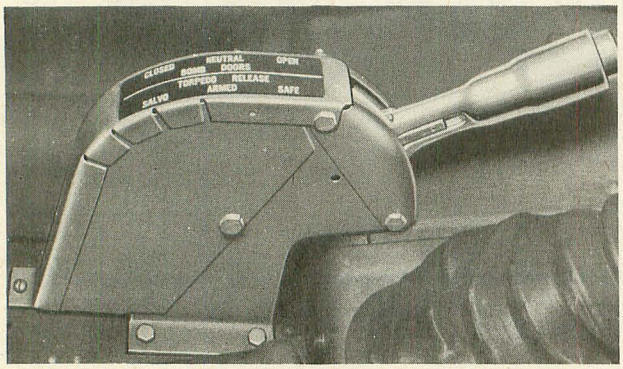


Fig. 39 — Bomb Door Control

(2) BOMB DOOR CONTROL.—The bomb doors, actuated by hydraulic pressure, are controlled by a handle mounted on the floor adjacent to the left side of the pilot's seat. To open the bomb doors, press down the thumb button and move the control forward to "OPEN." To close the bomb doors, press down the button, and move the control aft to "CLOSED." The handle should be returned to "NEUTRAL" after each operation.

c. BOMBING OPERATION.—Normal.

(1) Bomb doors—"OPEN."

(2) Master bomb control switch—"ON."

(3) Bomb selector switch—"INDIVIDUAL RELEASE" or "QUADRANT RELEASE."

(4) Fusing switch—"UP."

(5) Individual bomb release switch—PRESS BUTTON TO RELEASE BOMB.

(6) Quadrant release—TO DESIRED SELECTIONS.

CAUTION

Do not open doors in excess of 321 mph indicated airspeed.

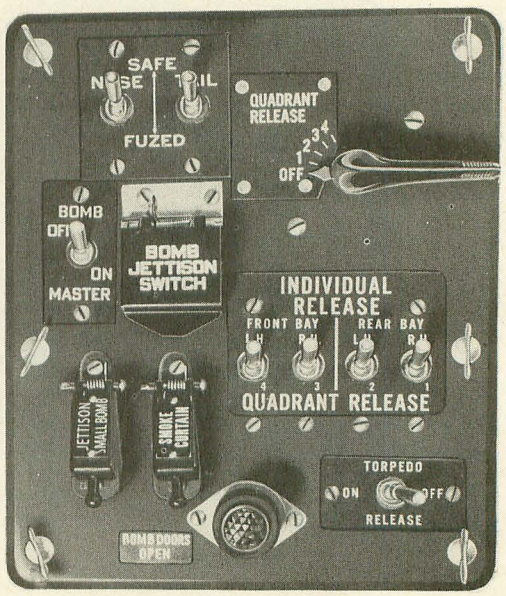


Fig. 40 — Bomb Control Panel

(A-20G-1-DO to A-20G-15-DO incl.)

(7) Bomb clearance angles are as follows:

10 degrees on each side
30 degrees on forward end
15 degrees on aft end

CAUTION

Do not drop bombs while the airplane is at an an angle of dive in excess of 20 degrees.

d. BOMBING OPERATION—Emergency.

(1) Bomb doors—"OPEN."

(2) Master bomb control switch—"ON."

(3) Bomb jettison switch or small bomb containers jettison switch—"PUSH IN."

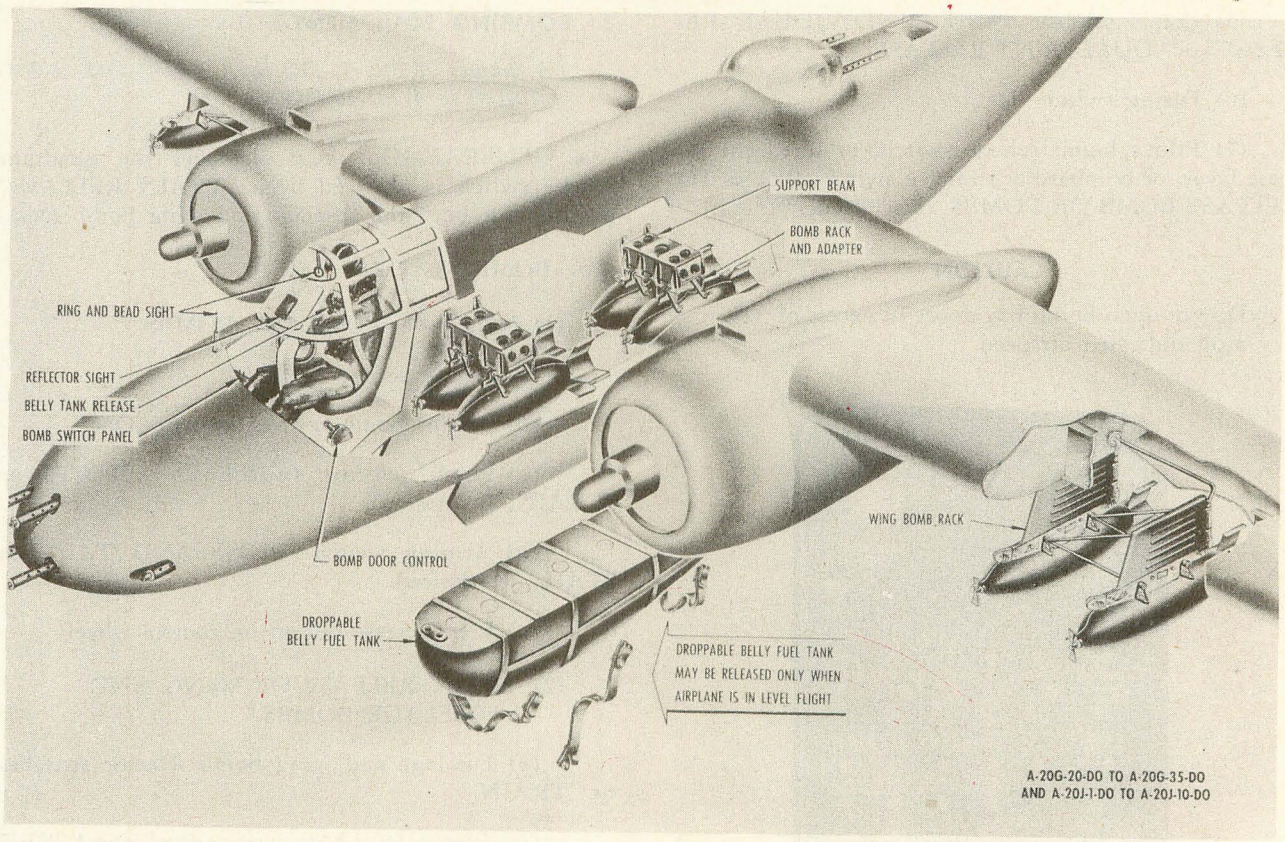


Fig. 41 — Bombing Arrangement

2. BOMBING EQUIPMENT.

(Airplanes A-20G-20-DO to A-20G-30-DO and A-20J-1-DO to A-20J-5-DO.)

a. GENERAL.—Provision is made to carry bombs below the wings and in the fuselage. Provision is also made for long-distance bombing missions by the installation of a belly fuel tank that can be released manually. A bombardier's nose section *(airplanes A-20J)* permits the bombardier to take over control of bomb release from the pilot.

b. BOMBING CONTROLS.

(1) BOMB CONTROL PANEL.—A bomb control panel is provided at the right of the pilot's seat just below the instrument panel, and contains switches identical to those outlined in paragraph **1.**, preceding, with the addition of:

(a) WING BOMB RELEASE CONTROLS.—There are four single-pole single-throw switches on the bomb control panel. No provisions are made for train release of the wing racks.

(2) BOMBARDIER'S CONTROLS *(Airplanes A-20J-1-DO to A-20J-5-DO).*—The bombardier's controls consist of a right-left indicator control to assist the pilot in staying "on line" with the target, and a bomb release switch. The switch is inoperative until the bomb bay doors are opened by the pilot, closing the bomb release circuit. Selection of the bombs to be released is made by the pilot.

(3) BELLY FUEL TANK RELEASE CONTROL. To release the belly fuel tank, pull hard on the manual control handle (red) to the right of the pilot's seat.

b. ATTACK BOMBING OPERATION—Wing Bombs Installed.

(1) Arm bombs by throwing "ON" either the nose or tail fusing switch.

(2) Select wing bomb by throwing to "ON" position the respective wing rack selector switch.

(3) Press bomber's switch on pilot's control wheel, or press bombardier's release switch.

c. LONG RANGE BOMBING OPERATION—Belly Fuel Tank Installed.

(1) Drain belly tank.

(2) Pull hard on manual control handle to release belly fuel tank.

(3) Bomb bay doors—"OPEN."

(4) Master bomb control switch—"ON."

(5) Bomb selector switch—"INDIVIDUAL RELEASE" or "QUADRANT RELEASE."

(6) Fusing switch "UP."

(7) Pilot's bomb release switch, or quadrant release lever, or bombardier's release switch—PRESS TO RELEASE BOMB OR BOMBS, as selected.

CAUTION

Do not open bomb bay doors in excess of 321 mph indicated airspeed.

Fig. 42 — Bomb Control Panel

(A-20G-20-DO to A-20G-35-DO and A-20J-1-DO to A-20J-5-DO incl.)

(8) Bomb clearance angles are as follows:

10 degrees on each side
30 degrees on forward end
15 degrees on aft end

CAUTION

Do not drop bombs while airplane is on an angle of dive in excess of 20 degrees.

3. BOMBING EQUIPMENT.

(Airplanes A-20G-35-DO to A-20G-45-DO, A-20J-10-DO to A-20J-20-DO.)

a. GENERAL.—On these airplanes the quadrant release switch is replaced by a "TRAIN RELEASE" position for both the fuselage and wing bomb racks.

b. BOMBING OPERATION.

(1) NORMAL—FUSELAGE BOMBS.

(a) Bomb doors—"OPEN."

(b) Master bomb control switch—"ON."

(c) Bomb selector switches—"SELECT" or "TRAIN," as desired.

(d) Arming switch—"NOSE AND TAIL" or "TAIL," as desired.

(e) Press release button on control wheel.

(2) TRAIN RELEASE OF WING AND FUSELAGE BOMBS.

(a) Fuselage and wing bomb selector switches to "TRAIN."

(b) Press release button on control wheel. Wing bombs will drop first.

(3) TRAIN RELEASE OF FUSELAGE BOMBS ONLY.

Note

This procedure must be followed if wing bombs are not being carried, or, if wing bombs are being carried but it is desired to train release the fuselage bombs only.

(a) If wing bombs are being carried, turn wing bomb switches "OFF."

(b) Place first fuselage bomb selector switch in "SELECT" position.

(c) Other selector switches in "TRAIN."

(d) Press release button on control wheel once for each bomb to be released.

(4) TRAIN RELEASE OF WING BOMBS ONLY.

(a) Master bomb control switch "ON."

(b) All wing bomb selector switches to "TRAIN."

(c) Arming switch to "NOSE AND TAIL" or "TAIL" as desired.

(d) Press release button on control wheel once for each bomb to be released.

Note

Opening or closing of bomb bay doors does not affect release of wing bombs.

4. BOMBING EQUIPMENT.

(Airplanes A-20G-40-DO to A-20G-45-DO and A-20J-15-DO to A-20J-20-DO.)

a. In addition to the bombing equipment described above, these airplanes have the following equipment:

(1) BOMB SALVO SWITCH.—The salvo switch provides for the salvo release of all bombs. If the bomb bay doors are closed when the salvo switch is used, a safety switch will prevent the fuselage bombs dropping. The wing bombs, however, will be salvoed regardless of the position of the bomb bay doors. Bombs may be dropped either safe or armed, depending on the position of the arming switch.

(2) FRAGMENTATION BOMB PANEL.

(a) GENERAL.—The fragmentation bomb panel is located aft of the main bomb panel and contains all switches necessary for the release of fragmentation bombs when carried. The controls on this panel consist of a master switch, five selector switches and a salvo switch.

(b) OPERATION.

1. Master switch "ON."
2. Selector switch to "SELECT."
3. Press bomb release switch on control wheel.

Note

Fragmentation bombs are carried in the following five positions: "L.H. OUTBOARD," "L.H. INBOARD," "CENTER," "R.H. INBOARD," and "R.H. OUTBOARD." Each position has two racks—one in the forward bomb bay and one in the aft bomb bay. If the bomb release button is pressed and immediately released, bombs in the aft rack of the position selected will be released. If the release button is held momentarily, both the aft rack and forward rack of the position selected will be released.

4. Next selector switch to "SELECT."
5. Press bomb release switch on control wheel.
6. Continue through all five selector switches.

Note

Train release of the fragmentation bombs may be accomplished by placing all selector switches in "TRAIN" position. Release switch should then be pressed and held until one aft and one forward rack is released. Release bomb release switch, press, hold, until another position is released. Proceed until all five positions have been released.

(c) BOMB SALVO—FRAGMENTATION BOMBS.—The fragmentation bomb SALVO switch provides for the salvo release of all fragmentation bombs. Fragmentation bombs can be released in salvo only in the "SAFE" condition.

5. ARMAMENT.

(Airplanes A-20G-1-DO to A-20G-15-DO.)

Note

The *P-70A-2 airplane* has six .50 caliber fixed guns installed in the nose. One single .50 caliber flexible gun is installed in the upper rear gunner's position and another .50 caliber flexible gun is located in the lower gunner's position. The SCR-540 Radar antenna is also installed in the gun nose.

a. GENERAL.

(1) Two Type M-2 fixed .50 caliber machine guns and four fixed Type M-2 20 mm aircraft cannons are installed in the nose section of *airplanes AAF 42-53535 to AAF 42-53785.* The guns are set to converge at 250 yards, and are directed upon the target by a type N-3A optical gun sight. Total firing time available per gun is as follows:

GUN	ROUNDS AVAILABLE PER GUN	FIRING TIME
20 mm Cannon	60 rds.	10 sec.
.50 Cal. Gun	350 rds.	26 sec.

(2) On *airplanes AAF 42-53785 to AAF 42-54284,* six fixed Type M-2 .50 caliber machine guns are installed in place of the above-mentioned installation. Total firing time available per gun is as follows:

GUN	ROUNDS AVAILABLE PER GUN	FIRING TIME
.50 Cal Gun	350 rds.	26 sec.

(3) One Type M-2 .50 caliber flexible machine gun is installed in the upper rear gunner's position. It is provided with a flexible chute and an integral ammunition box holding 500 rounds of ammunition. A Type M-2 .30 caliber flexible machine gun, installed at the lower gunner's position, has provision for 500 rounds

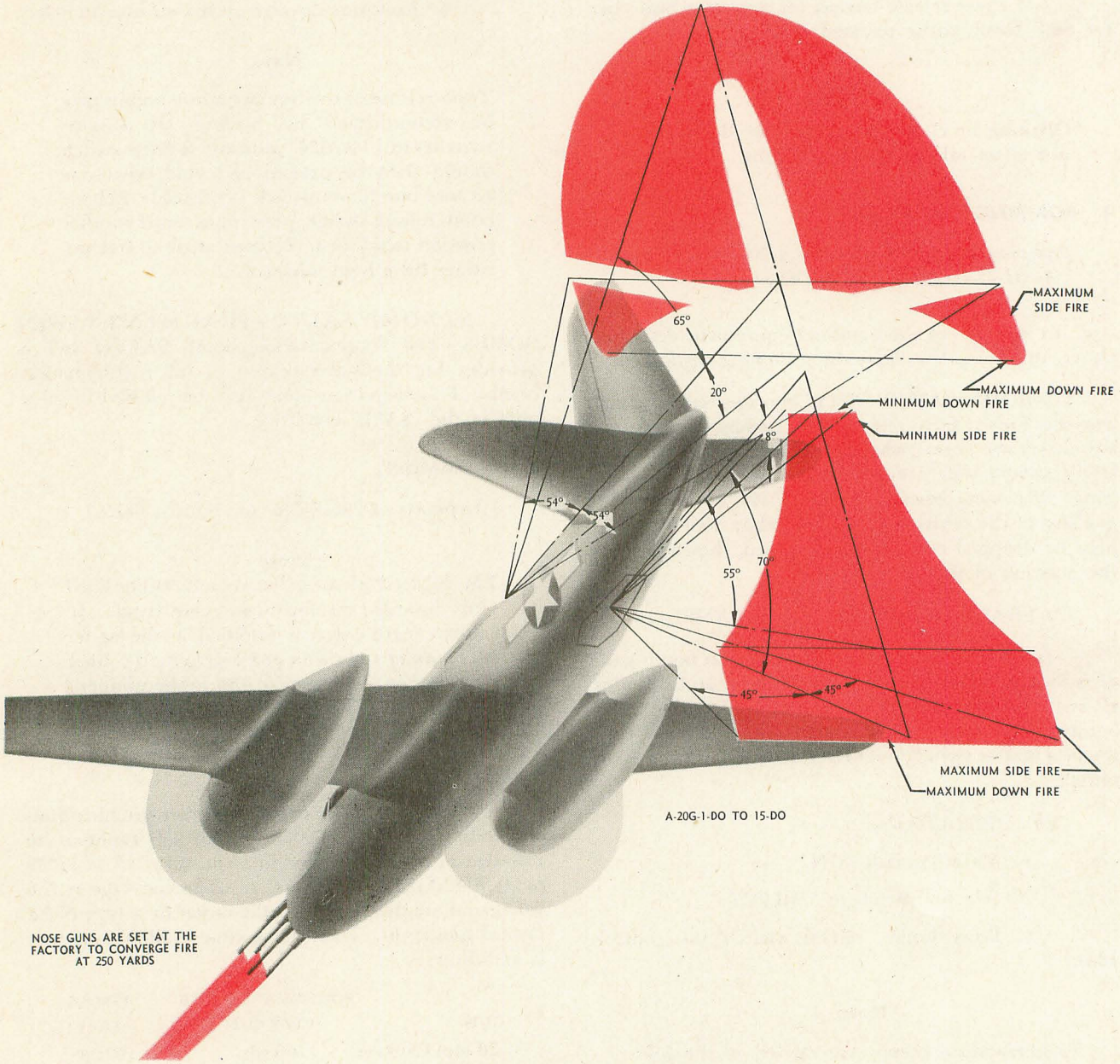


Fig. 43 — Angles of Gunfire

of ammunition in 100 round boxes adjacent to the gun position.

(4) A Type N-1 gun sight aiming point camera is installed in the nose of the airplane.

b. OPERATION OF PILOT'S GUN CONTROLS.

(1) PREFLIGHT.

(a) Check to see that fixed guns are properly charged.

(b) Test for proper functioning of optical gun sight.

(2) COMBAT.

(a) Gun heater "ON" after take-off. (This procedure should only be performed if temperatures are equal to or below —17.8°C (0°F).

Note

The gun heater is thermostatically controlled and will keep the guns above freezing at outside air temperatures as low as —54°C (—65°F). Firing a cold gun causes uneven expansion, and probable failure of the breech mechanism.

(b) Select guns to be fired, and place respective selector switches "ON." If the gun camera is to be used, place "ON." The camera is controlled by the gun firing trigger switch.

(c) If the gun camera overrun control is to be used, turn "ON" the switch and set the interval pointer at the control box.

Note

The overrun control unit causes the camera to run for a period equal to the setting indicated by the overrun control pointer, after the gun trigger switch has been released.

(d) Gun reflector sight "ON." Adjust the intensity with the "ON-OFF" rheostat, located on the gun selector switch panel.

(e) Fire guns. Push trigger switch, located on the right side of the control wheel, for the duration of the salvo.

(3) BEFORE LANDING.

(a) Shut "OFF" the camera, the gun selector switches, and the camera overrun control after use.

c. OPERATION OF THE UPPER FLEXIBLE MACHINE GUN.

(1) Slide back the enclosure door, and open the gun tunnel doors by pushing down on the door crank handle.

(2) Release the gun by pushing aft on the catch at the rear of the mount. Swing the gun forward and up, and lock the mount in the vertical position.

(3) Insure that ammunition belts are properly adjusted.

(4) Release safety.

(5) Charge gun by pulling charging handle back twice.

(6) Press trigger to fire.

(7) Restow the gun after use by pulling out on the two knobs at the base of the gun mount. Swing the gun down into place.

d. OPERATION OF THE LOWER FLEXIBLE MACHINE GUN.

(1) With the lower door open, release the gun mount by lifting the catch. Swing the gun down horizontally.

(2) Latch gun mount securely by inserting locking pin.

(3) Release the catch at the base of the mount and swing the gun into line.

(4) Release safety.

(5) Charge gun by pulling charging handle back twice.

(6) Press trigger to fire.

6. ARMAMENT.

(Airplanes A-20G-20-DO to A-20G-45-DO and A-20J-1-DO to A-20J-20-DO.)

Note

The P-70B-2 airplane is equipped with six forward firing .50 caliber package guns. These are mounted three on each side of the fuselage at the wing root. One .50 caliber flexible gun is mounted at the lower gunner's position. SCR-720 Radar equipment is installed in the gun nose.

a. GENERAL.

(1) Six Type M-2 fixed .50 caliber machine guns are installed in the attack nose section *(airplanes A-20G-20-DO to A-20G-45-DO)* and two similar guns are installed in the bombardier nose section *(airplanes A-20J-1-DO to A-20J-20-DO)*. The machine guns are set to give converging fire at 250 yards and are aimed by a Type N-3A optical gun sight. Total firing time available per gun is as follows:

GUN	ROUNDS AVAILABLE PER GUN	FIRING TIME
.50 Cal.	350 rds.	26 sec.

(2) Two .50 caliber modified M-2 machine guns are installed in the Plexiglas-enclosed turret of the gunner's compartment. The guns have a fire dispersion range from the horizontal to an elevation of 85 degrees. They operate through an azimuth angle of 360 degrees, except when the gun interrupters prevent their firing. Total firing time available per gun is as follows:

GUN	ROUNDS AVAILABLE PER GUN	FIRING TIME
.50 Cal.	400 rds.	30 sec.

(3) One Type M-2 .50 caliber flexible machine gun is installed at the lower gunner's position. It is provided with a flexible chute and an integral ammunition box above the gun emplacement. Total firing time available is as follows:

GUN	ROUNDS AVAILABLE PER GUN	FIRING TIME
.50 Cal.	400 rds.	30 sec.

b. OPERATION OF PILOT'S GUN CONTROLS. Operation of the pilot's gun controls is identical with the procedure outlined in paragraph **3.**, *b.*, preceding.

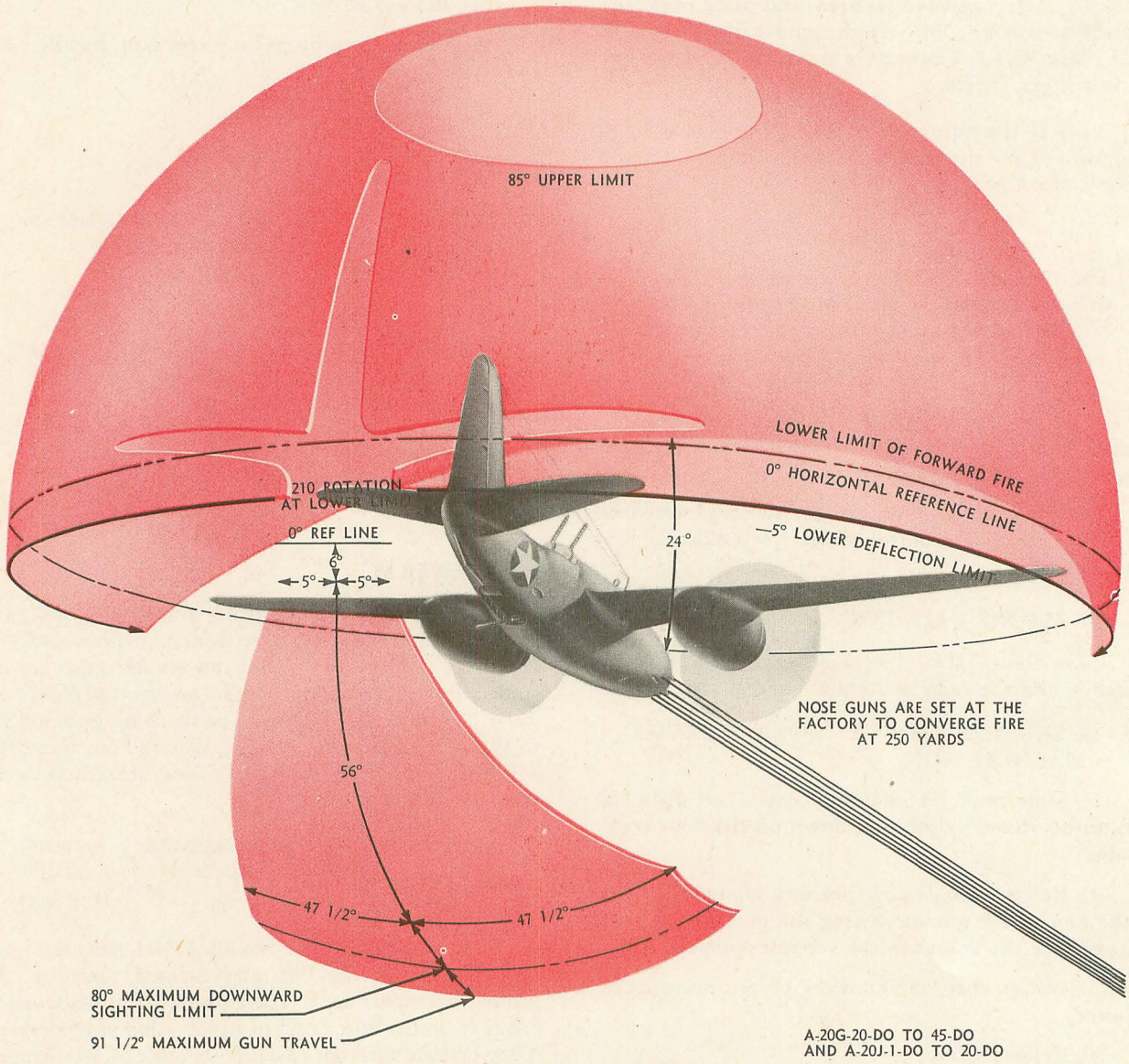


Fig. 44 — Angles of Gunfire

c. OPERATION OF TURRET GUN CONTROLS.

(1) PREFLIGHT.

(a) External power supply must be used for ground operation.

(b) Adjust seat for desired height by adding or omitting cushions.

(c) Lower seat by releasing spring catches and enter turret.

Note

Do not use the sight link rods as handgrips when entering turret.

(2) COMBAT.

(a) Turn power switch "ON." Azimuth and elevation power switch is located on the turret seat.

Note

Any overload will open the switch after which it must again be closed to operate the turret.

(b) Turn gun safety switch "ON."

(c) Gun sight rheostat "ON." Adjust to desired brilliancy.

(d) Hands on "pistol" grips, left hand depressing safety switch located on L.H. grip.

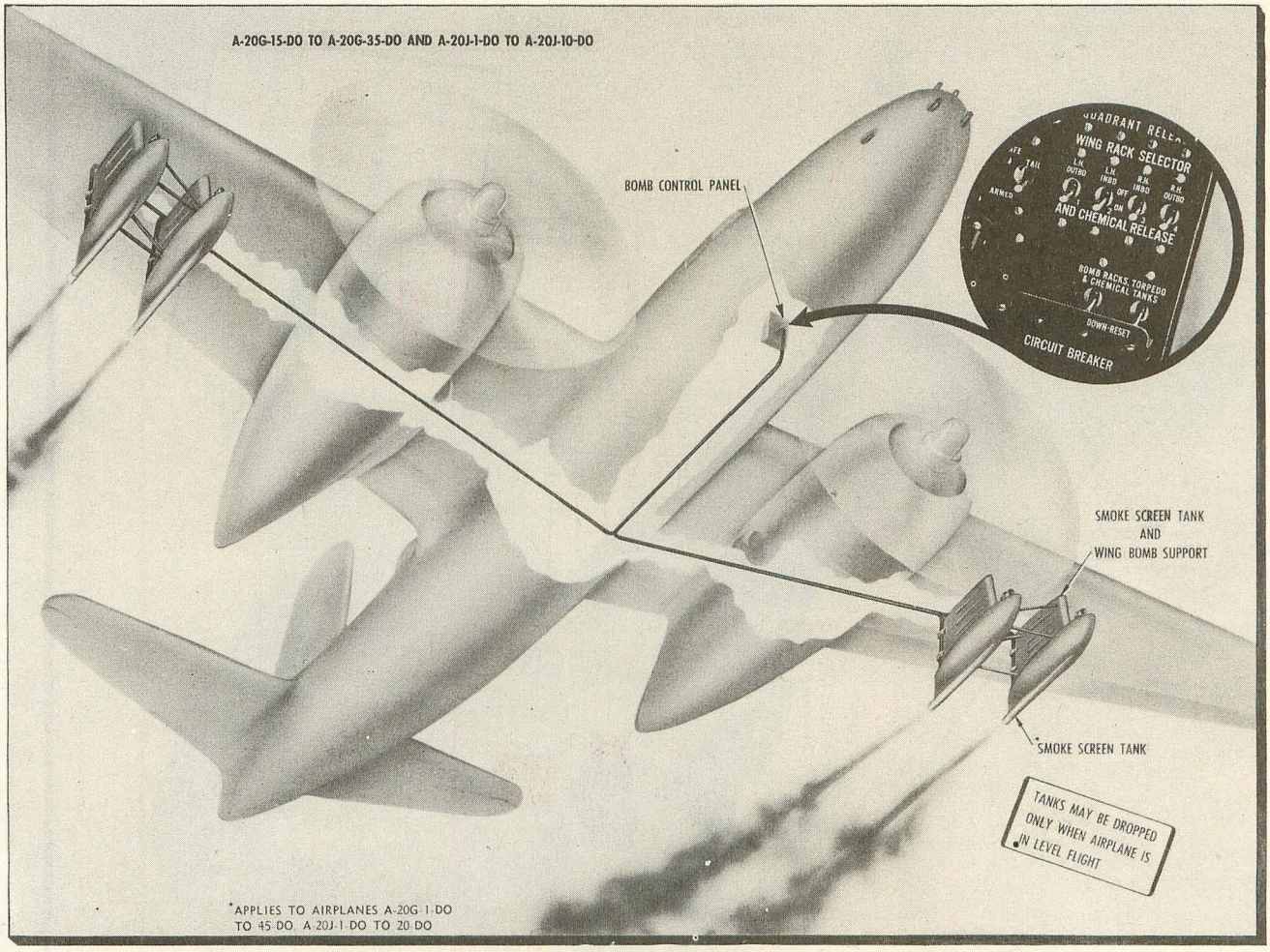


Fig. 45 — Smoke Screen Equipment

(e) Operate turret by twisting handgrips (fore and aft to elevate and lower guns; push against one grip and pull on the other to turn).

Note

For high speed operation, press high speed switch proceeding with above operation.

(f) Fire both guns by squeezing either trigger switch.

Note

Fire interruptors are installed which automatically open gun circuits individually whenever guns are aimed at tail surfaces.

(3) BEFORE LANDING.

(a) Azimuth and elevation power switch "OFF."

(b) Gun safety switch "OFF."

(c) Gun sight rheostat "OFF."

d. Operation of the lower flexible machine gun is identical with the procedure outlined in paragraph **5.**, *d.*, preceding.

7. SMOKE SCREEN EQUIPMENT.

(Airplanes A-20G-15-DO to A-20G-45-DO and A-20J-1-DO to A-20J-20-DO.)

a. GENERAL.—Provisions are made for carrying four chemical tanks supported by two racks on each outer wing. Release of smoke screen and tanks is controlled by individual toggle switches located on the center of the pilot's bomb control panel.

Chemical Tank Weight Empty	68 lbs.
Chemical Tank Weight Full	588 lbs.
Chemical Tank Capacity	33 gals.
Effective Duration	7 secs.

b. OPERATION.—To release smoke from the tank selected, throw "ON" any one of the four switches on

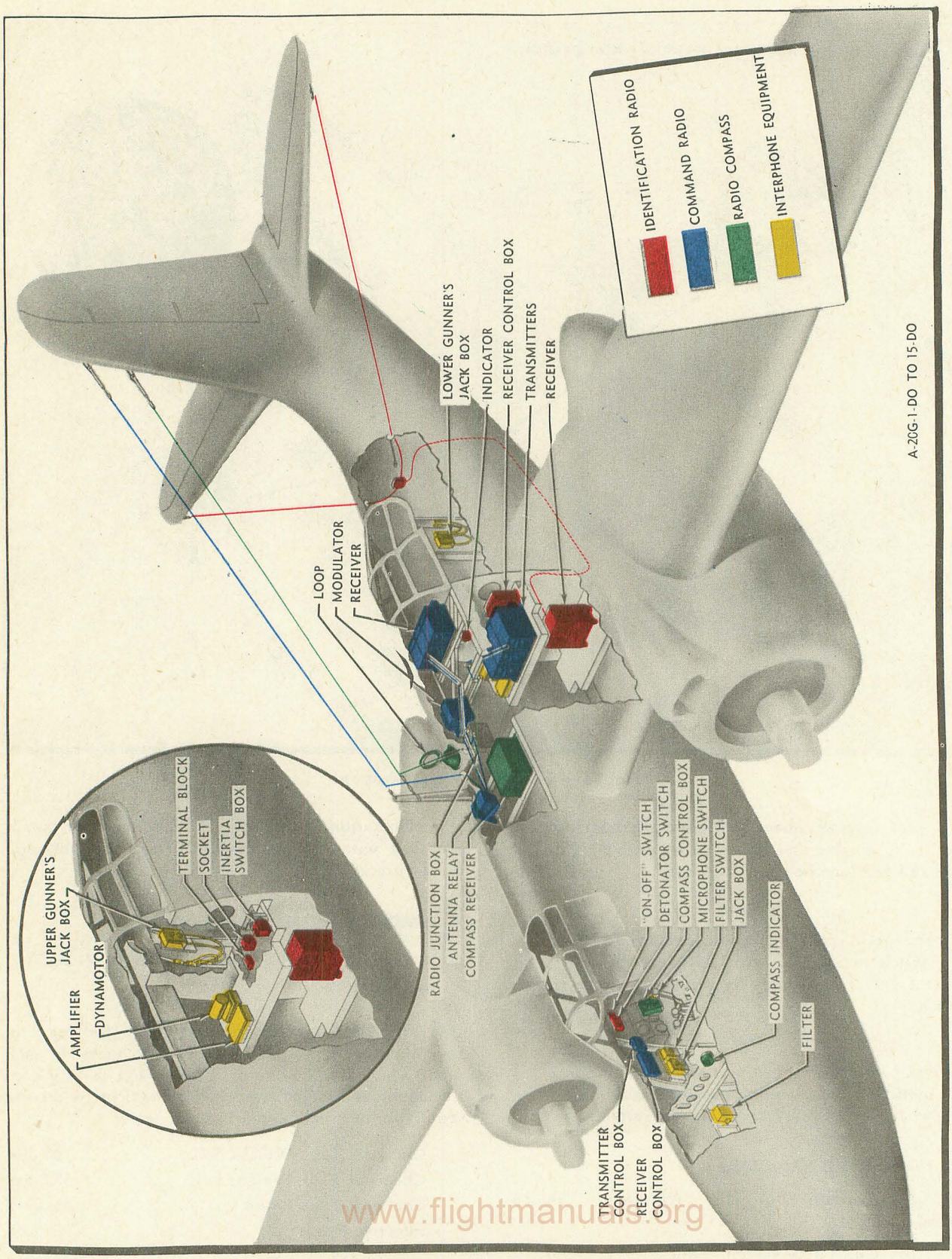


Fig. 46 — Communications Equipment

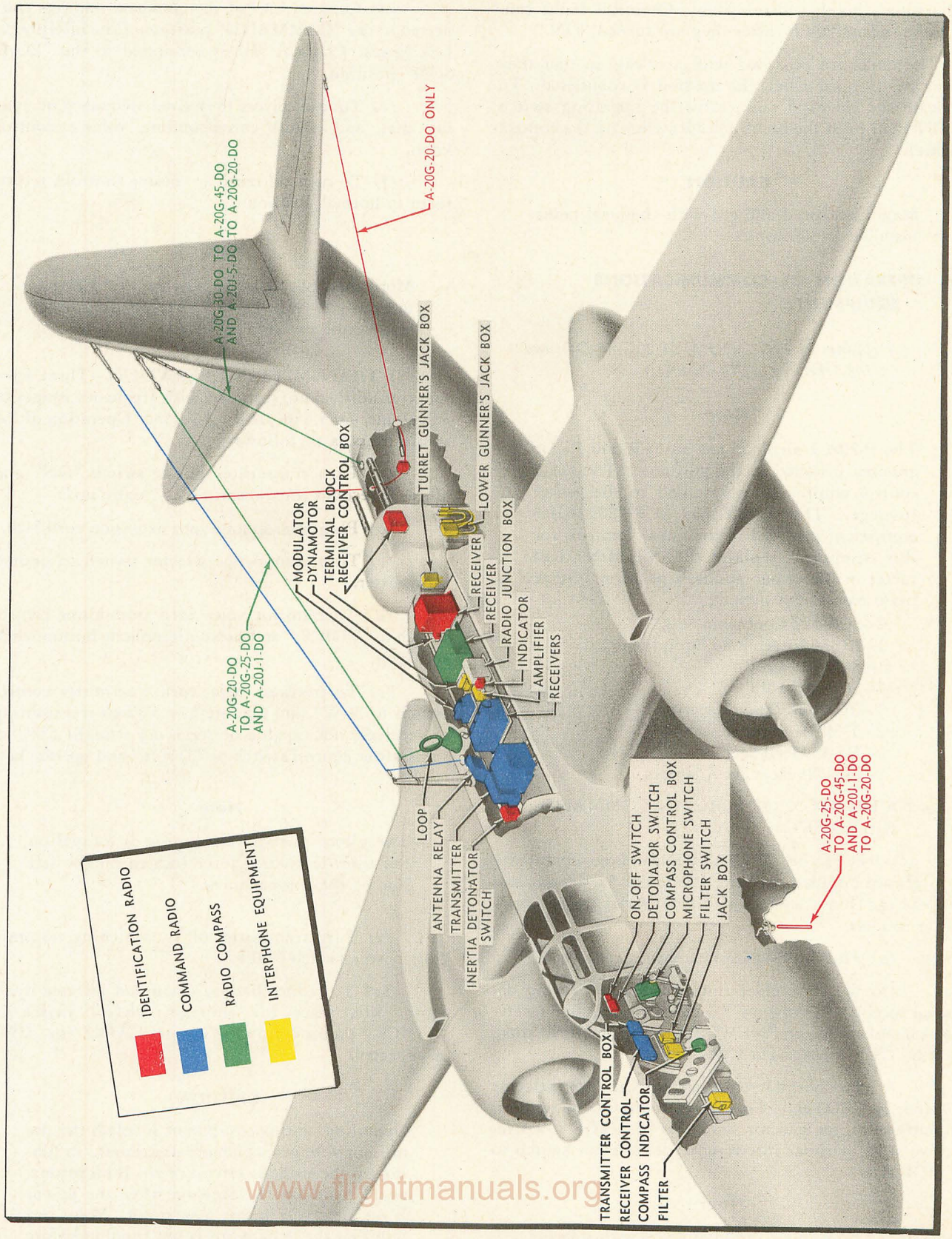


Fig. 47 — Communications Equipment

the pilot's bomb control panel. Chemical tanks cannot be turned "OFF" after they are turned "ON."

The tanks are provided with a release so that they may be dropped when the mission is completed. To release the chemical tank, leave the operating switch "ON" and press the bomb release switch on the control wheel.

CAUTION

Maximum speed allowed with chemical tanks installed is 306 mph.

8. OPERATION OF COMMUNICATIONS EQUIPMENT.

(Airplanes A-20G-1-DO to A-20G-45-DO and A-20J-1-DO to A-20J-20-DO.)

Note

The P-70A-2 airplane has an SCR-540 Radar antenna installed in the gun nose. The radio control equipment is installed in the center fuselage. The P-70B has SCR-720 Radar equipment installed in the nose. Controls for this equipment replaces the .50 caliber ball turret in the upper gunner's position. Other radio equipment includes:

2—SCR-522 Command Sets
1—RC-36 Interphone Equipment
1—SCR-729 I F F
1—SCR-695 I F F
1—BC-1206 Range Receiver
2—T-30 Microphones
2—HS-33 Head Sets
2—MC-385 Heat Set Adapters

a. OPERATION OF SCR-274N COMMAND RADIO SET.

(1) RECEIVER OPERATION.—Three separate receivers are installed covering 190-550kc, 3.0-6.0 mc, and 6.0-9.1 mc frequency bands. Operation of the receivers is as follows:

(a) Plug headset into extension cord jack.

(b) Select receiver tuning control covering desired reception frequency. Turn corresponding receiver control switch to "MCW" for voice or MCW code, or to "CW" for straight CW code.

(c) For normal reception, set the filter selector switch to "BOTH." To receive radio range without interference, set selector switch to "RANGE." To receive voice without interference, set selector switch to "VOICE."

Note

It is impossible to receive voice with selector switch in "RANGE" position.

(d) Channel "A" of the command radio is connected to the "COMMAND" position of the interphone jack boxes. Channel "B" is connected to the "LIAISON" position.

(e) Tune receivers to desired frequency on tuning dial, and adjust corresponding volume control knob.

(f) To turn off receiver volume controls, return them to normal position.

Note

More than one receiver may be heard simultaneously by turning the corresponding headset selector switches to "A" or "B."

(2) TRANSMITTER OPERATION.—Three separate transmitters are installed with frequency ranges of 3.0-4.0 mc, 4.0-5.3 mc, and 5.3-7.0 mc. Operation of the transmitters is as follows:

(a) Turn transmitter power switch "ON" and allow 15 seconds for transmitter to "warm up."

(b) Plug microphone into extension cord jack.

(c) Turn transmitter selector switch to desired transmitter.

(d) To transmit voice turn transmitter control switch to "VOICE," and press microphone button while speaking.

(e) To transmit code, turn transmitter control switch to "CW" and operate key. When transmitting to receivers not capable of receiving straight CW, set transmitter control switch to "TONE" and operate key.

Note

The pilots' push-to-talk button is located on the throttle control lever located on the left side of the compartment.

(f) Turn transmitter off by switching transmitting power switch "OFF."

(g) To reduce battery drain and increase dynamotor life, place the emission selector switch in "VOICE," unless continued use on "TONE" or "CW" is expected.

CAUTION

Operation of this equipment involves the use of high voltages which are dangerous. In tuning up the antenna circuit of the transmitters, avoid touching the antenna when the power is on, or severe burns may result. Make certain that the dynamotor is not running before making any adjustment other than tuning up.

(3) BOMBARDIER OPERATION. *(Airplanes A-20J-1-DO to A-20J-20-DO.)*— Channels "A" and "B" can be used by the bombardier for reception and transmission. However, the band must be selected by the pilot.

b. OPERATION OF THE RC-36 INTERPHONE EQUIPMENT.

(1) The interphone amplifier is "ON" whenever the airplane's electrical system is "ON," as it is connected directly to the airplane's battery.

(2) Interphone jack boxes are installed at stations of the pilot, the upper gunner, and lower gunner *(airplanes A-20G-1-DO to A-20G-35-DO)* and bombardier *(A-20J-1-DO to A-20J-10-DO)*. Each jack box has a volume control and a selector switch. The selector switch has the following positions:

(a) "COMP." The audio output of the compass receiver will be heard in the interphone.

(b) "LIAISON." The command set receiver audio output will be heard in the channel "B" in the earphones. The command set transmitter may be modulated with the microphone switch closed.

Note

As no liaison set is used in this airplane, one audio channel of the command set is connected to the "LIAISON" position of the jack box.

(c) "COMMAND." The command set receiver audio output will be heard in channel "A" in the earphones. The command set transmitter may be modulated with the microphone switch closed.

(d) "INTER." Communication with any other crew member having his jack box switch at "INTER" position will be obtained.

(e) "CALL." This emergency position will enable any crew member to call all members of the crew regardless of the position of their jack box switch.

(3) A filter switch box, located in the pilot's compartment, is used to filter out radio range signals or radio-telephone signals. The selector switch has the following positions:

(a) "RANGE." Radio range signals only can be heard.

(b) "VOICE." Radio-telephone signals only can be heard.

(c) "BOTH." Both radio range and radio-telephone signals are heard.

Note

To use the filter, the headset cord must be plugged into the phone jack on the filter switch box.

c. OPERATION OF SCR-522 COMMAND SET. *(Airplanes A-20G-45-DO and A-20J-20-DO.)*—On these airplanes an SCR-522 Command Radio is installed in addition to the SCR-274N equipment. The SCR-522 set should be checked prior to take-off to make certain that all plugs and cable leads are properly connected and that the "AUDIO," "RELAY," and "GAIN" controls are properly adjusted. To insure that the airplane's storage battery will not be excessively drained, it is essential that the use of the radio set on the ground prior to take-off be reduced to the shortest possible time.

Note

When the SCR-522 set is installed, both channels "A" and "B" of the SCR-274N Command Radio are connected to the "COMMAND" position of the interphone jack boxes. The SCR-522 set is connected to the "LIAISON" or "VHF COMM" position.

(1) RECEIVING.

(a) Place the "T-R-REM." switch in "R" position.

(b) To start the equipment, press push button "A," "B," "C," or "D."

(2) TRANSMITTING.

(a) To start the equipment, press push button "A," "B," "C," or "D," depending on which channel is to be used.

(b) Allow approximately one minute for the vacuum tubes to warm up.

(c) Place the "T-R-REM." switch in "T" position.

(d) Speak into microphone.

(3) PRESS TO TRANSMIT (PRESS TO TALK) OPERATION.

(a) Place the "T-R-REM." switch in "REM." position.

(b) To start the equipment, press push button "A," "B," "C," or "D."

(c) TO RECEIVE: Under these conditions the receiver is in operation.

(d) TO TRANSMIT: Press the "push to talk" button and speak into the microphone.

(e) TO RECEIVE AGAIN: Release the "push to talk" button.

(4) STOPPING THE EQUIPMENT.—To stop the equipment, press the "OFF" push button.

d. OPERATION OF SCR-535A IDENTIFICATION EQUIPMENT.

(Airplanes A-20G-1-DO to A-20G-20-DO or SCR 695A Identification Equipment—Airplanes A-20G-25-DO to A-20G-45-DO and A-20J-1-DO to A-20J-20-DO.)

(1) The radio control box is located in the rear gunner's compartment. An on-off switch and detonator switches are located on the right side of the pilot's compartment.

(2) PREFLIGHT CHECK.

(a) Check the detonator circuit for proper operation.

(b) Set the sensitivity controls in accordance with the instructions in the *SCR-535A Radio Set Operating Instructions Handbook.*

(3) OPERATION.

(a) To turn on, turn either the on-off switch in the pilot's compartment, or the on-off switch on the control box to "ON."

(b) Adjust knob "V" until the pointer of the voltmeter on the face of the control box points to the red marking on the voltmeter scale.

(c) To turn off, turn the on-off switch of both control box and pilot's switch to "OFF."

CAUTION

The radio destroyer dual push button marked "DANGER," is located on the right-hand side of the pilot's compartment, and should be used only when abandoning the airplane over enemy territory. When the two buttons are pressed simultaneously a detonator is set off in the receiver that will destroy it internally. No damage will be done either to the airplane or personnel. Bodily contact with the receiver should be avoided at the time of destruction.

e. OPERATION OF MN-26-Y RADIO COMPASS. On *airplanes A-20J-1-DO to A-20J-20-DO,* provisions are made in the bombardier's nose section for a radio compass. On *airplanes A-20G-1-DO to A-20G-40-DO and A-20J-1-DO to A-20J-15-DO,* the radio compass consists of a control box, located on the right side of the pilot's compartment; a radio compass indicator, located on the left side of the instrument panel; a radio compass loop, installed on the top of the fuselage aft of the pilot's enclosur door; and a receiver, mounted on the fuselage deck truss, forward of the gunner's cockpit. The loop is installed in a fixed position with its plane perpendicular to the line of flight. The frequency range of this equipment is covered in three bands, calibrated in kilocycles as follows: Band I, 150 to 325; Band II, 325 to 695; Band III, 3400 to 7000 kc. The master control switch of the radio compass control box marked "COMP," "REC ANT," and "REC LOOP," controls all radio compass equipment functions except tuning and adjustment of signal level as follows:

"COMP." For obtaining communications reception and visual on-course indication of homing.

"REC ANT." For communication and aural radio range reception.

"REC LOOP." For communications reception during conditions of severe rain and snow static, aural radio range reception, and aural null homing from communications stations.

"AUDIO." Regulates the level of the audio signal in the headsets.

"COMPASS." Regulates the extent of pointer deflection of the left-right indicator needle.

(1) NORMAL RECEPTION.—(ANTENNA.)

(a) Turn master switch to "REC ANT."

(b) Select desired frequency range.

(c) Snap "CW" switch "ON" or "OFF" as desired.

(d) Tune in station.

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

(2) ANTI-RAIN-STATIC RECEPTION—(LOOP).

(a) Turn master switch to "REC LOOP."

(b) Select desired frequency range.

(c) Snap "CW" switch "ON" or "OFF" as desired.

(d) Tune in station.

(e) If the station is directly in line with the airplane's course, no signal will be heard, as the loop is fixed with its plane perpendicular to the line of flight.

(f) Adjust "AUDIO" control for desired headset volume.

(3) HOMING—RADIO RANGE RECEPTION.—It is necessary to either have a map showing the radio range course and characteristics, or to know the location of the course and its characteristic "A" and "N" signal areas.

(a) Turn master switch to "REC ANT."

(b) Turn band switch to 150-325kc.

(c) Tune to desired frequency.

(d) Adjust "AUDIO" control to desired signal level.

(e) Turn airplane so as to intercept the radio range course.

(f) The "A" and "N" signals will blend into a continuous dash interrupted by the station identification when on course.

(g) The airplane may then be flown on course to the location of the radio range station.

(h) Arrival at destination is indicated by an abrupt decrease in headset volume known as the "cone of silence."

(4) VISUAL RADIO COMPASS HOMING.

(a) Adjust compass control to maximum.

(b) Turn master switch to "COMP."

(c) Select desired frequency range, and tune in station.

(d) Listen carefully for station identification to insure that the desired station is being received. "AUDIO" control may be set for any audio output level without affecting the deflection of the left-right indicator needle.

(e) Alter the airplane's course to left or right as shown by the left-right indicator needle, until reading "ZERO" or "on-course."

(f) Although "on-course" indications will be obtained both when approaching and when flying away from a transmitter, no confusion as to location of the station need result. (If a course correction to the right, is accompanied by a deflection of the indicating needle in the same direction, the station is aft; if the deflection is in the opposite direction, the station is forward.) The indicating needle points in the general direction of the transmitting station.

(g) Reduce "COMPASS" control setting until an intermediate value has been obtained. This permits the course to be followed accurately.

(5) AURAL NULL HOMING.—This type may be used in place of visual radio compass homing should any of the compass circuits of the indicator be inoperative, or in cases of severe rain static. This method is undesirable because of the possibility of 180 degrees ambiguity of direction.

(a) Turn master switch to "REC LOOP."

(b) Select desired frequency range, and tune in station.

(c) Listen carefully for station identification.

(d) When homing on weak signals, turn "CW" switch "ON."

(e) Adjust "AUDIO" control for desired audio level.

(f) Turn airplane until headphone volume decreases to minimum.

(g) Fly airplane on this null course until desired position has been reached.

f. MN-26-C RADIO COMPASS AND ZB ADAPTER. *(Airplanes A-20G-45DO and A-20J-20-DO.)*—This equipment is installed in place of the MN-26-Y radio compass. Bands I and II on this set are calibrated the same as on the MN-26-Y set; i.e., Band I, 150 to 325 kilocycles. Band II, 325 to 695 kilocycles. Band III is calibrated from 695 kilocycles to 1500 kilocycles. The ZB adapter may be used on this band. Operation of the equipment is identical to the operation of the MN-26-Y radio compass.

9. OXYGEN SYSTEM.

(Airplanes A-20G-1-DO to A-20G-15-DO, incl.)

Note

A low pressure demand type oxygen system is installed in P-70 airplanes.

a. USE OF OXYGEN.—To provide safety and personnel efficiency at high altitudes, a British high-pressure type oxygen system is provided for the three crew members. The time required to complete the mission determines the use of oxygen at the various levels. A suggested formula for the use of oxygen is as follows:

(1) At 10000 ft. and above on all flights.

(2) From the ground up on all combat and tactical flights at night.

(3) Between 8000 and 10000 ft on all flights of four hours or greater duration.

b. DURATION OF OXYGEN.—The duration of the oxygen supply carried in the eight cylinders, with an initial pressure of 1800 pounds per square inch, varies with the altitude and the consequent increase in the oxygen requirements. The following duration at various altitudes represents the maximum hours available to one man, and must be divided by the number of men in the crew for the actual duration.

REGULATOR SETTING	MAN HOURS
10,000 ft.	35
15,000 ft.	24
20,000 ft.	19
25,000 ft.	15
30,000 ft.	13
35,000 ft.	9

c. PREFLIGHT CHECK.

(1) Check the pilot's regulator controls to make certain that they are "OFF."

(2) Turn the pilot's shut-off valve, located on the floor to the right of the pilot's seat, "ON."

(3) Insure that the cylinders are full (as indicated by the gauge on the oxygen flow regulator).

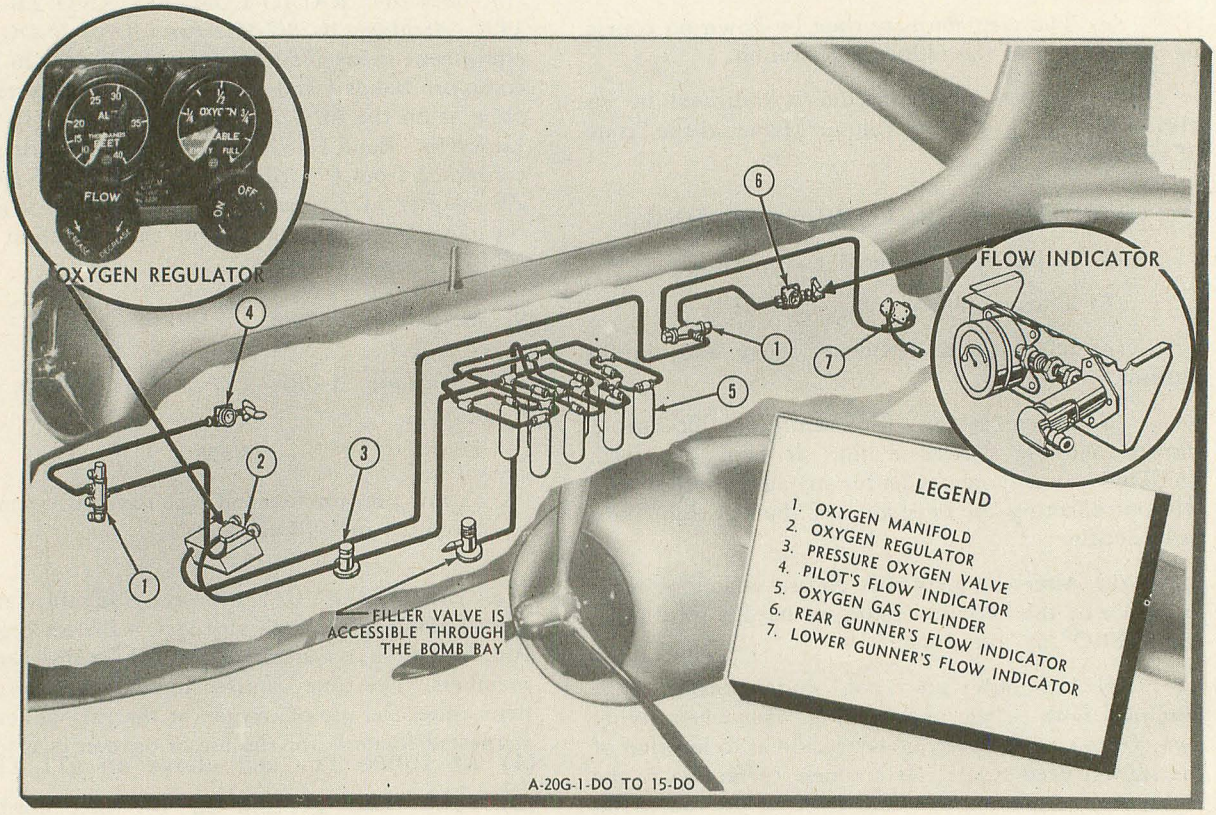


Fig. 48 — Oxygen System Installation

(4) See that each crew member is supplied with a mask, and that his mask tube connector fits into the oxygen outlet socket.

d. USE IN FLIGHT.

(1) Adjust the mask to fit snugly on the face. To test, pinch the mask's supply tube, and draw air lightly into the lungs. If properly fitted, the mask should be "drawn in" without leaking. Test the mask frequently while in flight.

(2) Clip the mask to the clothing to prevent it pulling away from the face.

(3) The pilot should set the oxygen regulator so that the gauge on the regulator coincides with the altimeter reading. This should supply sufficient oxygen to all the personnel. If the pilot, or one of the gunners, feels he is not getting a sufficient supply, the pilot should open the regulator to a higher altitude reading. A measured quantity of pure oxygen is supplied by the regulator to each of the crew members' stations, where it is mixed with the ambient air in the user's mask.

CAUTION

Each of the crew should watch his oxygen flow indicator to insure that oxygen is being delivered. If no flow is indicated, check the supply tubing for kinks, or the mask for looseness. If this does not remedy the trouble, notify the pilot immediately.

e. AFTER FLIGHT.—After flight, the pilot should close the regulator and turn the shut-off valve, located on the floor to the right of the pilot's seat, "OFF."

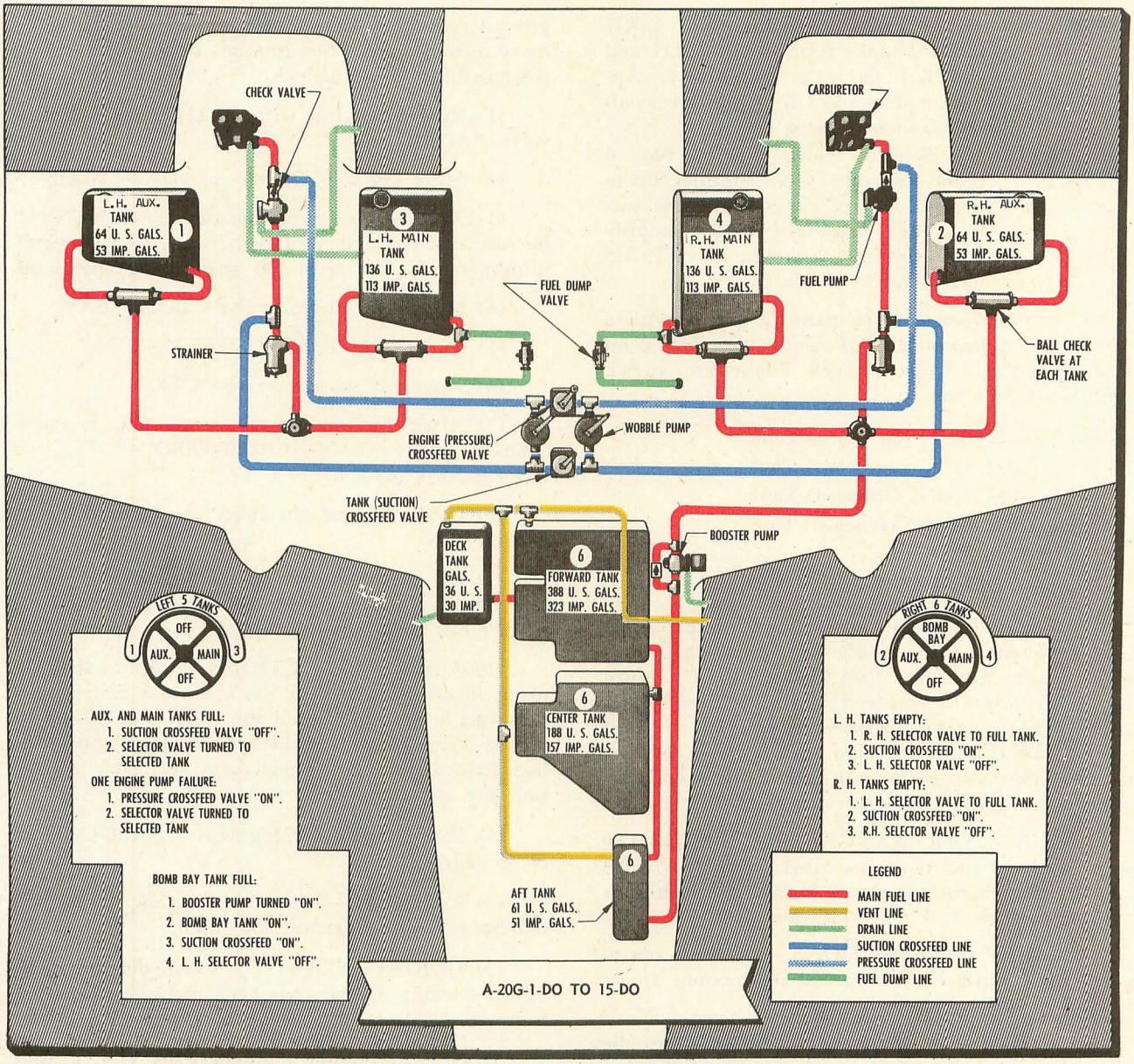


Fig. 49 — Long Range Fuel System

10. LONG RANGE FUEL SYSTEM.

(A-20G-1-DO to A-20G-15-DO.)

a. GENERAL.

(1) A long range fuel system is furnished to provide adequate ferrying facilities over long distances. The system can be removed easily when the ferrying mission has been completed. It incorporates a bomb bay installation, comprised of four all-metal fuel tanks with a total fuel capacity of 676 US gallons. The fuel is drawn from the tanks by an electrically-driven fuel booster pump, and is forced under pressure to the fuel tank selector valve in the RH inboard wing. From here the fuel is supplied to the engine (or engines, as may be determined by the setting of the tank cross-feed control). In normal operation, each engine has an individual fuel system whereby the LH tanks supply the LH engine, and the RH tanks supply the RH engine. However, if the need arises, or in the case of the ferry fuel installation, any tank may be used to supply both engines by the operation of the cross-feed controls. The normal positions of the fuel tank selector controls, with the cross-feed controls "OFF," are as follows:

"OFF."	No fuel is supplied to the engines.
"AUX."	No. 1 LH outboard tank and No. 2 RH outboard tank supply fuel to the LH and RH engines, respectively. Approximately 64 US gallons are available from each tank.

"MAIN." No. 3 LH inboard and No. 4 RH inboard tanks supply to the LH and the RH engines, respectively. Approximately 136 US gallons are available from each tank.

"BOMB BAY." LH Selector valve "OFF." No. 6 bomb bay tanks "ON," supplies fuel to the RH engine only. Turn the suction (tank) cross-feed "ON" to supply both engines. Approximately 676 US gallons are available.

(2) A liquidometer fuel quantity gauge, with a selector, is mounted on the RH side of the pilot's compartment on the instrument panel. The selector switch points are as follows:

No. 1—"LH AUX" (outboard) Tank.
No. 2—"RH AUX" (outboard) Tank.
No. 3—"LH MAIN" (inboard) Tank.
No. 4—"RH MAIN" (inboard) Tank.
No. 5—"OFF."
No. 6—"BOMB BAY."

(3) The two cross-feed controls are located on the fuel valve control panel on the left side of the pilot's compartment. The "ENGINE CROSS-FEED" control operates the pressure cross-feed system and the "TANK CROSS-FEED" control operates the suction cross-feed system. The engine cross-feed should be "ON" for take-off; otherwise, both cross-feed controls are normally in the "OFF" position.

b. FILLING LONG RANGE FUEL TANKS.—The bomb bay ferry fuel tanks are filled (capacity 676 US gallons) through the filler neck on the fuselage deck tank, located just aft of the pilot's seat.

c. LOADING INSTRUCTIONS.—Take care not to exceed the balance limits. Special instructions are as follows:

(1) AMMUNITION.—As ammunition must be carried for protection in flight, observe the following restrictions to maintain proper weight and balance distribution.

LOCATION	AMMUNITION (ROUNDS)
20 mm Cannon (4)	20 (For Each Cannon)
Forward .50 Cal. (2)	100 (For Each Gun)
Rear Upper .50 Cal.	100
Rear Lower .30 Cal.	100

(2) CREW'S LUGGAGE.—The crew's luggage should not exceed 120 pounds (40 pounds per man), and must be stowed in the rear gunner's compartment as far forward as possible.

d. PREFLIGHT TEST.—The preflight test should be carried out in the manner specified in Section II. Due to the installation of the long range fuel tanks, the following steps must be included in the engine ground run prior to take-off. Operate the engines to make certain that all fuel lines are full, and to prevent the possibility of an airlock.

(1) Run the engines with the LH and RH selector valve—"AUX."

(2) Move LH and RH selector valves—"MAIN."

(3) Turn bomb bay booster pump switch—"ON." Be sure that the amber light, adjacent to the switch, illuminates, indicating proper operation of the pump.

(4) Move RH selector valve—"BOMB BAY."

(5) Turn "TANK CROSS-FEED"—"ON."

(6) Move LH selector valve—"OFF."

(7) After five minutes, move LH selector—"MAIN," move "TANK CROSS-FEED"—"OFF," and RH selector—"MAIN."

(8) Continue preflight check in accordance with Section II.

(9) On completion of satisfactory engine operation on all tank combinations, stop the engines and re-fill tanks to capacity.

e. FLIGHT INSTRUCTIONS.—Operate the airplane in accordance with the operation instructions, provided in Section II, and the flight operation data, provided in Appendix II. Exceptions to these operation instructions, due to the long-range fuel tank installation, are as follows:

(1) PREFLIGHT.—Wing flaps—"HALF-DOWN" (22½ degrees).

(2) TAKE-OFF.—Raise the wing flaps when the indicated airspeed reaches 165 mph.

(3) DURING FLIGHT.—When the pre-determined cruising altitude has been reached, proceed as follows:

(a) Turn booster pump switch "ON" (insure that amber light is illuminated).

(b) RH selector—"BOMB BAY" (No. 6).

(c) Tank cross-feed—"ON."

(d) LH selector—"OFF," liquidometer switch (No. 6).

CAUTION

The carburetor overflow line pumps 10 gallons of fuel to the main tanks per hour. When the main tanks are full, this fuel is pumped overboard. Therefore the quantity of fuel in the main tanks must be checked periodically. When the liquidometer gauge indicates more than 120 gallons of fuel in the main tanks, switch over to the main tanks temporarily.

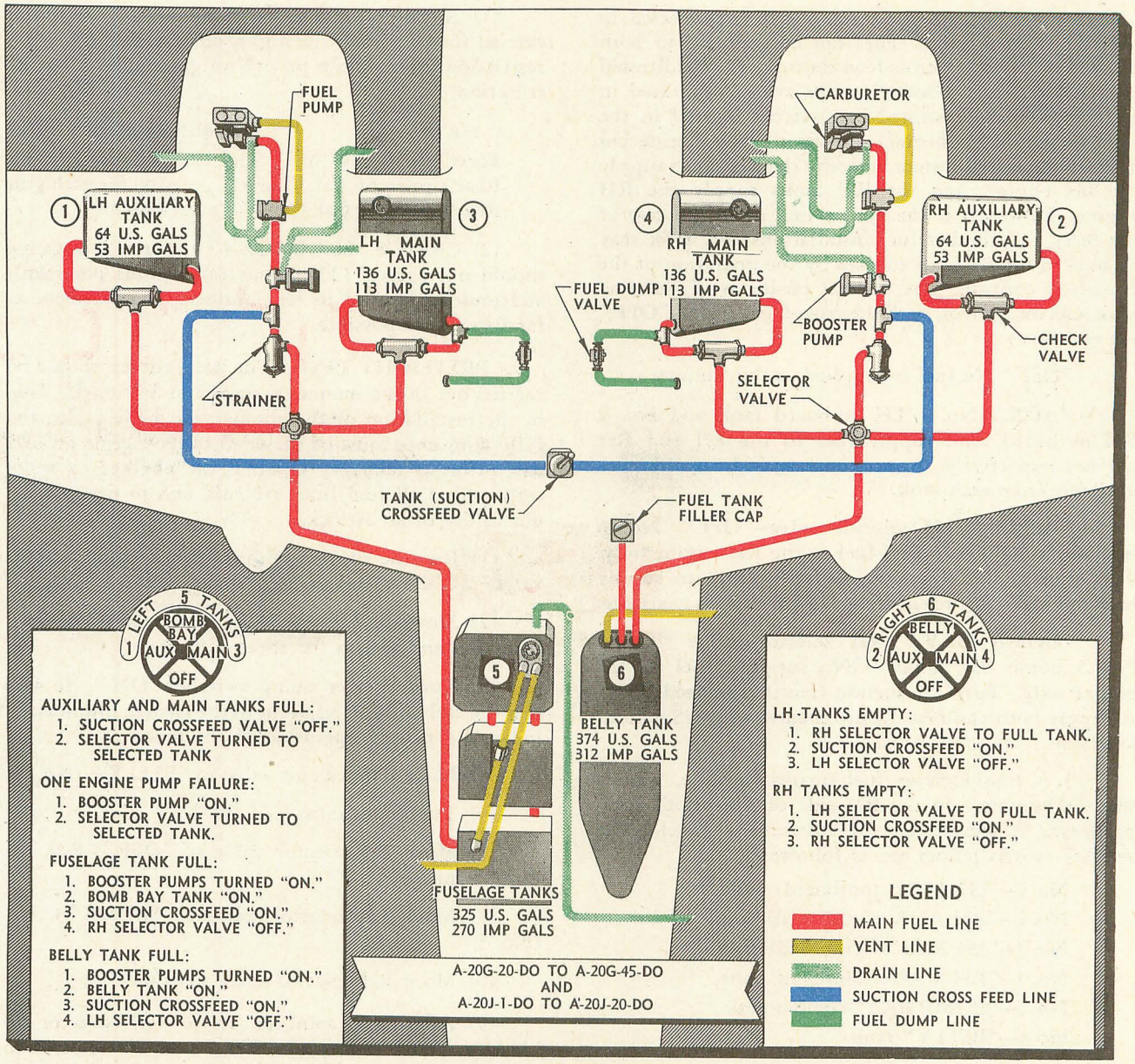


Fig. 50 — Long Range Fuel System

(e) When the liquidometer gauge indicates that the fuel quantity in the bomb bay tanks is approximately 20 gallons, turn the LH selector valve—"AUX."

(f) Turn cross-feed—"OFF."

(g) Turn RH selector valve—"AUX," and booster pump—"OFF." (See CAUTION.)

(h) When the fuel quantity in the "AUX" tanks registers less than 15 gallons each, turn the RH and the LH selector valves—"MAIN."

11. LONG RANGE AND COMBAT FUEL SYSTEM.

(Airplanes A-20G-20-DO to A-20G-45-DO and A-20J-1-DO to A-20J-20-DO).

a. GENERAL.

(1) The combat fuel system consists of three bomb bay fuel tanks (capacity 325 US gallons) that can be used in combat. These tanks are connected to the LH selector valve. Fuel can be supplied to both engines by use of the cross-feed control. The long range system consists of one droppable tank (capacity 374 US gal-

lons) located beneath the fuselage. It is connected to the RH selector valve. Fuel can be supplied to both engines by using the cross-feed control. Two additional electrically driven booster pumps are incorporated in each nacelle and operated by switches located in the pilot's cockpit. In normal operation, each engine has an individual fuel system whereby the LH tanks supply the LH engine, and the RH tanks supply the RH engine. However, if the need arises, or in the case of the ferry and combat fuel installations, any tank may be used to supply both engines by the operation of the cross-feed control. The normal positions of the fuel tank selector control, with the cross-feed control "OFF," are as follows:

"OFF." No fuel is supplied to the engines.

"AUX." No. 1 LH outboard tank and No. 2 RH outboard tank supply fuel to the LH and RH engines respectively. Approximately 64 US gallons are available from each tank.

"BELLY." LH selector valve—"OFF." No. 6 belly tank "ON" supplies fuel to the RH engine only. Turn the suction (tank) cross-feed "ON" to supply both engines. Approximately 374 US gallons available.

"BOMB BAY." RH selector valve "OFF." No. 5 bomb bay tanks "ON" supplies fuel to LH engine only. Turn the suction (tank) cross-feed "ON" to supply both engines. Approximately 325 US gallons available.

(2) A liquidometer fuel quantity gauge, with a selector mounted on the RH side of the pilot's compartment, is located on the instrument panel. The selector switch points are as follows:

No. 1—"LH AUX" (outboard) tank.
No. 2—"RH AUX" (outboard) tank.
No. 3—"LH MAIN" (inboard) tank.
No. 4—"RH MAIN" (inboard) tank.
No. 5—"BOMB BAY" combat tank.
No. 6—"BELLY" tank.

(3) The cross-feed control is located on the fuel control panel on the left side of the pilot's compartment. The "TANK CROSS-FEED" control operates the suction cross-feed system. In normal operation the cross-feed control is set in "OFF" position.

b. FILLING THE BOMB BAY FUEL TANKS.—These tanks are filled (capacity 325 US gallons) through the filler neck, located on the No. 1 tank in the forward bomb bay underneath the pilot's walkway.

c. FILLING THE BELLY FUEL TANK.—This tank is filled (capacity 374 US gallons) through the filler casting installed on the aft side of the forward bulkhead in the bomb bay.

d. LOADING INSTRUCTIONS.—Take care not to exceed the balance limits. Special instructions are as follows:

(1) AMMUNITION.—As ammunition must be carried for protection in flight, observe the following restrictions to maintain proper weight and balance distribution:

LOCATION	AMMUNITION (ROUNDS)
Forward .50 Cal. (6)	350 for each gun
Rear Upper .50 Cal. (Turret)	100 for each gun
Rear Lower .50 Cal.	100

(2) CREW'S LUGGAGE.—The crew's luggage should not exceed 120 pounds (40 pounds per man), and must be stowed in rear gunners' compartment as far forward as possible.

e. PREFLIGHT TEST.—The preflight test should be carried out in the manner specified in Section II. Due to the installation of the combat and belly tanks, the following steps must be included in the engine ground run prior to take-off. Operate the engines to make certain that all fuel lines are full, and to prevent the possibility of an airlock.

(1) Run the engines with the RH and LH selector valve "AUX." (Tanks 1 and 2—run for three minutes.)

(2) Move the LH and RH selector valves "MAIN." (Tanks 3 and 4—run for three minutes.)

(3) Turn booster pump switches "ON." Be sure that the amber light, adjacent to the switch, illuminates, indicating proper operation of the pump.

(4) Move RH selector valve to "BELLY." (No. 6.)

(5) Turn tank cross-feed "ON."

(6) Move LH selector valve to "OFF." Run for three minutes.

(7) Move LH selector valve to "BOMB BAY." (No. 5.)

(8) Move RH selector valve to "OFF."

(9) After five minutes, move RH selector to "MAIN," tank cross-feed "OFF," and LH selector to "MAIN."

(10) Booster pumps—"OFF."

(11) Continue preflight check in accordance with Section II.

(12) On completion of satisfactory engine operation on all tank combinations, stop the engines and re-fill tanks to capacity.

f. FLIGHT INSTRUCTIONS.—Operate the airplane in accordance with the operation instructions provided in Section II, and the flight operation data provided in Appendix II. Exception to these operations due to the belly fuel tank installation, are as follows:

(1) TAKE-OFF.—Wing flaps—"HALF DOWN" (22½ degrees).

(2) TAKE-OFF.—Raise the wing flaps when the indicated airspeed reaches 165 mph.

(3) DURING FLIGHT.—When the pre-determined cruising altitude has been reached, proceed as follows:

(a) Turn booster pump switches "ON." (Insure that amber light is illuminated.)

(b) LH selector—"BOMB BAY (No. 5).

(c) Tank cross-feed—"ON."

(d) RH selector—"OFF."

OR: If Using Belly Tank:

(e) Booster pumps—"ON."

(f) RH selector—"BELLY" (No. 6).

(g) Tank cross-feed—"ON."

(h) LH selector—"OFF."

(i) When the liquidometer gauge warning light or indicator indicates that the fuel quantity in either the bomb bay or belly tanks is empty, turn the LH selector valve—"AUX."

(j) Avoid running tanks dry before turning selector to next tank.

(k) Turn cross-feed—"OFF."

(l) Turn RH selector valve—"AUX," and booster pumps "OFF."

CAUTION

The carburetor overflow line pumps 10 gallons of fuel to the main tanks per hour. When the main tanks are full, this fuel is pumped overboard. Therefore, the quantity of fuel in the main tanks must be checked periodically. When the liquidometer guage indicates more than 120 gallons of fuel in the main tanks, switch over to the main tanks temporarily.

(m) When the fuel quantity in the "AUX" tanks registers empty, turn the RH and LH selector valves—"MAIN."

12. HEATING AND VENTILATING SYSTEM.

(Airplanes A-20G-1-DO to A-20G-10-DO.)

a. GENERAL.—A 40,000 Btu per hour Stewart Warner heater, located on the top forward end of the aft bomb bay, supplies heated air to the pilot's and gunners' compartment. A Stewart Warner 8500 Btu per hour heater in the nose of the airplane is independently operated by a switch on the pilot's upper electrical panel labeled "GUN HEATER."

(1) OPERATION OF SYSTEM.—Outside air enters the fuselage heater through an air scoop on the right side of the fuselage beside the heater. The fuel-air mixture to operate the heater is obtained from the right-hand engine. The pilot controls the air intake and also the amount of fuel-air mixture by means of two controls located on a panel behind the pilot's right shoulder. This system may be operated only in flight. To start the heater, turn on the "PILOT'S CABIN HEAT" switch located on the pilot's upper electrical panel. Operate the "AIR" and "HEAT" controls on the pilot's control panel.

Note

When operating the airplane at freezing temperatures, set the "HEAT" control approximately half open until the heater starts.

The "AIR" control opens the air scoop a maximum of one inch. To obtain cold ventilating air, use the "AIR" control independently. The pilot's outlet is located on the floor to the right of the pilot's seat and is manually operated by a lever which connects a damper.

The rear gunner's outlet is located in the forward right-hand corner of the compartment near the floor. This outlet is controlled by a sliding door.

A Spencer thermostat prevents operations of the gun heater until the outside temperature falls below 44°C (40°F). The thermostat automatically turns the heater off when the nose of the airplane is heated to 38°C (100°F).

13. HEATING AND VENTILATING SYSTEM.

(Airplanes A-20G-20-DO to A-20G-45-DO and A-20J-1-DO to A-20J-20-DO.)

a. GENERAL.—Two independent 40,000 Btu per hour Stewart Warner heating systems are installed in these airplanes. One heater, located in the right-hand nose wheel tunnel, supplies the pilot's compartment; the other heater is installed just aft of the gunners' shelf on the floor of the gunners' compartment. The .50 Cal. machine guns in the attack nose of *airplanes A-20G-20-DO to A-20G-45-DO* are warmed by six Morris electric heaters that fit over the top and sides of the gun breeches. These heating units have thermostatic controls to maintain constant temperatures. This system may be operated only in flight. In *airplanes A-20J-1-DO to A-20J-20-DO,* warm air is provided for the bombardier's nose section through flexible ducts from the pilot's heater.

(1) PILOT'S HEATING AND VENTILATING SYSTEM.—The pilot's heater receives its fuel-air mixture from the left-hand engine and ventilating air from a scoop located just aft of the heater on the right side of the airplane. The heated air is distributed through

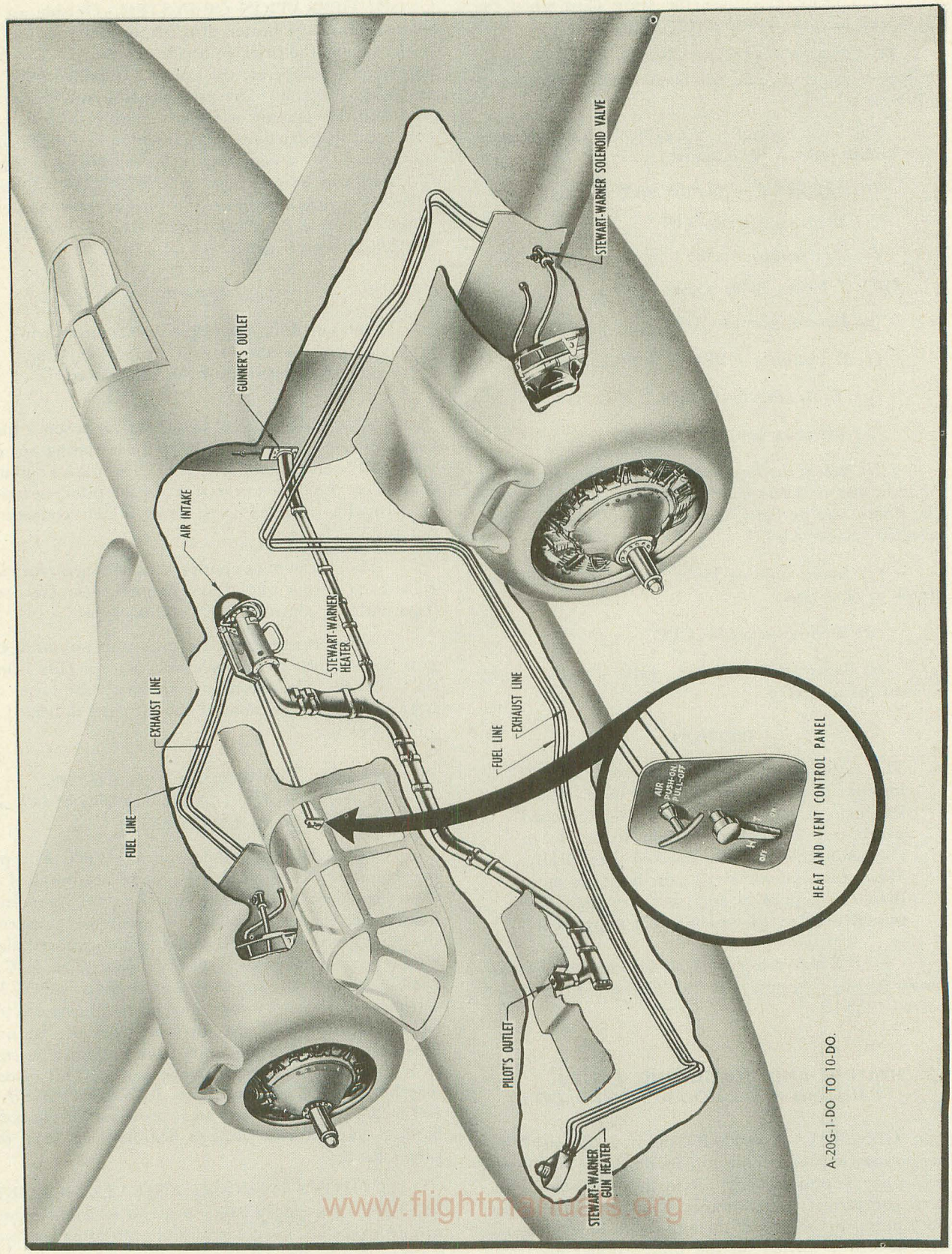


Fig. 51 —Heating and Ventilating System

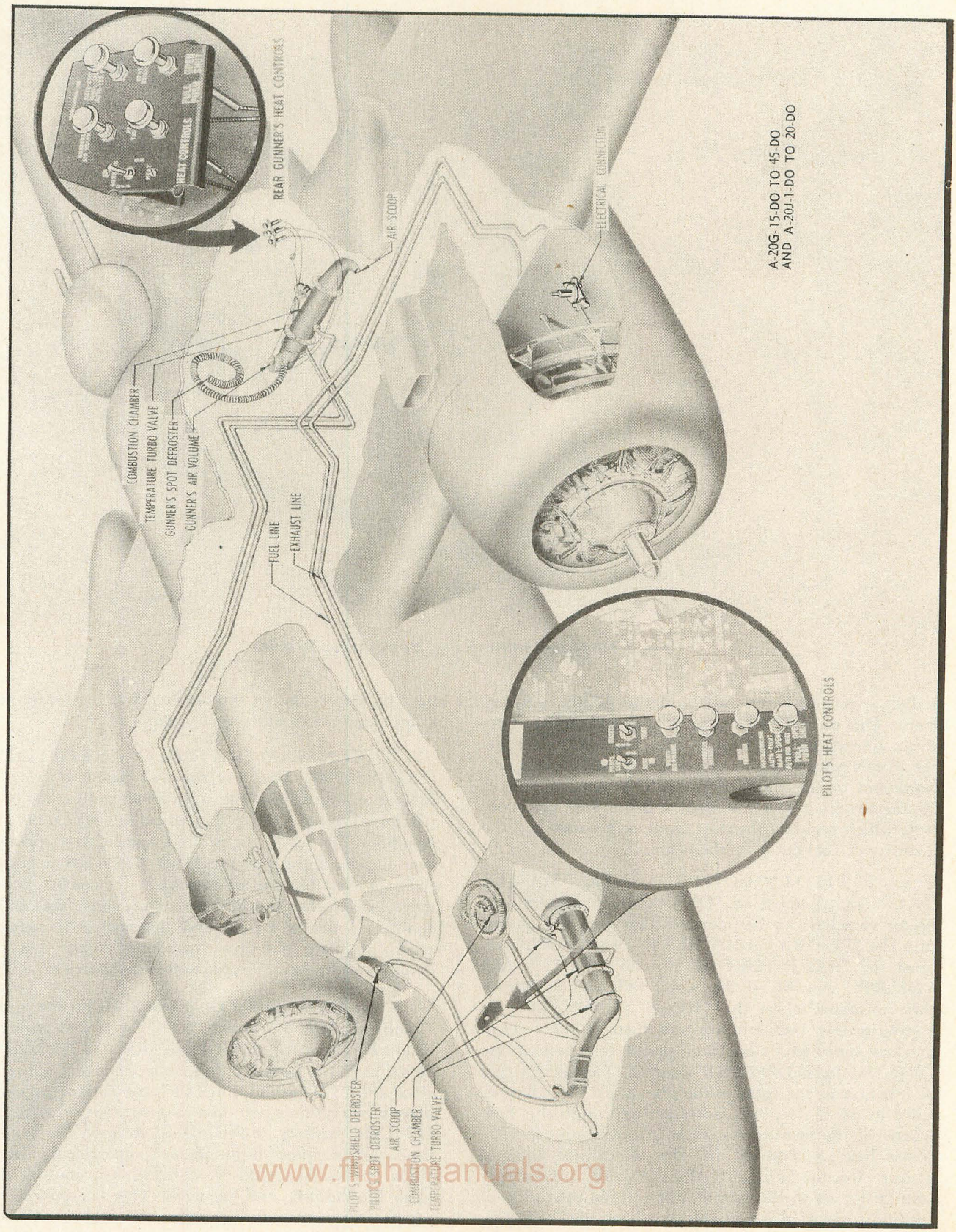


Fig. 52 — Heating and Ventilating System

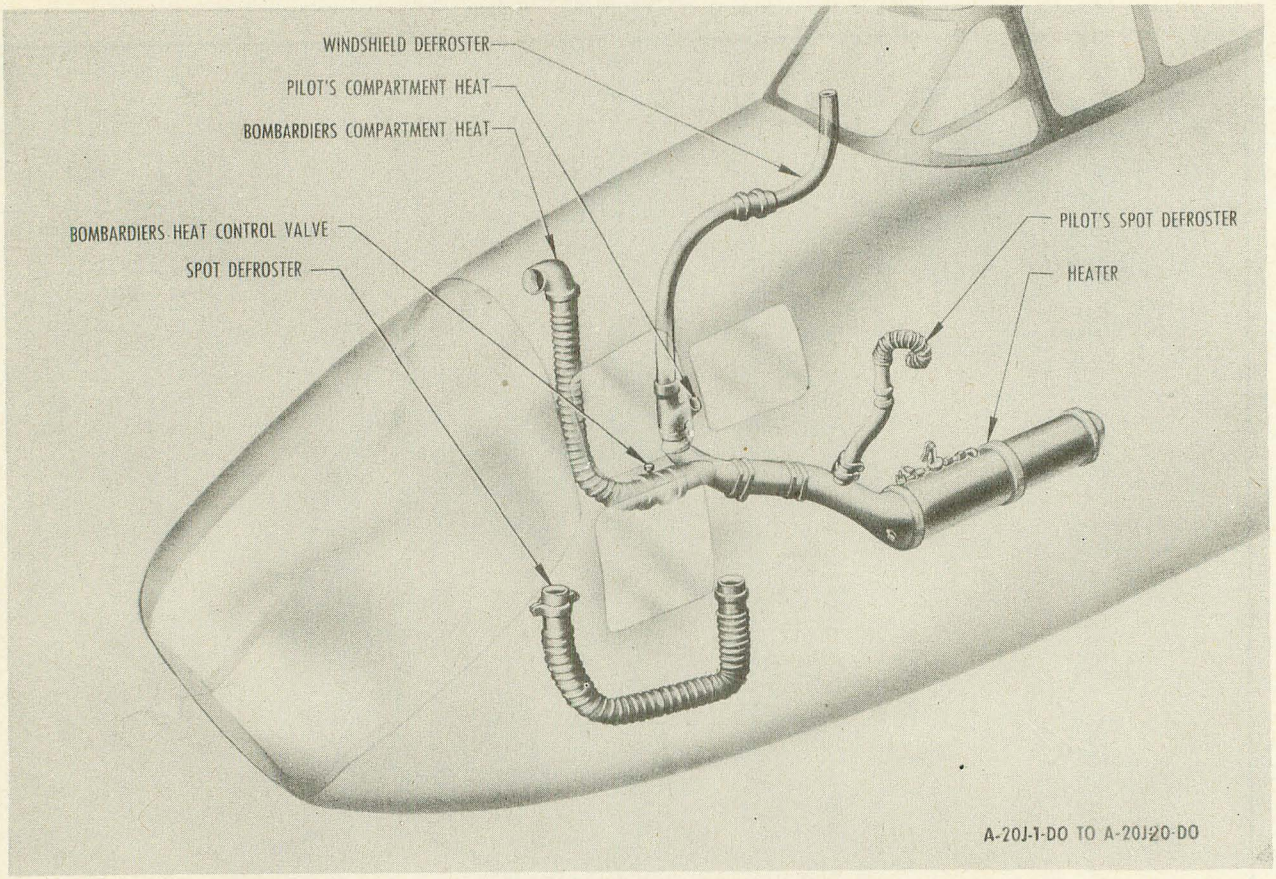


Fig. 53 — Nose Heating and Ventilating System

a duct system to three outlets in the pilot's compartment. One outlet defrosts the windshield, another delivers air to a flexible spot de-icer, and the third heats the pilot's compartment. A control panel, located forward and to the right of the pilot's seat, contains a master switch, a heater switch, and the push-pull controls which regulate the flow from each outlet and the quantity of fuel entering the heater.

(a) PILOT'S CONTROLS.—The "MASTER HEAT" switch must be "ON" before the individual heater switches can be operated. To start the heater, turn the "PILOT'S CABIN HEAT" switch "ON," and open the "HEAT THROTTLE" and "PILOT'S AIR VOLUME" control. If the heater fails to start within three minutes, close the "HEAT THROTTLE" for approximately two minutes and then re-open. Heat may be supplied to the windshield by opening the "WINDSHIELD DEFROST" control. The flexible spot de-icer hose at the right of the pilot's seat has a flapper valve in the outlet; heat is available through this hose whenever the heating system is in operation. If additional heat is required for the windshield or spot de-icer, close the "PILOT'S AIR VOLUME." To supply ventilating air to the system, discontinue operation of the above-mentioned controls and open the "VENTILATING AIR" control. This control over-powers the heat regulator unit in the Stewart Warner heater and allows cold air to enter the system.

(2) GUNNERS' HEATING AND VENTILATING SYSTEM.—The rear gunner's heater obtains its fuel-air mixture from the right-hand engine and ventilating air from a scoop located on the left side of the airplane. The air is distributed immediately through two outlets; one supplying a flexible de-icer duct and the other heating the compartment. A control panel, located on the left side of the airplane above the heater, contains a heater switch and the push-pull controls which regulate the flow from each outlet and the quantity of fuel-air mixture entering the heater.

(a) GUNNERS' CONTROLS.—With the pilot's "MASTER HEAT" switch "ON," start the gunners' heater by operating the "GUNNERS' AIR VOLUME" control. If the heater fails to start for three minutes, close the "THROTTLE HEAT" control for approximately two minutes and then re-open. Open the "SPOT DE-ICER" control to obtain heat through the flexible hose. To ventilate the gunners' compartment, discontinue operation of the above-mentioned controls and open the "COLD AIR" control. This overpowers the temperature regulator unit in the Stewart Warner heater.

(3) BOMBARDIER'S HEATING AND VENTILATING SYSTEM.—A flexible duct, located on the right side of the bombardier's compartment, connects to the main heater duct leading to the pilot's heater. An additional length of flexible duct for spot heating is located on the left side of the compartment. To use the extra length of flexible hose, detach the main duct from the elbow outlet by twisting and pulling the duct. Insert the main duct into the end of the spot-heat hose, twisting it slightly to provide a tight fit. The main duct may also be used for spot de-icing by leaving the elbow end fitting off the flex hose.

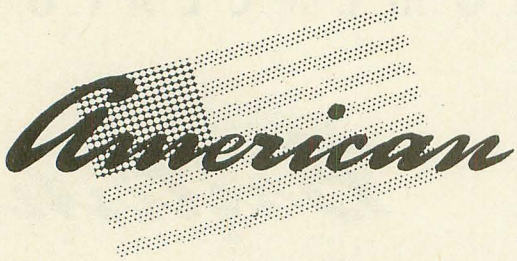
(a) BOMBARDIER'S CONTROLS.—The bombardier may control the degree of heat by operating the control valve in the heat duct. This valve is located below and to the right of the bombardier's seat. To operate the control, unscrew the knob and move the control handle to the "OPEN" or "CLOSED" position, as desired. Screw the knob tight to lock in place.

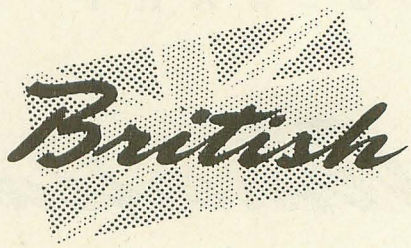
APPENDIX I

GLOSSARY OF NOMENCLATURE

American	British
ACCUMULATOR (HYDRAULIC)	PRESSURE RESERVOIR
AIRPLANE	AEROPLANE
ANGLE OF ATTACK	TRUE ANGLE OF INCIDENCE
ANTENNA	AERIAL
BATTERY (ELECTRICAL)	ACCUMULATOR
BEACON, AIRPORT	AERODROME-PROXIMITY BEACON
BEACON, RADIO RANGE	RADIO TRACK BEACON
BULLET PROOF GLASS	ARMOUR GLASS
CARBURETOR	CARBURETTOR OR CARBURETTER
CEILING	CLOUD HEIGHT
CYLINDER (HYDRAULIC)	JACK
DISTANCE	RUN
DUMP VALVE	JETTISON VALVE
EFFICIENCY, PROPELLER	NET EFFICIENCY
EMPENNAGE	TAIL UNIT
ENGINE OR POWER PLANT	AERO-ENGINE
ENGINE SECTION (COMPLETE)	POWER PLANT OR POWER EGG
EXIT	EGRESS
FEATHERING CONTROL	DIFFERENTIAL PITCH-CONTROL
FIELD, LANDING	LANDING GROUND
FILTER, AIR	AIR CLEANER
FLIGHT CONTROLS	FLYING CONTROLS
FLIGHT INDICATOR	ARTIFICIAL HORIZON
FLYING, BLIND	INSTRUMENT FLYING
GASOLINE, "GAS" OR FUEL	PETROL OR FUEL
GEAR, RETRACTABLE LANDING	RETRACTABLE UNDERCARRIAGE
GENERATOR	DYNAMO
GROSS WEIGHT	ALL-UP WEIGHT
GROUND (ELECTRICAL)	EARTH
GYRO HORIZON	ARTIFICIAL HORIZON
HOOD	BONNET

GLOSSARY OF NOMENCLATURE





IGNITION HARNESS	SHIELD
INTERPHONE	INTER-COMMUNICATION
INVERTER	MOTOR GENERATOR
LAND	ALIGHT
LEAN	WEAK
LEFT	PORT
LEVEL OFF	FLATTEN OUT
LOOP, RADIO	AERIAL LOOP
MAST, RADIO	AERIAL ROD
MANIFOLD PRESSURE	BOOST
METER, FREQUENCY	WAVEMETER
NAVIGATION, AIR	AVIGATION
NOSE HEAVY	BOW HEAVY
OIL PAN	SUMP
OVERLOAD	NON-STANDARD LOAD
PANEL, INBOARD	INNER PLANE
PANEL, OUTER	OUTER PLANE
PRIME	DOPE
PLUG, SPARK	SPARKING PLUG
PROPELLER	AIRSCREW
RADIO COMPASS	RADIO DIRECTION FINDER
RAFT, LIFE	DINGHY
RETICULE (GUN, TORPEDO, ETC.)	GRATICULE
RIGHT	STARBOARD
RUNWAY	LANDING STRIP
SET, COMMAND	PILOT CONTROLLER SET
STALLING SPEED	CRITICAL SPEED
STACK	PIPE
STRUT, OLEO	COMPRESSION STRUT
TACHOMETER	ENGINE SPEED INDICATOR
TAIL HEAVY	STERN HEAVY
WEIGHT, EMPTY	TARE WEIGHT OR TARE