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RESTRICTED NAVAER 01-25AC-501

Pilot's Handbook
of
Flight Operating Instructions

NAVY MODELS

SB2C-3 SBF-3 SBW-3
SB2C-4 SBF-4 SBW-4

AIRPLANES

THIS PUBLICATION SUPERSEDES NAVAER 01-25RA-1 DATED 1 MAY 1944
REVISED I JUNE 1944

PUBLISHED BY AUTHORITY OF
THE CHIEF OF THE BUREAU OF AERONAUTICS

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

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15 July 1945

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See Section I, Paragraph 1.b, for Major Differences.

Figure 1—Helldiver Airplanes

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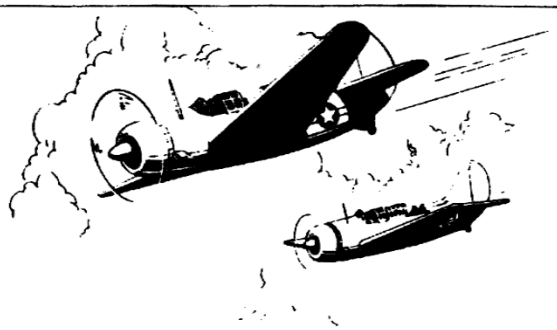


1. AIRPLANE.

a. GENERAL.

(1) The model SB2C-3 and SB2C-4 "Helldiver" airplanes, as illustrated in figure 1, are single engine, two place, low mid-wing monoplanes, designed for service as either carrier or land based dive bombers or torpedo launchers. Provisions are incorporated to permit long range scout observation by the addition of droppable wing and bomb bay fuel tanks.

(2) When in the 1000-lb. combat bomber condition, the gross weight of the SB2C-3 is approximately 15,060 pounds; gross weight of the SB2C-4 is approximately 15,202 pounds. In the long range scout condition the gross weight of the SB2C-3 is approximately 14,949 pounds; that of the SB2C-4 approximately 15,091 pounds.

Note

References in this publication to "the airplane" are applicable to both the SB2C-3 and SB2C-4. Data effective for only one of these models will be so noted.

(3) The airplane is equipped with hydraulically operated wing folding mechanism, landing gear, wing flaps, bomb bay doors, fixed gun chargers, automatic pilot, bomb displacing gear, brakes, and turtleback.

b. OVERALL DIMENSIONS.

(1) Span (wings extended).—49 feet, 8⅝ inches.

(2) Span (wings folded).—22 feet, 6½ inches.

(3) Length (parallel to ground, 3-point attitude).—36 feet, 8 inches.

(4) Height (3-point attitude, wings extended).—13 feet, 1½ inches.

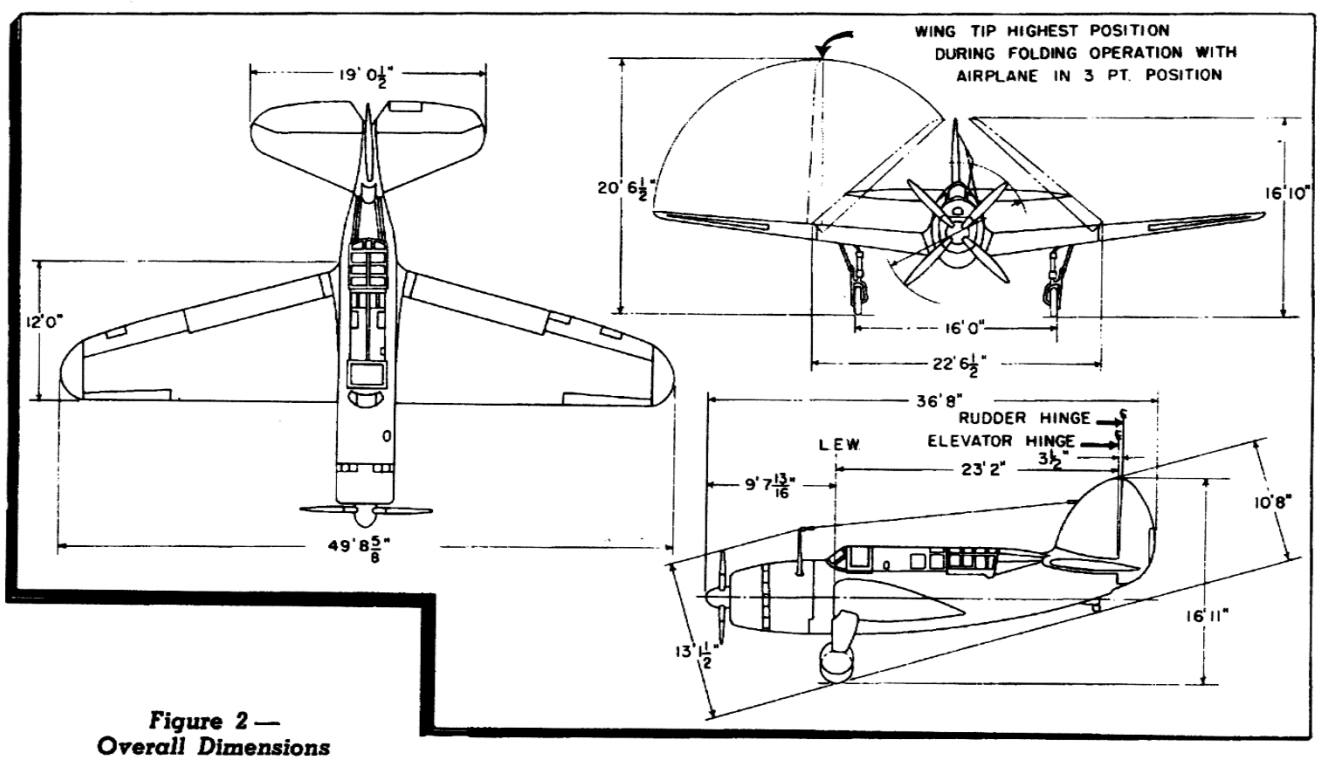


Figure 2 — Overall Dimensions

(5) Height (3-point attitude, wings folded). — 16 feet, 10 inches.

(6) Height (3-point attitude, wings at high point of travel).—20 feet 6½ inches.

d. MAJOR DIFFERENCES BETWEEN SB2C-3 and SB2C-4.

(1) Target approach doors removed from SB2C-4 and replaced by a removable access door.

(2) SB2C-4 has perforated flaps for greater diving control and stability.

(3) Propeller pitch lock added.

(4) Landing gear uplock mechanism redesigned for greater efficiency.

(5) Armor plate added to SB2C-4 speed ring for engine protection.

(6) Spinner added to streamline the propeller hub.

(7) A centrifugal fuel booster pump is installed in the SB2C-4 fuselage fuel cell.

(8) Rocket launching provisions incorporated in SB2C-4.

c. ARMAMENT.

(1) FUSELAGE BOMB LOADS. — The fuselage bomb bay is equipped with three Mark 51-7 bomb racks and is capable of carrying the following loads:

(a) Two 500-pound bombs.

(b) One smoke tank.

(c) One 1000-pound bomb (G.P.).

(d) Two 1000-pound armor piercing bombs.

(e) One 1600-pound armor piercing bomb.

(f) One 2000-pound bomb (with torpedo adapter).

(g) Three 120-pound cluster bombs (six 20-pound bombs per cluster).

(h) One 650-pound depth bomb.

(i) Two 325-pound depth bombs.

(j) One 2200-pound torpedo and adapter.

(2) WING BOMB RACK LOADS.—One Mark 51 Model 11 bomb rack is installed under each wing. Each rack is capable of carrying any one of the following loads:

(a) One 500-pound bomb.

(b) One smoke tank.

(c) One 325-pound depth bomb.

(d) One 650-pound depth bomb.

(e) One 120-pound cluster bomb (six 20-pound bombs per cluster).

(f) (SB2C-4 only) One gun container equipped with two .50 caliber machine guns, and 350 rounds of ammunition for each gun.

(3) ROCKETS (SB2C-4 only). — Provisions are made for carrying eight rockets, four under each wing.

(4) FIXED GUNS. — Two 20 mm. cannons are mounted in the center panel, with 200 rounds of ammunition per cannon.

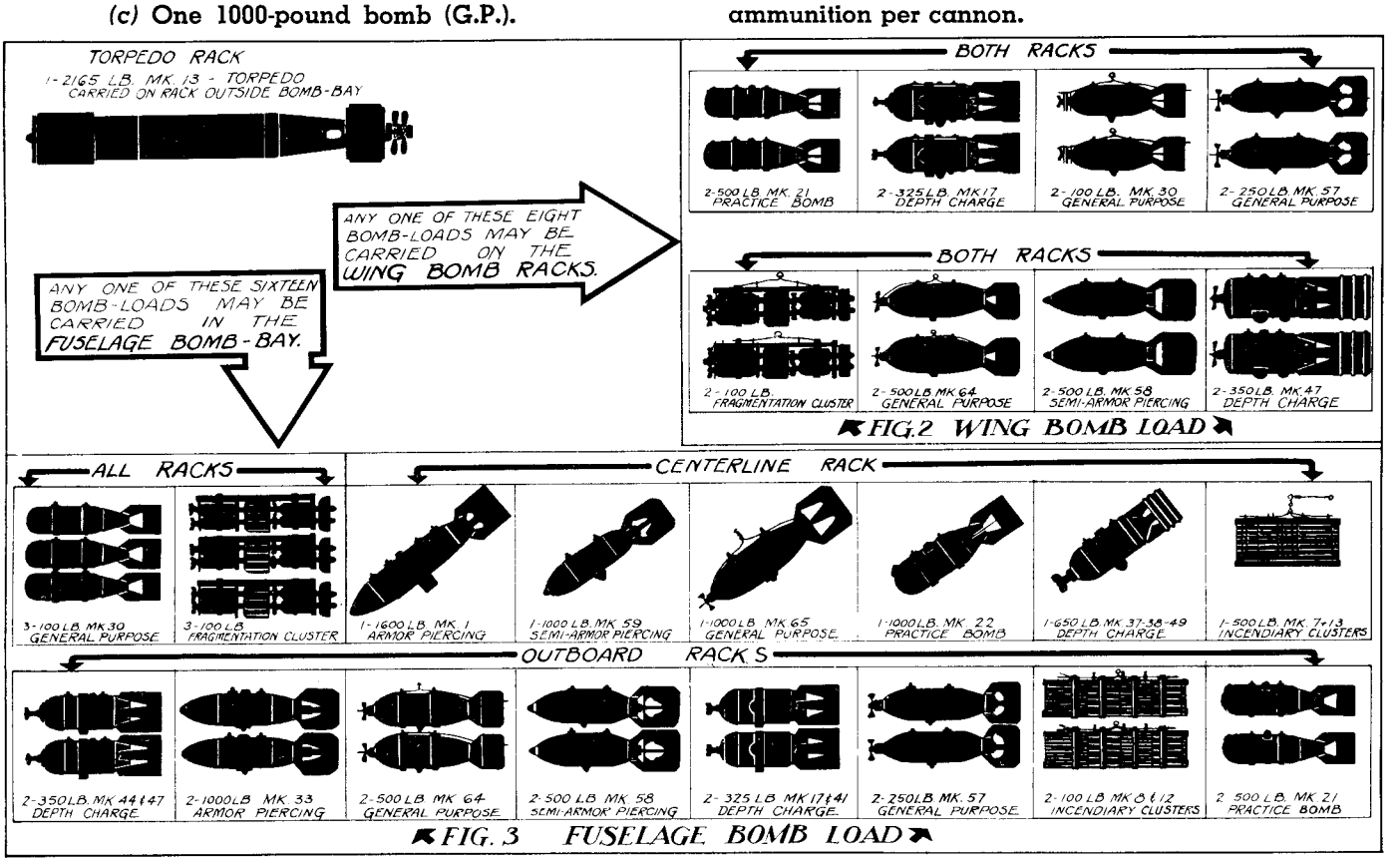


Figure 3 — Bomb Loads

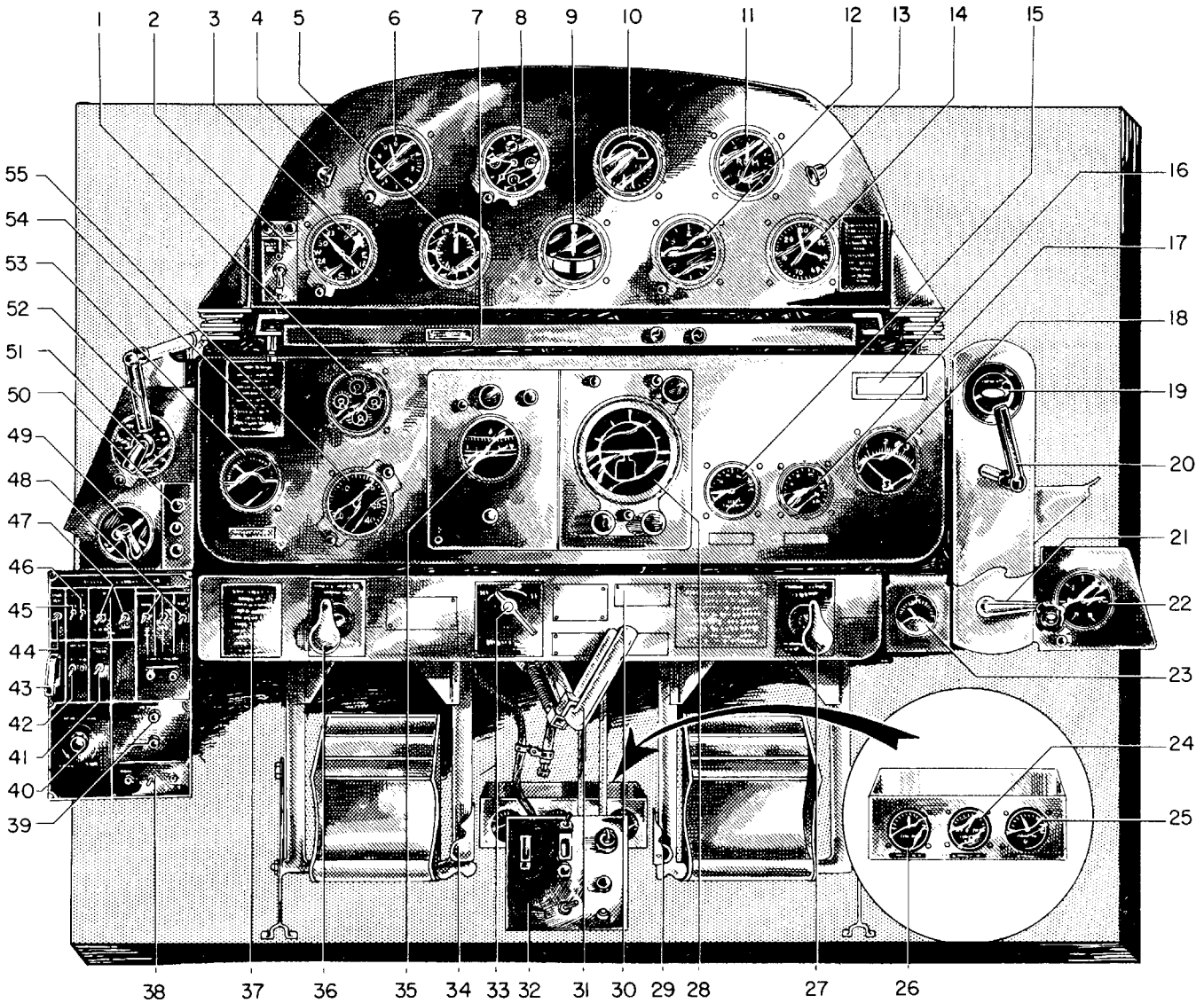


Figure 4 — Forward Cockpit, Looking Forward

1. Fuel Quantity Gage
2. Landing Gear Warning Light
3. Remote Indicating Compass
4. Instrument Board Light
5. Airspeed Indicator
6. Altimeter
7. Chart Board
8. Clock
9. Turn and Bank Indicator
10. Engine Gage Unit
11. Tachometer
12. Rate of Climb Indicator
13. Instrument Board Light
14. Manifold Pressure Gage
15. Hydraulic System Pressure Cage
16. Remote Compass Correction Card
17. Auto Pilot Oil Pressure Gage
18. Thermocouple
19. Oxygen Breather Indicator
20. Carburetor Air Filter Control
21. Cowl Flap Control
22. Accelerometor
23. Voltameter
24. Brake Accumulator Pressure Gage
25. Main Accumulator Pressure Gage
26. Hydro Pump Pressure Gage
27. Gun Charger
28. Bank and Climb Gyro
29. R. H. Rudder Pedal Lock
30. Airspeed Correction Card
31. Wing Fold Control
32. Rocket Station Distributor
33. Autopilot Control Valve
34. L. H. Rudder Pedal Lock
35. Directional Gyro
36. Gun Charger L. H. Panel
37. Take-off Check-off List
38. Gun Camera Switch
39. Breaker Switches—Camera
40. Gun Sight Rheostat
41. Fixed Guns Switch
42. Gun Sight Switch
43. Armament Master Switch
44. Bomb Bay Lights Switch
45. Left Wing Bomb Racks
46. Right Wing Bomb Racks
47. Bomb Arming Switch
48. Bomb Bay Rocks Switch
49. Ignition Switch
50. Altitude Limit Indicator
51. Altitude Limit Switch
52. Alternate Carburetor for Air Control
53. Free Air Temperature Gage
54. Landing Check-Off List
55. Altitude InIdicator

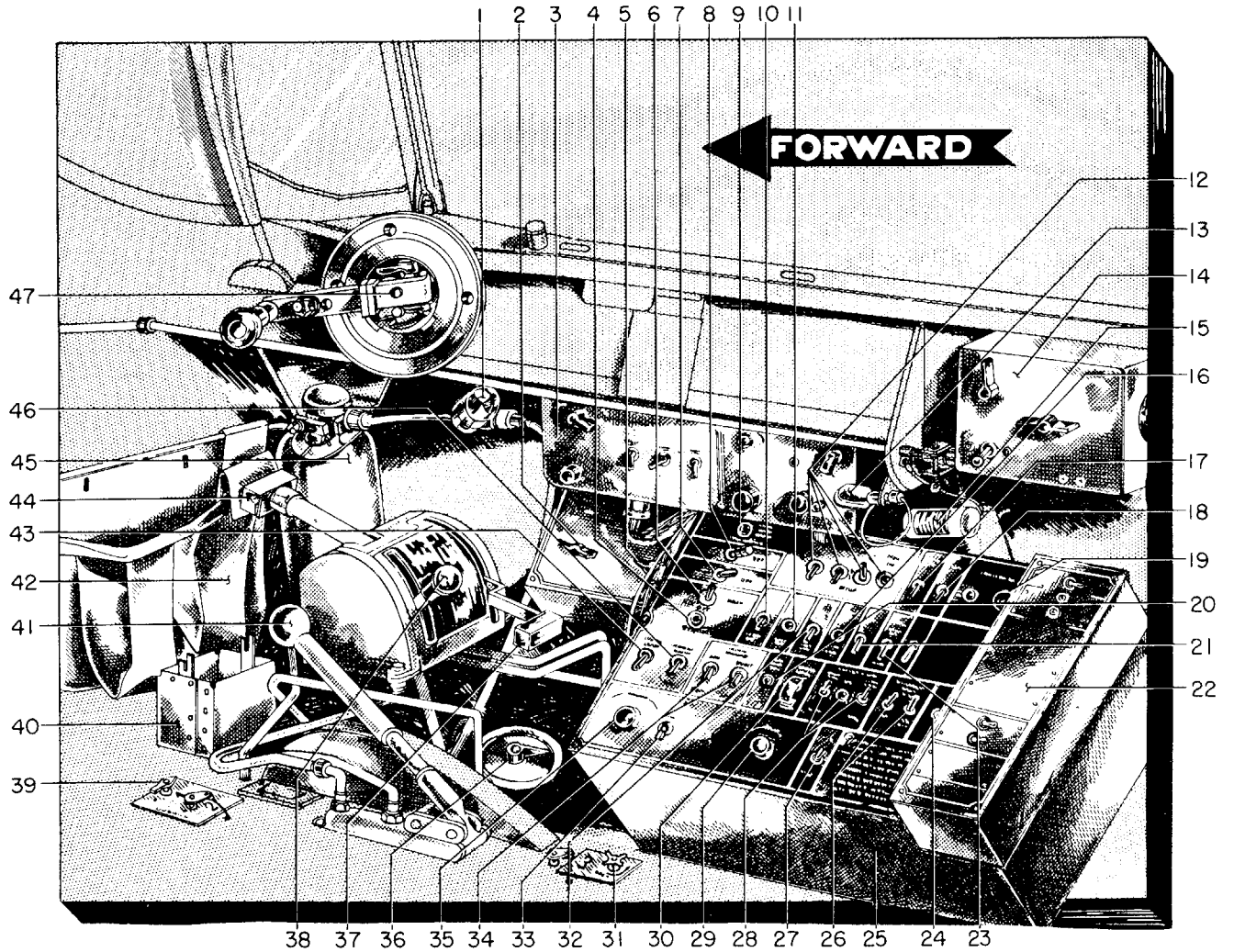


Figure 5 — Forward Cockpit, Right Side

1. Fluorescent Light—Right Side
2. Switch—Left Fluorescent Light
3. VHF-MHF Pilot's Receiver Control Box
4. Starter Breaker Switch
5. Switch—Right Fluorescent Light
6. Starter Mesh Switch
7. Primer Pump Switch
8. Auxiliary Fuel Pump Switch
9. Recognition Lights Keying Switch
10. Wing Tanks Selector Switch
11. Primer Pump Breaker Switch
12. Recognition Light's Switches
13. Switch Panel Lights
14. Pilot's ARC-1 Control Unit
15. Writing Pad
16. Fuel Gages Switch
17. Generator Switch
18. Battery Switch
19. Receptacle
20. Section Approach Light Breaker Switch
21. Master Cockpit Heater Switch
22. Rocket and Package Gun Switch Box
23. Front Cockpit Heater Switch
24. Remote Indicating Compass Switch
25. Main Switch Box
26. Formation Lights Switch
27. Pitot Heater Switch
28. Running Lights—Switch
29. Cockpit Lights—Switch
30. Oil Dilution Switch
31. Landing Gear By-Pass Valve
32. Approach Light Switch
33. Chart Board Light—Breaker Switch
34. Section Light Switch
35. Chart Board Light Switch
36. Flap Angle Indicator
37. Flap Selector
38. Flap Actuating Lever
39. Secondary Hydro Shut-Off Valve
40. Crash Pad and Gunsight Stowage Bracket
41. Hydro Hand Pump
42. Weighted Container
43. Radio Master Switch
44. Landing Gear Control
45. Oxygen Battle
46. Master Switch—Exterior Lights
47. Cabin Control Crank

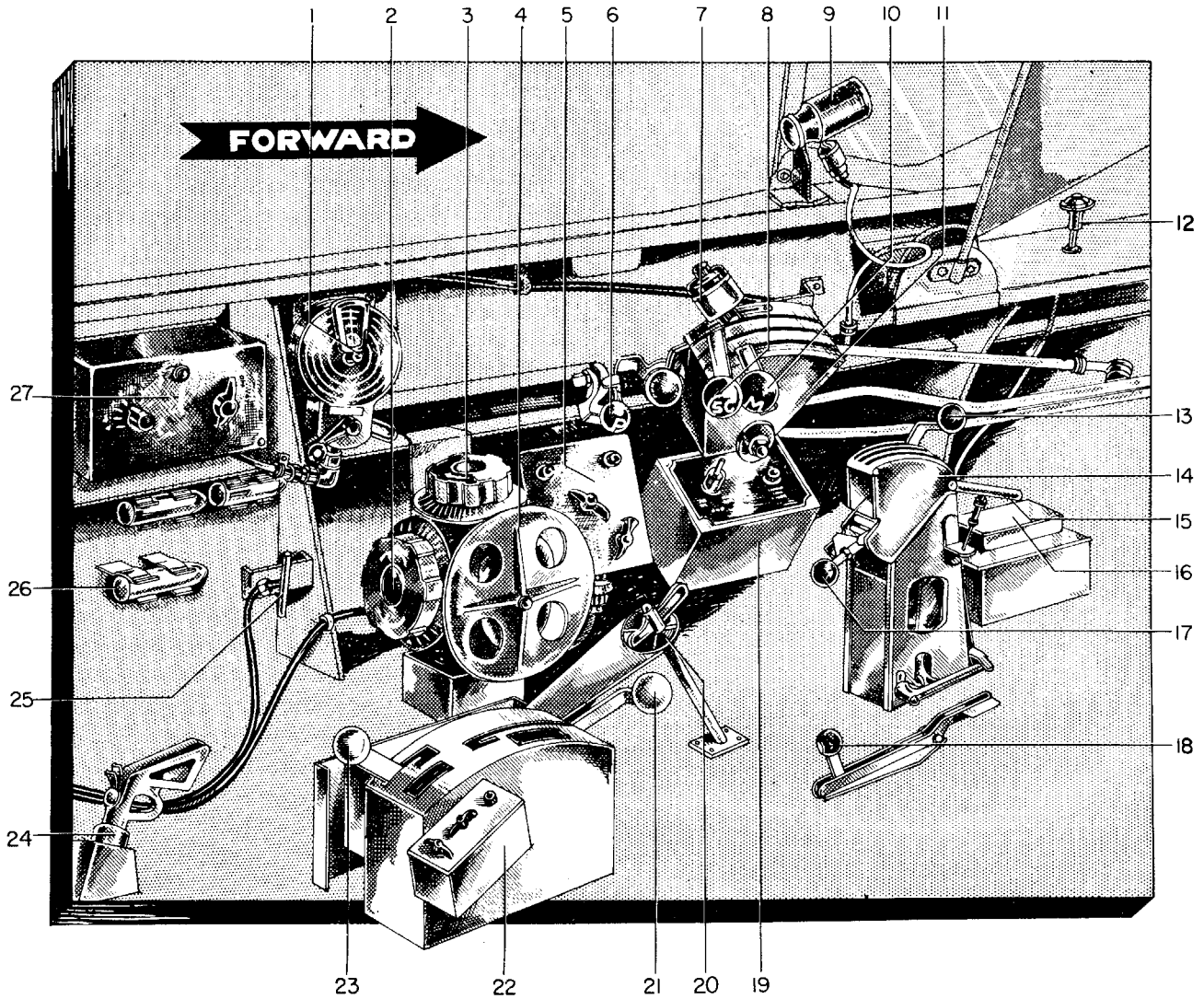


Figure 6 — Forward Cockpit, Left Side

1. ARB Pilot's Tuning Control
2. Aileron Trim Tab Control
3. Rudder Trim Tab Control
4. Elevator Trim Tab Control
5. IFF Control Box
6. Propeller Control
7. Throttle
8. Supercharger Control
9. Fluorescent Light
10. Mixture Control
11. Engine Control Quadrant
12. Ventilator Control
13. Bomb Selector Lever
14. Bomb Release Quadrant
15. Emergency Bomb Release
16. Spare Bulb Container
17. Bomb Arming Lever
18. Bomb Doors Control
19. Propeller Switch Panel
20. Fuel Selector
21. Arresting Gear Control
22. ARB Pilot's Control Box
23. Tailwheel Lock Control
24. Pyrotechnic Pistol
25. Tow-Target Release
26. Signal Cartridge
27. ATC Pilot's Control Box

(5) AFT COCKPIT FLEXIBLE GUN INSTALLATION.—Twin .30 caliber flexible machine gun mount with a total of 2000 rounds of ammunition.

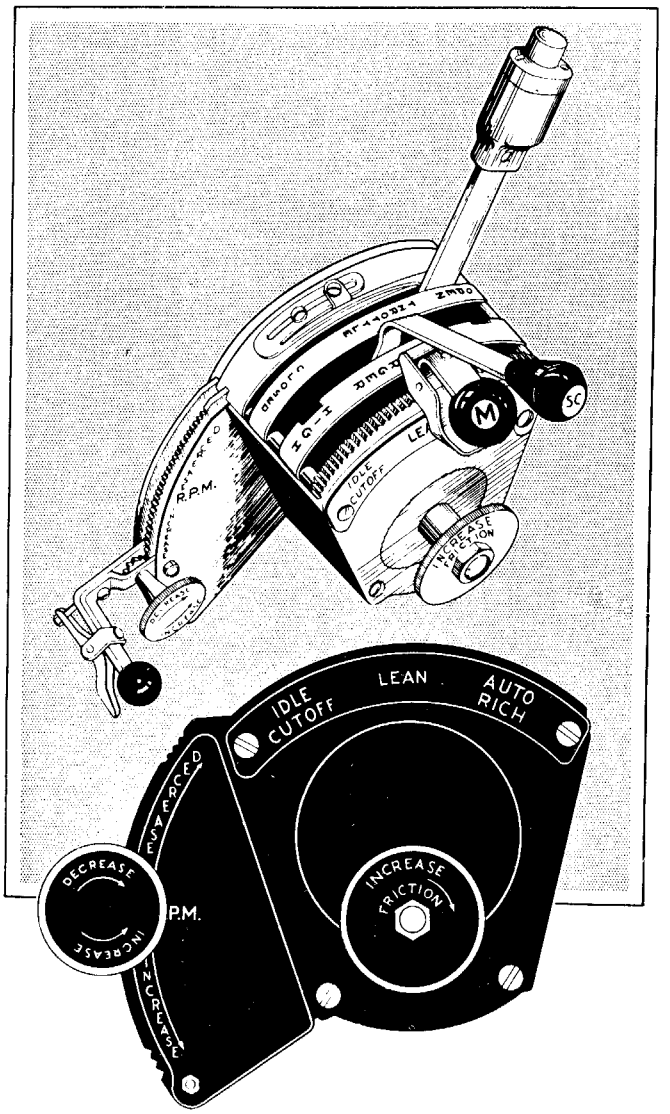


Figure 7—Engine Control Quadrant

2. POWER PLANT.

a. GENERAL.—Power is supplied by a radial, air-cooled Wright Cyclone Model R2600-20 engine having fourteen cylinders in two banks of seven cylinders each. This engine is equipped with a Stromberg Model PR-4841 injection carburetor, and a two speed, single stage supercharger. The propeller is a four bladed Curtiss Electric, having a diameter of 12 feet, 2 inches. High pitch angle propeller setting is 52.6°; low setting is 22.6°.

b. POWER PLANT CONTROLS.

(1) THROTTLE.—The throttle *(see figure 8)* is the outboard control lever on the engine controls quadrant. Its operation is conventional; to open the throttle push it forward. The quadrant is equipped with a notched spring type device so designed that a slight additional resistance to throttle movement is experienced when opened past manifold pressure (49 inches Hg. at sea level).

(2) FRICTION KNOB. — The engine controls quadrant is equipped with a friction knob for governing the amount of force required to operate the controls on the quadrant (throttle, mixture control, supercharger control, and propeller governor control). To increase friction, turn the knob clockwise; to decrease, turn counterclockwise.

(3) MIXTURE CONTROL.—The mixture control (marked "M") is the inboard lever on the engine controls quadrant and has three positions: "IDLE CUT-OFF," auto lean (marked "LEAN"), and "AUTO RICH." A "lift to release" type locking lever is installed on the control so that it cannot be accidentally moved, or vibrated out of the desired setting. Do not attempt to move the mixture control without first releasing the locking lever.

(4) SUPERCHARGER CONTROL.

(a) GENERAL. — The supercharger control (marked "SC") is the middle lever on the engine controls quadrant. It has two positions, the "LOW" blower position being fully forward, and the "HIGH," which is fully aft. The slot in which the control moves has a detent at each end. When shifting blower positions, be sure to seat the lever in the detent.

CAUTION

DO NOT USE AN INTERMEDIATE POSITION BETWEEN "LOW" AND "HIGH." THE USE OF SUCH POSITIONS WILL BURN OUT ONE OR BOTH BLOWER CLUTCHES.

(b) SHIFT PROCEDURE.

1. Except in an emergency, do not shift the supercharger control at more than five minute intervals, to allow the dissipation of heat from the clutches. The control must be locked at the extremity of its travel in either ratio to prevent clutch slippage. If practicable, at the end of each five hour period of continuous operation in one ratio, shift into the other ratio for a period of five minutes.

2. To shift from "LOW" to "HIGH" use the following procedure:

a. MIXTURE CONTROL.—"AUTO RICH" (to prevent engine cutting out).

b. EMERGENCY FUEL PUMP.—On.

c. THROTTLE.—Reduce as necessary to avoid exceeding desired manifold pressure in "HIGH."

d. Reduce rpm to 1700-1800 with propellor governor control.

e. Move supercharger control with a smooth, rapid motion from "LOW" to "HIGH" and lock.

f. Readjust rpm, throttle, mixture control, and emergency fuel pump as necessary to obtain desired power.

Note

Shifts from "LOW" to "HIGH" above 1800 rpm, but never below 1800 rpm, are permitted in emergencies only. Shifts shall not be made below 1700 rpm when shifting from "LOW" to "HIGH" in flight.

g. If a shift to "HIGH" is attempted much below 1700 rpm, and the clutch does not engage; if the engine oil pressure is lost, due to negative accelerations, or for some reason the rpm drops below 900, and the "HIGH" ratio clutch becomes disengaged, proceed as follows: Close the throttle and reduce rpm to the minimum possible; shift to "LOW" and then back to "HIGH" in the normal manner, as described above.

3. To shift from "HIGH" to "LOW":

a. Close throttle to obtain 1500 rpm or less (the lower the better).

b. Move control with a smooth, rapid motion from "HIGH" to "LOW" and lock.

c. Readjust rpm, throttle, and mixture control as necessary.

CAUTION

THIS ENGINE HAS AN OVERLAP PERIOD OF ONE SECOND OR MORE IN WHICH BOTH CLUTCHES ARE ENGAGED WHEN SHIFTING FROM "HIGH" TO "LOW." FOR THIS REASON, THE RPM MUST BE REDUCED TO 1500 OR LESS WHEN MAKING THIS SHIFT.

(5) PROPELLER CONTROLS.

(a) GENERAL.—The propeller controls consist of a toggle switch and a circuit breaker button located in the propeller switch box *(see figure 7)*, and a propeller governor control on the engine controls quadrant.

(b) TOGGLE SWITCH.—This switch has four positions: "AUTO," "INC RPM," "DEC RPM" and "MANUAL." The last three positions are used for manual operation of the propeller, i.e., operation in which the pilot controls the blade angle. When operating the propeller manually, the pilot changes the blade angle by moving the switch to "INC RPM" or "DEC RPM" and holding it there until the tachometer and manifold pressure gage indicate that the desired blade angle has been obtained. The switch, when released, snaps back to "MANUAL." As long as the switch is at "MANUAL" the blade angle remains fixed and the rpm varies with the throttle setting. However, the propeller is normally operated automatically; that is, the toggle switch is at "AUTO." With the switch in this position, the blade angle will vary so as to hold the rpm at a constant value determined by the position of the propeller governor control.

(c) PROPELLER GOVERNOR CONTROL.—This control is located on the aft end of the engine controls quadrant. It is equipped with a ratchet type lock to hold it in position, and a vernier dial for fine adjustment. The propeller governor control is used in conjunction with the toggle switch to maintain a constant rpm. With the toggle switch in "AUTO," adjust the governor control (forward to decrease rpm, and aft to increase rpm) to the position giving the desired rpm, and leave it there for as long as this rpm is desired.

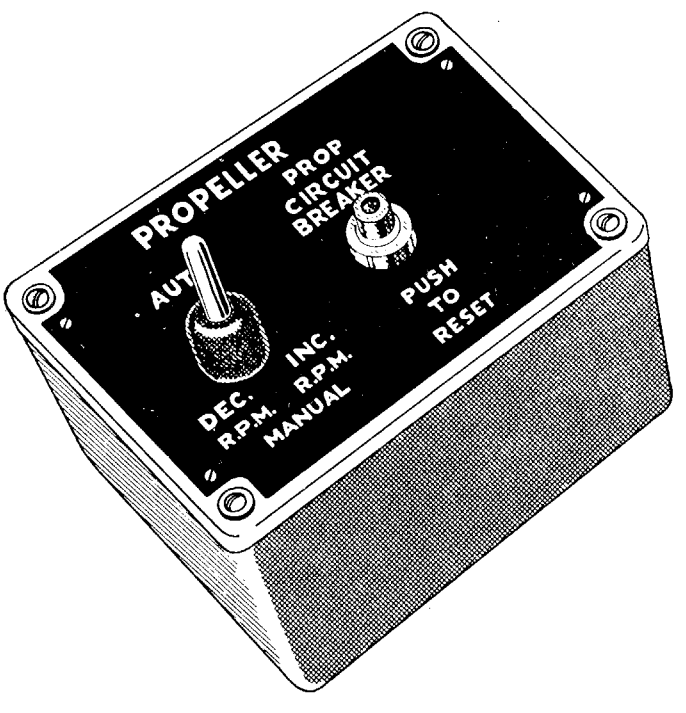


Figure 8 — Propeller Switch Panel

(d) PROPELLER CIRCUIT BREAKER BUTTON.—This button is located on the propeller switch box. It must be pushed in before the propeller toggle switch and governor control can be operative.

(6) CARBURETOR ALTERNATE AIR CONTROL.—This control, marked "ALTERNATE CARB AIR," is an "L" shaped handle located to the left of the instrument panel *(see figure 4)*. The direct air position of the control is fully forward; alternate air position fully aft. No intermediate position should ever be used. Always lock the control by rotating it one-quarter turn clockwise, so that the handle points

down. To unlock, rotate the handle one-quarter turn counterclockwise, so that the handle points inboard.

(7) CARBURETOR AIR FILTER CONTROL.—The "L" shaped handle on the right side of the instrument panel marked "CARB AIR FILTER" *(see figure 9)* controls four openings in the engine speed ring through which filtered air is drawn when necessary; that is, when operating under sandy or dusty conditions. For filtered air, pull the "CARB AIR FILTER" control handle fully aft, and lock by rotating one-quarter turn clockwise. Filtered air cannot be obtained with the carburetor air control in the alternate (pulled aft) position.

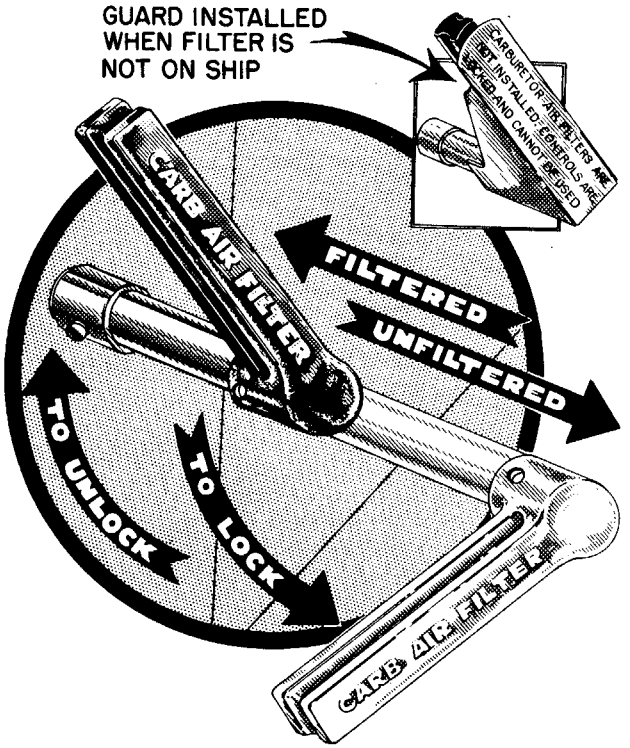


Figure 9 — Carburetor Air Filter Control

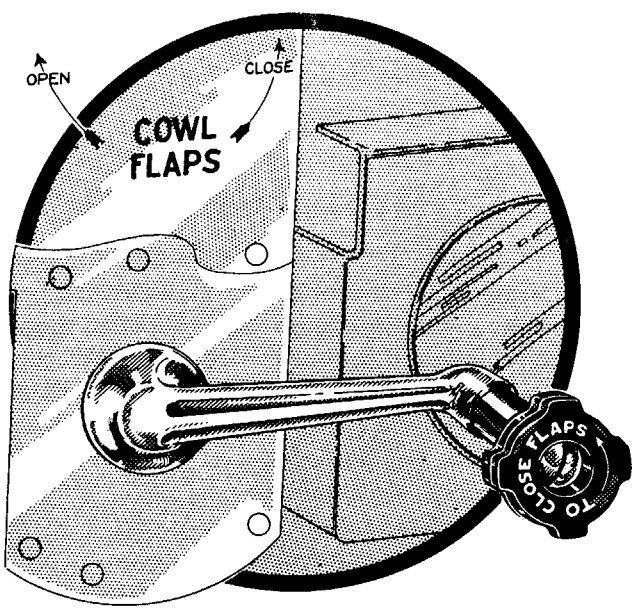


Figure 10 — Cowl Flaps Control

(8) COWL FLAPS CONTROL.—The cowl flaps are manually operated by means of a hand crank located to the right of the main instrument panel *(see figure 10)*. Rotate the crank clockwise to open the flaps, and counterclockwise to close them. The flaps can be set at any intermediate position between open and closed.

(9) IGNITION SWITCH.—See Section I, paragraph 7c(i).

(10) BATTERY SWITCH.—See Section I, paragraph 7b(1).

(11) PRIMER SWITCH.—See Section I, paragraph 7c(h).

(12) STARTER SWITCH.—See Section I, paragraph 7 c. (j).

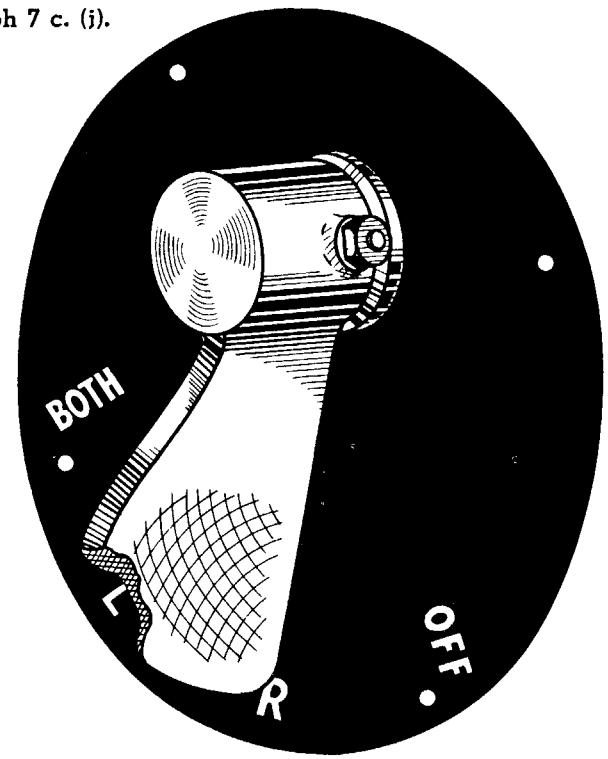


Figure 11 — Ignition Switch

3. FLIGHT CONTROLS.

a. AILERON, ELEVATOR, AND RUDDER.—These controls are conventional, operated by the usual control stick and standard underhung rudder pedals. The pedals are adjusted by means of a spring loaded plunger located on the inboard side of each pedal.

b. TRIM TABS.

(1) GENERAL.—The trim tab controls, located on the left hand side of the pilot's cockpit *(see figure 12)*, are rotated in the direction of the desired resultant motion of the airplane. Indicators adjacent

to the controls show the degree of movement of the tabs.

(2) AILERON TRIM TABS. — The aileron trim tab control wheel is rotated counterclockwise to lower the left wing, and clockwise to lower the right wing.

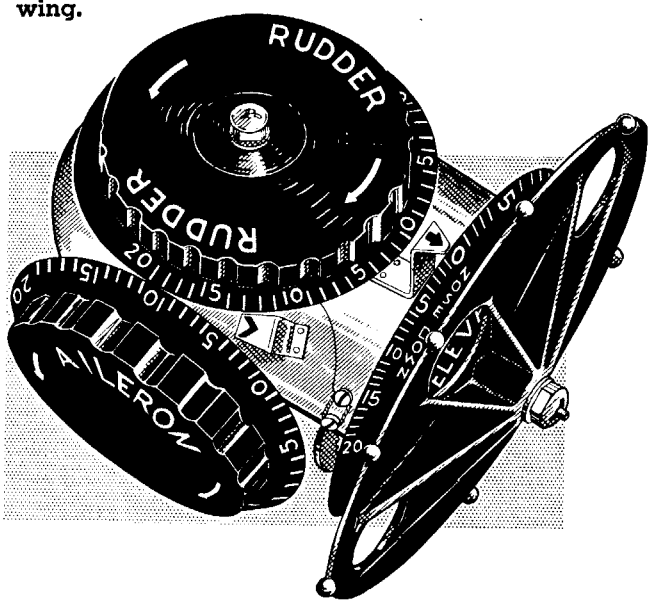


Figure 12 — Trim Tab Controls

(3) ELEVATOR TRIM TABS. — The wheel controlling elevator trim tabs is rotated forward to lower the nose, and aft to raise the nose of the airplane.

(4) RUDDER TRIM TAB.—Clockwise rotation of the rudder trim tab control turns the nose of the airplane to the right, and counterclockwise rotation turns it to the left.

c. FLAPS AND DIVE BRAKES.

(1) GENERAL.—Double split, hydraulically operated flaps are attached to the trailing edge of the wings. SB2C-3 model airplanes are equipped with solid flaps; SB2C-4 airplanes have perforated wing flaps. On both models they extend from the fuselage to the wingfold line on the center panel, and from the wingfold lines to the ailerons on the outer panels. They can be used either as landing flaps or dive brakes. In SB2C-3 landing flap operation, the upper flaps remain fixed and the lower flap moves down to a maximum angle of 60 . In dive brake operation, both upper and lower flaps extend to an angle of about 25°. On SB2C-4 model airplanes, in landing flap operation, the upper flap remains fixed and the lower flap moves down to a maximum angle of 52°; in dive brake operation, both upper and lower flaps extend to 35°. In landing flap and dive brake operation, on both SB2C-3 and SB2C-4 airplanes, the flaps can be extended to any intermediate position.

CAUTION

FLAP SELECTOR FORCES AT THE WINGFOLD ARE TRANSMITTED THROUGH BELLCRANKS WHICH DISENGAGE WHEN THE WINGS ARE FOLDED. THEREFORE, ALWAYS MAKE SURE THAT THE FLAPS ARE CLOSED BEFORE FOLDING OR SPREADING THE WINGS.

(2) WING FLAP CONTROL.—The wing flap controls are mounted on the landing gear and flap control quadrant, located on the floor right and forward of the pilot's seat *(see figure 13)*. Two controls are provided, one to select the flaps desired (landing or diving), and the other to actuate the flaps selected. A flap angle indicator *(see figure 14)* located on the floor aft of the quadrant, indicates the degree of opening (flaps extended). The flap selector lever can be set in either of two positions: "LANDING" or "DIVING"; the actuating lever can be set in any of three positions: "CLOSED," "NEUTRAL," and "EXTENDED."

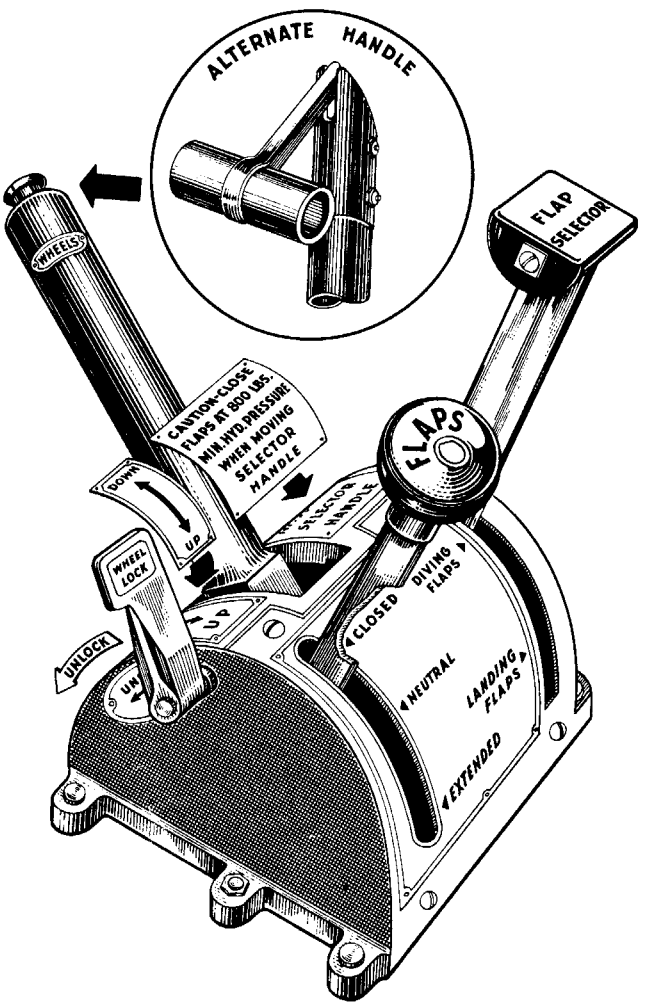


Figure 13 — Landing Gear & Flap Control Quadrant

(a) TO OPEN FLAPS.—With the selector lever at the desired setting, move the actuating lever to the "EXTENDED" position and hold it there until the flap angle indicator shows the required degree of opening, then return the actuating lever to "NEUTRAL" position.

Note

To change setting of the selector lever, the actuating lever must first be in "CLOSED" position.

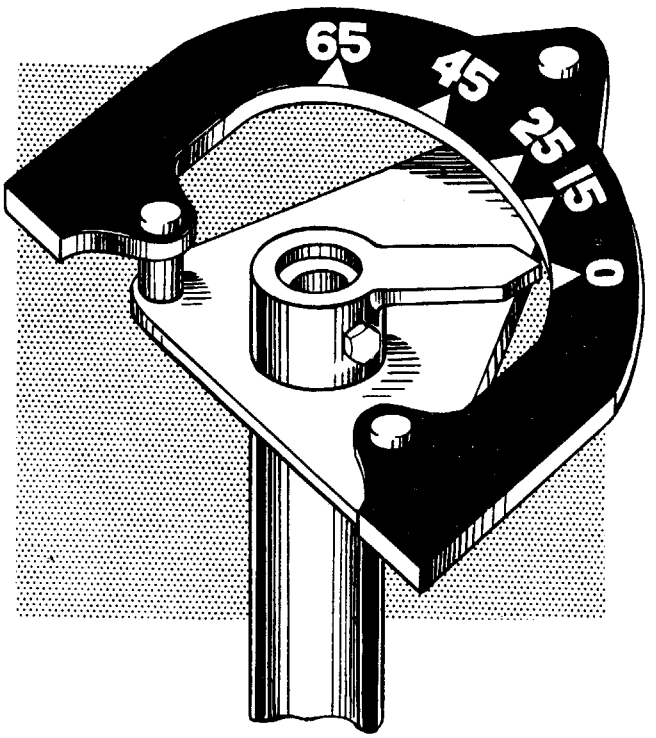


Figure 14 — Flap Angle Indicator

(b) TO CLOSE FLAPS.—Move actuating lever to "CLOSED," where it must remain until the angle indicator is at "O," then return it to "NEUTRAL."

(3) WING FLAP OPERATION WHEN USING ROCKETS (SB2C-4 only).—See Section V, paragraph 2

Note

Move selector lever fully to the desired position when making flap selections.

d. SLATS. — The airplane is equipped with two slats, one on the leading edge of each outer wing panel. The slat actuating mechanism is interconnected with the main landing gear, so that slats automatically extend when the gear is lowered, and close when it is retracted. No pilot control is provided for the slats alone.

4. FUEL SYSTEM.

(See figure 16.)

a. DESCRIPTION.—The system is basically a forced feed type, making use of an engine driven pump, and an electric auxiliary pump. In addition to the above, the SB2C-4 is also equipped with a fuel booster pump. Provisions are made in SB2C-3 and SB2C-4 aircraft for three integral self-sealing tanks and three droppable tanks.

b. FUEL SPECIFICATION. — AN-F-28, Performance Grade 100/130.

c. FUEL PRESSURE.—16 to 18 psi desired.

d. PUMPS.—The main fuel pump is engine driven, mounted on the right hand side of the engine. An electric auxiliary fuel pump is installed in the system between the fuel tank selector valve and the engine driven pump, and is located aft of the firewall, on the lower left longeron. The fuel booster pump (SB2C-4 only) is located at the exit of the fuel line from the bottom forward section of the fuselage fuel cell, and is installed for use during take-off to eliminate the possibility of vapor lock, and to assure a constant vapor free fuel flow to the carburetor to prevent engine cut-out. The auxiliary fuel pump must be on in order to use the booster pump.

Note

The booster pump is effective only when fuel is being drawn from the fuselage cell.

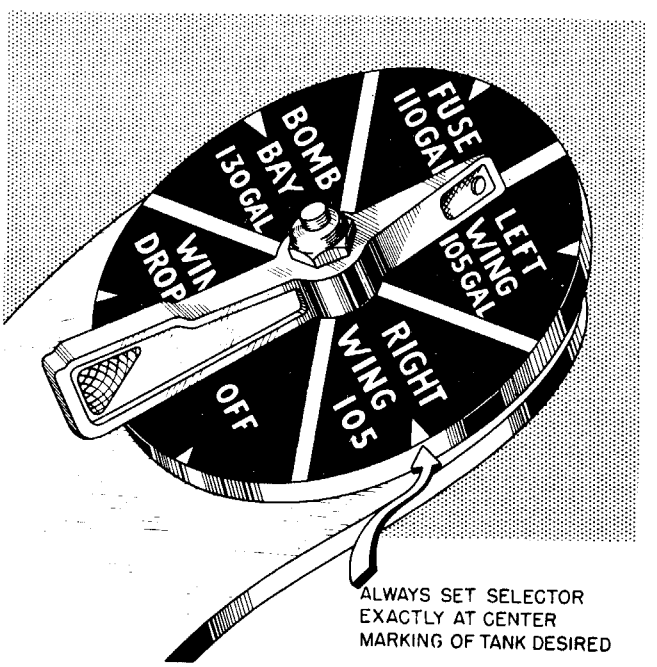
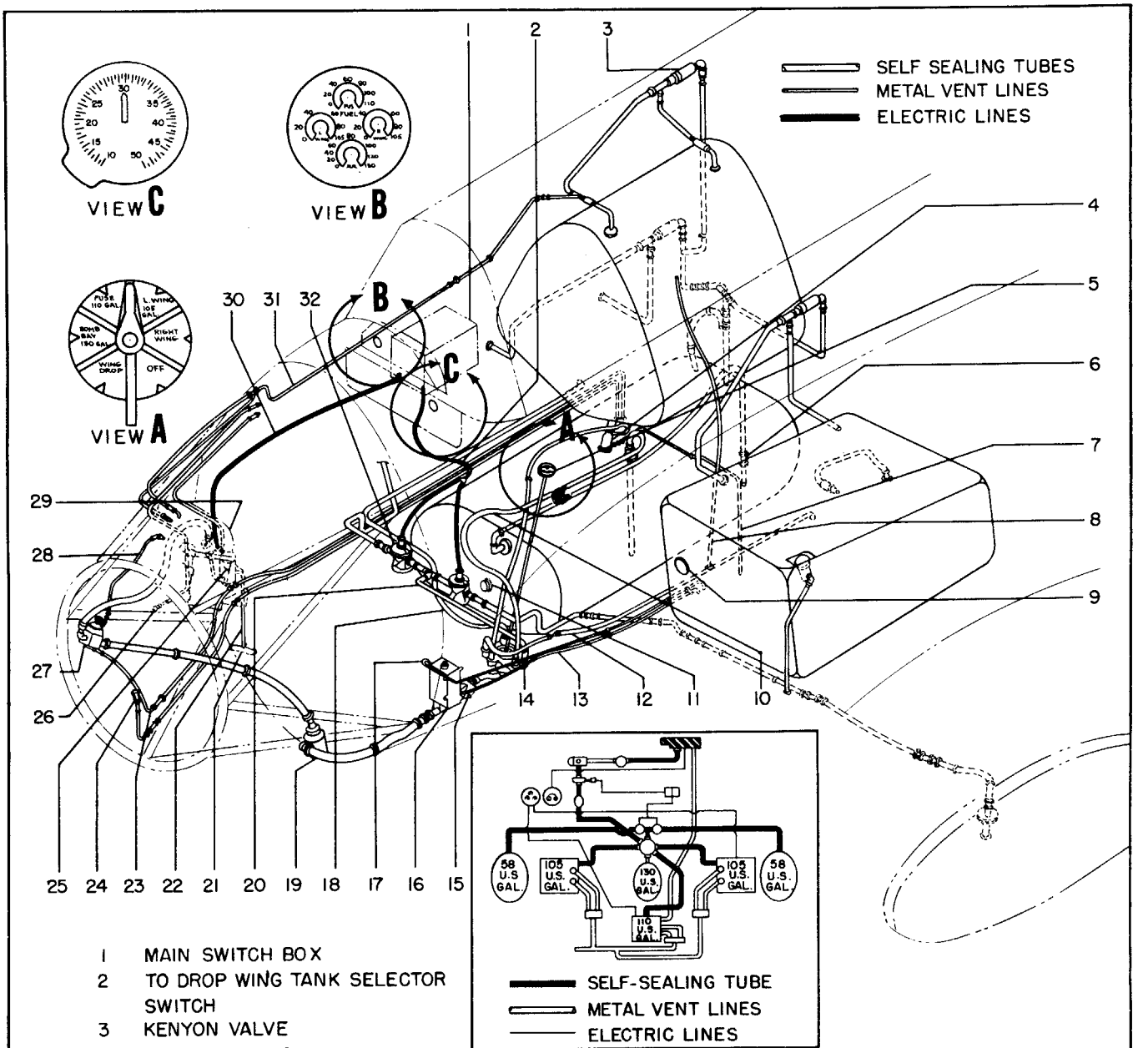


Figure 15 — Fuel Selector Control

g. FUEL SYSTEM CONTROLS.

(1) FUEL SELECTOR VALVE.—The control for the selector valve *(see figure 15)* is located on the left side of the cockpit, directly forward of the arresting gear control. Six positions are indicated on the control dial: "LEFT WING," "RIGHT WING," "FUSE," "BOMB BAY," "WING DROP," and "OFF." Be sure to feel for the "notch" in the selector valve when moving the control to a given segment.



1 MAIN SWITCH BOX
2 TO DROP WING TANK SELECTOR SWITCH
3 KENYON VALVE
4 BOOSTER PUMP
5 FUEL SELECTOR VALVE CONTROL
6 AUXILIARY TANK VENT LINE
7 BOOSTER PUMP DRAIN
8 FUSELAGE TANK OVERFLOW DRAIN
9 LIQUID LEVEL GAGE
10 FUEL INLET FROM AUXILIARY TANK
11 AUXILIARY TANK GAGE
12 FUEL INLET FROM LEFT WING TANK
13 AUXILIARY PUMP DRAIN LINE
14 SELECTOR VALVE
15 FUEL DRAIN VALVE
16 AUXILIARY FUEL PUMP
17 AUXILIARY PUMP VENT LINE
18 FUEL INLET FROM RIGHT WING TANK
19 FUEL STRAINER
20 FUEL INLET FROM L. & R. WING TANKS
21 OIL LINE (REF.)
22 OIL DILUTION LINE
23 FUEL PUMP DRAIN
24 SUPERCHARGER DRAIN
25 SOLENOID DILUTION CONTROL VALVE
26 MANIFOLD PRESSURE LINE
27 FUEL PUMP
28 VENT FROM FUEL PUMP TO CARBURETOR
29 CARBURETOR (REF.)
30 TO OIL DILUTION CONTROL SWITCH
31 VENT LINES - FUSELAGE TANKS TO CARB.
32 CHECK VALVE

Figure 16 — Fuel System Diagram

(2) SELECTION OF DROPPABLE TANKS.—An electric toggle switch on the main switch panel *(see figure 32)* operates two solenoid valves in the

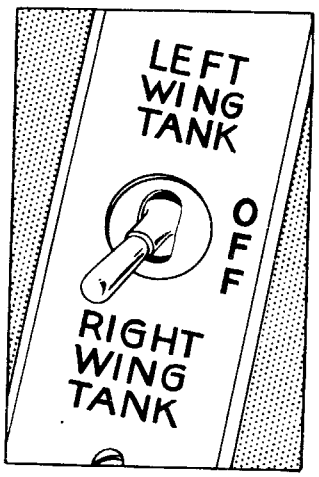


Figure 17 — Droppable Wing Tank Switch

lines from the droppable wing tanks. This switch has two positions marked "LEFT WING TANK" and "RIGHT WING TANK." For tank shifting procedure see Section II, paragraph 3a.

(3) JETTISONING CONTROLS. — The controls used for jettisoning the droppable tanks are the same as those used for releasing bombs, namely, the station selector switches on the armament switch panel and bomb release button on the control stick for electrical release; the Mk. 4 bomb release and "EMERGENCY SALVO RELEASE" for manual jettisoning. (See Section V for bomb release procedure.)

(4) DEFUELING VALVE.—A quick defueling valve is located in the fuel line between the selector valve, and the auxiliary fuel pump. When the airplane is in three point attitude the fuel tanks can be drained by attaching an external pump to this valve.

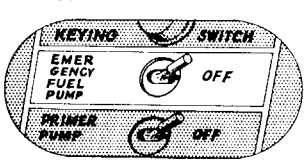


Figure 18 — Emergency Fuel Pump Switch

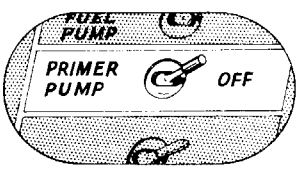


Figure 19 — Primer Pump Switch

(5) AUXILIARY FUEL PUMP CONTROL.—The auxiliary fuel pump is controlled by a switch located on the main switch panel *(see figure 18)*. For auxiliary pump operation see Section II, paragraph.

(6) FUEL BOOSTER PUMP CONTROL (SB2C-4 only).—The "ON-OFF" switch controlling the booster pump is located on the main switch panel *(see figure 32*

(7) PRIMER.—The priming unit is operated through a switch located on the main switch panel *(see figure 19)*. To operate, flip the switch on, and hold it there. When released, the switch will snap back to "OFF."

Figure 20 — Fuel Booster Pump Control Switch

(8) FUEL QUANTITY GAUGE.—The quantity gauge *(see figure 21)*, is located on the main instrument panel, and indicates the amount of fuel contained in the "FUSE," "R WING," and "L WING" protected fuel cells, and in the "AUX" bomb bay tank. Since no provision is made for indicating the

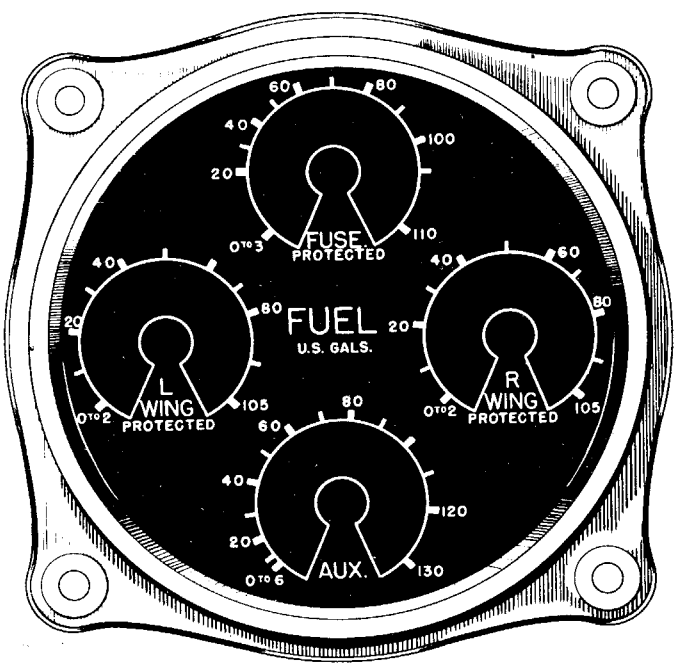


Figure 21 — Fuel Quantity Gage

quantity of fuel contained in the droppable wing tanks, consumption from these tanks must be determined from the elapsed time during which fuel is withdrawn.

(9) FUEL PRESSURE GAUGE.—The fuel pressure gauge is contained in the engine gauge unit mounted on the main instrument panel. It indicates pressure at the carburetor, and should read 16 to 18 psi, never below 16 psi, for normal operation.

e. TANKS.

(1) GENERAL.—The tanks consist of two self-sealing integral wing tanks, one self-sealing integral fuselage tank. Two droppable wing tanks, and a droppable bomb bay tank may also be carried.

(2) TANK CAPACITIES.

FUSELAGE TANK	110 U. S. (92 Imp.) gals.
WING TANK, INTEGRAL, Left	105 U. S. (87 Imp.) gals.
WING TANK, INTEGRAL, Right	105 U. S. (87 Imp.) gals.
DROPPABLE, Left Wing	58 U. S. (48 Imp.) gals.
DROPPABLE, Right Wing	58 U. S. (48 Imp.) gals.
DROPPABLE, Bomb Bay	130 U. S. (108 Imp.) gals.
TOTAL MAX. FUEL CAPACITY	566 U. S. (470 Imp.) gals.

f. VAPOR RETURN.—The vapor lines to the fuselage tank will normally return 3 to 5 gallons per hour. Therefore, when operating with all tanks full, use about 10 gallons of fuel from the fuselage tank before selecting one of the other tanks. This is necessary to provide room for the returned fuel which otherwise would overflow into the vent line.

5. OIL SYSTEM.

(a) GENERAL.

(1) OIL SPECIFICATION.—AN-VV-O-446.

(2) GRADE OF OIL.—This varies with temperature, as shown in the following table:

Desired Operating Zone	Grade of Oil	Emerg. Take-Off Only Minimum	Normal Take-Off Minimum
54°C.-95°C. (129°F.-203°F.)	1100	15°C.-(59°F.)	25°C.(77°F.)
60°C.-102°C.(140°F.-216°F.)	1200	20°C.-(68°F.)	30°C.(88°F.)

Before take-off, the "NORMAL TAKE-OFF" oil-in temperature specified above shall be obtained.

(3) TANK CAPACITY.—Service capacity of the oil tank is 25 U. S. (21 Imp.) gallons.

(4) OIL COOLER.—Mounted on the bottom portion of the engine mount ring.

(5) CYCLE OF OIL.

a. COLD OIL CYCLE.—When the oil is cold (temperature less than 21.1°C. or 70°F), it flows as follows: from the tank into the engine, through an engine driven pump and two scavenger pumps, then into the oil temperature control valve which passes it back to the bottom of the tank.

b. WARM OIL CYCLE.—Warm oil (temperature greater than 21.1°C. or 70°F.), flows from the tank through the engine and pumps into the oil temperature control valve, which passes it through the oil cooler into the top of the tank.

(6) OIL SYSTEM OPERATING PRESSURES.

(a) NORMAL.—80 to 95 psi.

(b) MAXIMUM.—90 psi.

(c) IDLING.—25 psi.

b. OIL SYSTEM CONTROLS.

(1) OIL COOLER FLAPS CONTROL.—The oil cooler flaps, located in the bottom section of the engine cowl, are interconnected with the cowl flaps, and operate simultaneously. For engine cowl flaps operation see Section I, paragraph 2 (a8).

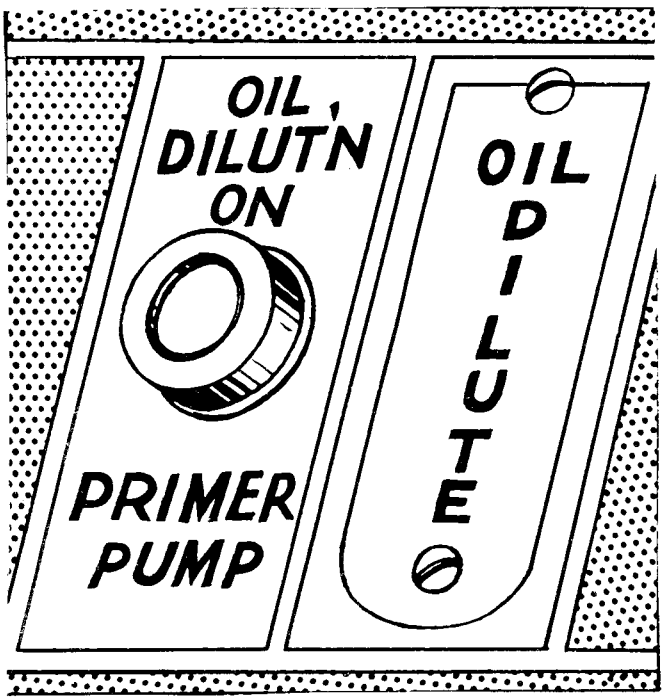


Figure 22 — Oil Dilution Switch

(2) OIL TEMPERATURE GAUGE.—Contained in the engine gauge unit, located on the main instrument panel.

6. HYDRAULIC SYSTEM.

a. GENERAL.

(1) The hydraulic system can be divided into three systems: power, main, and secondary.

(2) In the power system the engine driven pump forces hydraulic fluid from the reservoir to the unloading valve, which maintains an operating pressure of 850 to 1050 psi. The system accumulator prevents this pressure from dropping when the pump is stopped or unloaded.

(3) The main system includes brakes, wing flaps, and landing gear. A second accumulator is used to maintain brake hydraulic pressure.

(4) The secondary system includes the automatic pilot, displacing gear, gun chargers, bomb doors, and wingfold, of which all except the automatic pilot operate on the 850 psi pressure. The auto pilot operates on pressure of 155 plus or minus 20 psi. Hydro fluid before entering the auto pilot is lowered to this pressure by a reducer.

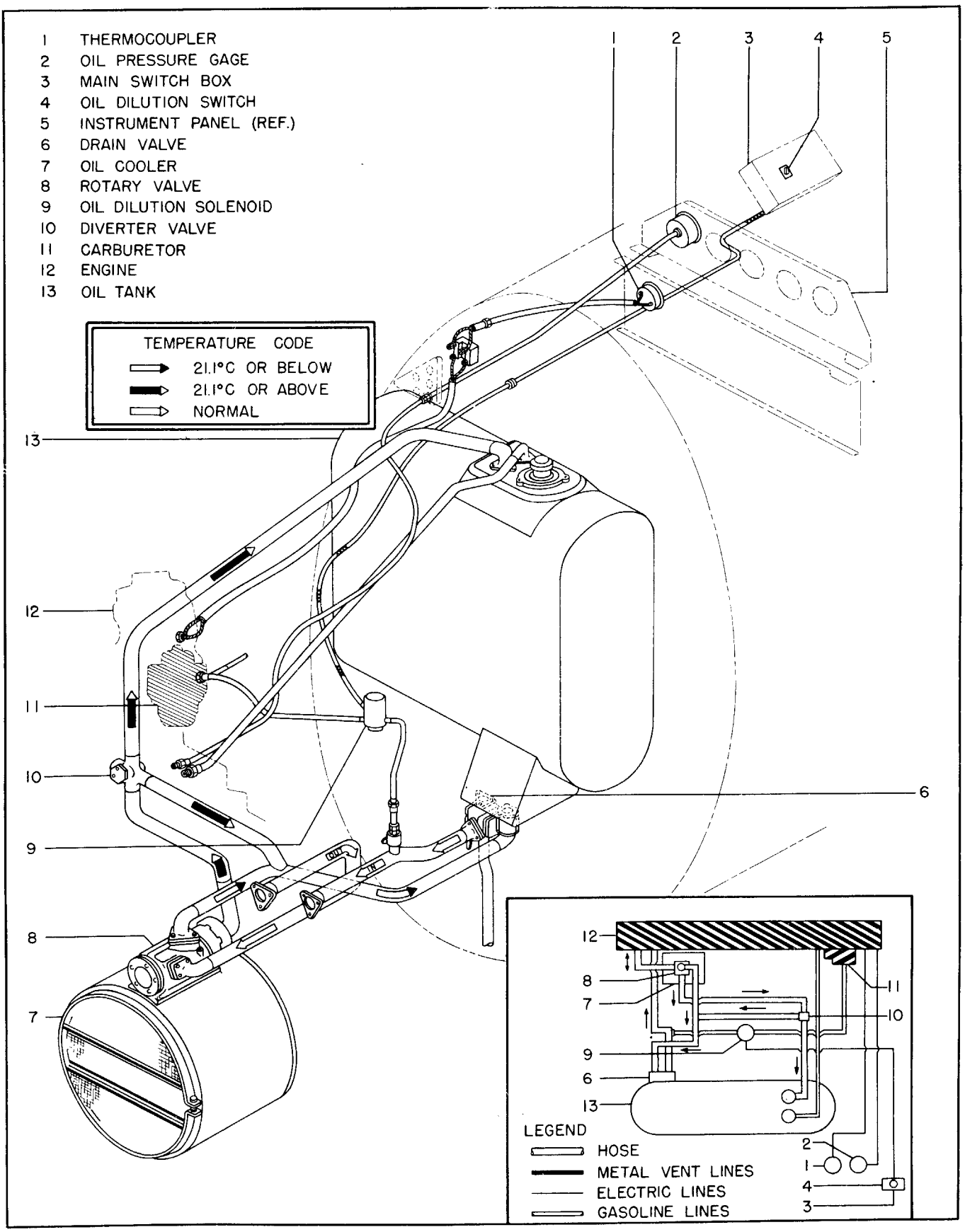


Figure 23 — Oil System Diagram

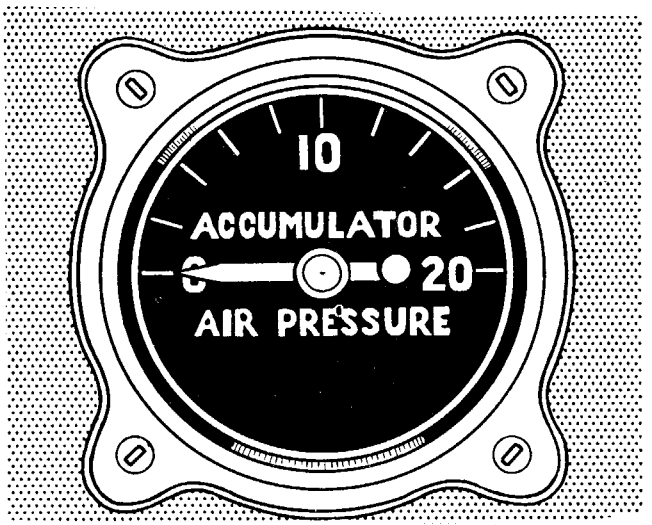


Figure 24 — Accumulator Air Pressure Gage

b. HYDRAULIC CONTROLS.

(1) CONTROL VALVES.—There are two system control valves installed for emergency use, to allow is located on the floor, to the right of the pilot's seat releasing of all system pressure.

(a) No. 1 VALVE.—This quick shut-off valve is located on the floor, to the right of the pilot's seat *(see figure 5)*. It serves to shut off the secondary system from the main and power systems in case of damage to the secondary system. This valve must be open for normal operation of the hydraulic system.

(b) No. 3 VALVE.—This valve, also located on the floor to the right of the pilot's seat, serves to release all the hydraulic pressure in the system *(see figure 25)*. Turn the valve counterclockwise to open

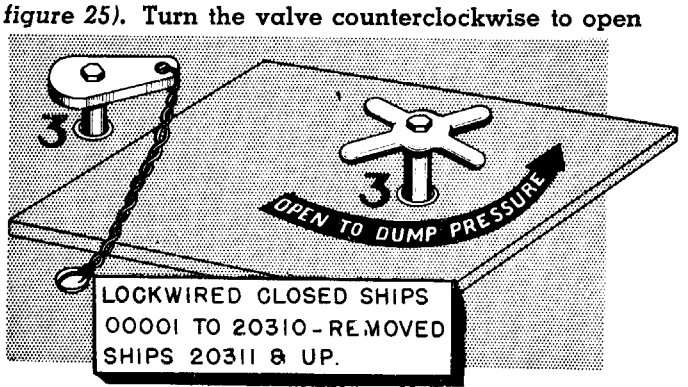


Figure 25 — No. 3 Dump Valve

it. The No. 3 valve should be closed at all times except in emergencies, as outlined in Section IV.

(2) HYDRAULIC HAND PUMP—PILOT'S COCKPIT.—The hand pump is located directly right of the pilot's seat *(see figure 5)*. It is used to supply pressure to the system when the engine driven pump is not operating.

(3) HYDRAULIC HAND PUMP — GUNNER'S COCKPIT.—This pump is located on the left hand side of the gunner's cockpit, and is employed to raise or lower the turtleback. It is used in connection with a control valve and a lever *(see figure 47* Pull the lever forward to collapse turtleback, aft to raise it. Continuous operation of the hand pump is necessary to assure a constant supply of pressure to the turtleback actuating strut.

The valve is provided to allow the gunner to collapse the turtleback in an emergency, without

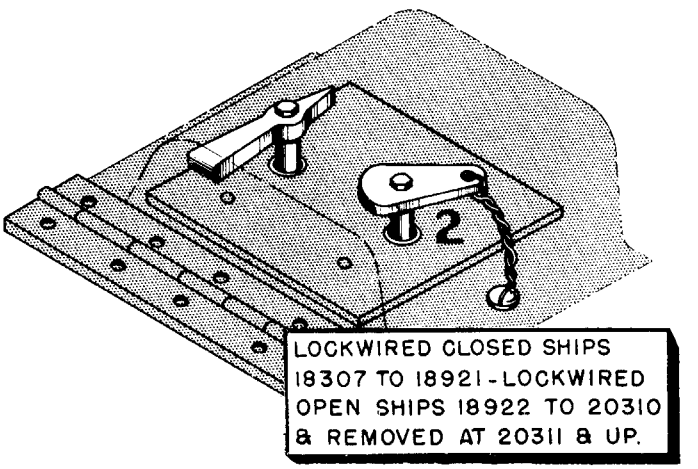


Figure 26 — No. 2 Shut-Off Valve

operating the hand pump. During normal operation this valve is closed; open it only when rapid collapsing of the turtleback is desired.

c. GAUGES.

(1) HYDRAULIC SYSTEM PRESSURE GAUGE.—This gauge is located on the right hand side of the lower instrument panel and indicates pressure in the entire system, normally 850 to 1050 psi *(see figure 4)*.

(2) ENGINE DRIVEN PUMP PRESSURE GAUGE.—This is the left hand gauge on the panel between the rudder pedals *(see figure 27)*. It registers only

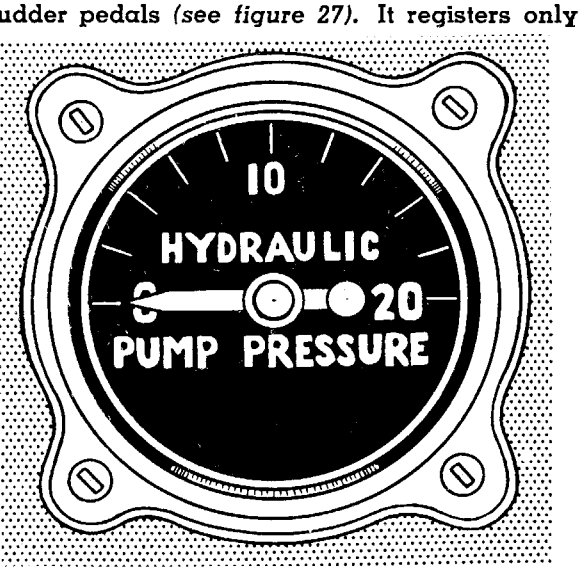


Figure 27 — Hydraulic Pump Pressure Gage

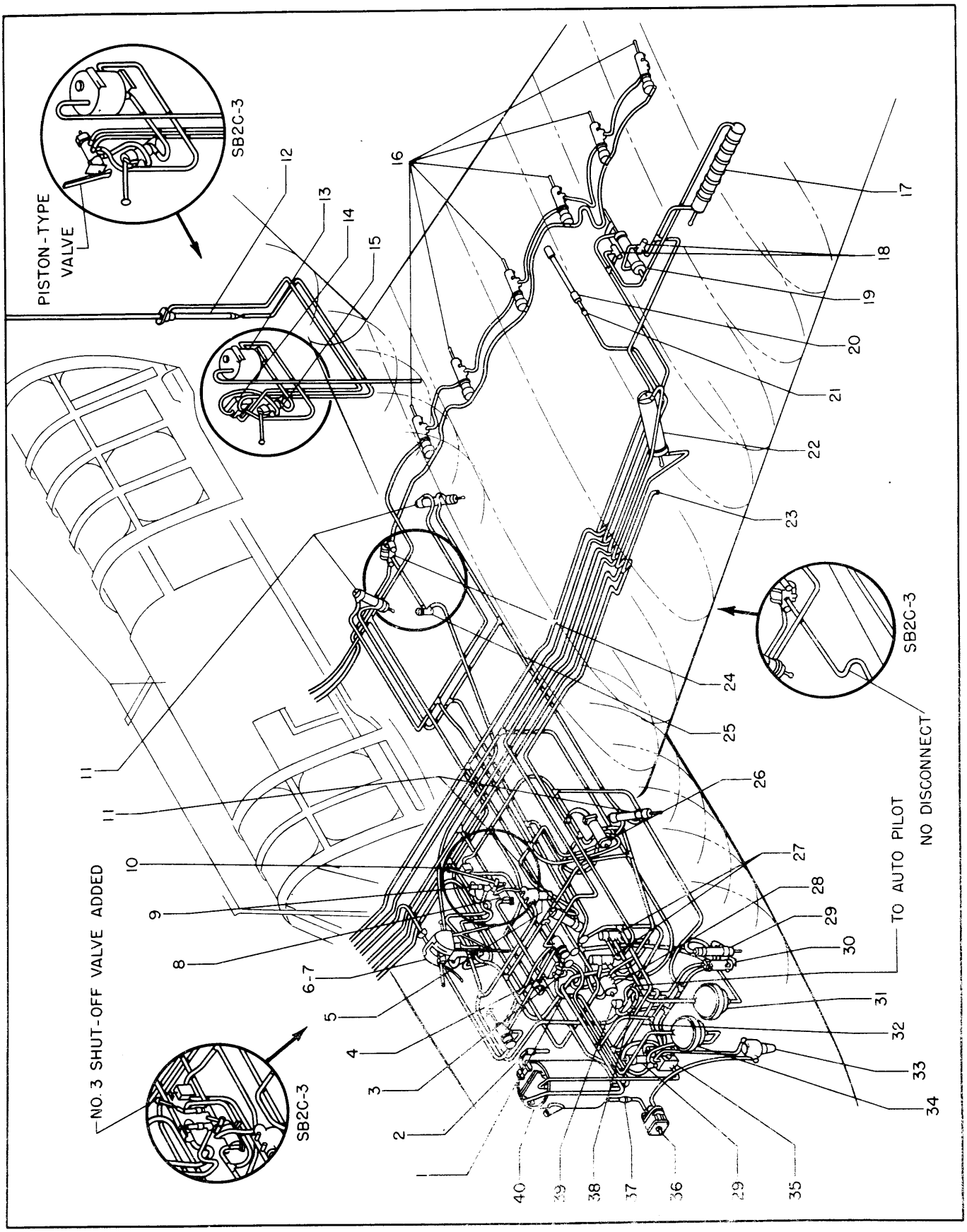


Figure 28 — Hydraulic System Diagram

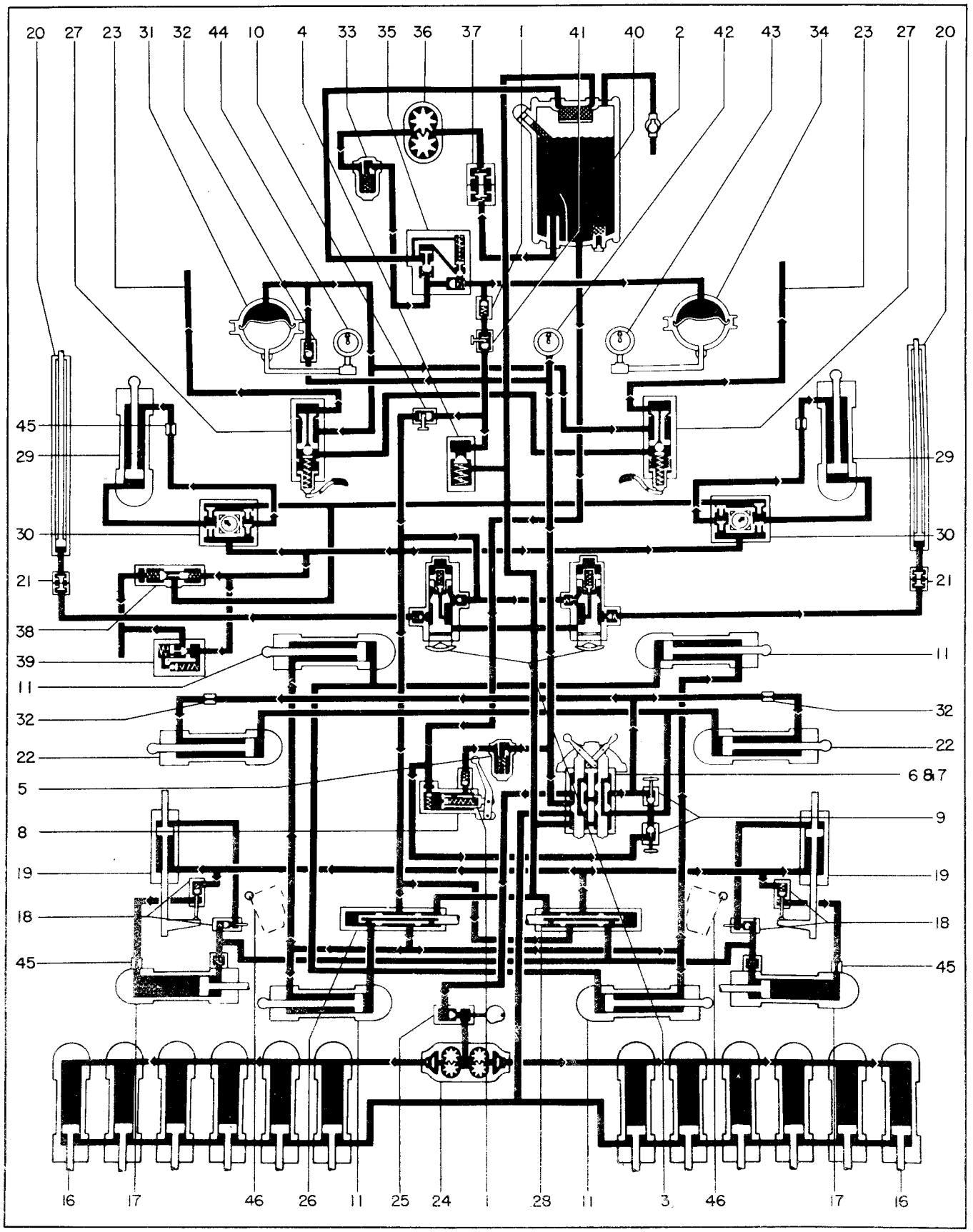


Figure 29 — Hydraulic System Schematic

Parts List for Figure 29

1 Check Valve
2 Vent Filter
3 Gun Charger Valves
4 Relief Valve
5 Filter
6 Landing Gear & Flap Control Valve
7 Landing Gear & Flap Control Valve
8 Emergency Hand Pump
9 No. 3 Shut-Off Valve
10 No. 1 Shut-Off Valve
11 Bomb Door Strut
12 Turtleback Strut
13 Reservoir (Turtleback)
14 Turtleback Control Valve
15 Hand Pump (Turtleback)
16 Wing Flap Operating Struts
17 Wing Fold Strut
18 Sequence Valve—Outboard
19 Pin Pull Strut
20 Gun Charging Cylinder
21 Disconnect
22 Landing Gear Strut
23 Landing Gear Brake
24 Flow Equalizer
25 Sequence Valve
26 Bomb Door Control Valve
27 Brake Control Valve
28 Wing Fold Control Valve
29 Displacing Gear Strut
30 Displacing Gear Valve
31 Brake System Accumulator
32 Two Way Restrictor
33 Filter
34 System Accumulator
35 Unloading Valve
36 Engine Driven Pump
37 Disconnect
38 Pressure Reducer
39 Pressure Regulator
40 Reservoir
41 No. 2 Shut-Off Valve
42 System Pressure Gage
43 Accumulator Air Pressure Gage
44 Brake System Air Pressure Gage
45 Two Way Restrictor
46 Wing Outer Panel

when the unloading valve permits a flow of hydraulic fluid to the primary system.

(3) BRAKE ACCUMULATOR PRESSURE GAUGE.—The center gauge on the panel between the rudder pedals. It indicates the reserve pressure stored on the air side of the brake pressure accumulator.

(4) SYSTEM ACCUMULATOR PRESSURE GAUGE.—This is the right hand gauge on the panel between the rudder pedals *(see figure 24)*. It indicates the reserve pressure stored in the air side of the main system pressure accumulator.

d. EMERGENCY HYDRAULIC OPERATION.—Refer to Section IV, paragraph 3

7. ELECTRICAL SYSTEM.

a. GENERAL.—The electrical system for both the SB2C-3 and SB2C-4 airplanes is the shielded wire type. Aside from some of the radio circuits, the system employs single conductor circuits which use the frame of the airplane as the ground return. Current is supplied by two 12-volt batteries connected in series, and a 27.7 volt generator.

Power for radio circuits is provided by a dynamotor and a motor alternator. The following are operated by the electrical system: radio, lights, starter, propeller, auxiliary fuel pump, fuel booster pump, pitot heater, armament equipment, drop wing tanks control, indicating and warning lights.

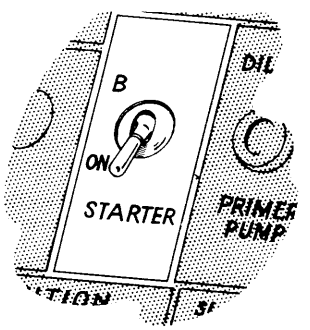


Figure 30 — Starter Switch

b. ESSENTIAL CONTROLS.

(1) BATTERY SWITCH. — The battery switch *(see figure 32)* is located on the main switch box. "OFF" position only is indicated.

(2) GENERATOR FIELD SWITCH.—Located on the main switch box *(see figure 32)*. Flip the switch up to turn on; moving it down to "OFF" position isolates the generator from the rest of the electrical system. The generator switch should be on at all times.

(3) VOLTAMMETER.—The voltammeter, located on the main switch box, is the "push-for-volts" type, with the voltage side connected to the bus *(see figure 32)*. This indicator reads battery voltage when the engine is not running and the battery switch is turned "ON." With the engine operating at from 1200 to 1400 rpm, generator voltage is indicated when the generator cuts in, the current reading being the current output of the generator. The normal reading should be between 27.0 and 28.5 volts when the engine is turning approximately 1400 rpm. A quick check should be made prior to take-off to note that

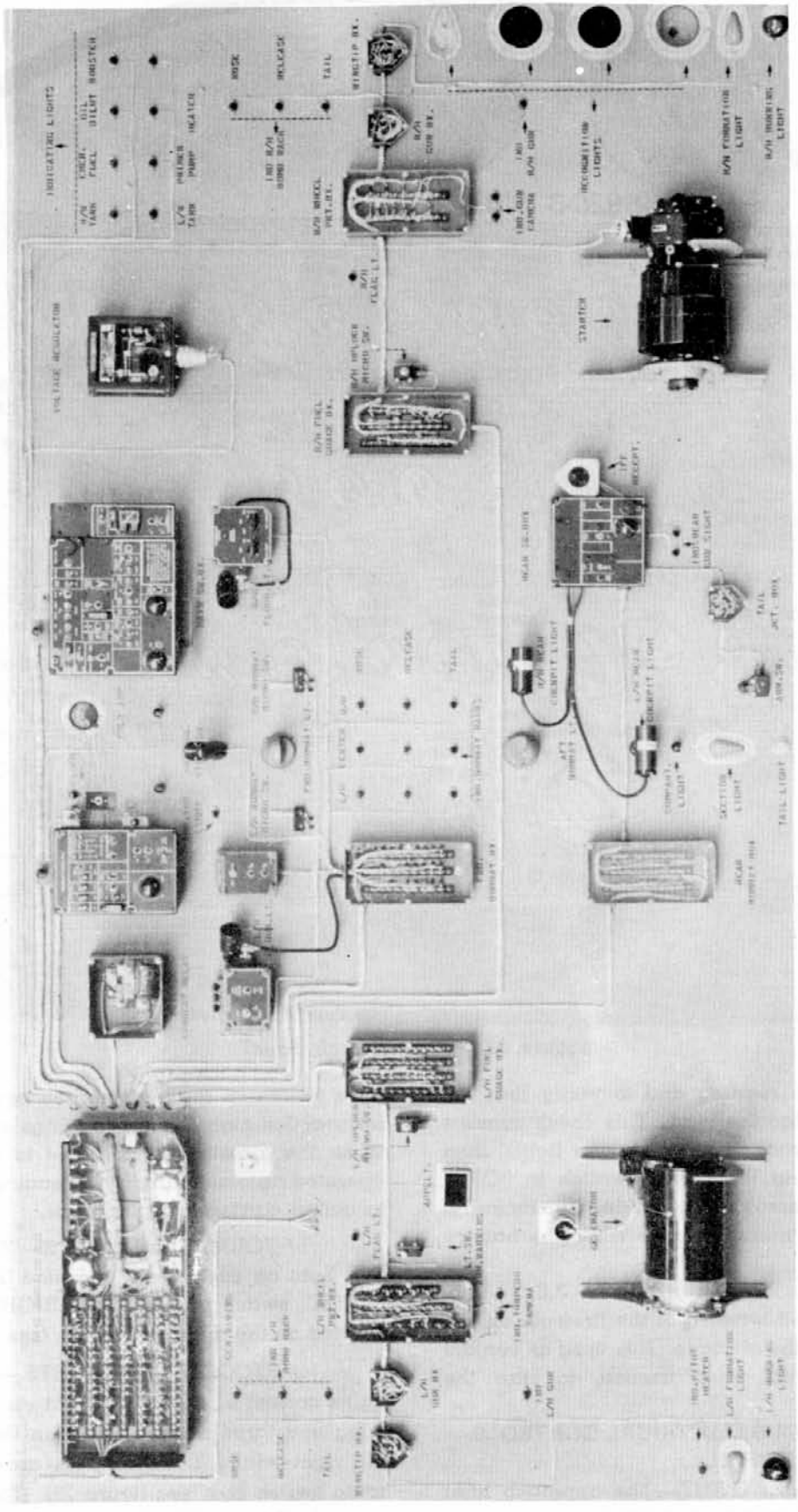


Figure 31 — Electrical System Diagram

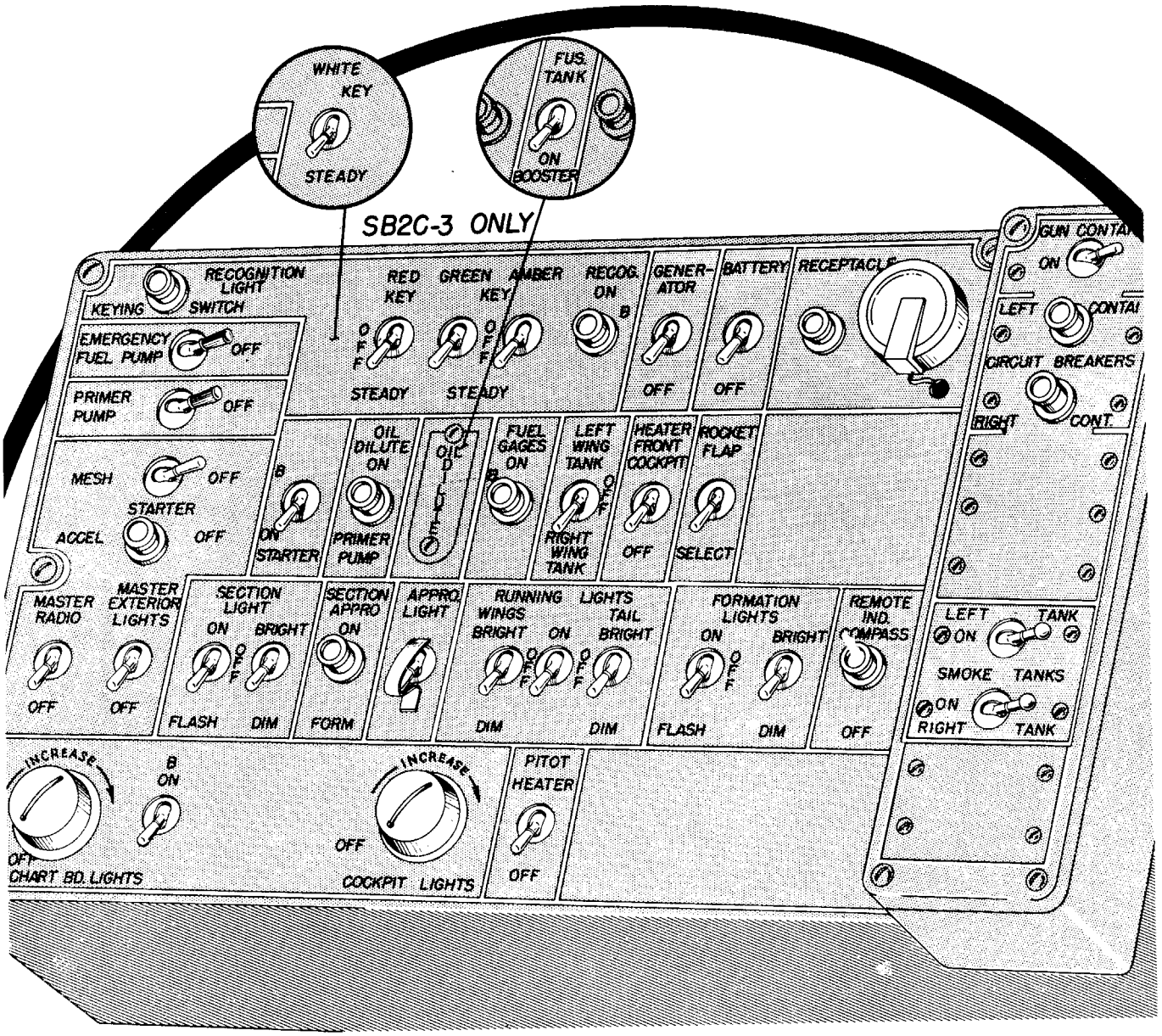


Figure 32 — Main Switch Panel

the voltammeter is reading and to verify that the generator is carrying the load. This check consists of turning on the cockpit or instrument lights, then momentarily placing the battery switch in "OFF" position. If the generator is operating saisfactorily, the lights will continue to operate while the battery switch is "OFF."

(4) EXTERNAL POWER RECEPTACLE. — This receptacle is located forward of the firewall, on the right hand side of the airplane. It is used as contact for auxiliary power, when needed, to start the engine.

c. MISCELLANEOUS ELECTRICAL CONTROLS.—

(1) EXTERIOR LIGHTS.

(a) APPROACH LIGHT.—The approach light is in the leading edge of the left wing. It is operated by a switch on the main switch box *(see figure 32)* for practice night carrier landings executed ashore, when the arresting hook is not to be extended; or operated automatically by extending the hook prior to actual carrier night landings.

(b) FORMATION LIGHTS.—There is a formation light on each wing, operated by an "ON-OFF-FLASH" switch and a "DIM-BRIGHT" switch, both located on the main switch box *(see figure 32).*

(c) RECOGNITION LIGHTS.—The recognition lights consist of one white light on top of the right wing and three colored lights on the under side of the right wing. Their controls are located on the main switch box *(see figure 32).* To flick the lights on and off intermittently, move the control switches

(d) RUNNING LIGHTS.—There is a running light on each wing tip and one on the tail of the airplane. Control is by two "BRIGHT-DIM-OFF" *figure 33)* is on the armament switch box.

(e) SECTION LIGHT.—The section light is located on top of the fuselage, aft of the gunner's enclosure. This light is controlled by two switches *(see figure 32)*, one the "BRIGHT-DIM" type and the other, which also controls the formation lights, the "ON-OFF-FLASH" type. To flash the lights, turn the switch to "FLASH" position and release it.

(2) INTERIOR LIGHTS.

(a) INSTRUMENT LIGHTS.—Two fluorescent lights, one directed to each side of the instrument panel, are controlled by a rheostat on the rheostat box *(see figure 32)*. The intensity of the light is controlled by the rheostat, and the lens in the light hoods can be adjusted to emit visible light when turned counterclockwise to the stops and ultra-violet when rotated 90° clockwise, making the instruments visible but leaving the cockpit in darkness.

(b) Four hooded lamps are provided for general cockpit illumination, controlled by a rheostat on the rheostat box.

(c) BOMB BAY LIGHTS.—Two lights, one in the fore, and one in the aft section of the bomb bay, are provided to enable the pilot to ascertain visually that loads carried in the bay have been armed and/or released. The switch controlling these lights *(see figure 32)* is on the armament switch box.

(d) CIRCUIT BREAKERS. — Circuit breakers are included in the various switch boxes. All are of the conventional "push to reset" type and show a luminous ring when not in the normal "in" position. Before take-off, all breakers should be visually inspected to assure they are set.

(e) RECEPTACLE. — A receptacle *(see figure 33)* is included in the main switch box. No "on-off" switch is provided, it being intended that the plug be disconnected when it is desired to turn off the equipment.

(f) ARMAMENT SWITCHES.—All armament electrical controls are located in the armament switch box. *(See figure 33.)*

(g) RADIO.—Switches and control boxes for the pilot's equipment are located as shown in figure 32. (For radio operation see Section V, paragraph 3.)

(h) PRIMER SWITCH.—Located on the main switch box, has two positions "PRIMER" and "OFF" *(see figure 32)*. To prime the engine, hold the switch at "PRIMER"; when released it will return to "OFF."

(i) IGNITION SWITCH.—This switch is located to the left of the instrument panel *(see figure 11)*, and has four positions: "BOTH," "L," "R," and "OFF".

(j) STARTER SWITCH.—Located on the main switch box has three positions: "STARTER", "MESH" and "OFF".

(k) PROPELLER BREAKER SWITCH.—See Section I, paragraph 3. c. (b).

(l) PROPELLER SELECTOR SWITCH. — See Section I, paragraph 3. c. (a).

(m) AUXILIARY FUEL PUMP SWITCH.—See Section I, paragraph 3. d. (7).

(n) DROPPABLE WING TANK SWITCH.—See Section I, paragraph 3. d. (a).

(o) BOOSTER PUMP SWITCH (SB2C-4 only). —See Section I, paragraph 4. g. (6).

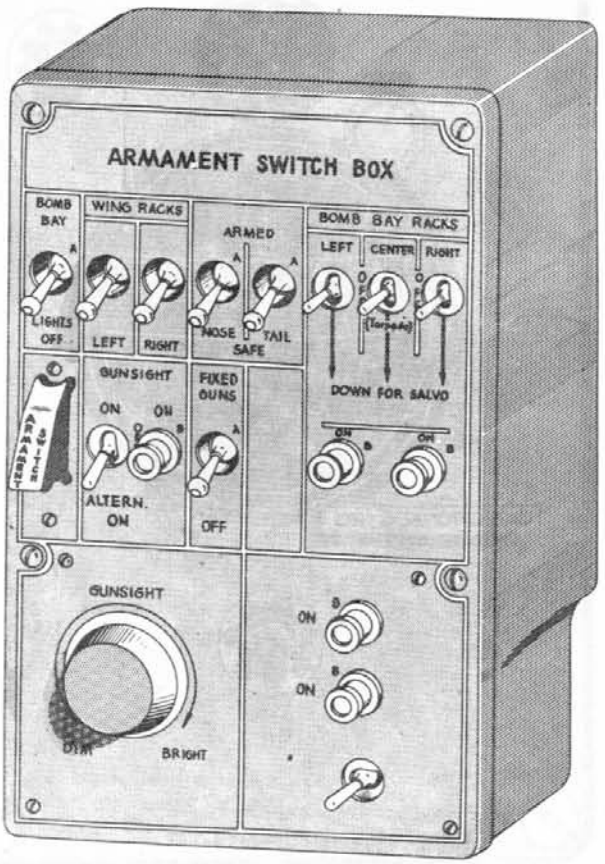


Figure 33 — Armament Switch Panel

8. AUXILIARY CONTROLS.

a. AUTOMATIC PILOT.

(1) GENERAL.—The automatic pilot is hydraulically operated. The controls for it consist of a directional gyro and a bank and climb gyro mounted on the lower instrument panel *(see figure 4)*, and a control valve *(see figure 34)* just below the lower instrument panel.

(2) CONTROL VALVE.—This valve has three positions: "OFF", "BLEED", and "ON". When 'ON" it allows hydraulic oil to flow through the auto pilot

system and actuate struts which operate the air controls. Turning the valve to "BLEED" causes the flow of hydro oil to bypass the servo units, thereby bleeding out any air that may be in the system. Moving the valve to "OFF" shuts off the flow of oil, rendering the system inoperative.

(3) BANK AND CLIMB GYRO.—This instrument is located on the lower instrument panel, to the right of the centerline of the airplane *(see figure 34)*. It contains an artificial horizon and a miniature airplane, and is equipped with the following dials:

(a) AILERON AND ELEVATOR SIGNAL ADJUSTING DIALS.—Located at the top of the instrument *(see figure 34)*. Rotate clockwise to increase "signal strength" or sensitiveness of the instrument.

(b) AILERON AND ELEVATOR TRIM ADJUSTING KNOBS.—At bottom of instrument *(see figure 34)*. Rotate aileron knob in direction of desired wing heaviness. Rotate elevator knob clockwise for dive; counterclockwise for climb.

(c) ADJUSTING KNOB FOR MINIATURE AIRPLANE.—At bottom of instrument *(see figure 34)*; turn clockwise to move airplane up.

(d) CAGING KNOB.—Upper right corner of instrument *(see figure 34)*. Pull aft and turn fully clockwise to "cage" or lock the instrument.

(4) DIRECTIONAL GYRO.—This instrument is —Located at the bottom of the instrument *(see figure* the airplane *(see figure 34)*. It contains two compass cards, one of which remains fixed in space while the other turns with the airplane. The former is called the "directional card" and is the bottom card in the instrument. The latter is the top card and is called the "reference card." (To the pilot this is the card which remains fixed, while the other seems to turn.)

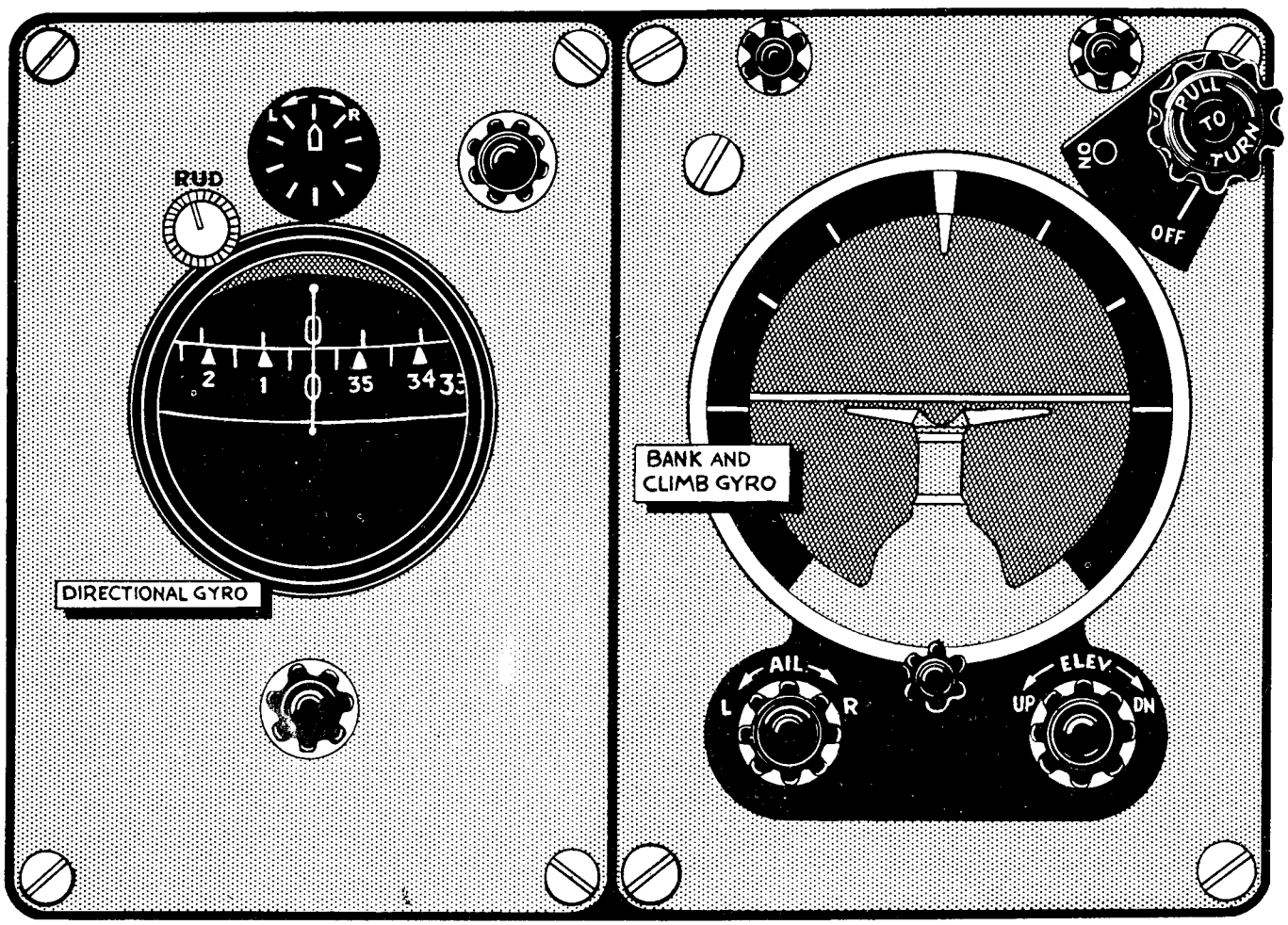


Figure 34 — Auto Pilot Controls

The instrument is equipped with the following dials:

(a) DIRECTIONAL CARD ADJUSTING DIAL.—Located at the bottom of the instrument *(see figure 34)*. Rotate to turn the directional card.

(b) REFERENCE CARD ADJUSTING DIAL.—In the upper right corner of the instrument *(see figure 34)*. Rotate to turn the reference card.

(c) SIGNAL ADJUSTING KNOB.—Located in the upper left corner of the directional gyro *(see figure 34)*. Turn clockwise to increase "signal strength" or sensitiveness of the instrument.

(d) CAGING KNOB.—At bottom of instrument. (This is the same dial that adjusts the directional card.) Push forward to "cage" or lock the gyro.

(5) AUTO PILOT OIL PRESSURE GAUGE.—Located on the lower instrument panel. Pressure for the automatic pilot system is 155 plus or minus 20 psi.

b. TAIL WHEEL LOCK.—To facilitate taxiing, the tail wheel can be unlocked in fore and aft position. The lock mechanism is controlled by a handle as-

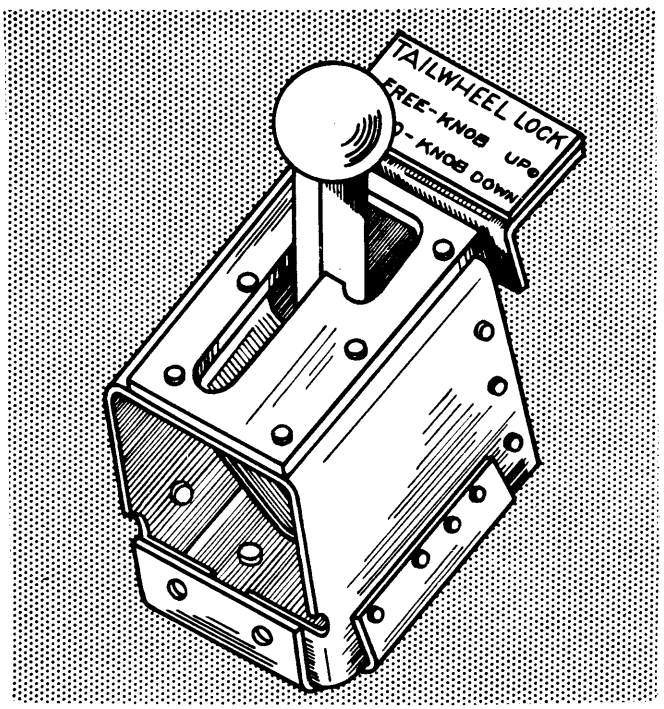


Figure 35 — Tailwheel Lock Control

sembly *(see figure 35)* attached to the aft part of the arresting gear control unit on the left side of the pilot's cockpit.

c. WINDSHIELD DEFROSTER AND COCKPIT HEATER.—An "ON-OFF" switch marked "HEATERS FRONT COCKPIT" *(see figure 32),* is mounted on the main switch panel. Moving the switch up to "ON" position causes heated air to be blown across the windshield, for defrosting, and into the cockpit, for heating simultaneously. The "OFF" position only is designated.

d. PITOT HEATER.—The pitot tube is equipped with a resistance heater to melt ice that may form in or on the tube. A toggle switch, with the "OFF" position indicated, and marked "PITOT HEATER," is mounted on the main switch box *(see figure 32).* Flip the switch up to the on position, and leave it there as long as there is any danger of ice forming around the tube.

e. ARRESTING HOOK.

(1) SB2C-3 airplanes are equipped with a manually retracted arresting hook, the control unit for which is located to the left of the pilot's seat. By depressing the plunger in the top of the handle on the control unit, moving it forward, and releasing the plunger so that a lock on the handle arm engages in a slot in the lock plate on the top of the control quadrant, the arresting hook is locked in the extended position. A light shows through a hole in the top of the quadrant when the hook is in this position. To retract the hook, release the control handle by depressing the plunger and moving it fully aft, where the lock on the handle arm engages another slot in the lock plate, securing it in the up position. A centrally located slot in the lock plate permits the deck crew to partially retract the hook when it is disengaged from the arresting cable, thereby assisting the pilot to expedite taxiing the airplane away from the danger area on the carrier deck.

(2) ARRESTING HOOK.—SB2C-4 airplanes are equipped with a latch type arresting hook, the control for which is on the left side of the cockpit. It consists of a handle which moves in a slot having notches at each end. When the handle is locked in the notch at the forward or "UP" end of the slot, the hook is held in the up position by a latch. Moving the handle aft to the "DOWN" position of the slot releases the latch and allows the hook to drop. When releasing the hook, always lock the control lever in the "DOWN" position; otherwise, when the hook bounces up from the deck, it may engage the latch and become secured in the up position.

f. LANDING GEAR CONTROL.—The landing gear controls are mounted on the landing gear and flap control quadrant, located on the floor, to the right and forward of the pilot's seat. Two controls are provided, one to extend or retract the gear, and the other to lock the control in the "DOWN" position (gear extended). *(See figure 13.)* The locking control may be unlocked by turning it counterclockwise to the "UNLOCK" position.

(1) TO LOWER THE GEAR.—Depress the thumb button located on the end of the control handle, then move the control handle to the "DOWN" position.

(2) TO RETRACT THE GEAR.—Depress the thumb button, and move the control handle to the "UP" position.

Note

Always move the control handle to the maximum "UP" or "DOWN" position. Be sure the locking key snaps into place to assure the handle is locked in the desired position.

CAUTION
DO NOT FORCE HANDLE FORWARD AS MECHANICAL LOCK MAY BE SPRUNG, PREVENTING ENGAGEMENT.

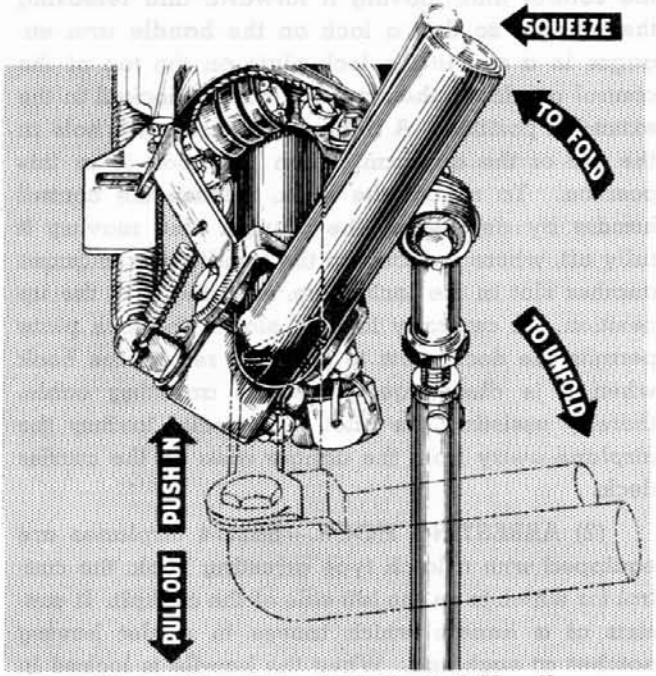


Figure 36 — Wingfold Control Handle

g. WINGFOLD CONTROL. — The wingfold control is located on the centerline of the airplane directly below the lower instrument panel. *(See figure 36.)* To fold the wings, pull the red control handle full aft and rotate it clockwise. Flag indicators, normally flush with the surface of the wings, become visible near the wing fold line as the wings are folded. To spread (unfold) the wings, turn the control handle clockwise. After the wings lower to the normal position and the flag indicators completely disappear (unless the flags completely disappear the locking bolts are not home), push the handle full forward to lock in place.

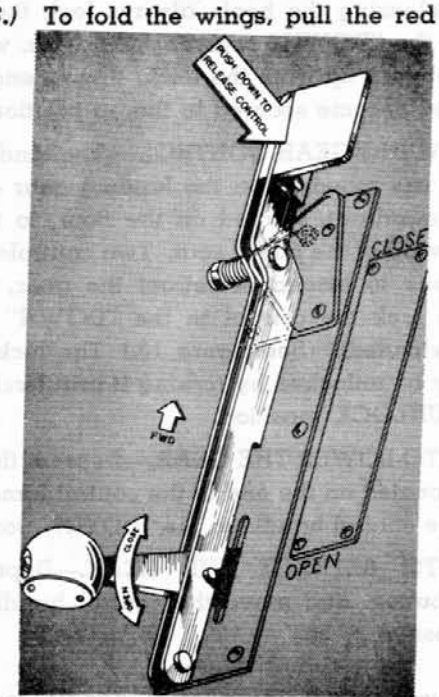


Figure 37 — Bomb Bay Door Control

h. BOMB BAY DOOR CONTROL.—The bomb bay door handle is located on the pilot's floor, to the left and forward of the seat *(see figure 37)*. The control is moved aft to open the doors and forward to close them. For emergency operation, refer to Section IV paragraph 3.

CAUTION
DO NOT CLOSE BOMB BAY DOORS UNTIL CERTAIN THAT DISPLACING GEAR HAS FULLY RETRACTED.

i. BRAKES.—The toe operated brake treadles are mounted above the rudder pedals. A brake accumulator is provided to insure effectiveness of the brakes for six to twelve applications when landing after failure of the hydraulic power system. Extreme care must be exercised in such an emergency so that pressure in the brake accumulator is not dissipated before landing is completed, by premature or unnecessary application of the brakes.

9. MISCELLANEOUS CONTROLS AND EQUIPMENT.

a. PILOT'S COCKPIT.

(1) PILOT'S COCKPIT VENTILATION. — The control for ventilation of the pilot's cockpit *(see figure 38)* is located on the left side of the cockpit, aft of the ignition switch.

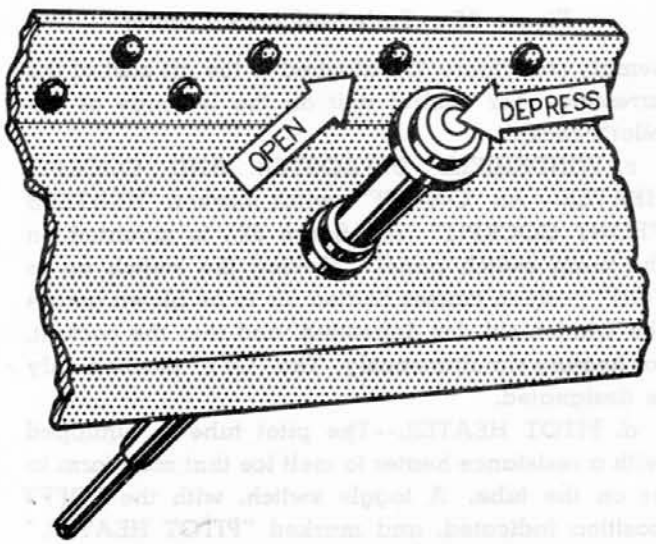


Figure 38 — Pilot's Ventilation Control

(2) PILOT'S COCKPIT ENCLOSURE.—The pilot's cockpit enclosure is operated by means of a crank and drum assembly mounted on the right hand sill *(see figure 39)*. Clockwise rotation of the crank

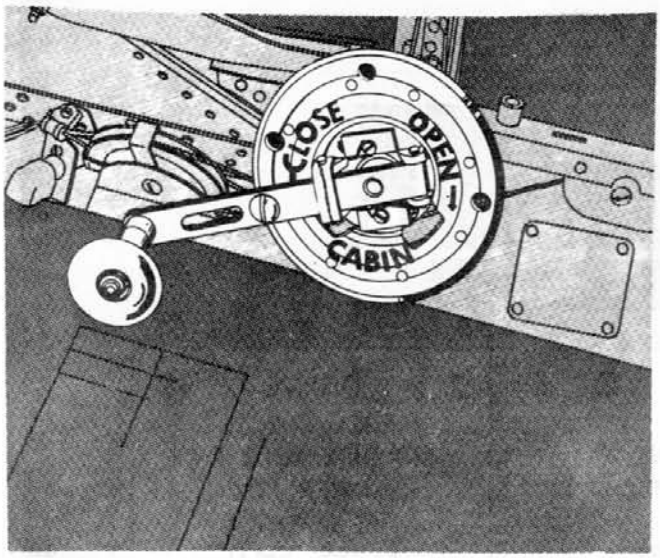


Figure 39 — Pilot's Cabin Crank

opens the enclosure, counterclockwise rotation closes it. The enclosure may be locked at each full rotation of the crank by pushing down on the thumb lock on the crank lever after the plunger, also on the lever, is seated in a corresponding hole in the face of the drum.

(3) PILOT'S SEAT ADJUSTMENT.—The seat is held in position by a locking pin. For vertical adjustment, release the locking pin by raising the lever on the right side of the seat *(see figure 40)*, and either raising the seat by relieving it of weight, allowing the shock cord suspension to move it up, or lowering it by applying sufficient weight to overcome the force of the shock cord. When the desired vertical adjustment is obtained, lower the lever to lock the seat in place. Horizontal adjustments are not obtainable.

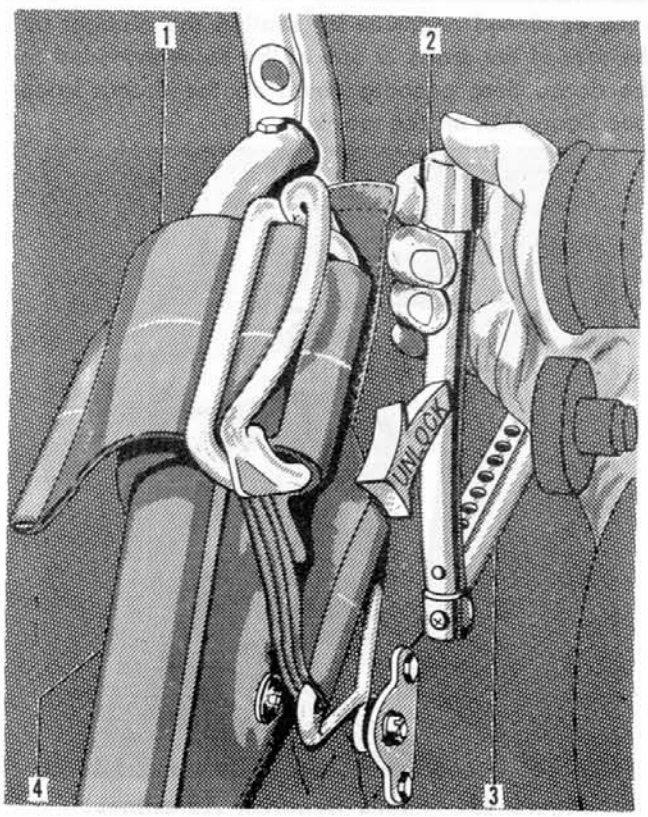


Figure 40 — Pilot's Seat Adjustment

(4) PILOT'S HEADREST.—The headrest must be used during catapulting operations. It is adjustable in the fore and aft position, as follows:

(a) Remove cotter from pin which locks the tube on the headrest to the support *(see figure 43)*.

(b) Move headrest fore and aft until the hole in support is in line with the proper hole in the tube.

(c) Replace pin and cotter.

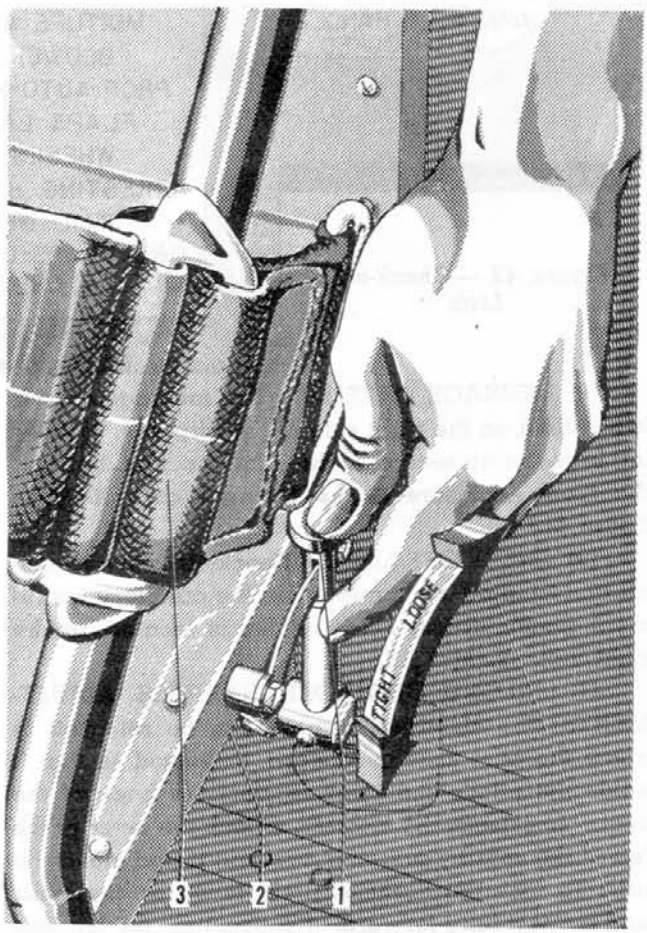


Figure 41 — Pilot's Seat Adjustment

(5) CHARTBOARD.—The chartboard is located in the pilot's cockpit between the flight instrument panel, and the auxiliary flight panel. It is mounted on rollers, and fixed to two tracks, which permit sliding in and out of the board between the panels and out of the way when not in use *(see figure 4)*.

(6) MAP CASE.—The map case is installed aft and to the left of the pilot's seat.

(7) PILOT'S RELIEF TUBE.—The relief tube is stowed on a bracket on the lower part of the pilot's seat.

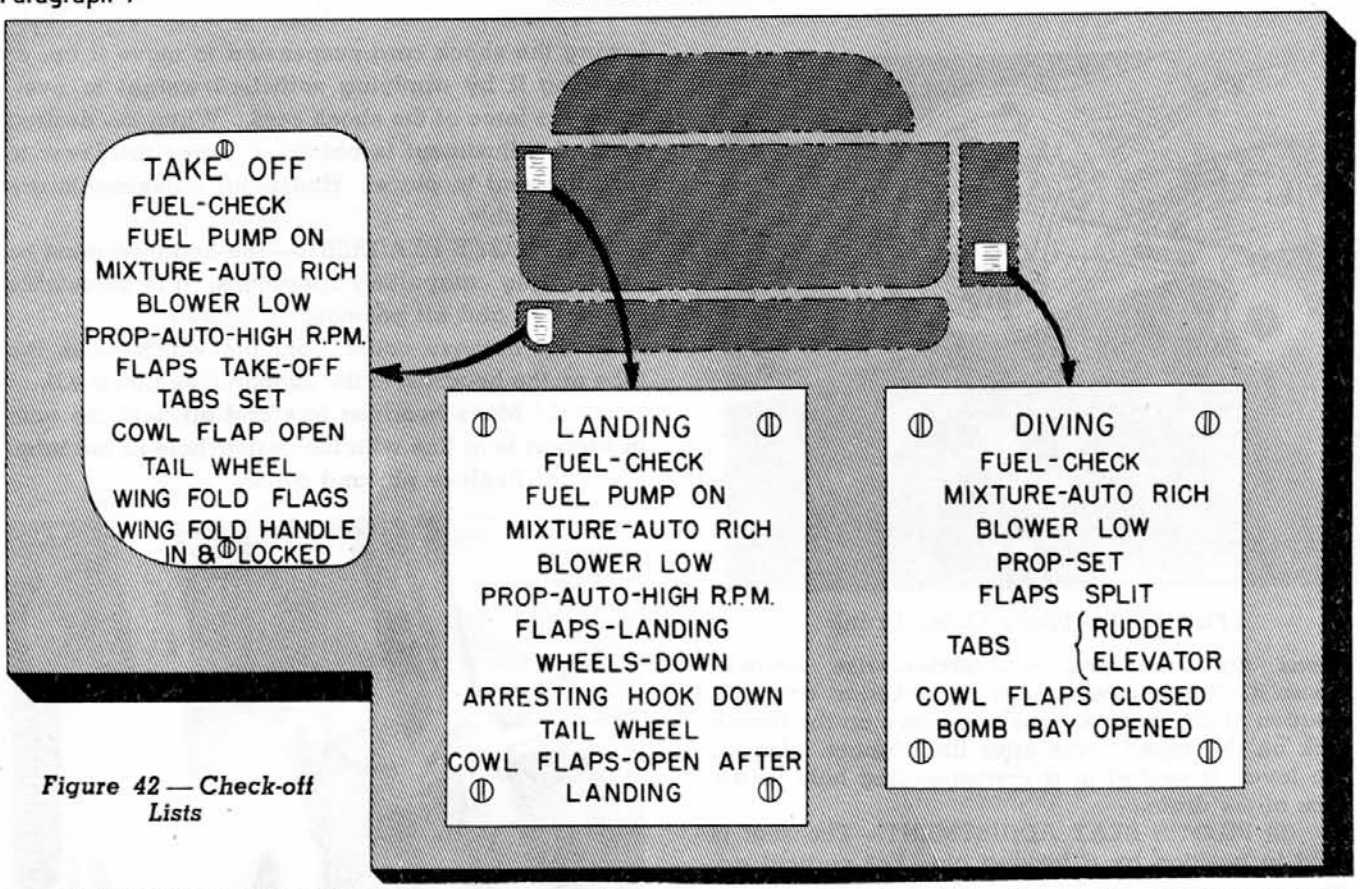


Figure 42 — Check-off Lists

(8) MESSAGE CARRIER.—The message carrier is installed on the right side of the airplane, extending from the aft section of the pilot's cockpit, through the fixed enclosure to the gunner's cockpit. *(See figure 48.)*

(9) CHECK-OFF LISTS.—Check-off lists for take-off and landing are mounted on the auxiliary instrument panel; diving check-off list is located on the right hand cockpit sill.

(10) PILOT'S SHOULDER HARNESS ADJUSTMENT.—The shoulder harness can be released to allow the pilot to lean forward, or locked so that it holds the pilot's shoulders against the back of the seat. To release the harness, unlock the lever at the left of the seat by pressing down on it and moving it aft. To lock the harness, press down on the lever and move it fully forward. ("Releasing" the harness does not mean severing or unfastening it from the seat. Instead, it consists of unlocking a spring loaded plate which is mounted behind the seat, and to which one end of the harness is attached.)

b. GUNNER'S COCKPIT.

(1) GUNNER'S COCKPIT ENCLOSURE. — The gunner's cockpit enclosure is operated by a crank and drum assembly on the right hand sill, forward of the seat *(see figure 44)*. Rotation of the crank counterclockwise opens the enclosure; clockwise rotation closes it. This enclosure can be locked in the open or closed positions by seating the plunger on the arm of the crank in one of the holes provided in the drum, then pushing down on the thumb latch *(see figure 44)*, on the crank.

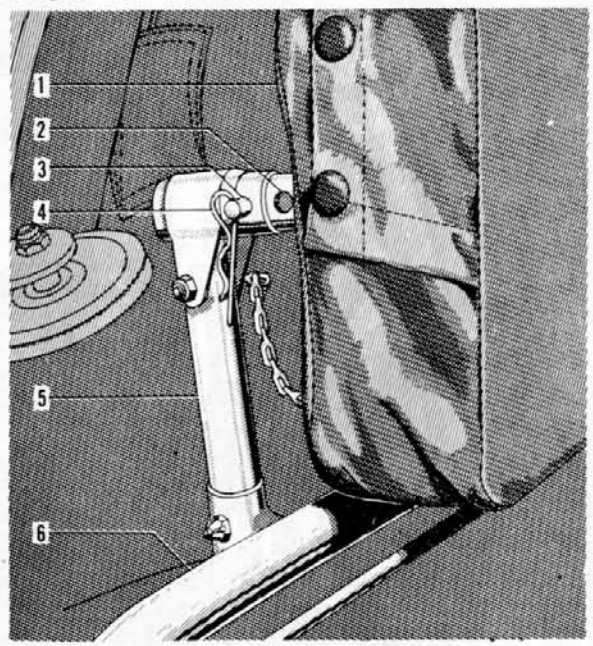


Figure 43 — Pilot's Headrest Adjustment

(2) GUNNER'S SHOULDER HARNESS ADJUSTMENT.—The shoulder harness can be adjusted to allow forward movement, or tightened to hold the

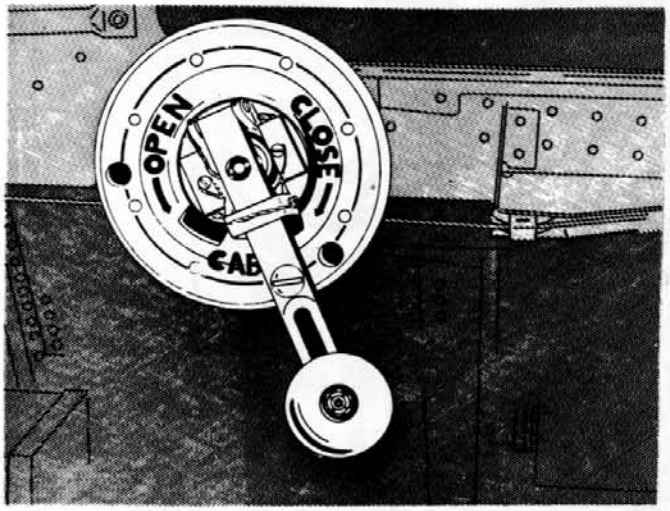


Figure 44 — Gunner's Cabin Crank

gunner's shoulders against the back of the seat. All adjustment is made with the buckle, the two shoulder straps and the two lap belts being joined togther and secured to a plate on the back of the seat. To release the harness, unfasten the buckle, and all straps will be free.

(3) COCKPIT LIGHTS.

(a) A gunner's cockpit contains two spot lights *(see figure 29)* for illumination of instruments and radio dials. These lights are mounted on swivel attachments and can be spotted in any desired direction.

(b) A rheostat is mounted on each light to control the brilliancy. On the aft switch panel a switch is provided for intermittent lighting.

(4) DRIFT SIGNALS.—Drift signals are carried on the floor of the aft cockpit. These signals can be dropped over the side into the water where they will burn brilliantly and allow the observer to take drift readings. Signals also provide smoke for daylight operations.

(5) RECEPTACLE.—A receptacle is provided in the aft switch panel. To use, unscrew the cap, plug in whatever accessory is to be used, and operate the switch. The receptacle is a source of 24 volts direct current.

(6) WEIGHTED CONTAINER.

(a) A metal weighted container is stowed in

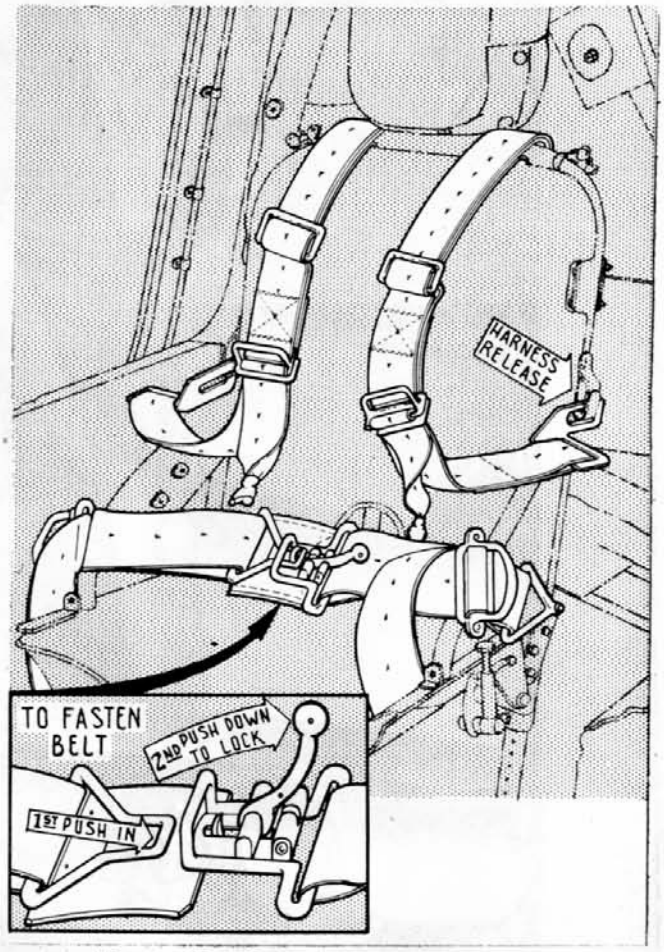


Figure 45 — Pilot's Shoulder Harness

a canvas bag mounted on the left side of the gunner's cockpit *(see figure 47)*. It is easily removed from stowage, and used as a holder of restricted code books, log books, and other confidential material that would be of value to the enemy.

(b) Should it become necessary to abandon the airplane, attach the container to any part of the plane with the snap fastener on the end of the cable attached to the container. The container will then sink with the aircraft, destroying the information held therein.

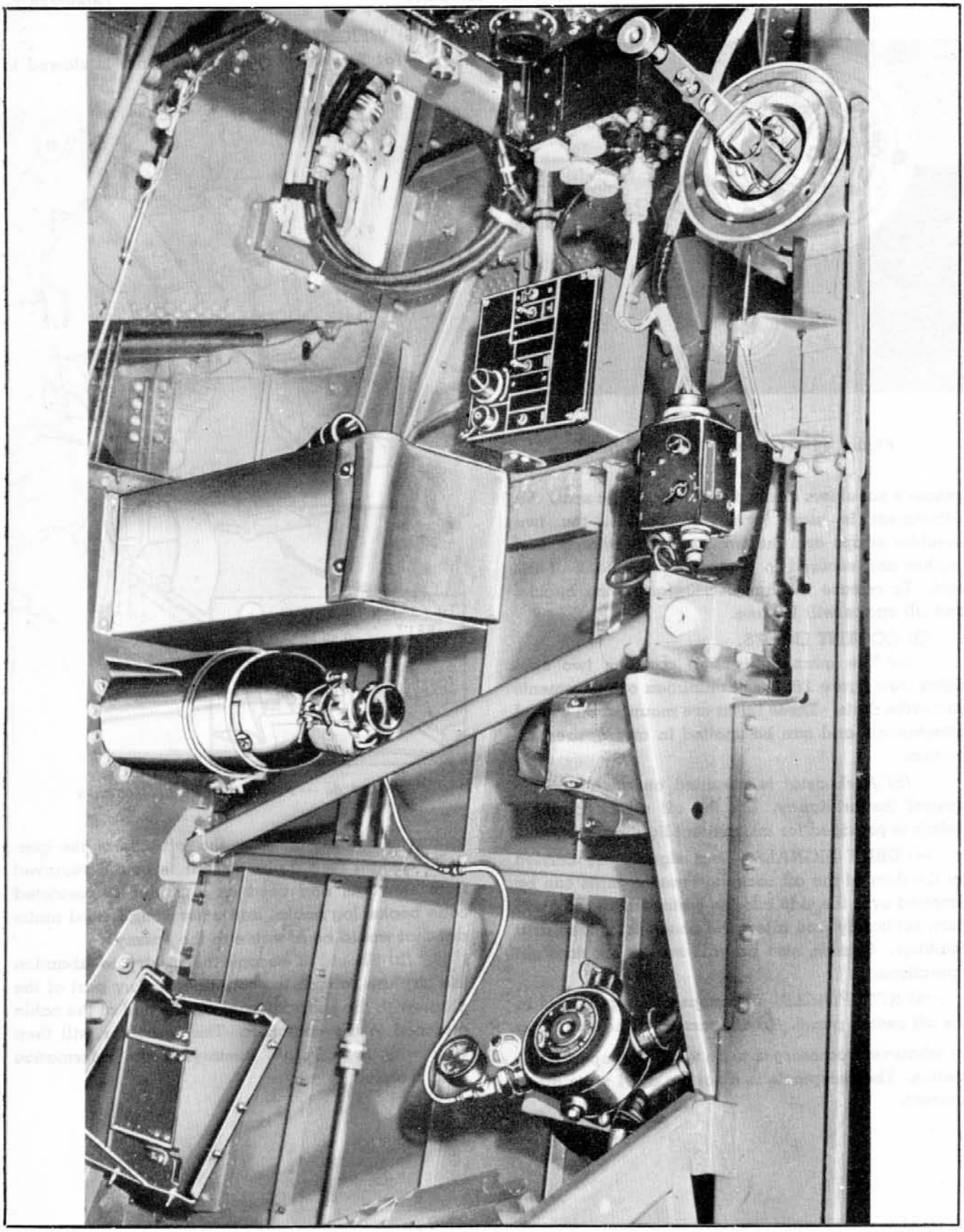


Figure 46—Aft Cockpit, Right Side

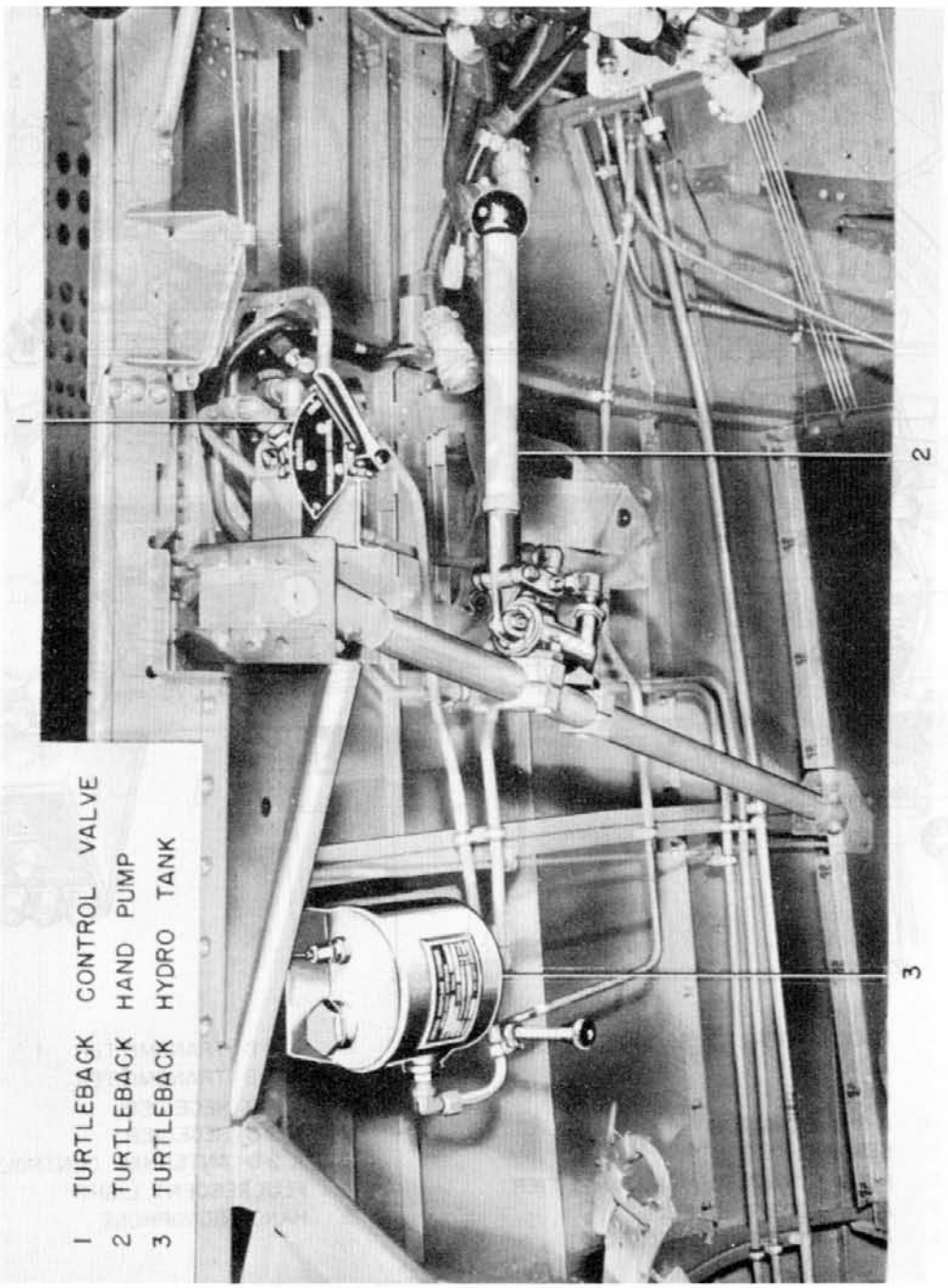
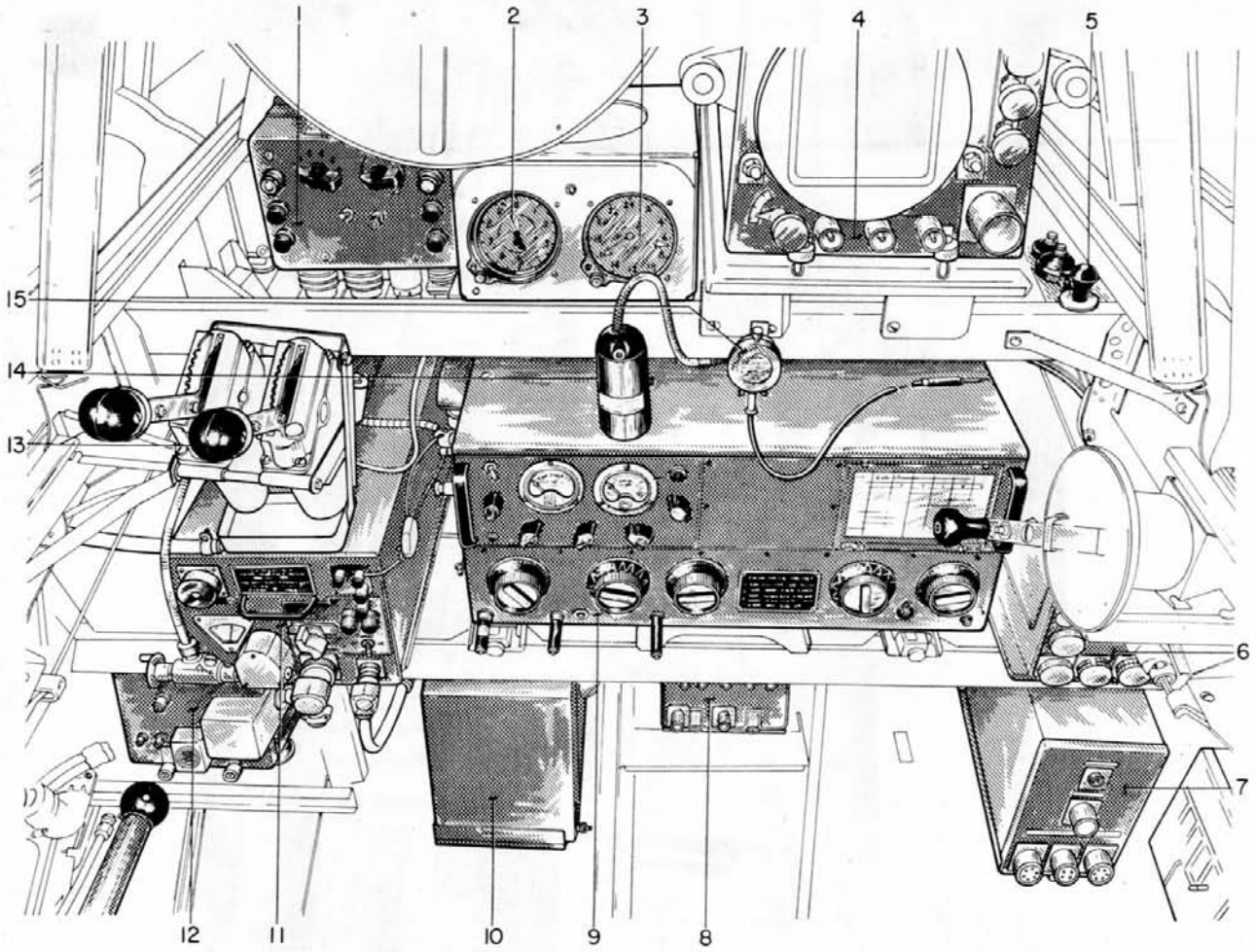


Figure 47—Aft Cockpit, Left Side



1 RADAR OPERATOR'S CONTROL UNIT
2 ALTIMETER
3 CLOCK
4 A S B INDICATOR
5 SENDING KEY
6 RL-9 DYNAMOTOR AND AMPLIFIER
7 A S B POWER SUPPLY
8 A S B ANTENNA SWITCH UNIT
9 A T C TRANSMITTER
10 A S B TRANSMITTER
11 A R B RECEIVER
12 A S B RECEIVER
13 A S B ANTENNAS CONTROLS
14 FLUORESCENT LIGHT
15 HAND .MICROPHONE

Figure 48—Aft Cockpit, Looking Forward

Normal Operating Instructions

SECTION · II

1. BEFORE ENTERING THE PILOT'S COMPARTMENT.

a. FLIGHT LIMITATIONS AND RESTRICTIONS.

(1) MANEUVERS RESTRICTED.

(a) LOOP (WITH BOMBS OR AUXILIARY FUEL TANKS).

(b) AILERON ROLL (USE ONLY FOR ENTERING DIVE).

(c) SNAP ROLL (WITH BOMBS OR AUXILIARY FUEL TANKS).

(d) CHANDELLE (WITH BOMBS OR AUXILIARY FUEL TANKS).

(e) IMMELMAN TURN (WITH BOMBS OR AUXILIARY FUEL TANKS).

(f) INVERTED FLIGHT (USE ONLY FOR ENTERING DIVE).

(g) NORMAL SPIN (NOT OVER TWO TURNS). (WITH BOMBS OR AUXILIARY FUEL TANKS).

(h) PROLONGED SPIN.

(i) INVERTED SPIN.

(2) LIMITING INDICATED AIRSPEEDS.

(a) FOR EXTENDING LANDING FLAPS.—130 knots.

(b) FOR EXTENDING DIVING FLAPS.—240 knots.

(c) FOR EXTENDING LANDING GEAR.—175 knots.

(d) FOR OPENING BOMB BAY DOORS.—240 knots.

(3) MAXIMUM ALLOWABLE INDICATED AIRSPEEDS.

(a) DIVING SPEEDS AT ALTITUDES UP TO 10,000 FT.—350 knots.

(b) DIVING SPEEDS AT ALTITUDES ABOVE 10,000 FT.—325 knots.

Note

These limitations may be supplemented or superseded by instructions included in Service Publications.

(2) BEFORE ENTERING THE COCKPIT, THE PILOT SHOULD:

(a) Check tires (90 psi if land-based; 110 psi if carrier based).

(b) Check if pitot tube cover has been removed.

(c) Check quantity of ammunition in the airplane.

(d) Check if wing gun ammunition box covers are secured.

(e) Check if fuel tank caps are secured.

(f) Check if arresting hook is latched up.

b. OBTAINING GROSS WEIGHT AND BALANCE.

(1) Check the gross weight and C. G. location for take-off, and for anticipated loading for landing. Consult Flight Charts in Appendix 1, to determine the characteristics of the airplane at the given loading condition.

(2) Loading data are furnished in the Handbook of Weight and Balance Data, AN 01-1B-40.

c. ENTRANCE TO AIRPLANE.

(1) If the front movable enclosure is open, the airplane can be entered from either side; if closed, entry must be made from the right side only, using the following procedure:

(a) Utilizing the walkway on the right wing where the wing joins the fuselage, and the handgrips provided in the side of the fuselage, walk forward on the wing to the cockpit.

(b) Push in on the access door at the lower right corner of the windshield, and slide the enclosure aft.

(c) Enter the cockpit

CAUTION

Do not step on the leveling lugs on the cockpit sill, as they are used for boresighting the wing cannons and may be bent out of alignment.

(2) The aft, or gunner's cockpit, is accessible from either side of the airplane if the rear movable enclosure is open; if closed, entry must be made as follows:

(a) Stand on the trailing edge of the walkway on the right wing, where the wing joins the fuselage.

(b) Push in on the button located in the fuselage immediately above the stencilled words "CABIN RELEASE," and slide the enclosure full forward.

(c) Utilizing the recess in the side of the fuselage labeled "STEP," enter the cockpit.

2. ON ENTERING THE PILOT'S COMPARTMENT.

a. STANDARD CHECK FOR ALL FLIGHTS.

(1) IGNITION SWITCH.—"OFF."

(2) BATTERY SWITCH.—"OFF."

(3) MASTER ARMAMENT SWITCH. — "OFF" *(see figure 38.)*

(4) GUN CHARGERS.—"SAFE" *(see figure 61.)*

(5) MASTER ROCKET SWITCH.—"OFF" (SB2C-4 only).

(6) AUTOMATIC PILOT.—"OFF" *(see figure* 34

(7) CIRCUIT BREAKERS.—Pushed in.

(8) TIME CLOCK.—Wind and set the clock. *(See figure 4.)*

(9) WINGFOLD LOCK.—If wings are extended, make certain the wingfold pin flags are flush with the top surface of the wings, indicating that the locking pins are in position. The wingfold pin control handle must be forward as much as possible.

(10) HYDRAULIC VALVES.—"No. 1" SHUT-OFF VALVE—"OPEN."

"No. 3" BYPASS VALVE—"CLOSED."

(11) WING FLAPS.—The wing flaps must be closed and the indicator on the flap control lever *(see figure 14)*, at "O", if wings are extended. If the wings are folded, the flap selector must be left in whatever position it is found when the pilot enters the cockpit until the wings are extended.

(12) COWL FLAPS.—Open *(see figure 4).*

(13) OIL COOLER FLAPS.—Open.

(14) LANDING GEAR.—See that main landing gear locking flags are visible above the upper surface of the wings and that landing gear control lever *(see figure 10)* is secured in "DOWN" position.

(15) TAILWHEEL LOCK. — "UNLOCK" position if airplane is to be taxied. Land take-offs and catapult shots are made with tailwheel locked; carrier fly-offs and landings with tailwheel unlocked.

(16) CYLINDER HEAD & OIL TEMPERATURES. —Note the cylinder head and oil temperatures in order to know which starting procedure to use. Head temperature is indicated by a dial on the instrument panel and oil temperature by a gauge in the same panel. *(See figure 10.)*

(17) OXYGEN SYSTEM. — See Section V, paragraph 1.

(18) PILOT'S SEAT.—Check for correct vertical adjustment. Lock in position after adjusted properly.

(19) PILOT'S SEAT BELT & SHOULDER STRAPS. —Check for proper adjustment and security.

(20) RUDDER & BRAKE PEDALS.—Check for proper leg-length adjustment. See that pedal surfaces are even with each other.

(21) FLIGHT CONTROLS.—After the wings are spread, move the rudder pedals and control stick so that every control surface passes through its entire range of movement, to make certain nothing is impeding movement of the controls.

(22) TRIM TABS.—Tab settings depend upon wind velocity, weight of the airplane, whether catapult or running take-off, etc. Until the pilot becomes familiar with the airplane, settings of aileron 0°, elevator 0° and rudder 8° right are recommended.

(23) ENCLOSURES.—Forward and aft enclosures locked open. Visually check the jettisoning mechanism in forward enclosure for security.

(24) ARRESTING HOOK.—Locked in "UP" position.

(25) FLARES.—If a pyrotechnic pistol is installed, inspect shells for proper colors.

(26) CATAPULTING.—If airplane is to be catapulted, *the chartboard must be locked in place.*

(27) RADIO.—Refer to Section V, paragraph 3.

(28) ARMAMENT.—Refer to Section V, paragraph 2.

(29) BATTERY SWITCH.—"ON."

(30) INSTRUMENTS.—Check settings. Test setting knobs for freedom of movement.

(31) FUEL.—Check readings of the fuel gauges.

(33) ALTIMETER.—Set the altimeter *(see figure 4 to field elevation.*

(34) BATTERY SWITCH.—"OFF."

b. CHECK FOR NIGHT FLIGHTS.

(1) Complete check list as indicated by *a.* above.

(2) With battery switch "ON," turn up rheostats on the right console to test the cockpit and instrument lights.

(3) Test the section, running, recognition, and formation lights by turning the "MASTER EXTERIOR LIGHTS" switch "ON," and operating the switches.

(4) Check the approach light operation if arrested night landings are to be made.

3. FUEL AND OIL SYSTEM MANAGEMENT.

a. OPERATION OF FUEL SYSTEM.

(1) Before starting a take-off, switch the fuel selector valve to "FUSE," and turn "ON" the auxiliary fuel pump switch to insure the proper system pressure (16 to 18 psi). Use about 10 gallons from the fuselage tank to allow room for the normal vapor return of 3 to 5 gallons per hour.

(2) Switch to one of the droppable tanks using that fuel first as the tanks greatly increase drag, and cause restrictions to be placed on maneuvers. When switching tanks, turn "ON" the auxiliary fuel pump, select the proper tank on the selector and the dropwing tank electric switch, and check the fuel pressure as the auxiliary fuel pump is turned off. If the pressure drops below 16 psi, turn the auxiliary pump on again.

(3) Fuel may be drawn from either droppable wing tank but the pilot should compensate by means of the trim tabs for the loss of weight on one wing as the fuel is used. Trim tab adjustment will compensate for a full tank on one wing and an empty tank on the other. Since no gauge is provided for the droppable tanks, fuel consumption from these tanks must be determined from the elapsed time during which fuel is withdrawn.

(4) The droppable tanks are jettisoned in the same manner that bombs are released. See Section V, paragraph 2. *d.* for bomb release procedure.

(5) The auxiliary fuel pump should always be on when:

(a) Starting the engine.

(b) Taking off.

(c) Climbing to operational altitude.

(d) Switching fuel tanks.

(e) Engine driven pump fails.

(f) At or above 5000 ft. altitude if a fluctuation of from ½ to 1 psi is indicated by the fuel pressure gauge.

(g) Landing.

b. OPERATION OF FUEL SYSTEM — SB2C-4.

(1) Operation of the SB2C-4 fuel system is the same as that for the SB2C-3, except that a fuel booster pump is provided for use during take-offs, landings and at high altitudes, to eliminate the possibility of vapor lock and to assure a constant flow of vapor fire fuel to the carburetor. The booster pump is effective only when fuel is being drawn from the fuselage tank, and must be used in conjunction with the auxiliary fuel pump.

c. OPERATION OF OIL SYSTEM.

(1) OPERATING PRESSURE.—The required system operating pressure is 80 to 95 psi, maximum pressure 95 psi, idling pressure 15 psi. The desired operating temperature is 70° to 85° C. (158° to 210° F).

4. STARTING ENGINE.

a. STARTING PROCEDURE.

(1) IN CASE OF FIRE.—The pilot should visually check to ascertain that a member of the ground crew is on duty off his wing tip with a fire bottle before starting the engine. If an engine fire breaks out while starting, turn the fuel selector valve "OFF", switch the auxiliary fuel pump switch to "OFF", increase the throttle setting but keep the ignition switch on "BOTH" until the propeller has stopped turning. This will pull any fuel and fire in the line, ducts, and carburetor into the engine where the fuel will be ignited, partially dissipated and passed out through the exhaust with the flames. If the fire continues or shows any signs of spreading, the fire bottle should be employed by the ground crew.

(2) See that wheels are chocked. If chocks are not available operate hand pump until approximately 800 pounds of hydraulic pressure is in system, then set brakes.

(3) MIXTURE CONTROL.—"IDLE CUTOFF".

(4) SUPERCHARGER CONTROL.—"LOW" position.

(5) PROPELLER GOVERNOR CONTROL. — Full "INCREASE RPM".

(6) PROPELLER TOGGLE SWITCH.—"AUTO".

(7) PROPELLER BREAKER BUTTON.—Pushed in.

(8) THROTTLE.—Set for 1200 rpm maximum—(open approximately ¾ inch).

(9) COWL FLAPS.—"OPEN".

(10) OIL COOLER FLAPS.—"OPEN".

(11) FUEL SELECTOR VALVE.—"FUSE."

(12) CARBURETOR ALTERNATE AIR. — Direct air position (pushed forward).

(13) WITH BATTERY AND IGNITION SWITCHES "OFF", rotate propeller by hand, four revolutions in normal direction of rotation.

(14) CHECK FOR ALL-CLEAR AROUND PROPELLER.

(15) BATTERY SWITCH.—On.

(16) GENERATOR SWITCH.—On.

(17) IGNITION SWITCH.—"BOTH".

(18) AUXILIARY FUEL PUMP.—On.

(19) STARTER SWITCH.—Flip to "STARTER" for 15 seconds.

(20) PRIMER SWITCH.—On. (See priming instructions at end of this procedure).

(21) STARTER SWITCH. — "MESH" for not longer than 30 seconds at any one time; wait a minimum of 30 seconds for second trial.

(22) Flick primer "ON" as necessary for several seconds with engine firing, and immediately move mixture control forward to "AUTO RICH."

(23) If engine does not start in two attempts, return mixture control to "IDLE CUT-OFF", and let starter cool for at least 3 minutes before another starting attempt is made.

(24) Do not touch throttle setting during starting procedure.

(25) If oil pressure is not up to 40 psi in 30 seconds, stop engine and investigate.

(26) After the engine is firing smoothly, adjust the throttle slowly until a maximum of 1200 rpm is attained. Turn auxiliary fuel pump "OFF," check fuel pressure, and warm up normally.

(27) Repeated warning: Do not touch throttle setting during starting. Set correctly as in Item (8), and leave it there until engine is running smoothly.

(28) If engine is overprimed, move the throttle fully open, mixture control "IDLE CUT-OFF", ignition switch "OFF", and rotate propeller four or five revolutions by hand in normal direction, then repeat starting procedure.

Note

Successful starting demands accuracy. It is obtained only by knowing the procedure and following it carefully.

b. PRIMING INSTRUCTIONS.

(1) Outside air temperature —30° C. to +4°C. (—22° F. to + 40° F. — Hold primer switch on for minimum of 3 seconds immediately prior to "MESH" starter. With starter engaged, hold primer on 3 seconds, then flick intermittently as temperature requires and experience dictates. Higher temperatures require less priming.

(2) Outside air temperature 4° C. to 18° C. (40° F. to 64° F.) — Engage primer 3 seconds immediately prior to "MESH" starter. Hold primer on until engine fires smoothly.

5. ENGINE WARM-UP AND GROUND TEST.

a. GENERAL.—The warm-up should be conducted at a maximum of 1200 rpm until oil pressure is 80 psi and the oil temperature is at least 30° C. (86.0° F.), cylinder head temperature 150° C. (302° F.), 232° C. (450° F.) maximum, then open the throttle to obtain 30 in. Hg. If the oil pressure drops, warm-up should be continued at 1200 maximum rpm. Check the fuel pressure. During warm-up, the cowl flaps should be fully open. The alternate carburetor air control should be locked in the direct (pushed in) position unless atmospheric icing conditions exist, in which case alternate air can be used. However, the control should be returned to direct air before take-off. The position of the oil cooler flaps is optional, depending upon outside air temperature.

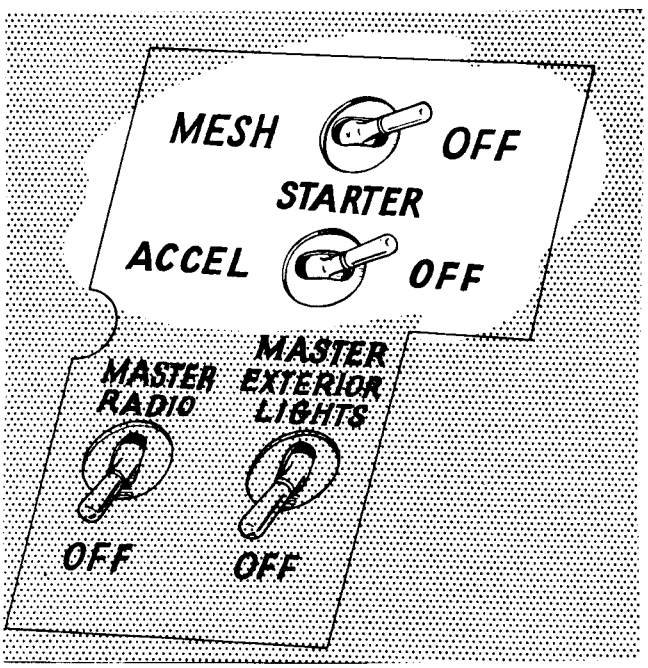


Figure 49 — Starter Switch

b. SUPERCHARGER DESLUDGING. — To loosen any small accumulation of sludge and dirt, shift the supercharger clutches to "HIGH" for two 30-second periods during warm-up prior to each day's flight. To allow the dissipation of heat from the clutches, do not shift the supercharger control at more than five-minute intervals, except in an emergency. These shifts should be made with the engine turning up about 1000 rpm (between idle and 1000 rpm permitted).

c. MAGNETO CHECK.—At about 2100 rpm, 30 in. Hg. maximum manifold pressure, turn the ignition switch from "BOTH" to "L" and "R" in turn, which should result in a drop of not more than 80 rpm.

THIS CHECK SHOULD NOT EXCEED 30 SECONDS. Switch to "BOTH" between checks to allow the engine to clear out.

d. PROPELLER CHECK.—With propeller toggle switch in "AUTO" and the propeller governor lever in full "INC RPM" position, open the throttle until the engine turns about 2000 rpm. Pull the propeller governor up until about 1800 rpm or a manifold pressure of 30 in. maximum is reached. At this setting the propeller should hold the engine speed constant with no surges or irregularities. Return the governor control to full "INC RPM" position; if rpm reading is 2000, the propeller is operating properly and is ready for flight.

e. HYDRAULIC SYSTEM.—With engine running, check the hydraulic pressure gauge. This gauge should read between 850 and 1050 psi. After the wings are spread, extend and retract the wing flaps in both the "LANDING" flaps and "DIVING" flaps conditions.

CAUTION

Do not attempt to check flap operation with the wings folded.

f. AUTOMATIC PILOT GROUND CHECK PROCEDURE.

(1) Uncage bank and climb gyro.

(2) Set directional card to compass reading and uncage directional gyro.

(3) Line up reference card with directional card.

(4) Turn elevator and aileron indices to "O".

(5) Turn auto pilot valve to "BLEED".

(6) Turn rudder manual control knob one full turn.

(7) Turn manual control knobs for elevator and aileron hard over in either direction.

(The last three steps cause the hydraulic oil to bleed through the system.)

(8) Hold all controls at least 15 seconds in each extreme position; then turn rudder, elevator and aileron manual control knobs back to "O".

(9) Turn auto pilot valve "ON".

(10) Check auto pilot oil pressure; should be 155 plus or minus 20 psi.

(11) Check for air in system by operating stick and rudder pedals. If the controls have a "mushy" or "springy" feel to them, air in the system is indicated. If this condition is found, repeat steps (5) through (11), until the air is out of the system.

(12) Turn auto pilot valve "OFF".

g. IDLE MIXTURE CHECK.

(1) Check the idle mixture adjustment as follows: With the throttle set to obtain about 600 rpm, move the mixture control lever with a slow, steady pull, toward or into "IDLE CUT-OFF" and observe the tachometer for any increase in rpm during the process of leaning. Return the mixture control to "AUTO RICH" before the rpm drops to a point where the engine cuts out, but do not return it before a definite drop in rpm is observed.

(2) During the leaning process, an increase of 5 rpm is considered optimum. If the increase in rpm exceeds 10, the setting is too rich. If no increase in rpm is indicated the setting is too lean and the engine may cut out when in a glide or when the throttle is advanced. If the idle mixture is not adjusted properly readjust it before taking off, if at all possible.

h. GENERATOR SYSTEM CHECK.

(1) Disconnect external power source, if used.

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

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

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

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

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

6. SCRAMBLE TAKE-OFF.

a. GENERAL.—If an emergency take-off is necessary, use the following control settings:

(1) PROPELLER TOGGLE SWITCH.—"AUTO".

(2) PROPELLER GOVERNOR CONTROL. — Full "INC RPM" position.

(3) CARBURETOR ALTERNATE AIR CONTROL. —Direct air position (pushed forward).

(4) MANIFOLD PRESSURE.—49 in. Hg.

(5) COWL FLAPS.—Open.

(6) OIL COOLER FLAPS.—Closed until oil temperature reaches 20° C. (68° F.)

(7) FUEL SELECTOR VALVE.—"FUSE".

(8) AUXILIARY FUEL PUMP.—On.

(9) BOOSTER PUMP (SB2C-4 only).—On.

b. The oil pressure should be steady at take-off power. The oil temperature should be at least 20° C. (68° F.)

7. TAXIING.

a. FLAPS.—Since the flaps can very easily be damaged by flying debris, it is recommended that they be retracted during taxiing.

b. COWL FLAPS. — Open during all ground maneuvers.

c. OIL COOLER FLAPS.—Open.

d. BRAKES.—The brakes provide adequate control for all ground maneuvers. However, they are sensitive and must be used carefully.

e. TAIL WHEEL.—The tail wheel should be in "UNLOCK" position when the airplane is being taxied except during extended cross-wind taxiing, in which case the tail wheel should be locked to relieve excessive braking action.

8. TAKE-OFF.

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

b. CHECK-OFF LIST (LAND TAKE-OFF).

(1) FUEL SELECTOR VALVE.—"FUSE".

(2) AUXILIARY FUEL PUMP.—"ON".

(3) BOOSTER PUMP (SB2C-4 only).—On.

(4) MIXTURE CONTROL.—"AUTO RICH".

(5) SUPERCHARGER.—"LOW".

(6) PROPELLER TOGGLE SWITCH.—"AUTO".

(7) PROPELLER GOVERNOR CONTROL. — "INC. RPM".

(8) COWL FLAPS.—"OPEN".

(9) OIL COOLER FLAPS.—"OPEN".

(10) TRIM TABS.—Aileron 0°; rudder 8° R; elevator 0°.

(11) FLAPS. — "LANDING". (See Section II, paragraph *d* (1) for flap deflection angle).

(12) CARBURETOR ALTERNATE AIR CONTROL.—Direct air position.

(13) ENCLOSURES.—Locked open.

(14) TAIL WHEEL.—Locked.

(15) MANIFOLD PRESSURE.—49 in. Hg., 2800 rpm.

c. CHECK-OFF LIST (CARRIER TAKE-OFF).

(1) Check cockpits for any loose equipment and either secure it to the airplane or remove it.

(2) FLAPS.—"LANDING", 45° deflection.

(3) FUEL SELECTOR VALVE.—"FUSE".

(4) AUXILIARY FUEL PUMP.—On.

(5) FUEL BOOSTER PUMP (SB2C-4 only).—On.

(6) ENCLOSURES.—Locked open.

(7) COWL FLAPS.—Open.

(8) OIL COOLER FLAPS.—Open.

(9) CARBURETOR ALTERNATE AIR CONTROL. —Direct air position.

(10) MIXTURE CONTROL.—"AUTO RICH".

(11) PROPELLER TOGGLE SWITCH.—"AUTO".

(12) PROPELLER GOVERNOR CONTROL.—Full "INC RPM" position.

(13) SUPERCHARGER.—"LOW".

(14) CHART BOARD.—Locked closed.

(15) THROTTLE FRICTION CONTROL. — "INCREASE."

(16) ENGINE SPEED.—2800 rpm; manifold pressure 49 in. Hg.

(17) HEAD REST.—If airplane is to be catapaulted, the head rest adjustment must be correct for pilot's use. (See Section I, paragraph 9. *a.* (4)).

(18) TAIL WHEEL.—Locked.

(19) SHOULDER HARNESS.—Locked.

(20) PARACHUTE.—Off or unlocked.

CAUTION

Do not exceed 263° C. (505° F.) Cylinder head temperature limit for take-off.

d. GENERAL.

(1) FLAP SETTINGS. — For normal land-based operations, it is recommended that a landing flap setting of 20° be used for take-off. However, any setting from 0° to 60° may be used for SB2C-3 airplanes, 0° to 52° for SB2C-4, the higher settings giving shorter ground distance. Take-offs with flaps retracted are easily accomplished with a small increase in run, dispensing with the inconvenience of retracting the flaps after take-off. The rate of climb immediately after take-off with flaps deflected is inferior to that with flaps retracted. Take-off with high flap setting should be made only when necessary to obtain the shortest possible deck run, and after more experience with the increased settings. The elevator trim tab should be set slightly tail heavy when the high flap setting is used.

(2) TAB SETTINGS.—The tab settings vary with the individual airplane and the loading conditions. However, it is recommended that elevator 0° aileron 0°, and rudder 8° right be used until the pilot is familiar with the airplane.

e. MINIMUM RUN TAKE-OFF.

(1) WING FLAPS.—"LANDING" (45°).

(2) PROPELLER TOGGLE SWITCH.—"AUTO".

(3) PROPELLER GOVERNOR CONTROL.—Full "INC RPM" position.

(4) MANIFOLD PRESSURE.—49 in. Hg.

(5) Hold brakes slightly until 2800 rpm is reached.

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

Note

The best carrier take-off results have been obtained by maintaining the airplane in flight attitude until near to becoming airborne, when a slightly nose-high attitude is attained. This procedure provides the minimum of "settling" after leaving the deck.

(7) Take off when minimum flying speed is reached. *(See figure 49, Appendix I).* If take-off is made from an unpaved or muddy runway, the tail of the airplane should be slightly lower than indicated by (6), above.

(8) If the airplane is to be catapulted use full take-off power (2800 rpm, 49 in. Hg. manifold pressure). A 45° flap setting is recommended with tab settings of aileron 0°, elevator 0°, and rudder 8° right.

CAUTION

(1) Excessive and violent displacements of elevator surfaces should, as much as possible, be avoided immediately after becoming air-borne following catapult take-off.
(2) All controls and locking devices (chartboard, propeller governor, throttle, fuel selector, mixture control, etc.) must be in proper adjustment to overcome the force of inertia originated by the catapulting operation.

(3) The pilot's headrest must be properly adjusted for his use.

9. ENGINE FAILURE DURING TAKE-OFF.

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

b. As many as possible of the operations listed below should be performed in the order given:

(1) LANDING GEAR.-"UP" if unable to land on field from which take-off was made.

(2) LANDING FLAPS.—"DOWN".

(3) MIXTURE CONTROL.—"IDLE CUT-OFF".

(4) IGNITION SWITCH.—"OFF".

(5) FUEL SELECTOR VALVE.—"OFF".

(6) BATTERY SWITCH.—"OFF".

10. CLIMB AND LEVEL FLIGHT.

a. MILITARY POWER CLIMB AND LEVEL FLIGHT.—2600 rpm, 43.5 in. Hg. manifold pressure at sea level, maximum, for 30 minutes Operate in accordance with the Power Plant Chart in Section III.)

CAUTION

Do not exceed 248° C. (478° F.) cylinder head temperature in military power.

b. NORMAL RATED (MAXIMUM CONTINUOUS) POWER CLIMB AND LEVEL FLIGHT.—2400 rpm, 41 in. Hg. manifold pressure at sea level, maximum. (Operate in accordance with Power Plant Chart in Section III.)

c. CRUISING.—It is recommended that all cruising operations be conducted at powers below maximum cruise (Refer to Plant Chart, Section III) for best engine economy. A cylinder head temperature of 218°c. must not be exceeded.

11. GENERAL FLYING CHARACTERISTICS.

a. CHANGING POWER.

(1) When increasing engine power, adjust first the propeller governor, then the throttle.

(2) When decreasing engine power, adjust the throttle first and then the propeller governor. If necessary, readjust the throttle slightly.

b. AUTOMATIC PILOT OPERATION. — Engage by turning the automatic pilot valve "ON". After the automatic pilot is in operation, the course-setting knob and the elevator and aileron trim knobs may be adjusted slightly if necessary to put the airplane in straight and level flight.

c. CYLINDER HEAD TEMPERATURES AND COWL FLAP ADJUSTMENT.—The cylinder head temperatures may be controlled by the degree of opening of the cowl flaps. The following cowl flap settings are recommended:

All ground operation—"OPEN"
Take-off—"OPEN"
Climb—As required
Cruising—As required
Diving—"CLOSED" .

Landing—"CLOSED" until landing completed
Operation of the engine shall be such as to maintain the cylinder head temperatures within the following limits:

(1) "AUTO-LEAN" Operation:
218° C. Maximum cruise or lower powers.
232° C. Normal rated power to maximum cruise.
248° C. Military power (30 minutes max.)
"AUTO-LEAN" is recommended for use at all powers.

(2) "AUTO-RICH" operation.
Use of "AUTO-RICH" mixture will increase the fuel consumption approximately 10 to 20 gallons per hour in the cruise range, and from 5 to 8 gallons per hour at higher powers. Cylinder head temperature limits for "AUTO-RICH" operation are the same

as for "AUTO-LEAN" with the following exceptions:
248° C. Normal rated power (one hour max.)
263° C. Take-off (5 minutes max.)

12. STALLS.

a. For the power-off stalling speed and characteristics at various gross weights, flap settings, etc., refer to Appendix I.

b. A definite warning before a stall is given by the airplane, in the form of a buffeting of the tail surfaces, which is relayed to the stick. A drop of the left wing will be noticed at stalling speed.

c. The ailerons are effective at or below stalling speed.

13. SPINS.

a. Spins should be prevented by the proper use of the rudder, elevator, and throttle controls. However, should a stall not be overcome before a spin develops, the following method of recovery is recommended:

(1) Kick the rudder HARD and with a POSITIVE motion FULL against the spin and hold.

(2) After about one-quarter to one-half turn, move the elevator controls FULL forward with a POSITIVE motion.

(3) Keep ailerons in neutral.

(4) Hold controls in this arrangement positively and long enough for them to take effect. It is advisable to judge the lapse of time by the number of turns made. In the event of a vicious spin, applied controls for recovery should be held for at least five turns before attempting any other means for promoting recovery.

b. Slow and cautious movement of the controls during recovery is to be avoided, as in some cases, with such movement of the rudder and elevators, spinning will continue indefinitely; whereas, brisk and positive operation of these controls will effect recovery.

c. In order to promote ease of recovery from a spin, the elevator trim tabs should be set so as to make the airplane nose-heavy for normal spinning.

d. Use of the throttle in an attempt to recover from a bad spin, although effective at times, is very poor practice and generally should be considered as a measure to be tried only as a last resort.

e. Recovery technique for the spins entered from stalls in accelerated flight is the same as that for recovery from normal, intentional spins. However, it must be remembered that spins entered during accelerated flight will usually be much faster due to the greater speed at entry. Therefore, there is more need for rapid and positive application of recovery controls and the controls may need to be held in the recovery position for a longer period of time.

f. TO RECOVER FROM A SPIN ENTERED IN ACCELERATED FLIGHT:

(1) Employ prompt recovery controls, as outlined in paragraph 13-a, above, and hold these controls until rotation stops.

(2) Neutralize rudder after rotation ceases.

(3) Level wings.

(4) Pull out at such a rate as to avoid placing excessive "g" loading on th airplane, thus avoiding another stall.

g. TECHNIQUE FOR RECOVERY FROM INVERTED SPINS.

(1) Cut the gun.

(2) Kick hard opposite rudder against the direction of rotation. It is mandatory that a visual determination of the direction of rotation be made by reference to the nose of the airplane. The turn indicator will show the true direction of rotation in either normal or inverted spins.

(3) Pull the stick back, neutralizing the ailerons.

(4) As soon as autorotation ceases, complete the recovery from the inverted position by either rolling out with the ailerons or completing the loop or a combination of the two.

(5) Ease the throttle on very gradually to prevent engine bearing damage, as during the evolution oil pressure will probably have been lost.

14. PERMISSIBLE ACROBATICS.

a. When carrying bombs, depth charges, and/or droppable fuel tanks, the following maneuvers are permitted:

(1) AILERON ROLL. (Only for entering dive).

(2) WING OVER.

(3) VERTICAL TURN.

(4) INVERTED FLIGHT. (Only for entering dives, but not permitted when carrying filled droppable fuel tanks.)

b. When not carrying such load items, the following acrobatics are permissable:

(1) LOOP.

(2) AILERON ROLL.

(3) CHANDELLE.

(4) IMMELMAN TURN.

(5) WING OVER.

(6) VERTICAL TURN.

(7) INVERTED FLIGHT. (Only for entering dives).

15. DIVING.

a. Caution should be observed in diving from high altitudes as the manifold pressure will build up rapidly at constant throttle setting. The throttle should be opened slowly at the completion of a dive so that the partly cooled engine will not cut out.

b. PROPELLER.—"AUTOMATIC". 2200 rpm (3100 rpm max. overspeed permissible for 30 seconds).

c. COWL FLAPS.—"CLOSED".

d. BOMB DOORS.—"OPEN".

e. WING FLAPS.—"DIVING".

f. THROTTLE.-Adjust throttle to maintain a minimum of 15 in. manifold pressure.

g. COCKPIT HEATER.-ON.

h. COCKPIT ENCLOSURE.-CLOSED.

i. COCKPIT VENTILATOR.-CLOSED.

j. It is recommended that the airplane be trimmed nose-heavy during dives, increasing the stick force necessary in the pull-out.

k. The "SNAP PULL-OUT" shall not be used in recovering from dives nor shall abrupt movements of the controls be employed in any maneuvers at high speed.

16. APPROACH AND LANDING.

a. APPROACH.—During descent for landing at speeds near stall with the constant speed propeller control in the high rpm (low pitch) position and throttle almost closed, the blade angle does not increase when the throttle is advanced until an engine rpm corresponding to the governor setting is obtained. Under these conditions, it has been found that the lag in the governor action will allow the propeller and engine combination to over-speed beyond take-off rpm if the throttle is opened suddenly. Therefore, adjust the propeller governor control for 2400-2600 rpm, and advance the throttle smoothly if power is required.

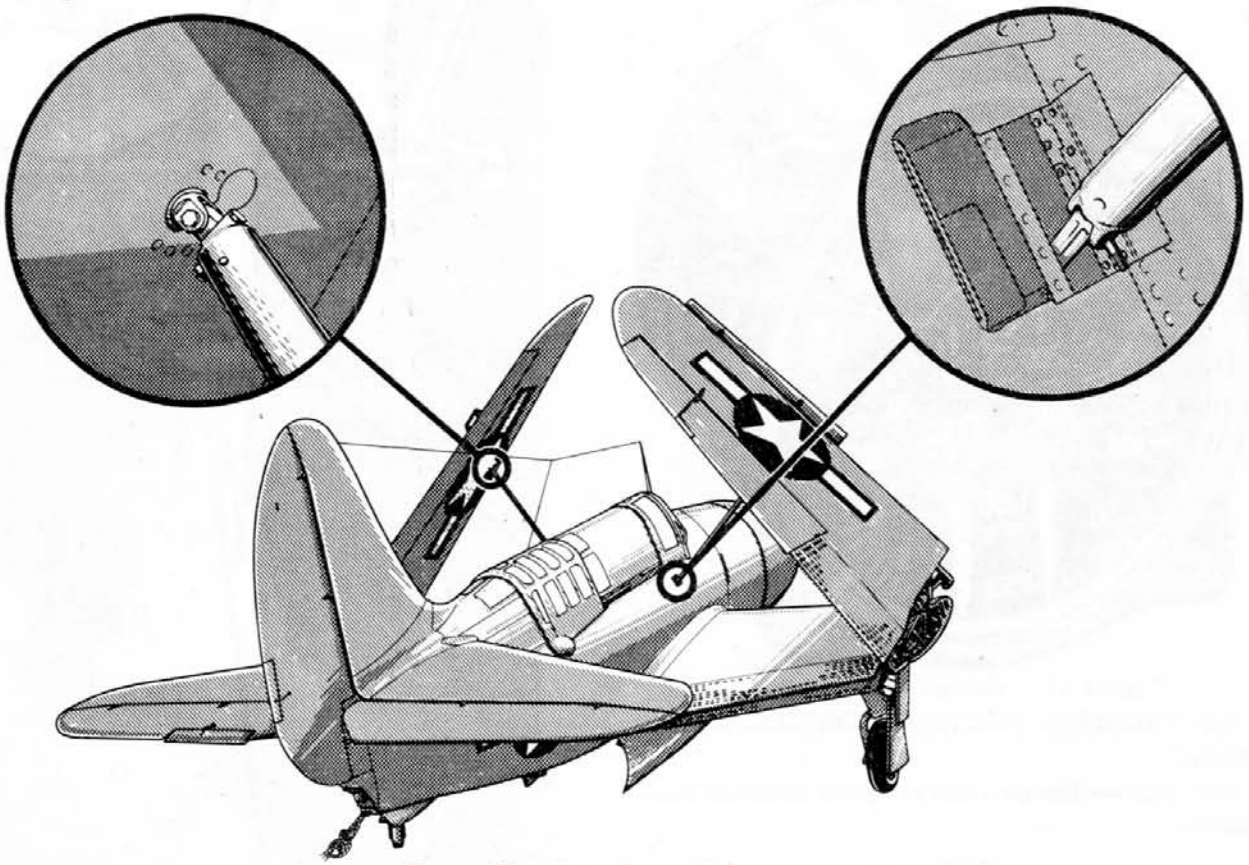


Figure 50 — Jury Strut Attachments

h. Observe the following procedure in case of engine over-speeding during a dive:

(1) Close throttle.

(2) If at all possible, increase the propeller pitch.

(3) Reduce the airspeed to the minimum for a safe glide.

engine.

b. GROUND LANDING.

(1) RADIO.—Check for correct tower frequency.

(2) ARMAMENT MASTER SWITCH.—"OFF".

(3) GUN CHARGERS.—"SAFE".

(4) CHARGE GUN CONTAINERS (PACKAGE GUNS).—"SAFE".

(5) MASTER ROCKET SWITCH.—"SAFE".

(6) FUEL SELECTOR VALVE.—Select tank with most fuel.

(7) AUXILIARY FUEL PUMP.—"ON".

BOOSTER PUMP (SB2C-4).-"ON" if main fuselage tank is selected.

(8) SUPERCHARGER.—"LOW".

(9) MIXTURE CONTROL.—"AUTO RICH".

10) CARBURETOR ALTERNATE AIR CONTROL.—Direct (pushed in).

(11) ENCLOSURES.—Locked open.

(12) LANDING GEAR.—LOCKED "DOWN".

(13) TAIL WHEEL.—Locked.

(14) WING FLAPS.—"LANDING"—Setting 52°.

(15) COWL FLAPS.—"CLOSED".

(16) PROPELLER TOGGLE SWITCH.—"AUTO"

(17) PROPELLER GOVERNOR.- Full "INCREASE RPM" when it is determined that a landing will be made.

Figure 51 — Engine Gage Unit

(18) THROTTLE FRICTION CONTROL. — "DECREASE".

(19) Tighten lap belt and shoulder harness; lock harness.

Note

After landing and before taxiing, return wing flaps to "O" and cowl flaps to "OPEN".

c. CARRIER LANDING.

(1) ARMAMENT MASTER SWITCH.—"OFF".

(2) GUN CHARGERS.—"SAFE".

(3) CHARGE GUN CONTAINERS. (PACKAGE GUNS).—"SAFE".

(4) MASTER ROCKET SWITCH.—"OFF".

(5) FUEL SELECTOR VALVE.—Select tank with most fuel.

(6) AUXILIARY FUEL PUMP.—"ON".

(7) SUPERCHARGER.—"LOW".

(8) MIXTURE CONTROL.—"AUTO RICH".

(9) CARBURETOR ALTERNATE AIR CONTROL —DIRECT (pushed in).

(10) ENCLOSURES.—Locked open.

(11) LANDING GEAR.—LOCKED "DOWN".

(12) TAIL WHEEL.—"UNLOCK".

(13) WING FLAPS.—"LANDING"—Setting 45°.

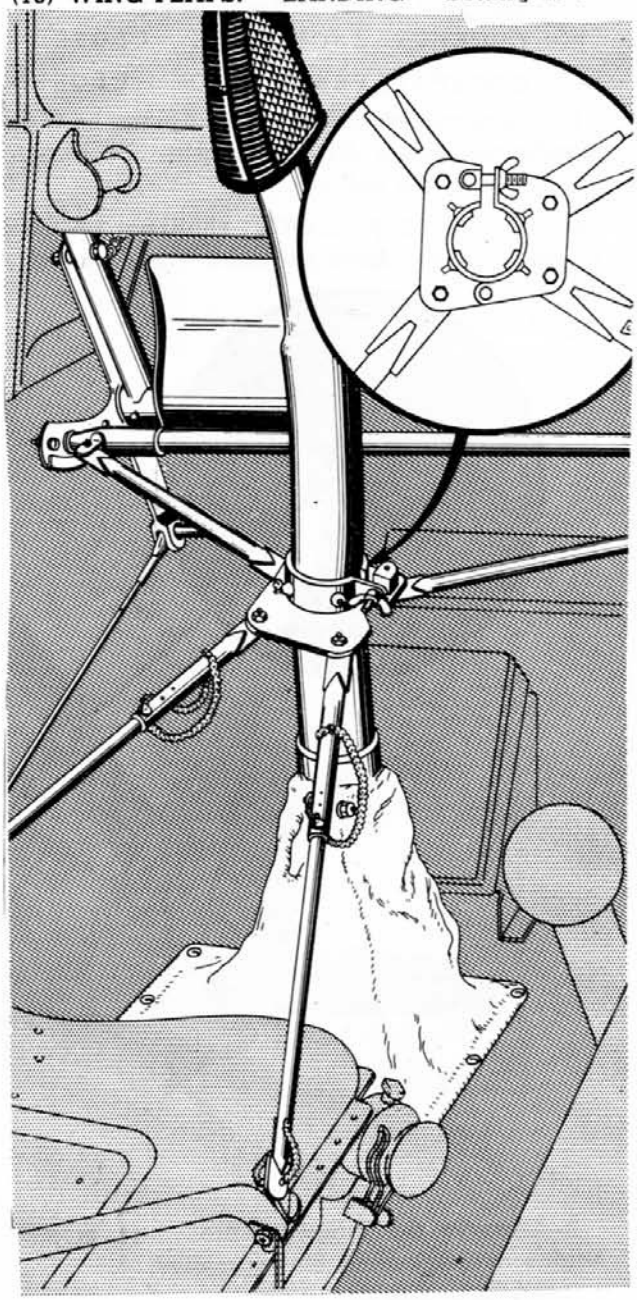


Figure 52 — Parking Harness

(14) COWL FLAPS.—As required.

(15) PROPELLER TOGGLE SWITCH.—"AUTO".

(16) PROPELLER GOVERNOR CONTROL.- Full "INCREASE RPM" when it is determined that a landing will be made.

(17) THROTTLE FRICTION CONTROL. — "DECREASE".

(18) ARRESTING HOOK.—"DOWN".

(19) Tighten lap belt and shoulder harness; lock harness.

d. CROSS WIND LANDING.—When it is found necessary to land cross wind, it is recommended that a power-on landing, slightly wheels first, be made.

e. MINIMUM RUN LANDING.—The recommended procedure for executing a minimum run landing is as follows:

(1) A carrier approach, with a 3-point landing near the end of the runway.

(2) Retract the landing flaps and apply brakes when the wheels are on the ground. Do not apply brakes so hard as to actually lock the wheels.

(3) Hold wheels on the ground by means of elevator control.

(4) During the last portion of the landing roll, the elevator will lose its effectiveness. Therefore, continue to apply the brakes hard, but not hard enough to raise the tail wheel off the ground.

(5) In event the airplane cannot be stopped by the time the end of the runway is reached, it is better to "ground loop" than to retract the landing gear. To ground loop, kick the rudder pedal hard one way or the other, keeping the aileron control neutral. This only applies when there are no obstructions or other airplanes with which collision is possible.

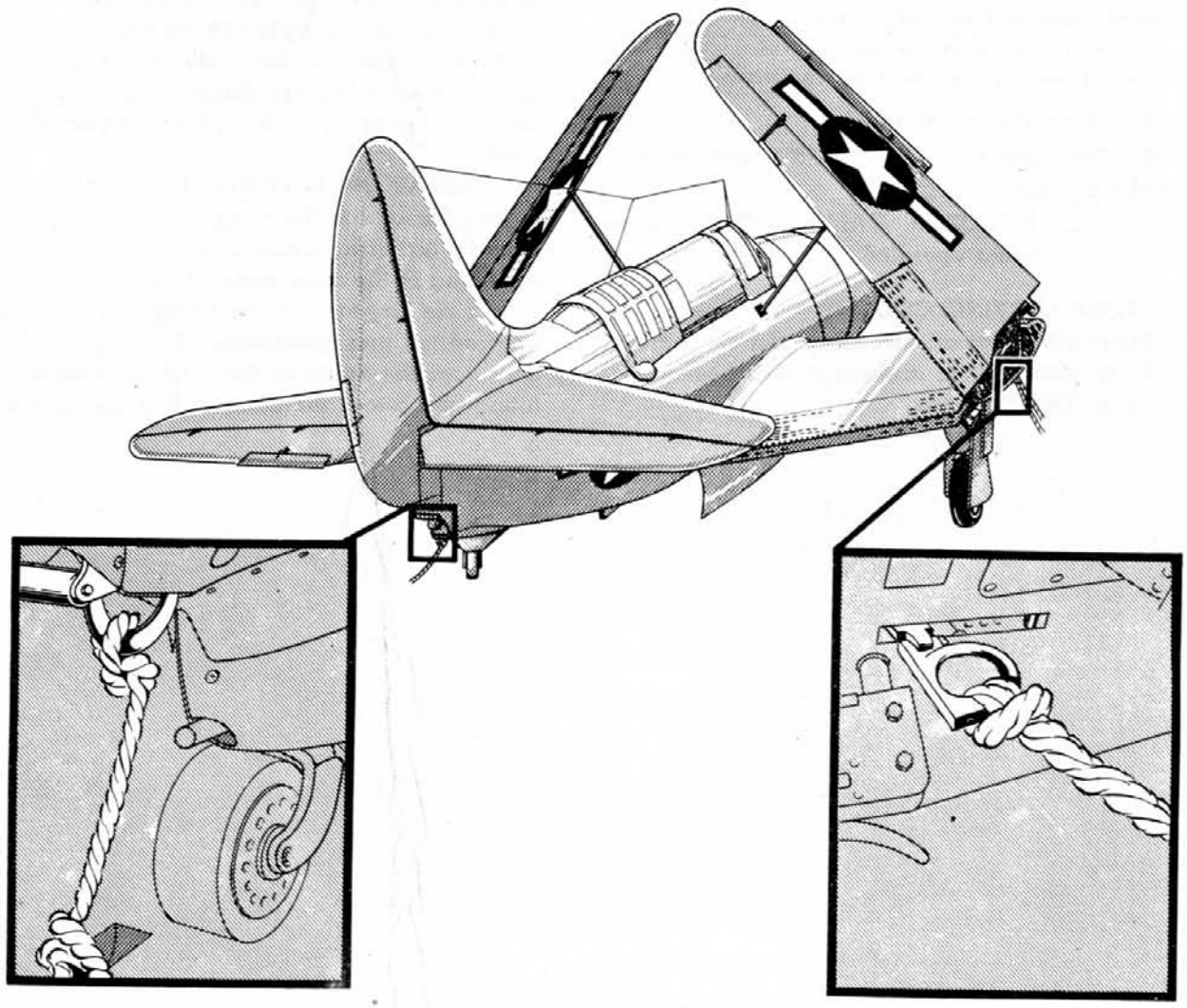


Figure 53 — Tie Down Links

17. STOPPING OF ENGINE.

a. Before stopping the engine, idle it at about 1000 rpm until the cylinder heads have cooled. In extremely warm weather the engine may be stopped when the head temperatures have dropped to about 200°-210° C. (392°-410° F.). In cold weather allow the cylinder heads to cool to lower temperatures.

Note

If it is absolutely necessary to stop the engine before properly cooling off, throttle down to at least 1000 to 1200 rpm BEFORE STOPPING.

b. CHECK-OFF LIST.

(1) COWL FLAPS.—"OPEN".

(2) PROPELLER.—Full "INCREASE RPM".

(3) Increase the engine rpm to 1000 and operate in each blower position for 30 seconds or more. The procedure of taxiing back to the line in "HIGH" blower satisfies this requirement. Carrier-based airplanes need not desludge after flight.

(4) MIXTURE CONTROL.—"IDLE CUT-OFF". The engine should stop in a few seconds.

(5) THROTTLE.—Full open.

(6) IGNITION SWITCH.—"OFF", after propeller stops turning.

(7) FUEL SELECTOR VALVE.—"OFF", when engine is not being operated.

18. BEFORE LEAVING COCKPIT.

a. Make sure that all electrical controls (battery switch, ignition switch, armament switches, lights, etc. are in "OFF" position.

b. INSTALLING PARKING HARNESS.—If the airplane is to be left unattended for any length of time the parking harness must be installed. Attach the adjustable ends of the harness to the pilot's seat and the fixed ends to the rudder pedal adjustment plates. (The use of control surface battens is recommended, in addition to the parking harness, wherever possible.)

19. MOORING.

a. TIEING DOWN.—There are three points at which the tie-down lines may be attached to the airplane. Located on the center panel just inboard of the wingfolds (figure 53) are retractable tie-down rings. The catapulting hold-back shackle in the rear of the fuselage just above the arresting gear hook may be used to secure the tail. In extreme cases, the towing eyes on the main landing gear should be used.

b. INSTALLING JURY STRUTS.—If the airplane is to be parked with the wings folded, the jury struts must be installed. Swing back the cover plate over the fitting in the outer panel *(figure 50)*. Insert one end of the jury strut in the fitting and turn the strut one-quarter turn clockwise. Then open the little door over the fitting in the fuselage, swing out the fitting and attach the other end of the strut to it as

Operating Data

SECTION · III

The indicated airspeeds on this graph include the inherent airspeed error of the SB2C-5 airspeed indicator installation. They vary from correct indicated airspeeds as follows:

Indicated Airspeed Knots	*Calibrated Airspeed Knots*
120	120
130	131
140	142
150	153
160	164
170	175
180	185
190	196
200	207
210	217
220	228
230	239

Figure **54.** Airspeed Installation Correction Table

POWER PLANT CHART

AIRCRAFT MODEL(S): SB2C-3,-4

PROPELLER(S): (1) SPA-9-L 1462

ENGINE MODEL(S): (1) R-2600-20

GAUGE READING	FUEL PRESS.	OIL PRESS.	OIL TEMP.	COOLANT TEMP.		OIL[1] CONS.
DESIRED MAXIMUM	14 15.5	85-90 95	70-85 102			21
MINIMUM IDLING	13	80 15				

MAXIMUM PERMISSABLE DIVING RPM: 3100
MINIMUM RECOMMENDED CRUISE RPM:
MAXIMUM RECOMMENDED TURBO RPM:

OIL GRADE: 1120, AN-VV-O-446
FUEL GRADE: 100/130, AN-F-28

WAR EMERGENCY (COMBAT EMERGENCY)			MILITARY POWER (NON-COMBAT EMERGENCY)			OPERATING CONDITION			NORMAL RATED (MAXIMUM CONTINUOUS)			MAXIMUM CRUISE (NORMAL OPERATION)		
MINUTES			30 MINUTES 248°C			TIME LIMIT MAX. CYL. HD. TEMP.			UNLIMITED 232°C (4)			UNLIMITED 218°C		
			AUTO-LEAN* 2600			MIXTURE R. P. M.			*AUTO-LEAN 2400			AUTO-LEAN 2200		
MANIF. PRESS.	SUPER-CHARGER	FUEL[2] Gal/Min	MANIF. PRESS.	SUPER-CHARGER	FUEL[2] Gal/Min	STD. TEMP. °C	PRESSURE ALTITUDE	STD. TEMP. °F	MANIF. PRESS.	SUPER-CHARGER	FUEL GPH[3]	MANIF. PRESS.	SUPER-CHARGER	FUEL GPH[3]
						-55.0	40,000 FT.	-67.0						
						-55.0	38,000 FT.	-67.0						
						-55.0	36,000 FT.	-67.0						
						-52.4	34,000 FT.	-62.3						
						-48.4	32,000 FT.	-55.1						
						-44.4	30,000 FT.	-48.0						
						-40.5	28,000 FT.	-40.9						
						-36.5	26,000 FT.	-33.7						
						-32.5	24,000 FT.	-26.5				F.T.	HIGH	90
						-28.6	22,000 FT.	-19.4				29.0	HIGH	90
			F.T.	HIGH	2.8	-24.6	20,000 FT.	-12.3	F.T.	HIGH	150	29.0	HIGH	85
			F.T.	HIGH	3.1	-20.7	18,000 FT.	- 5.2	F.T.	HIGH	170	29.0	HIGH	82
			F.T.	HIGH	3.4	-16.7	16,000 FT.	2.0	39.5	HIGH	176	29.0	HIGH	80
			43.5	HIGH	3.3	-12.7	14,000 FT.	9.1	39.5	HIGH	170	F.T.	LOW	87
			43.5	HIGH	3.2	- 8.8	12,000 FT.	16.2	39.5	HIGH	155	F.T.	LOW	100
			43.5	HIGH	3.4	- 4.8	10,000 FT.	23.4	39.5	HIGH	170	32.0	LOW	130
			F.T.	LOW	3.4	- 0.8	8,000 FT.	30.5	F.T.	LOW	180	32.0	LOW	122
			F.T.	LOW	3.5	3.1	6,000 FT.	37.6	F.T.	LOW	187	32.0	LOW	112
			F.T.	LOW	3.7	7.1	4,000 FT.	44.7	F.T.	LOW	190	32.0	LOW	100
			43.5	LOW	3.5	11.0	2,000 FT.	51.8	41.0	LOW	187	32.0	LOW	90
			43.5	LOW	3.4	15.0	SEA LEVEL	59.0	41.0	LOW	180	32.0	LOW	85

GENERAL NOTES

(1) OIL CONSUMPTION: MAXIMUM U.S. QUART PER HOUR PER ENGINE.
(2) *Gal/Min:* APPROXIMATE U.S. GALLON PER *MINUTE* PER ENGINE
(3) GPH: APPROXIMATE U.S. GALLON PER HOUR PER ENGINE.
F.T.: MEANS FULL THROTTLE OPERATION.
VALUES ARE FOR LEVEL FLIGHT WITH RAM.

FOR COMPLETE CRUISING DATA SEE APPENDIX II
NOTE: TO DETERMINE CONSUMPTION IN BRITISH IMPERIAL UNITS, MULTIPLY BY 10 THEN DIVIDE BY 12. RED FIGURES ARE PRELIMINARY SUBJECT TO REVISION AFTER FLIGHT CHECK.

TAKE-OFF CONDITIONS: 2800 RPM, 49.0 IN HG.,
AUTO-RICH MIXTURE, LOW BLOWER
263°C CYL. HD. TEMP. MAX., - 5 MIN.

CONDITIONS TO AVOID:

SPECIAL NOTES

* OPERATION IN AUTO-LEAN IS CONTINGENT UPON MAINTAINING TEMPERATURE BELOW LIMITS.

(4) 248°C FOR ONE HOUR PERMISSIBLE WITH AUTO-RICH.

AAFMC-526 4-1-44

DATA AS OF 12-20-44 BASED ON PRELIMINARY DATA

Figure 55. Power Plant Chart

Emergency Operating Instructions

SECTION · IV

1. EMERGENCY TAXIING, TAKE-OFF, AND LANDING.

a. TAXIING.—The airplane cannot be taxied successfully without brakes, although it can be moved in a straight line if the tail wheel is locked. A brake accumulator pressure of 850 to 1050 psi is sufficient for approximately 10 applications of the brakes.

b. TAKE-OFF.—The airplane can be taken off without brakes if it is possible to maneuver it into the proper position on the take-off strip.

c. LANDING.

(1) FORCED LANDINGS.

(a) It is recommended that if at all possible, the bombs, rockets, and droppable tanks be jettisoned before landing.

(b) A forced landing should be made above the stalling speed, if possible, and with the landing gear retracted, in order that the pilot may have control of the plane and prevent the possibility of nosing over.

(c) In making a forced landing the pilot should consider the altitude, type of terrain, and characteristics of the airplane in determining the proper landing attitude.

(2) LANDING WITH WHEELS RETRACTED.—When a "belly landing" seems inevitable, keep the airplane in the air until most of the fuel is consumed, then complete as much as possible of the following:

(a) MASTER ARMAMENT SWITCH.—"OFF" (jettison bombs, rockets, and droppable fuel tanks if possible).

(b) GUN CHARGERS.—"SAFE".

(c) SEAT BELT AND SHOULDER HARNESS.—Secured.

(d) ENCLOSURES.—Locked open.

(e) WING FLAPS.—Fully extended.

(f) MIXTURE CONTROL (just before landing.)—"IDLE CUT-OFF".

After the engine stops:

(a) BATTERY SWITCH.—"OFF".

(b) IGNITION SWITCH.—"OFF".

(c) FUEL SELECTOR VALVE.—"OFF".

(3) WATER LANDINGS (DITCHING).—The same procedure as that outlined for "LANDING WITH WHEELS RETRACTED" ((2) above), is applicable to ditching.

2. FIRE.

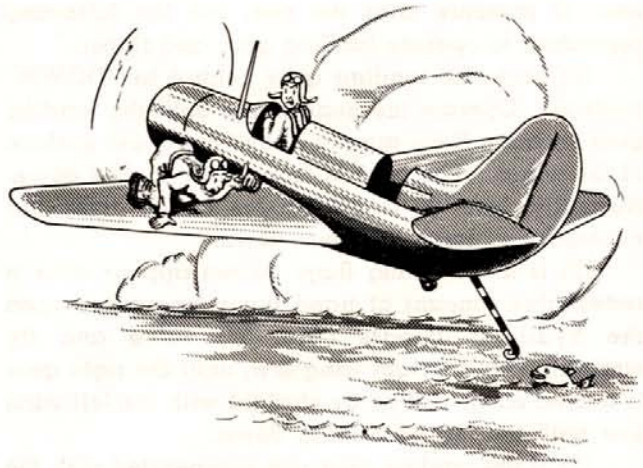
a. FIRE IN ENGINE COMPARTMENT.

(1) MIXTURE CONTROL.—"IDLE CUT-OFF".

(2) FUEL SELECTOR VALVE.—"OFF".

WARNING

DO NOT CUT THE IGNITION SWITCH.



(3) CARBURETOR ALTERNATE AIR CONTROL.—Direct (pushed forward).

(4) COWL FLAPS.—Closed.

(5) Increase engine power as much as circumstances permit in order to consume fuel that might otherwise feed the fire.

b. FIRE IN THE AIRPLANE, BUT OUTSIDE THE COCKPIT.—Close the enclosure and do not open it until abandoning the airplane.

c. PROCEDURE IN THE EVENT OF FIRE FED BY HYDRAULIC OIL IN WING AND/OR BOMB BAY DURING FLIGHT.

(1) "NO. 1" HYDRO VALVE.—Closed.

(2) FLAP ACTUATOR LEVER.—"NEUTRAL".

(3) If fire continues to burn, place the landing gear control handle in "DOWN" position. If it is the landing gear "up" line which is feeding the fire, it will continue to burn for a few moments due to oil being forced through the broken line by the retracting piston as the gear drops, but should cease very shortly after the landing gear is down.

d. ELECTRICAL FIRE.—If practicable, turn the switch to the circuit in which the fire takes place "OFF"; otherwise, turn off the battery and generator switches. If the fire is extinguished turn the circuits back on, one at a time, starting with the generator and battery switches. Watch for the circuit which caused the fire as it may flare up again when the circuit switch is thrown.

Note

There are no provisions on the airplane for extinguishing fire.

3. EMERGENCY OPERATION OF HYDRAULIC SYSTEM.

a. If for any reason hydraulic pressure drops off, immediately close the shut-off ("No. 1") hydro valve. If pressure rises after closing this valve, the landing gear and flaps may be operated in the normal manner. If pressure does not rise, use the following procedure to operate landing gear and flaps:

(1) Lock the landing gear control in "DOWN" position. Operate the hand pump until the landing gear warning flags appear above the upper surface of the wings. The gear is then safely locked down. Normally, from 80 to 100 strokes of the pump are necessary to force the gear down.

(2) If the warning flags do not appear after a reasonable amount of hand pump operation, open the hydraulic bypass ("No. 3") valve and fly straight, with the right wing low, until the right gear is locked down. Then fly straight with the left wing low until the left gear locks down.

(3) If the landing gear can be operated with the hand pump, it is possible that the flaps can be opened. To do this, move the flap control lever to the desired setting and operate the hand pump until the flap angle indicator shows the required degree of opening. If the landing gear cannot be pumped down, it is not possible to open the flaps.

Note

The only way in which a leak in a line from one of the brake treadles to the brake can be detected is by unequal braking action. Therefore, when landing after a hydraulic failure, apply brakes with extreme caution.

b. Should it be necessary to open the bomb bay doors after a hydraulic failure, proceed as follows:

(1) "NO. 1" SHUT-OFF VALVE.—"OPEN".

(2) "NO. 3" SHUT-OFF VALVE.—"OPEN".

(3) BOMB DOOR CONTROL HANDLE.—"OPEN". Springs under compression will be released and open the doors.

4. EMERGENCY OPERATION OF ELECTRICAL SYSTEM.

a. If while in flight the voltammeter reads off scale at the "30" volts end, the generator switch should be turned "OFF" and the needle will then return to "0". However, this is an emergency condition and should it occur, the battery alone is carrying the load. Under this circumstance all electrical loads should be reduced to a minimum at once, since the battery cannot supply normal needs for long. The master radio switch should be immediately turned "OFF", as well as the radar search equipment (notify the radar operator by "ICS"). Turn the propeller toggle switch to "OFF" operating the propeller in fixed pitch, and turn off all lights, if practicable. Operation of the above or any other electrical equipment should be kept to a minimum for the remainder of the flight, which should be terminated as soon as possible and the system checked by a competent mechanic.

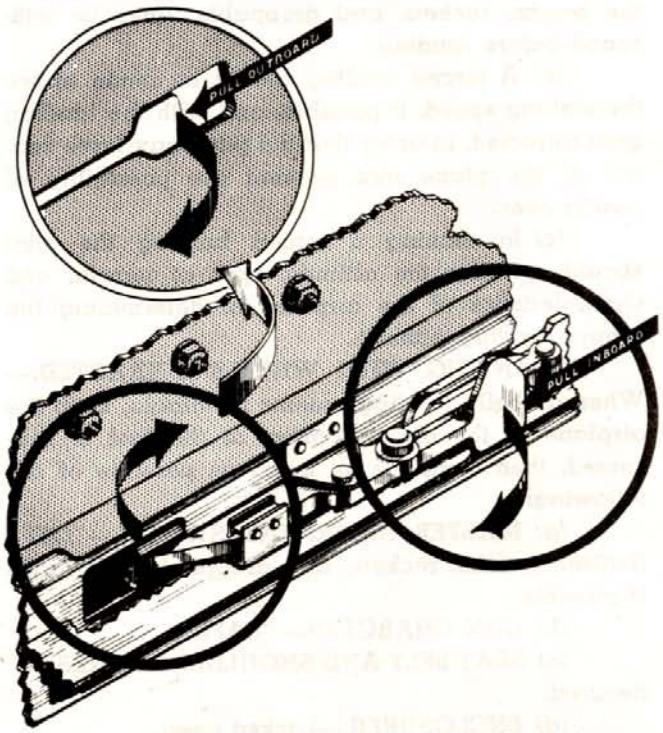


Figure 56 — Pilot's Escape Hatch Control

5. EMERGENCY EXITS.

a. PILOT'S COCKPIT.

(1) ESCAPE PANEL.—An escape panel is incorporated in the left side of the pilot's enclosure. It is

operated as follows:

(a) Pull inboard on the red locking lever.

(b) Push outboard on the panel.

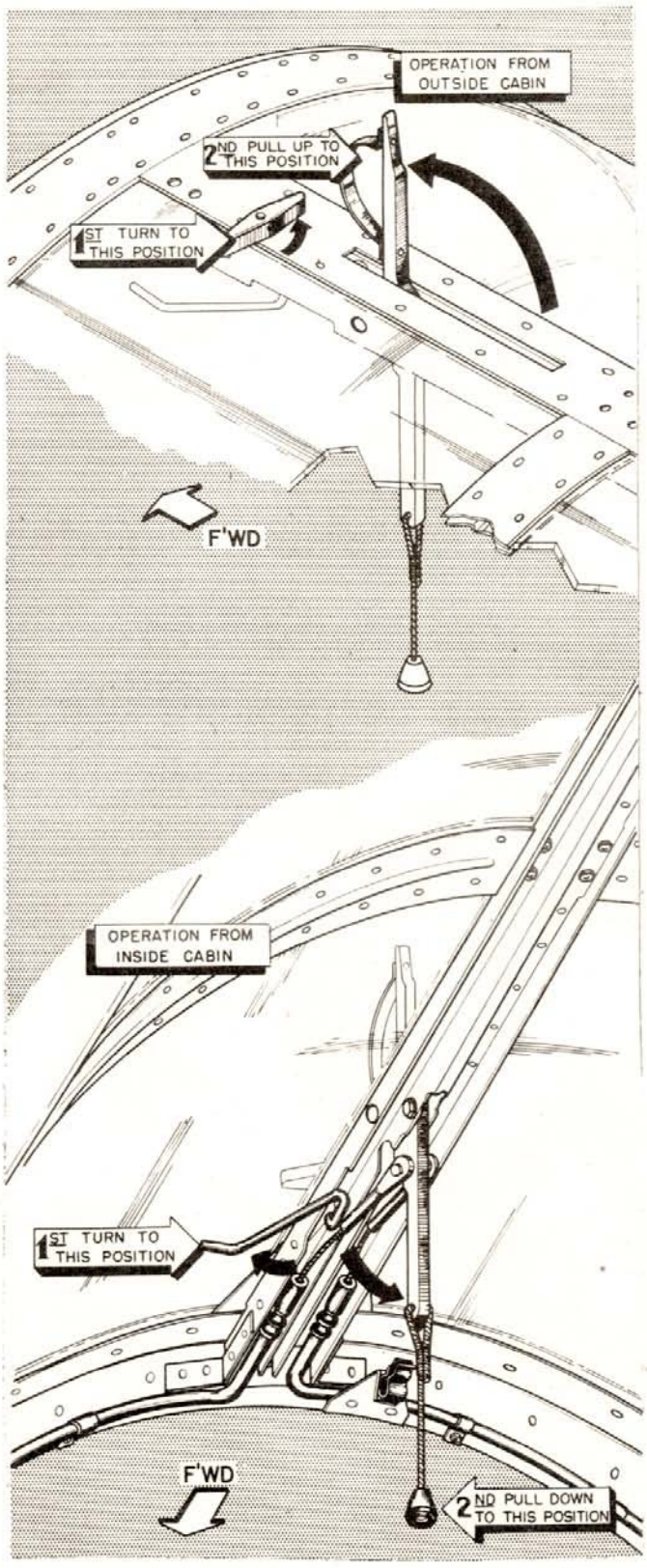


Figure 57 — Cabin Jettisoning Mechanism

(2) JETTISONING THE PILOT'S ENCLOSURE.

(a) Pull the locking key free of the pins through which it passes.

(b) Pull down and aft on the release knob.

(c) Push the enclosure off the airplane.

b. GUNNER'S COCKPIT.

(1) ESCAPE HATCH.—The top of the gunner's enclosure opens to form an escape hatch. It is opened as follows:

(a) Rotate the locking lever 90° counterclockwise.

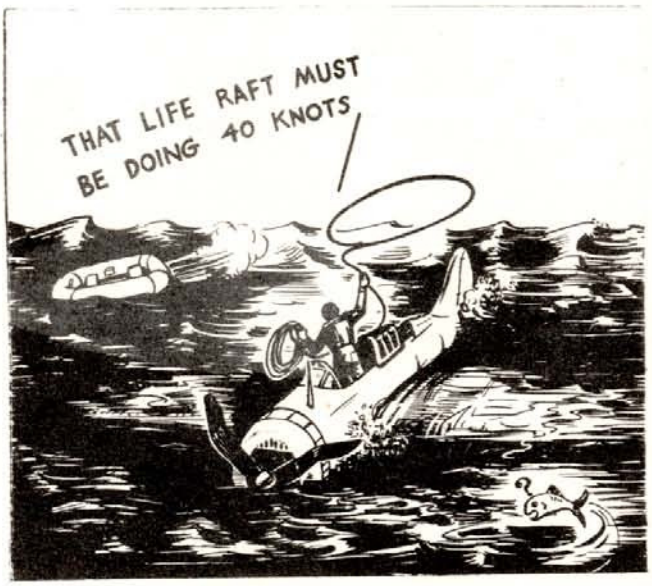
(b) Fold back top of the enclosure.

6. LIFE RAFT AND EMERGENCY EQUIPMENT.

a. The life raft and emergency equipment are stowed in a tube located in the fixed enclosure *(see figure 48)* forward of the gunner's cockpit, with the emergency equipment stowed forward of the raft. The procedure for removing the raft and emergency equipment, and inflating the raft, is as follows:

WARNING

THE RAFT INFLATES INSTANTLY AFTER PULLING HANDLE. IT IS NECESSARY TO EXERCISE EXTREME CARE THAT THE RAFT DOES NOT BREAK AWAY, UPON INFLATION, AND BECOME LOST.



(1) Release lock assembly on end of storage tube by pulling the handle inboard.

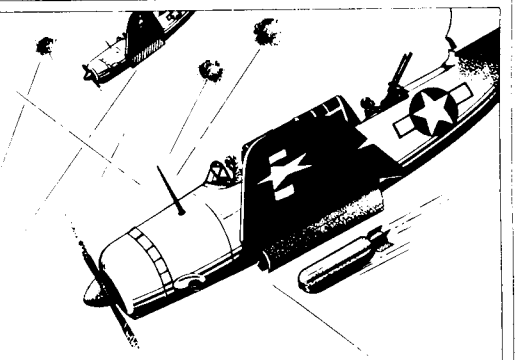
(2) Grasp the life raft firmly with both hands and pull sharply aft. The emergency equipment is secured to the forward end of the raft.

(3) Continue to pull on life raft until emergency equipment pocket is free of the tube.

(4) To inflate raft, follow instructions stencilled on the release flap: "TO OPERATE — LIFT FLAP AND PULL HANDLE HARD".

Operational Equipment

SECTION · V



1. OXYGEN SYSTEM.

a. The oxygen system consists of a cylinder, a diluter demand regulator, a mask, and an oxygen flow indicator. The pilot's oxygen equipment is located on the right side of the cockpit.

b. A valve on the oxygen cylinder must be turned on in order to operate the system. When this valve is on, a gauge mounted forward of the diluter demand regulator indicates the pressure in the system.

c. The diluter demand regulator has two valves—an air valve and an emergency valve. The air valve controls the flow of air from the cockpit into the regulator. Air flows into the regulator only when the valve is open.

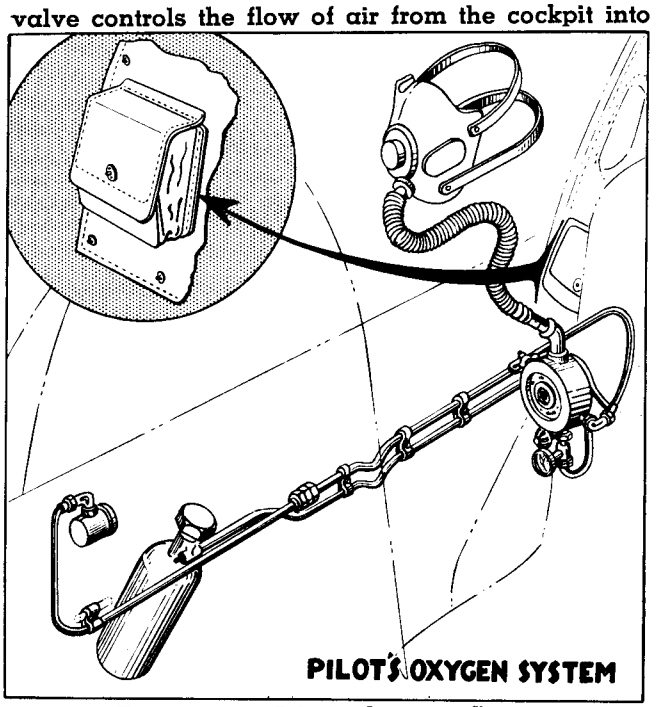


Figure 58 — Pilot's Oxygen System

The flow of oxygen through the regulator is controlled by the emergency valve. When this valve is off, oxygen flows through the regulator only when the pilot inhales. A continuous stream of oxygen is forced through the regulator when the emergency valve is "ON".

d. In normal operation, the air valve is "ON" and the emergency valve is "OFF". When the pilot inhales, oxygen is drawn into the regulator where it is mixed with air from the cockpit, the ratio of air to oxygen depending on altitude and being automatically regulated by an aneroid device in the regulator. The mixture of air and oxygen flows into the mask and is inhaled by the pilot.

e. When both valves are closed, no air can enter the regulator and the pilot breathes pure oxygen.

f. When the air valve is closed and the emergency valve open the pilot breathes pure oxygen,

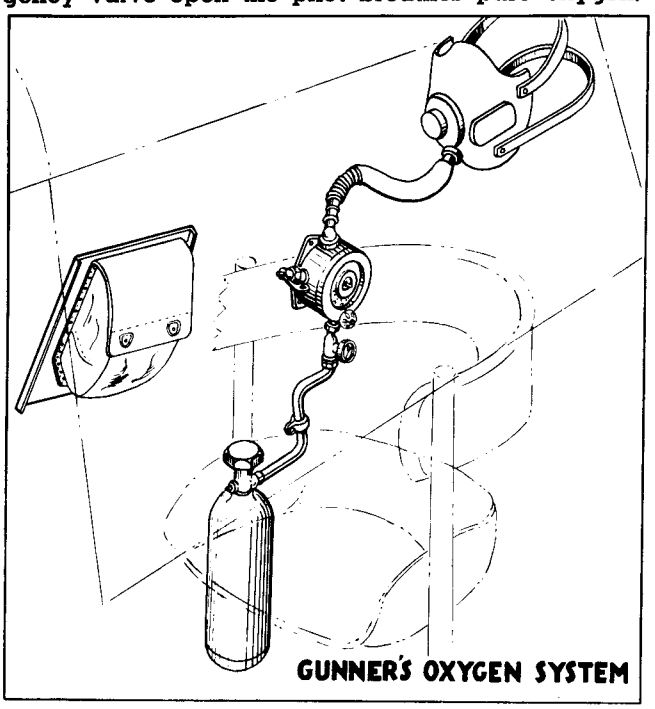


Figure 59 — Gunner's Oxygen System

but in this case oxygen goes through the regulator in a steady stream; whereas, when both valves are off, the oxygen goes through the regulator only when the pilot inhales. Operating the system with the emergency valve "ON" causes the oxygen supply to be rapidly diminished and should therefore be avoided as much as possible.

g. Operating with the air valve "OFF" is dangerous because no air can enter the system, and should the pilot lose consciousness and remain so long enough to deplete the oxygen supply, the possibility of his becoming conscious, even at low altitudes, is remote. At all times when the air valve is closed, exercise extreme caution to assure a flow of oxygen.

h. OXYGEN FLOW INDICATOR.—The oxygen flow indicator is mounted on the right instrument panel. As long as oxygen is flowing through the regulator, the indicator will "blink" open and shut each time the pilot breathes. It must be remembered that the indicator shows that oxygen—BUT NOT NECESSARILY ENOUGH OXYGEN—is flowing through the regulator.

i. PRE-FLIGHT LIST.—The following items shall be checked while the airplane is on the ground prior to flight in which the use of oxygen is anticipated.

(1) EMERGENCY VALVE.—"OFF".

(2) Open the cylinder valve and allow at least 10 seconds for pressure in the line to equalize. The pressure gauge should read 1800 plus or minus 50 psi if the cylinder is fully charged.

(3) Close cylinder valve. After a few minutes observe the pressure gauge and simultaneously open the cylinder valve. If the gauge pointer jumps, leakage is indicated.

(a) If leakage was found by (3) above, test further, as follows: Open the cylinder carefully noting the pressure gauge reading, then close cylinder valve. If the gauge pointer drops more than 100 psi in 5 minutes THERE IS EXCESSIVE LEAKAGE and the oxygen system must be repaired prior to use.

(4) Check mask fit by placing thumb over end of musk tube and inhaling lightly. If there is no leakage, the mask will adhere tightly to the face due to suction created. If mask leaks, tighten the mask suspension straps and adjust the nose wire, or both. DO NOT USE A MASK THAT LEAKS.

(5) Couple mask securely to breathing tube by means of the quick disconnect coupling. IMPORTANT: Mating parts of coupling must not be "cocked", but must be fully engaged.

(6) Open cylinder valve. Depress diaphragm knob through hole in center of regulator case and feel flow of oxygen into the mask, then release the diaphragm knob. Breathe several times observing the oxygen flow indicator for "blink", verifying the positive flow of oxygen.

Note

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

(7) Check emergency valve by turning counter clockwise slowly until oxygen flows vigorously into the mask, then close the valve.

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

j. OPERATION INSTRUCTIONS.

(1) Open oxygen cylinder valve. The pressure gauge should read 1800 plus or minus 50 psi, if the cylinder is fully charged.

(2) Set air valve to "ON" position, except when the presence of excessive carbon monoxide is suspected, then set to "OFF" position.

(3) Put on oxygen mask. Be sure that quick disconnect coupling is FULLY engaged.

(4) Check mask fit by squeezing mask tube and inhaling lightly. Mask will adhere tightly to face if there is no leakage. If the mask leaks, tighten mask suspension straps.

CAUTION

NEVER CHECK MASK FIT BY SQUEEZING MASK TUBE WHILE EMERGENCY VALVE IS ON.

(5) Breathe normally and observe oxygen flow indicator for "blink" verifying positive flow of oxygen.

(6) Check frequently:

(a) Cylinder pressure gauge for availability of oxygen supply.

(b) Oxygen flow indicator for flow of oxygen to mask.

k. All diluter demand regulators which (a) fail to satisfactorily meet the "Pre-Flight Check List", (above); (b) have been in service for 90 days subsequent to previous shop test; (c) are installed in airplanes undergoing major overhaul, shall be removed from the airplane and shop-tested to determine the suitability of each regulator for continued service usage.

2. ARMAMENT.

a. Pilot's Cockpit.

(1) ARMAMENT SWITCH BOX. The armament switch box *(see figure 33)* is located just below the auxiliary instrument panel.

(2) MASTER ARMAMENT SWITCH. This switch *(See figure 33)* must be on (in the up position) before bombs or torpedo can be armed and released electrically, the fixed guns, rockets, and/or gun contain-

ers fired, and the gun camera operated. The master armament switch should be "OFF" at all times except when it is intended to use some of the controls on the armament switch box, since inadvertent operation of other controls with the switch on may be disastrous.

(3) WARNING LIGHT. A warning light is located on the gunsight mount which operates if the master armament switch is on and the landing gear in the "DOWN" position. This is intended to serve as a reminder to turn the master switch "OFF" during landing operations and while on the ground.

(4) BOMB RELEASE.

(a) ELECTRICAL RELEASE. — The selector switches for electrical bomb release are located on the armament switch box, indicated as: "WING RACKS", "LEFT", "RIGHT", and "BOMB BAY RACKS": "LEFT", "CENTER", "RIGHT". Release procedure for dropping of bombs is as follows:

1. MASTER ARMAMENT SWITCH.—On.

2. SELECTOR SWITCHES.—Select bmob (or bombs) to be dropped.

WARNING

WHEN SALVO RELEASE OF FUSELAGE BOMBS IS INTENDED, PLACE THE "BOMB BAY RACKS" SELECTOR SWITCHES IN THE "DOWN FOR SALVO" POSITION. THE RELEASE MECHANISM IS SET TO RELEASE THE BOMBS AT SPLIT-SECOND INTERVALS TO PREVENT INTERFERENCE BETWEEN THEM WHEN LEAVING THE BOMB BAY OR ON THEIR PATH TO THE TARGET. HOWEVER, THIS SETTING IS EFFECTIVE ONLY WHEN RELEASE SWITCHES ARE PLACED AT "DOWN FOR SALVO".

3. CIRCUIT BREAKERS (on armament panel).—Pushed in.

4. ARMING SWITCHES (see figure 33 "NOSE", "TAIL", or both, as desired.

5. BOMB BAY DOORS.—"OPEN".

Note

The fuselage bombs cannot be dropped unless the bomb bay doors are open. A switch in the release circuit prevents closing of the circuit until the doors have been opened. Mal-adjustment of this switch also makes release of bombs impossible, even though the doors may be open.

6. Press bomb release button on the control stick.

(b) MANUAL RELEASE.—A MK.4, Mod. 3 manual bomb release quadrant is located on the left side of the cockpit *(see figure 60)*. There are three slots in the top of the quadrant, indicated as "L" (left wing rack) "SAL" (salvo of fuselage bombs), and "R" (right wing rack). Placing the release handle in any one of the slots and pulling it aft effects the release of the bomb(s) on the rack(s) indicated on the quadrant. THE BOMB BAY DOORS MUST BE OPEN BEFORE FUSELAGE BOMBS CAN BE RELEASED.

Note

There are no provisions made in SB2C-3 and SB2C-4 airplanes for manual arming of either wing or fuselage bombs.

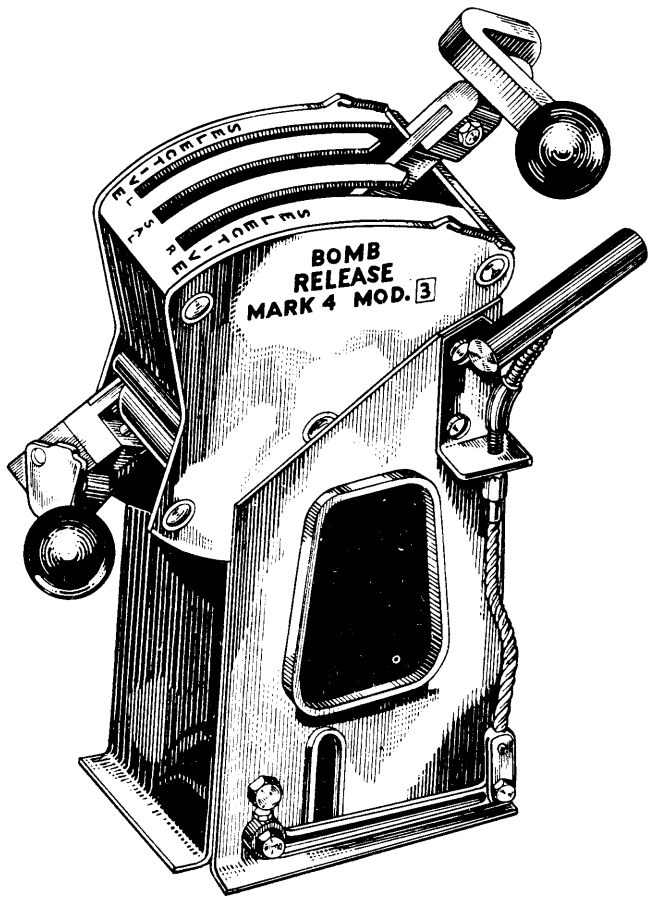


Figure 60 — Bomb Release Quadrant

(c) MANUAL SALVO RELEASE.—The "tee" handle "EMERGENCY SALVO RELEASE" just forfard of the Mk. 4 bomb release quadrant is provided for the simultaneous releasing of all bombs. With the bomb bay doors open (if fuselage bombs are carried) pull up on the tee handle and the wing and fuselage bombs will be dropped, BUT NOT ARMED.

(5) TORPEDO RELEASE.

(a) The torpedo may be released electrically or manually. For manual release, place the "BOMB RELEASE HANDLE" on the Mk. 4-3 quadrant in the center slot and move it aft to "SAL".

(b) For electrical torpedo release use the following procedure:

1. MASTER ARMAMENT SWITCH.—On.
2. SELECTOR SWITCH—"CENTER" and "(TORPEDO)".
3. CIRCUIT BREAKER SWITCH.—Pushed in.
4. Press bomb release button on the control stick to release torpedo.
5. Complete closure of the bomb doors is not possible when the torpedo is carried. To close the doors as far as possible when torpedo is loaded, proceed as follows:

a. With engine not running, open the number "3" hydraulic valve to dump pressure in the main accumulator.

b. Close the number "3" valve and move the bomb door control to "CLOSED".

c. Operate the hand pump until a sudden increase in pumping effort indicates that the bomb doors are closed as far as possible.

(6) FIXED GUN INSTALLATION CONTROL.

(a) The fixed guns (20 mm. cannons, one on either side of the center panel) are fired by means of the trigger on the grip of the control stick. Two hundred rounds of ammunition per gun can be carried. Since the guns are fired electrically, the master armament switch and the "FIXED GUNS" switch *(see figure 33)* must be on.

(b) The fixed guns must be charged before they can be fired. Two hydraulically operated gun chargers, one for each cannon, are located under the main instrument panel. *(See figure 61).* To charge the cannons, rotate the handles clockwise to the stops and push forward. Selective firing is accomplished by charging only the cannot to be fired.

(c) When the hydraulic pressure in the chargers reach 750 psi, the handles will fly back to their original positions. To release a dud or an unarmed shell, push the charger handle forward as often as necessary. To return guns to "SAFE" turn the handle counterclockwise to stop and push forward. In the event of a hydraulic system failure the cannons cannot be charged. If they have been previously charged and are on "SAFE" they may be recharged by rotating the handles clockwise to the stops, even though the hydraulic system has failed. In this condition the cannons cannot be returned to "SAFE" nor will the chargers eject duds or jammed shells.

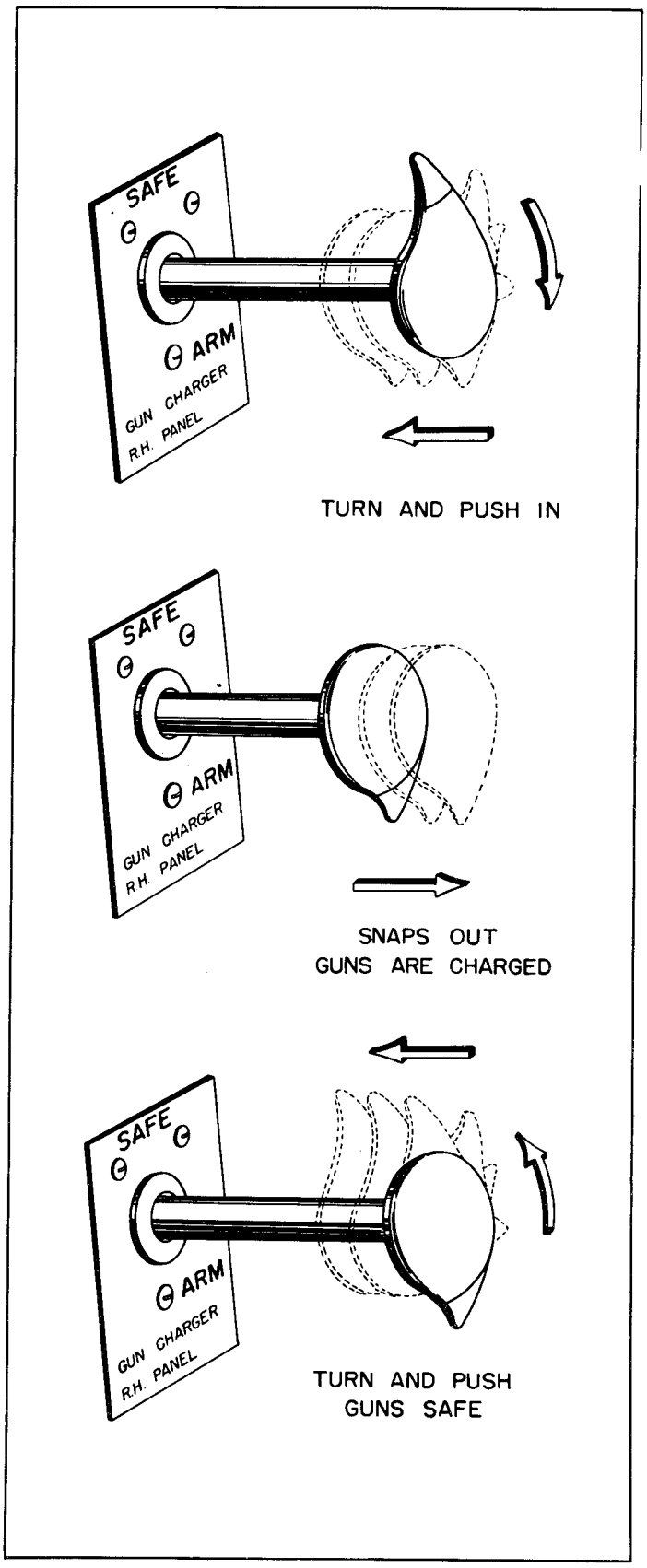


Figure 61 — Fixed Gun Charging Handle

CAUTION

A RUN-AWAY GUN CAN BE STOPPED BY TURNING THE GUN CHARGING HANDLE TO "SAFE" AND DEPRESSING TWICE. UPON LANDING, THE GROUND CREW SHOULD BE NOTIFIED OF THE FACT THAT THE GUN HAS RUN AWAY SO THAT PROPER PRECAUTION AND CORRECTIVE ACTION CAN BE TAKEN. A RUNAWAY GUN STOPPED IN THIS MANNER IS LIKELY TO RESUME AUTOMATIC FIRE IF CHARGED.

(a) The illuminated gun sight is stowed on a bracket on the pilot's floor, to the right of the seat. A bracket is located aft of the windshield to support the sight, which can be used as a gun sight, bomb sight, or torpedo director.

(b) To illuminate the sight, turn the knob on the armament switch box labeled "DIM-BRIGHT" *(see figure 33)* clockwise until the desired intensity is obtained.

(8) PILOT'S GUN CAMERA.

(a) The pilot's gun camera is located in the leading edge of the right center panel, outboard of the fixed gun. The camera is actuated electrically, being automatically controlled by circuits including a switch *(see figure 33)* located on the armament switch box, the bomb release switch, and the gun-firing switch on the control stick.

(9) GUN CONTAINERS (PACKAGE GUNS)—SB2C-4 ONLY.

(a) When gun containers are carried on the wing bomb racks, they are operated by means of the "GUN CONTAINERS" and "GUN CONTAINERS CHARGERS" switches. To fire the container guns select either the left container, right container, or both, by throwing the "LEFT" and/or "RIGHT" "GUN CONTAINERS CHARGERS" switches from "SAFE' 'to "CHARGE". With the master armament switch on throw the "GUN CONTAINERS" switch to "ON" and depress the trigger switch on the control stick. To jettison one or both containers, proceed as described under "BOMB RELEASE", Section V, paragraph 2 (4).

(b) By combining the operations described for fixed guns and gun containers, a salvo of all guns can be fired.

(10) ROCKET PROJECTILES. (SB2C-4 ONLY).

(a) Four rocket projectiles can be carried under each outer panel. Rockets are fired in the following manner:

1. Be sure the safety plug is fully inserted in the face of the MK-3 station distributor.

2. MASTER ARMAMENT SWITCH.—On.

3. Throw the "ON-OFF" switch on the station distributor to "ON".

4. Turn the "ARM-SAFE" switch to "ARM".

5. Operate the "TO RESET PULL AND TURN" knob until the numeral "1" appears in the "NEXT STATION" window.

6. If it is desired to fire a single pair of rockets or a series of pairs of rockets, throw the "SINGLE-AUTO" switch to "SINGLE". If the rapid firing of all rockets is desired, throw the "SINGLE-AUTO" switch to "AUTO". In either "SINGLE" or "AUTO" setting, the rockets will be fired in pairs going from outboard to inboard, one from each wing.

7. Rockets are fired by depressing the switch on the left side of the control stick. With the "SINGLE-AUTO" switch at "AUTO" the firing switch must be held in continuously, as long as automatic firing is desired or until all rockets are gone. With the "SINGLE-AUTO" switch on "SINGLE", a single pair of rockets will be released each time the firing switch on the control stick is operated.

8. Four pair of rockets are available, corresponding to Stations "1", "2", "3", "4", and "5". The "NEXT STATION" window will show which station is the next to be fired. After reaching "8" the numbers will repeat in the window; i.e., "1" will follow "8", so that when four stations have been fired, all rockets are gone regardless of the "NEXT STATION" indication.

(b) To avoid burning the outer panel lower flaps when firing rockets in a dive, the "ROCKET FLAPS — DIVE FLAPS" switch *(see figure 6)* must be set to "ROCKET FLAPS" prior to operating the wing flap control preparatory to entering a dive. If the outer panel flaps are inadvertently lowered, the rocket firing circuit is automatically opened. This condition cannot be corrected without closing the flaps by means of the wing flap control, setting the "ROCKET FLAPS — DIVE FLAPS" switch to "ROCKET FLAPS" and re-opening the flaps.

WARNING

DO NOT FIRE INBOARD ROCKETS BEFORE RELEASING DROPPABLE WING TANKS, AS ROCKETS WILL STRIKE THE TANKS.

b. GUNNER'S COCKPIT.

(1) FLEXIBLE GUN INSTALLATION.—The aft cockpit is equipped with a twin .30 caliber machine gun mount, manually operated. When not in use, the guns are stowed under the turtleback *(see figure 62)*. One thousand rounds of ammunition can be

carried for each gun.

(a) To unstow the guns lift up the locking handles *(see figure 62)* and remove the stowage cables. Pull the guns forward until they are locked onto the carriage which rides on the mounting ring. Press down the handle and move the carriage as far as it will go to either side of the ring. The guns may now be rotated to remove the muzzles from under the turtleback.

(b) After unstowing the guns, collapse the turtleback by pushing the valve lever *(see figure 46)* and operating the hand pump *(see figure 46)*. To lower the turtleback rapidly open the dump valve *(see figure 46)*.

(c) When the turtleback has been lowered, swing the armor plate into place by lifting up and turning the two locking keys, then swinging both pieces of armor plate inboard as far as they will go. To hold the armor plate closed fasten both pieces together by the elactic cord.

(d) Charge the guns by pulling and releasing the two "T" handles *(see figure 62)* each of which charges one gun. To fire, place the "SAFE-FIRE" button on "FIRE" and press the trigger with either thumb. Selective firing is accomplished by charging only the gun it is desired to fire.

(e) The guns are manually operated and can be rotated through an arc of 35° on each side of aft center. Vertical movement is obtained by raising or lowering the guns manually. Additional vertical movement is obtained by tilting the gun track, which movement is controlled by a foot latch *(see figure 62)* on the aft supporting strut.

(f) The gunner's seat is raised or lowered by either of two methods. If the breast armor plate is in place, the seat lock is released by raising a lever on the left seat support just inside the gun ring. If breast armor is not used, the seat lock is released by lifting a bar just below the forward edge of the seat and extending between the seat supports. The seat revolves on the seat ring and can be locked so that the gunner can face the fore and aft positions. The lock is located on the left side of the seat at the seat track.

(g) The guns are stowed by depressing a thumb latch *(see figure 62)* on the carriage and pushing the guns aft until muzzles are in place in the stowage bracket located on the turtleback. To secure the guns in this position, place the hooks on the ends of the stowage cables in the clips provided just forward of the gun handles.

Note

The turtleback must be in the raised position when guns are stowed.

(h) GUN SIGHT.—In order that the gun sight light may be operated, the switch *(see figure 33)* on the aft panel must be "ON".

(i) GUN CAMERA.—When the gun camera switch is depressed, operating the gun trigger closes the camera circuit. The camera then operates with the guns.

3. RADIO NAVIGATION AND COMMUNICATION EQUIPMENT.

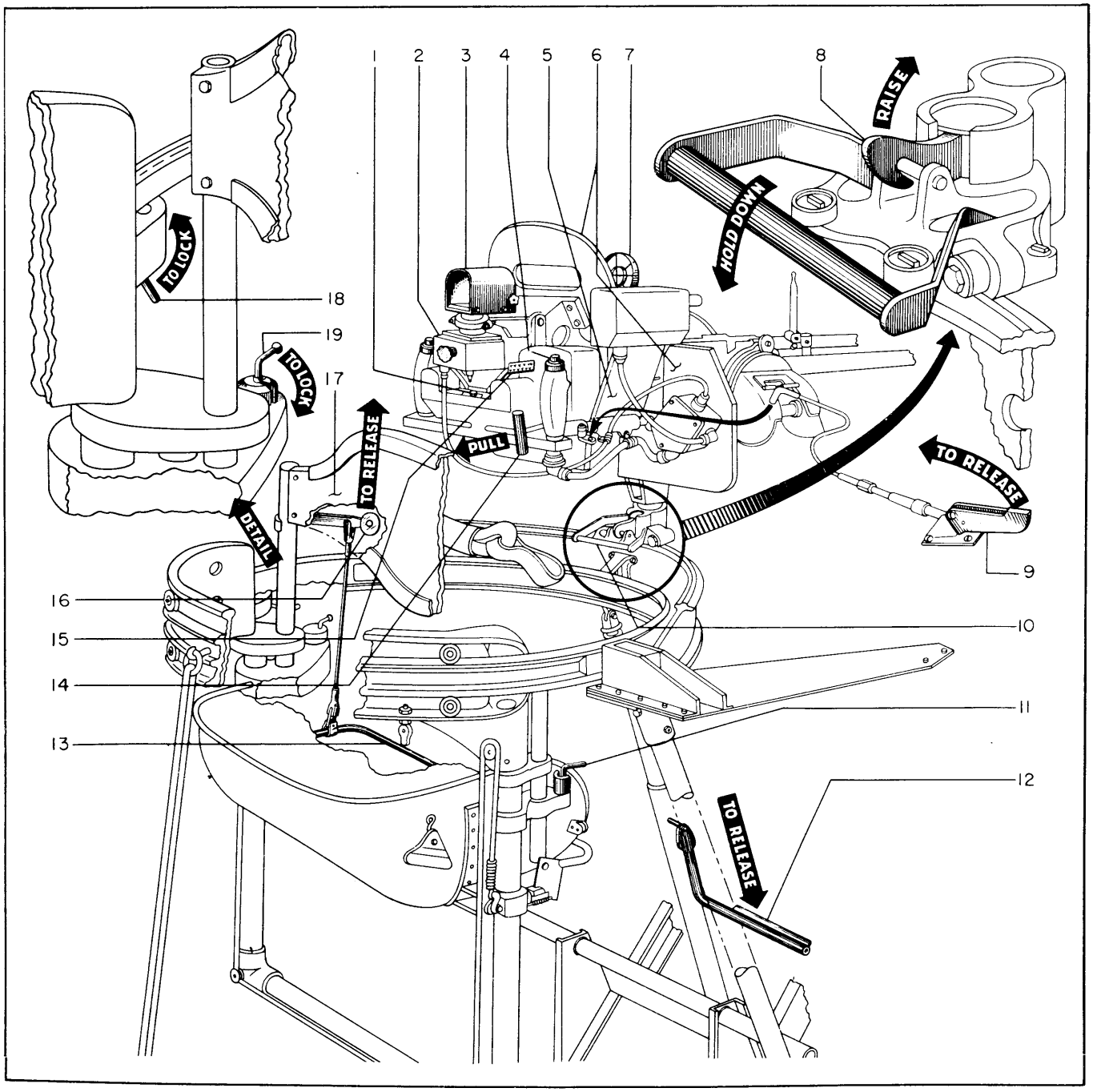
(See figure 48.)

a. UPON ENTERING COCKPIT.—Plug the headset into the phone extension cord leading to the jack box. Make certain that the microphone and headset plugs are fully engaged. If the use of a mask or lip microphone is anticipated, connect either one to the mask microphone cord.

b. POWER FOR RADIO.—With battery switch on, engine running, and generator charging, turn on the radio master switch located on the pilot's electrical switch panel. This supplies power to all radio and interphone equipment in the system with the exception of the AN/ART-13 transmitter, which is fed directly from the battery switch. While waiting about one minute for the equipment to warm up, turn off all audio outputs by the following procedure: On the RECEIVER CONTROL unit, turn the "SENSITIVITY" control counterclockwise to minimum. Throw the toggle switches marked "REC A", "REC B", and "REC C" to "OFF".

c. INTERPHONE TEST.—On the RECEIVER CONTROL unit, set the "MIC" selector switch to "ICS", press the press-to-talk switch on the microphone and call the other stations. Release the press-to-talk switch while awaiting replies. The "ICS" system should also be checked using the mask or lip microphone, if such is provided. In this case, the throttle switch must be pressed in order to talk.

d. RECEIVER "A" TEST (VHF ARC-4).—On the VHF control unit, make certain the "ON-OFF" switch is "ON", and the "RADIO-INTERPHONE" switch is on "RADIO". The "OUTPUT" control is not used in this installation. Set the "P-G, BOTH P-P" switch to "P-P" (plane to plane channel). On the RECEIVER CONTROL unit, throw the left hand toggle switch to "REC A", and advance the "VOLUME" control for normal reception if a signal is present. If signal is not present, advance the "VOLUME" control full clockwise to the maximum position. In the absence of a signal, no sound should be heard in the phones provided the equipment is operating correctly. Channel1 is now being



1. "Safe" Control
2. Sight Control
3. Electric Gun Sight
4. Camera Thumb Button
5. Gun Camera Mount
6. Armor Plate
7. Alternate Sight
8. Hook—30 Caliber Gun Mount
9. Stowage Cable Release L/R
10. Governs Position of Rotating Guns on Track
11. Control for Breast Armor Plate
12. Control Lever Soverning Tilt of Seat
13. Latch Rod to Elevate Seat
14. Charging Handle L/R
15. Trgger Lever L/R
16. To Raise or Lower Seat
17. Breast Armor Plate
18. Control to Lock Turret Seat on Track

Figure 62 — Flexible Guns (.30 Caliber)

received (regardless of position of the "CHAN SEL" switch). On the VHF control unit, set the "P-G, BOTH, P-P" switch to "P-G" (plane-to-ground). Set the "CHAN SEL" switch to position "1". Channel 2 is now being receiver. Set the "CHAN SEL" switch to position "2"; channel 2 continues to be received. Set the "CHAN SEL" switch to position "3"; channel 3 is now being received. Set the "CHAN SEL" switch to position "4", where channel 4 will be received.

Set the "P-G, BOTH, P-P" switch on "BOTH". The "P-P" channel output is now combined with the "P-G" channel output selected by the "CHAN SEL" switch, thus enabling the pilot to monitor the plane-to-plane and plane-to-ground channels simultaneously. In the event that signals appear at the same time on both channels, causing mutual interference in the headphones, the switch may be thrown to either "P-G" or "P-P", depending on which channel the pilot desires to receive. The "CHAN SEL" switch also selects the transmitting channel in addition to the receiving channel; the number of the channel corresponds to the switch number. The following table summarizes the above instructions on channel selection:

Channel Selection Position	Transmitter Channel	Receiver Channels Obtained for Each Position of "P-G, Both: P-P" Switch		
		"P-P"	"BOTH"	"P-G"
1	1 (P-P)	1	1 & 2	2
2	2 (P-G)	1	1 & 2	2
3	3 (P-G)	1	1 & 3	3
4	4 (P-G)	1	1 & 4	4

When satisfied that the VHF receiving equipment is functioning satisfactorily, throw the left hand taggle switch on the RECEIVER CONTROL unit to "OFF". Do not disturb the "VOLUME" control setting on the RECEIVER CONTROL unit.

e. For combat installation continue in accordance with procedure (1) below; for ferry installation continue in accordance with (2) below.

(1) RECEIVER "B" TEST (ARB) — COMBAT INSTALLATION.—On the RECEIVER CONTROL unit, throw the middle toggle switch to "REC B", and adjust the control (just above the toggle switch) marked "SET FOR MAX. TOLERABLE NOISE". If this control is not set for the maximum noise that can be received with comfort, weak signals may not be heard. The "VOLUME" control should not be disturbed from the setting found satisfactory when the VHF receiver was tested. Throw the "REC B" toggle switch to "OFF" thus completing the adjustments and test of the ARB receiver. Nevt set up receiver "C" (se subparagraph f. below).

(2) ARB RECEIVER TEST — FERRY INSTALLATION.

(a) Before proceeding with the operation of this equipment, it should be noted that certain combinations of the settings of the "HOMING-COMMUN" and "MVC-AVC" switches on the ARB control box cannot be obtained. This is a normal condition and no attempt should be made to force these switches into any positions to which they cannot be moved by normal pressure. It should be noted further that the two positions under "HOMING" on the "HOMING-COMMUN" switch are not used in this installation; no antenna is provided for these positions. Detailed instructions follow:

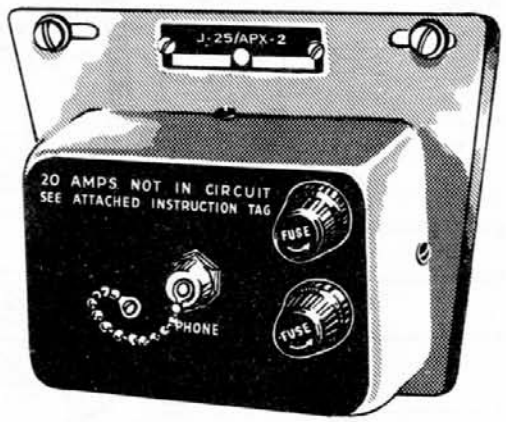


Figure 63 — J25 AN/APX-2 Junction Box

1. MCW RECEPTION.—Set the "HOMING-COMMUN" switch on one of the four bands under "COMMUN" on which reception is desired. If the band selected is either 195-560 I/C or 560-1600 I/C, set the "MVC-AVC" switch on "MCW" and tune in the signal by means of the ARB tuning head. Perform this final tuning with the "INCREASE OUTPUT" control reduced to a low but comfortable level. If the band selected is either 1.6-4.5 I/C or 4.5-9.05 I/C, set the "MVC-AVC" switch in the "BROAD" position when searching for the signal. When the signal has been located, shift the "MVC-AVC" switch to "MCW" and perform the final tuning as described above. For voice reception shift the "MVC-AVC" switch to "SHARP". Shifting from MVC to AVC operation or vice-versa, may require readjustment of the "INCREASE OUTPUT" control to maintain satisfactory volume level in the headphones.

2. RANGE RECEPTION.—The procedure is similar to that given above except that "MVC-AVC" switch must be set on "MCW" while receiving range signals. The "INCREASE OUTPUT" control should be set to the minimum value required for reception.

3. CW RECEPTION.—Set the "HOMING COMMUN" switch to the desired band under "COMMUN". Set the "MVC-AVC" switch on "CW". Advance the "INCREASE OUTPUT" control until normal background noise is heard. Tune in the desired signal and readjust the "INCREASE OUTPUT" control for a comfortable volume level.

(b) When satisfied that the receiver is performing satisfactorily, rotate the "INCREASE OUTPUT" full counterclockwise to minimum; thus completing adjustments and test of the ARB receiver.

f. RECEIVER "C" TEST. (HF UNIT OF ARC-5).—On the RECEIVER CONTROL unit, throw the right hand toggle switch to "REC C". Adjust the "SET FOR MAX. TOLERABLE NOISE" control. The "VOLUME" control should not be disturbed from the setting found satisfactory when the VHF receiver was tested. Throw the "REC C" toggle switch to "OFF" at the conclusion of the test.

g. For combat installation continue in accordance with procedure (1) below; for ferry installation continue in accordance with (2) below.

(1) NAVIGATION RECEIVER TEST (ARR-2)—COMBAT INSTALLATION.—O nthe RECEIVER CONTROL unit, operate the crank in the right hand section of the unit to bring the assigned channel number in the indicator window. Set the "CW-VOICE" switch to "CW". Set the "SENSITIVITY" knob to obtain a usable weak signal, or if the desired signal cannot be heard, to a fairly strong background hiss. Do not disturb the "VOLUME CONTROL" setting. If a signal is present, adjust the "PITCH" control to produce a pleasing audible tone. Readjust the "SENSITIVITY" control to keep the signal rather weak. IF THE SIGNAL IS TOO STRONG, A CLEAR-CUT COURSE INDICATION CANNOT BE OBTAINED. The secret in accurate interpretation of navigation signals lies in the use of the least setting of the "SENSITIVITY" control. Keep this control adjusted to receive only one character predominantly. The lower the signal level, the better the operation. When satisfied that the NAVIGATION RECEIVER is operating properly, proceed as described in subparagraph h., below. Do not disturb the above adjustments.

(2) FERRY INSTALLATION.—On the RECEIVER CONTROL unit, make certain the "SENSITIVITY" control is off (full counterclockwise), thus omitting the NAVIGATION RECEIVER from the line-up.

h. For combat installation continue in accordance with (1) below; for ferry installation continue in accordance with (2) below.

(1) SIMULTANEOUS OPERATION — COMBAT INSTALLATION.—On the RECEIVER CONTROL unit, throw the three toggle switches to "REC A", "REC B", and "REC C", respectively.

(2) SIMULTANEOUS OPERATION—FERRY INSTALLATION.—On the RECEIVER CONTROL unit, throw the left and right hand toggle switches to "REC A" and "REC C", respectively. On the ARB RECEIVER CONTROL box, turn up the "INCREASE OUTPUT" control for normal operation (see subparagraph e. (1) above).

i. VHF TRANSMISSION (ARC-4).

WARNING

THE INSTRUCTIONS FOR OPERATING TRANSMITTERS ARE SUBJECT TO LOCAL LIMITATIONS REGARDING RADIO SILENCE.

Voice transmission only is provided by the VHF equipment. The receiving equipment should be in operation as described above. On the VHF CONTROL unit, place the "CHAN SEL" switch at the position corresponding to the desired channel in accordance with the table in subparagraph d., above. On the RECEIVER CONTROL unit, place the "ICS-VHF-MHF" microphone switch on "VHF". Press the press-to-talk switch on the hand-held microphone and proceed with transmission. If a mask or lip microphone is used in place of the hand-held microphone, press the throttle switch.

j. HF, MHF, LF TRANSMISSION (ART-13).—The following instructions assume that the "LOCAL-REMOTE" switch located on the transmitter front panel has been placed in the "REMOTE" position. On the ATC TRANSMITTER CONTROL unit, make certain that the emission switch is on "VOICE". Select the desired channel by means of the "CHANNEL" switch. After about 25 seconds the indicator lamp will light indicating that the transmitter is set up on the channel selected and that it is under control of the pilot. While waiting for the switching operation to be completed, place the "ICS-VHF-MHF" switch on the RECEIVER CONTROL unit on "MHF". When the indicator lamp lights, press the press-to-talk switch on the hand-held microphone and talk. Release the switch to listen. If a mask or lip microphone is used, press the throttle switch to talk.

k. PILOT'S CHECK-OFF LIST.

(1) BEFORE TAKEOFF:

(a) Plug in headset and mask or lip microphone is used.

(b) Turn "ON" master radio switch.

(c) Test ICS.

(d) Test REC "A" (VHF).

(e) Test ARB receiver.

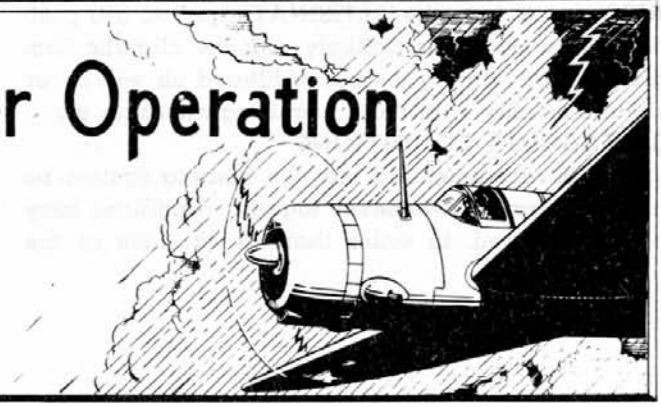
(f) Test REC "C".

(g) Test navigation receiver (if combat instal-
(h) Set up for simultaneous operation.
(i) Make VHF test transmission.
(j) Make ART-13 test transmission.

(2) AFTER LANDING:
(a) Turn "OFF" master radio switch.

Extreme Weather Operation

SECTION VI



1. COLD WEATHER OPERATION.

a. GROUND OPERATION.

(1) ENGINE STARTING.—The engine is started and warmed up in approximately the same manner at all times, regardless of weather conditions. However, in cold weather the engine is harder to start and requires more priming. Care must be taken not to flood the blower and lower cylinders with raw gasoline by priming excessively. If flooding does occur, turn the engine over several times by hand with battery switch "OFF", before attempting to start again.

(2) ENGINE WARM-UP.—A longer warm-up period is required in cold weather which should not be shortened by closing the cowl flaps, as this may cause the cylinder fins to crack or the insulation on the ignition system to burn.

(3) HYDRAULIC SYSTEM. — Operation of the hydraulic system in temperatures below —18°C. (0°F.) may result in injury to the system unless precautionary measures are taken. It is therefore recommended that operations in such temperatures be preceded by the following steps:

(a) Before starting the engine, exhaust hydro oil from the main accumulator by opening the number three (shut-off) valve, which dumps the oil into the reservoir. Then close the valve and actuate the wing flaps and bomb bay doors by means of the hand pump, to force cold oil from the reservoir into circulation. The hydraulic system pressure gauge should read the same as the accumulator air pressure gauge (above 550 psi, the pre-load pressure of the accumulator).

(b) To exhaust the oil in the brake accumulator, open the number three (shut-off) valve. With the valve open, operate the brake pedals until the brake accumulator air pressure gauge will drop no farther, indicating the pre-load pressure (350-450 psi). Close the number three valve and work the hand pump until the brake accumulator air gauge reads about 800 psi and coincides with the reading of the hydraulic system gauge. Operate the brake a few times to circulate the oil.

b. FLIGHT OPERATION.

(1) CARBURETOR ICING.—When outside air temperature is near the freezing point of water and moisture content of the air is high, the carburetor has a tendency to ice up. This can be reduced by operating the engine with the carburetor air control in the alternate air position (pulled aft). The atmospheric conditions causing the carburetor to ice may be detected by the presence of sleet, snow, light rain, or cloudiness accompanied by near-freezing temperature. The actual formation of ice in the carburetor is indicated by a slow dropping off of manifold pressure. The pilot should switch to alternate air as soon as he realizes conditions are favorable for icing, instead of waiting until there is a manifold pressure drop.

(2) OIL TEMPERATURE AND PRESSURE GAUGES.—Temperatures below 0°C. (32°F.) congeal oil in the oil pressure gauge line, and may cause the gauges to become sluggish when the engine is started and the readings inaccurate until the oil is warm. If the gauges fail to read at all (either in cold or warm weather), stop the engine and investigate the cause of the trouble.

(3) HYDRAULIC OPERATION.

(a) The operation of any individual hydraulic unit may be sluggish if the actuating cylinder is located where it cannot benefit from cockpit or engine heat, as are the landing gear, bomb bay, and flap actuating struts. The operation of such units in flight should be started earlier than usual, and sufficient additional time allowed for completion of the operating cycle.

(b) Before landing, operate the brake pedals a few times to circulate the cold oil so that the brakes will be easier to apply when needed.

2. DESERT CONDITIONS.

a. Under sandy conditions operate with the "CARBURETOR AIR FILTER" control in the FILTERED AIR (pulled aft) position. It is not possible to obtain filtered air when the "CARBURETOR ALTERNATE

AIR" control is in the **ALTERNATE** (pulled aft) position. However, it is unlikely that the climatic conditions necessitating the use of filtered air will occur simultaneously with those requiring alternate air.

3. FOGGING CONDITIONS.

a. It is recommended that the heating system be put in operation whenever fogging conditions may be encountered, in order that the aft face of the windshield and the forward face of the bullet resistant glass be kept warmer than outside air temperature. The heating unit should also be kept in operation and the cockpit ventilator and enclosure closed during dives. Use of the heating system, even though air temperatures are high, will result in maximum protection against loss of vision regardless of climatic conditions.

APPENDIX · I

Note

Flight tests to determine best operating methods and resultant fuel consumption were conducted with the SB2C-3 airplane at NAS Patuxent River from February to July 1944.

The operating methods developed during the tests are discussed in this section, and the attached charts plot the results obtained using these methods.

The Patuxent River information is used in lieu of specification data. Similar data for the SB2C-4 airplane will be included in this handbook by revision.

1. ENGINE

a. GENERAL.—To obtain the most economical operation consistant with long engine life and reasonably simplified operating methods, the engine should be operated in accordance with the Pilot's Operating Chart (Plate III) and the Engine Operating Limits (Plate IV).

b. RPM—MANIFOLD PRESSURE COMBINATIONS.

(1) At any gross weight, by entering Plate III at the density altitude and IAS to be flown (or the correct IAS from Plate II if external drag items are present), the rpm to use and the resulting fuel consumption in gallons per hour may be read from the chart. For the correct manifold pressure to use with the specified rpm, refer to Plate IV, on which the desired combinations of rpm and manifold pressure are shown.

(2) Variations in air temperature will affect the power developed at any one combination of rpm and manifold pressure, and this will be indicated by a variation from the intended airspeed. When this occurs the rpm and manifold pressure should be adjusted until the desired airspeed is obtained.

(3) When the adjustment is made refer to Plate IV and interpolate between rpm—manifold pressure lines to maintain the proper relation between rpm and manifold pressure.

(4) The effect of such adjustments on fuel consumption is negligible as long as the intended IAS is held.

(5) At part throttle, manifold pressure should not be changed without a corresponding change in rpm.

(6) In the full-throttle range, the rpm shown on Plate III can only be approximate because of the effect of varying air temperature on power.

(7) Use full-throttle and adjust the rpm as necessary until the desired airspeed is obtained.

(8) Any tendency of the engine to surge at full throttle may be overcome by backing off the throttle until the surge disappears. As much as an inch reduction of manifold pressure may be employed in this manner with no loss in power.

(9) Failure to realize the performance indicated on Plate III using reasonably close approximations to the recommended rpm and correct manifold

pressure, may be caused by faulty carburetion, subnormal magneto timing, or incorrect valve clearances and timing.

(10) If the fuel consumption is substantially as indicated on Plate III, the carburetor may be eliminated as a cause of the discrepancy. Magneto and valve timing should then be carefully checked to determine the cause for the loss in performance.

(11) The existence of any external drag items must be taken into consideration and corrections made from Plate II.

(12) Operation in "HIGH" blower at 2600 rpm is not recommended above 17,000 feet density altitude, and operation at 2400 rpm is not recommended above 19,500 feet density altitude. The efficiency of the propeller falls off above these altitudes, so that equal or greater airspeed will be obtained at lower rpm.

(13) Above 20,000 feet altitude, excessive richness of the mixture (with the mixture control in either "AUTO RICH" or "AUTO LEAN") causes the brake horsepower available at 2600 rpm and 2400 rpm to be reduced below that obtained at 2300 rpm.

c. MIXTURE CONTROL AND CYLINDER HEAD TEMPERATURES.

(1) "AUTO LEAN" mixture may be used for all flight operations (including military power climb), except takeoff and landing, provided cylinder head temperatures are held within the following limits:

(a) 218° C. maximum cruise or lower powers.

(b) 232° C. normal rated power to maximum cruise.

(c) 248° C. military power (five minutes max.).

(2) "AUTO LEAN" is recommended for use at all powers. Plate III and Plate IV are drawn for the use of auto lean mixture.

(3) Use of "AUTO RICH" mixture will increase the fuel consumption approximately 10 to 20 gallons per hour in the cruise range, and from 5 to 8 gallons per hour at higher powers.

(4) Cylinder head temperature limits for "AUTO RICH" operation are the same as for "AUTO LEAN" operation, with the following exceptions:

(a) 248° C. normal rated power (one hour maximum).

(b) 263° C. take-off (five minutes maximum).

d. BLOWER RATIO. (See Plates III and IV.)

(1) Unless maximum speed is desired, use "LOW" blower below 16,000 feet, and increase rpm as necessary up to 2400 rpm before shifting to "HIGH" blower.

(2) For high speed at normal rated or military power, shift to "HIGH" blower at 10,000 feet.

(3) Above 16,000 feet, use "HIGH" blower at all times (except in prolonged dives).

CONDENSED OPERATING INSTRUCTIONS
AUTO LEAN MIXTURE

LOW BLOWER
MILITARY POWER
2600 rpm 43.5 inches manifold pressure.
Shift to "HIGH" blower when manifold pressure drops to 34 inches.
NORMAL RATED POWER
2400 rpm 41.0 inches manifold pressure.
Shift to "HIGH" blower when manifold pressure drops to 32 inches.
ALL LOWER POWERS
S.L. TO 16,000 FEET.

rpm	Manifold Pressure
2300	36.0 inches
2200	32.0 inches
2100	30.0 inches
2000 to 1550	29.0 inches

HIGH BLOWER
MILITARY POWER
2600 rpm 43.5 inches manifold pressure.
Do not use 2600 rpm above 17,000 feet.
NORMAL RATED POWER
2400 rpm 39.5 inches manifold pressure.
Do not use 2400 rpm above 19,500 feet.
ALL LOWER POWERS
16,000 FEET—UP

rpm	Manifold Pressure
2300	34.0 inches
2200	29.0 inches
2100 to 1700	28.0 inches

If recommended manifold pressure cannot be obtained, use full throttle. If surging of rpm and manifold pressure is encountered, back off throttle until surging disappears.

140 knots IAS max. range speed—best miles per gallon at all altitudes. Fly below 5000 feet to get most range (unless better tailwind is available at high altitude).

e. COWL FLAPS.

(1) Opening the cowl flaps creates considerable drag as shown in the cowl flap table of Plate II. Therefore, as far as possible, their use should be limited to ground operations.

(2) The following guide to their use in flight is recommended:

(a) Level Flight.—Open the cowl flaps gradually as the temperature approaches the limit rather than opening them wide when the limit is reached.

(b) Climb.

1. Considerable cowl flap opening may be required when climbing in "AUTO LEAN" mixtures.

2. Increase the IAS approximately five knots by dropping the nose slightly in preference to using more than one-half cowl flap opening; or use "AUTO RICH" mixture to obtain increased cooling.

3. The use of "AUTO RICH" mixture with the rpm and manifold pressure recommended on Plate V (A and B) will result in a slight improvement in rate of climb over that indicated on these charts.

f. CARBURETOR AIR.

(1) Normal carburetor air temperature rise above outside air is between 6 and 12 degrees centigrade, using DIRECT air.

(2) The use of ALTERNATE air causes an additional rise of nearly 25 degrees.

g. MAXIMUM RANGE SPEED.

(1) One hundred and forty knots IAS is recommended as the best speed for long range at all gross weights.

(2) A slight improvement in range will be obtained by using 130 knots IAS when operating in high blower above 16,000 feet.

(3) In a head wind increase the IAS two knots for each 10 knots of headwind. Do not increase IAS above 140 knots in high blower.

(4) In a tailwind decrease the IAS two knots for every 10 knots of tailwind, but do not decrease IAS below 120 knots.

h. MINIMUM RECOMMENDED SPEED.—Minimum recommended IAS for all weights are indicated on Plate III. These speeds will give approximate maximum endurance at the lowest flyable altitude.

2. CHARTS AND TABLES.

a. GENERAL.—Any SB2C-3 airplane corresponding to the external configuration outlined below should fly within five percent of the charted fuel consumptions when flown at charted airspeeds, providing the power plant is operated as recommended.

b. EXTERNAL ITEMS.

(1) Two fixed forward firing 20 mm. guns, muzzles sealed, protruding from faired blisters, one in each wing.

(2) Non-retracting tailwheel and fairing.

(3) Two exhaust stacks in faired blisters, one on each side of cowl below center line.

(4) Two MK. 50 wing bomb racks, one on each wing.

(5) ASB antenna under each wing.

(6) IFF antenna beneath right wing.

(7) Aerial mast on left side of cowl forward of front cockpit, aerial to vertical fin, lead to rear cockpit.

(8) Wing slats closed except during landing and take-off.

(9) Adjustable trim tab on rudder, left aileron, and left elevator. Balance tabs on left and right aileron.

(10) Four-bladed Curtiss Electric properlor with shank cuffs, Model C5425-A44.

(11) Pitot airspeed head mounted on leading edge of left wing.

(12) Formation lights.

c. The following factors must be considered in checking actual versus plotted results:

(1) Airspeed (see Plate II). — Airspeed meter lines must be airtight and free from water or dirt.

(2) Weight.—Plate III is applicable to all weights.

(3) Drag.—Plate III is based on performance with only the external items listed above. Plate II is provided for drag induced by open cowl flaps, enclosures, or external loads.

(4) Air density.—Pressure altitude is indicated on the altimeter when the adjustment scale is set at 29.92 inches of mercury. Density altitude is determined by finding the intersection of the pressure altitude and outside air temperature on Plates I and III and reading the density altitude on the horizontal line. *All computations of airplane performance concerning airspeed must be based on density altitude.*

d. DESCRIPTION AND USE OF PLATES.

(1) Plate I—Performance Chart.

(a) Upper Graph.—Miles per gallon on *density altitude versus true airspeed* at 13,500 pounds gross weight.

(b) Lower Graph.—Pressure altitude conversion chart; gallons per hour and indicated airspeed on *density altitude versus true airspeed;* V max. at normal rated and military rated power at 13,500 pounds gross weight.

(2) Plate II: Airspeed calibration.—Charts for correction for drag of cowl flaps, cockpits, two 100 pound bombs, and torpedo.

(a) Use of Plate II.

1. The appropriate chart of Plate II is entered with the IAS to be flown, and the correct IAS to enter Plate III is read from the scale.

2. This value is then used to enter Plate III at the existing gross weight. The recommended rpm and resultant fuel consumption are then read from the curves.

3. If allowance must be made for two or more drag items, enter each drag chart with the IAS to be flown and read off "correct IAS to enter Plate III".

4. Add these figures and then subtract from the total the "IAS to be flown" multiplied by one less than the total number of drag items. The result will be the IAS to use for entering Plate III.

(b) Example:

IAS to be flown.....170 knots
Drag items.....(1) one droppable tank
(2) one-half open cowl flaps

1. At 170 knots IAS line, enter vertical scale of Drag Chart for droppable fuel tanks. Follow 170 IAS line to right until it intersects "1-tank" line. Directly beneath this point, on horizontal scale, read 177 knots, "Correct IAS to enter plate III."

2. At 170 knots IAS line, enter vertical scale of Cowl Flap Drag Chart. Follow 170 IAS line to right until it intersects "½ Open" line. Directly beneath this point on horizontal scale, read 178 knots, "Correct IAS to enter Plate III".

3. Add the figures obtained: 177+178=355.

4. Since these are two drag items, the IAS to be flown should be multiplied by two minus one, or one. $1 \times 170 = 170$.

5. Subtracting this number from 355 (355 — 170 = 185) gives 185 knots, the IAS for entering Plate III to predict fuel consumption. This means that it will take as much fuel to fly at 170 knots IAS with the external drag items as it would to fly at 185 knots without the drag items but at the same weight.

(3) Plate III—Pilot's Operating Chart.—Pressure altitude—density altitude conversion chart; gallons per hour, rpm, on *density altitude versus indicated airspeed and gross weight.*

(4) Plate IV—Engine Operating Limits.—rpm and manifold pressure on *pressure altitude versus brake horsepower.* Enter with pressure altitude and rpm from Plate III to get correct manifold pressure.

(5) Plate V (A) Rated Power Climb.—Time to climb, gallons fuel burned, no wind ground miles *covered versus pressure altitude.*

Note

This chart is based on use of constant rpm with gradually decreasing manifold pressure as altitude is gained. Nearly constant horsepower is obtained by this method of power control. For climbing purposes, such practice has advantages over the use of constant rpm manifold pressure combinations as shown on Plate IV. The method of power control shown by Plate IV does not give constant horsepower during a climb, but is excellently suited to use in level flight.

(6) Plate V (B) Maximum Climb.—Time to climb, gallons fuel burned, no-wind ground miles covered versus pressure altitude. See Note under description of Plate V (A).

3. COMPUTATION OF COMBAT RADIUS.

a. General.—The combat radius of this airplane is based upon the standard type problem specified by BuAer as follows:

(1) Twenty minutes warm-up and idling.

(2) One minute take-off.

(3) Twenty minutes rendezvous at 60% normal sea level power (n. s. p.) and "AUTO LEAN."

(4) Climb to 15,000 feet at 60% n.s.p. and "AUTO LEAN."

(5) Cruise out at 180 knots true airspeed and "AUTO LEAN."

(6) Dive, drop bomb, 15 minutes combat (five minutes at military rated and 10 minutes at normal rated.)

(7) Cruise back at 1500 feet at 170 knots true airspeed and "AUTO LEAN."

(8) Sixty minutes at V for maximum range and "AUTO LEAN" as allowance for rendezvous, landing, and reserve.

(9) Radius includes distance covered in climb, but not in descent.

b. Solution: One 1000 pound bomb (15,000 pounds gross weight).

(1) All fuel consumption immediately obtainable from the charts and tables are tabulated.

(2) The total fuel capacity is reduced, for computation, by a five percent safety factor.

(3) The total of the tabulated fuel consumption above is subtracted from the reduced fuel capacity to obtain the fuel available for the solution of the out-and-back problem.

(4) A running weight estimate should be made, using the fuel consumptions already obtained wherever possible (weight of gasoline computed at six pounds per gallon), and estimating as closely as possible other items.

(5) Example: From the starting weight of 15,000 pounds, the bomb weight (1000 pounds) and the fuel load (1830 pounds) are subtracted to obtain the weight empty, neglecting ammunition and other useful load items. To this empty weight is added the weight of fuel to be kept in reserve (234 pounds), and the landing weight obtained.

(6) An estimate must now be made of the weight of the fuel to be used during the return cruise over the miles covered in the climb, in order to determine the approximate weight at the start of this portion of the flight.

(7) Using Plate I estimate 3.1 miles per gallon; for 64 miles this will be roughly 21 gallons or 126 pounds.

(8) Use this figure to determine gross weight at start of last 64 miles return cruise, equal to 12404 pounds plus 126 pounds equal to 12530 pounds.

(9) When actual weight of fuel burned during this portion of flight is determined, enter it in the weight table.

(10) The fuel remaining for solution of the out-and-back problem may be assumed to be divided equally for purposes of weight estimation, since the distance out equals the distance back.

WEIGHTED TABULATION

Start	15,000 pounds
Warm-up and take-off	—60
Weight airborne	14,940 pounds
Rendezvous	—138
Weight at 1000 feet	14,802 pounds
Climb (S. L.—15000 feet)	—240
Weight at 15000 feet	14,562 pounds
Cruise outboard (est.)	—375
Weight at dive	14,187 pounds
Dive	—18
Release bomb	—1,000
Weight at pull-out	13,169 pounds
Military power (five minutes)	—102
	13,067 pounds
Rated power (10 minutes)	—174
Weight at start return	12,893 pounds
Start	15,000 pounds
Fuel (320 gallons—15 gallons safety factor)	—1,830
Bomb	—1,000
Weight empty	12,170 pounds
Reserve	+234
Weight at landing	12,404 pounds
Cruise return (64 miles)	+114
Cruise return (remainder)	+375
Weight at start return	12,893 pounds

FLYING TIME

	Item	*Elapsed Hours — Minutes*
Warm-up, Taxiing	20 minutes	00 — 00
Take-off	1 minute	00 — 01
Rendezvous	20 minutes	00 — 21.0
Climb	25.5 minutes	00 — 46.5
Cruise out	65 minutes	01 — 51.5
Dive	2 minutes	01 — 53.5
Military	5 minutes	01 — 58.5
Rated	10 minutes	02 — 8.5
Return cruise	22.5 minutes	
	68.5 minutes	03 — 39.5
Reserve	60 minutes	
Total		3. — 39.5

Fuel Consumption

Warm-up (20 min.) allowance for warm-up
Take-off and take-off from Plate V ..... 10 gal.

Rendezvous (20 Min.)
60% n.s.p. at 1000 ft. is 960 bhp
At 2100 rpm, from Plate IV. Read
68 gallons per hour from Plate III
20 min. × 68 gallons per hour = ... 23 gal.
60 min.

Climb
Use Plate V (B), interpolate at 15,000 feet to the take-off weight of 15,000 pounds and read 50 gallons required. Subtract allowance on chart for warm-up and take-off equals 10 gallons, since account has already been taken of the amount of fuel used for warm-up and take-off.
50 gallons — 10 gallons ..... 40 gal.

Dive estimated ..... 3 gal.

Military Power (five min.) at 15,000 feet
Read from Plate III at 2600 rpm
200 gal. per hour × 5 min. / 60 min. = ... 17 gal.

Rated Power (10 Min.) at 15,000 feet
Read from Plate III at 2400 rpm
176 gal. per hour × 10 min. / 60 min. = ... 29 gal.

Reserve (one hour at V for max. range at 15,000 feet).
Read from Plate III at 1500 feet at gross weight of 12,170 pounds ..... 39 gal.

Return cruise over distance covered in climb:
Read distance = 64 miles from Plate V (B).
From weight estimated above, approximate weight = 12,530 pounds.
From Plate I, 170 knots true airspeed at 15,000 ft. = 169 knots IAS.
Therefore, enter Plate III with 164 knots IAS and 12,530 gross weight. Read
Fuel consumption = 51 gallons per hour
64 miles = .376 hours = 22.5 minutes
170 knots
.376 hours × 51 gallons per hour = ... 19 gal.

Total ..... 180 gal.

Reduce available fuel by five per cent safety factor:
320 × 100 / 105 = 305 gallons
305 gal. — 180 gal. = 125 gal. available for out and back problem.

Outboard
From weight table, wt. = 14,562 lbs.
From Plate I, 180 knots true air speed at 15,000 feet = 142.5 IAS.
Enter Plate III with 142.5 IAS and 14,562 lbs., read fuel consumption = 61 gal. per hour.

Inboard
From weight table, wt. = 12,893 lbs.
From Plate I, 170 knots true airspeed at 1500 feet = 164 knots IAS.
Enter Plate III with 164 IAS and 12,893 lbs., read fuel consumption = 52 gal. per hour.

Find time to turn, or time outboard, from the following formula:

$$\text{Time to turn} = \frac{\text{gals. fuel available}}{\text{gal. per hour out} + \text{gal. per hour in} \times \frac{\text{(TAS OUT)}}{\text{(TAS IN)}}} = \frac{125}{61 + 52 \times \frac{(180)}{(170)}}$$

Time to turn = 1.08 hours.
1.08 hours = 65 min. outboard.
1.08 hours × 180 knots = 194 miles,
and 1.08 hr. × 61 gal. per hour = 66 gal.
194 miles out must equal 194 miles return,
therefore, time to return = $\frac{194 \text{ miles}}{170 \text{ knots}}$ = 1.14 hours = 68.5 minutes.

1.14 hours × 52 gallons per hour = 59 gallons.
66 gallons + 59 gallons = 125 gallons available (CHECK)

Combat radius =	distance covered in climb =	64 miles
	distance outboard cruise =	194 miles
	Total	258 miles

Combat radius as a 1000 pound bomber = 258 miles.

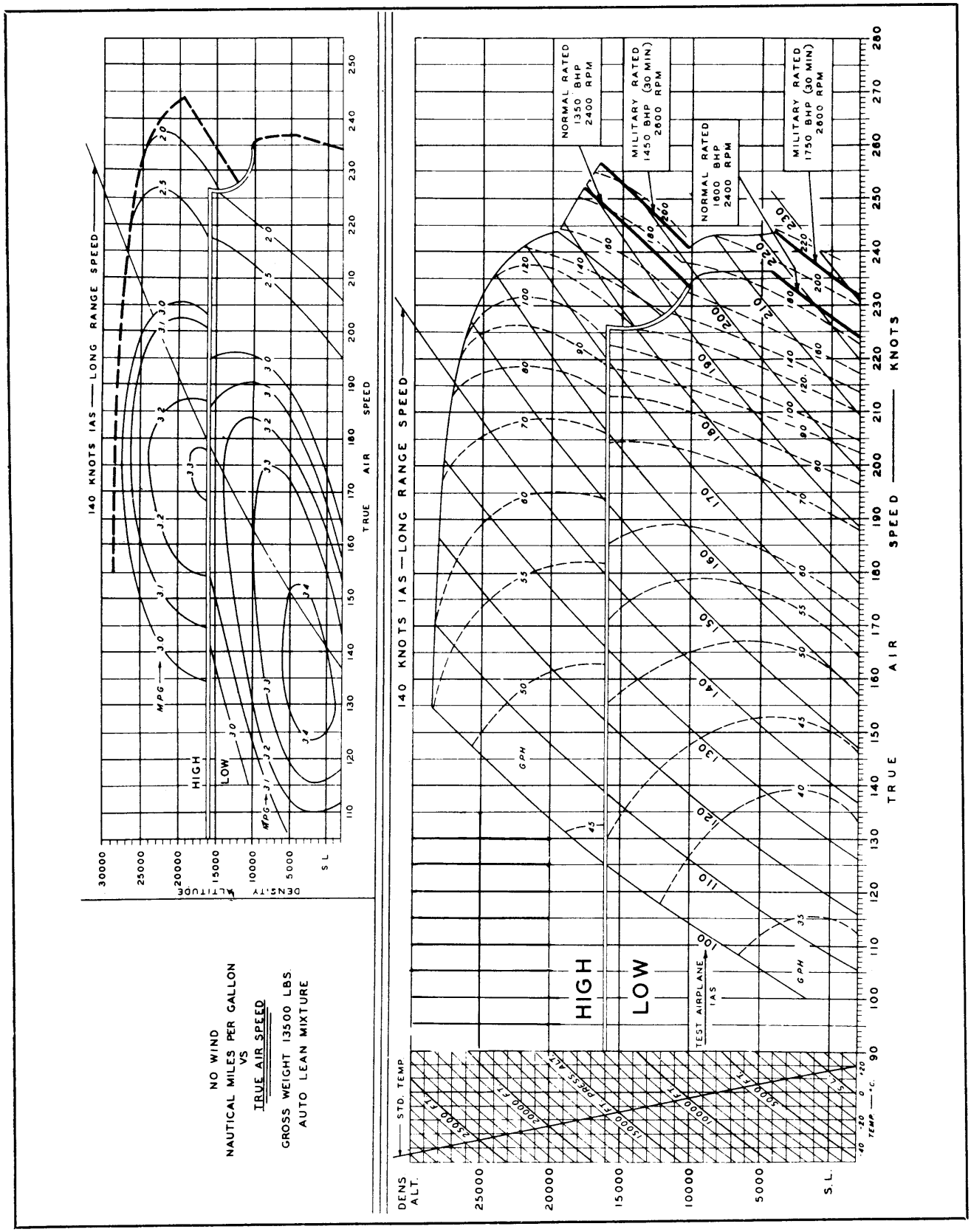
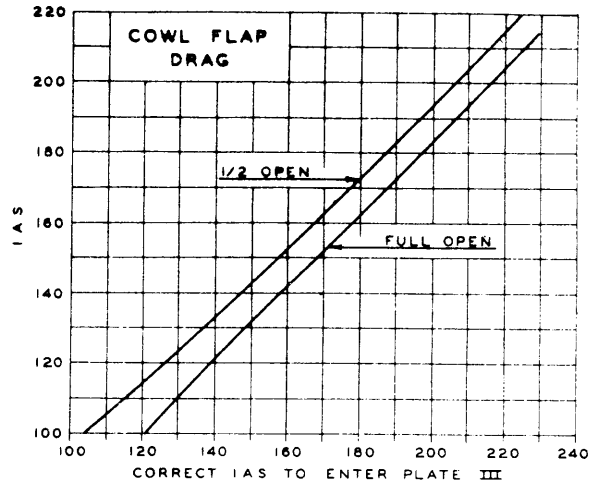


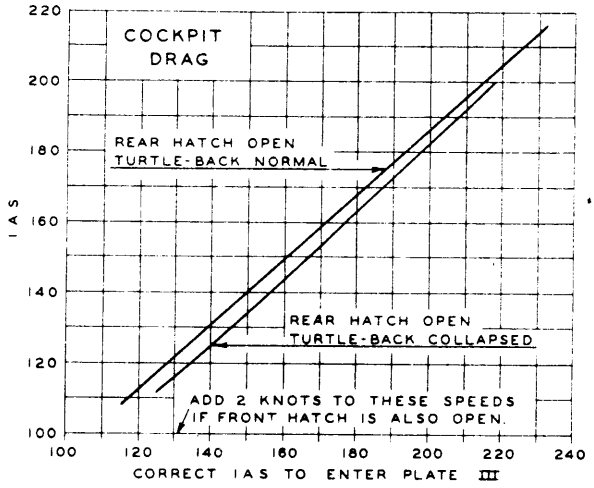
Plate I — Performance Chart

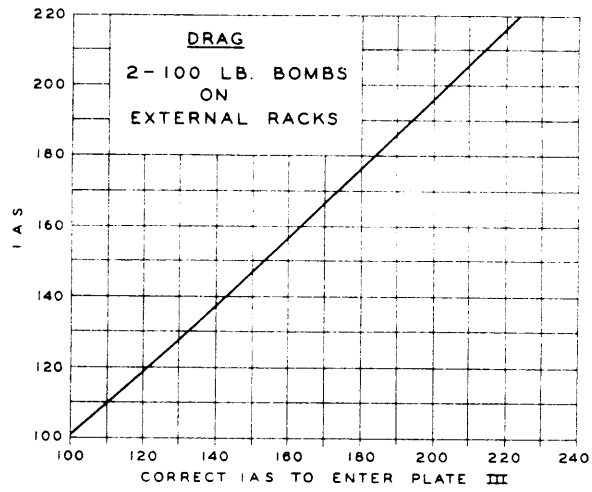
INSTRUCTIONS

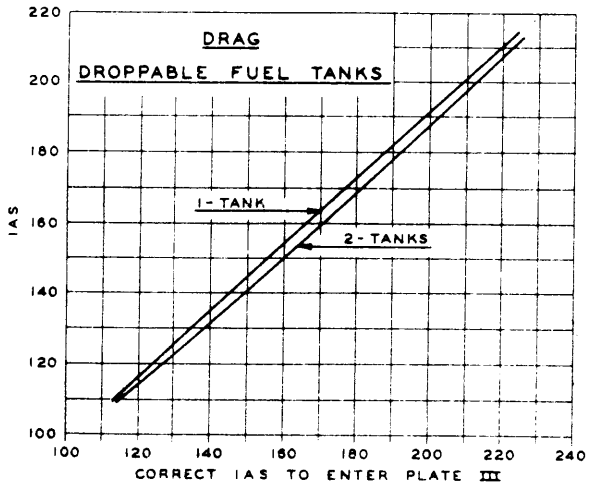
ENTER THE CHART APPLICABLE TO THE EXISTING DRAG CONDITION WITH THE INSTRUMENT IAS AND READ FROM THE LOWER SCALE THE CORRECT IAS WITH WHICH TO ENTER PLATE III.

THE IAS DETERMINED ABOVE IS USED TO ENTER THE LOWER CHART OF PLATE III OPPOSITE THE GROSS WT. MOVE VERTICALLY UPWARD TO THE DENSITY ALTITUDE AND READ FUEL CONSUMPTION AT RECOMMENDED OPERATING CONDITIONS.









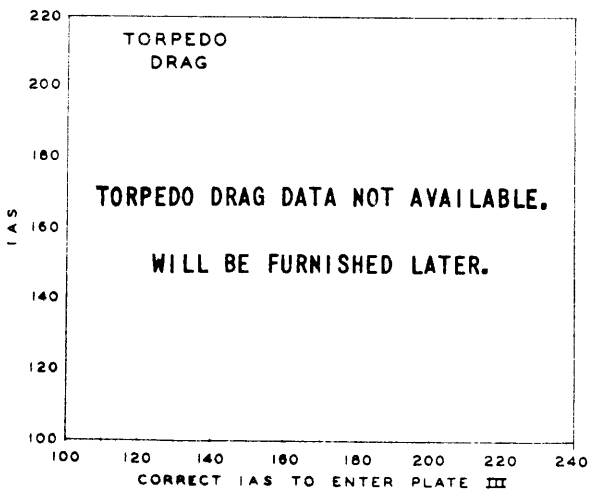


Plate II — Drag Data

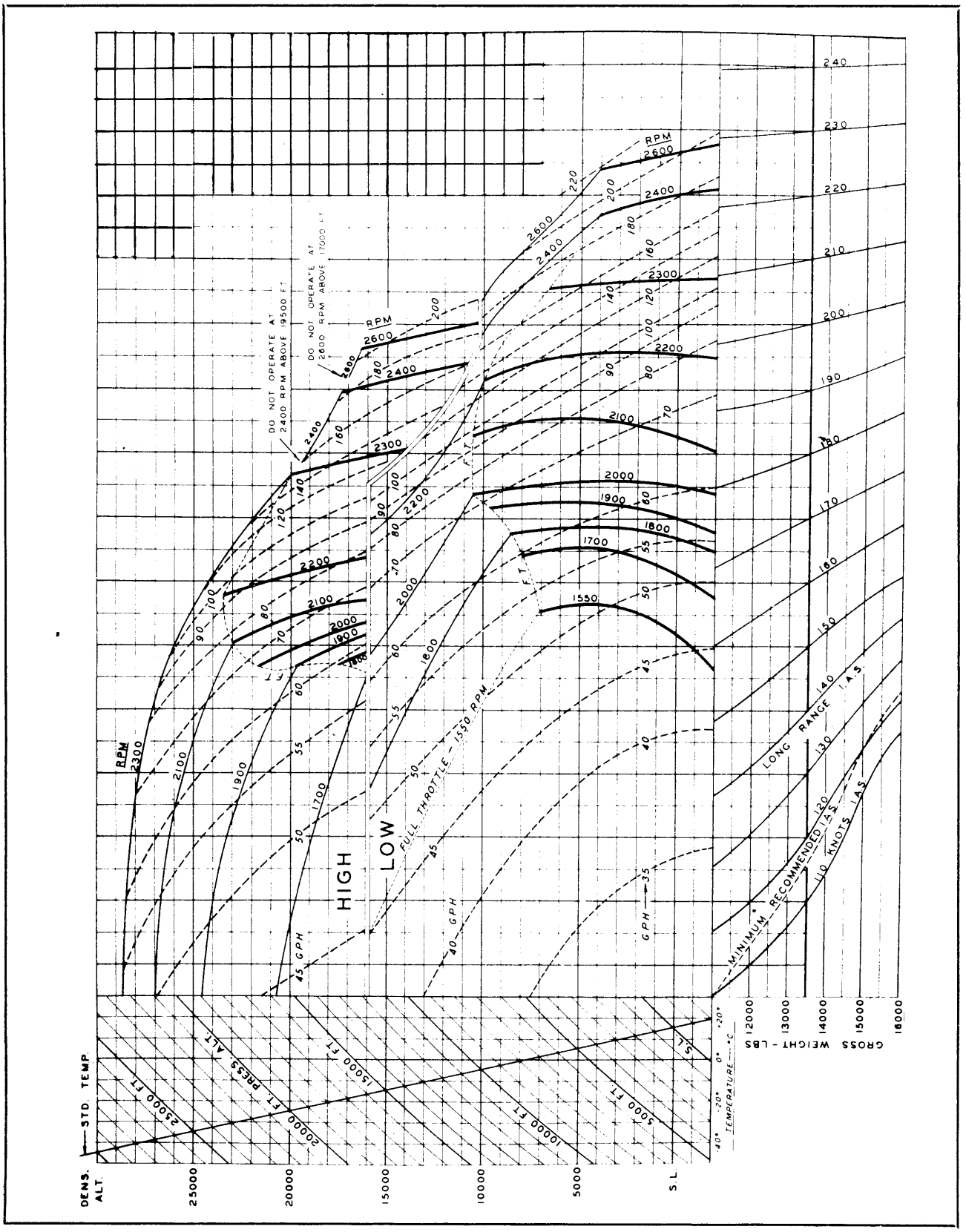


Plate III — Pilot's Operating Graph — Auto Lean Mixture

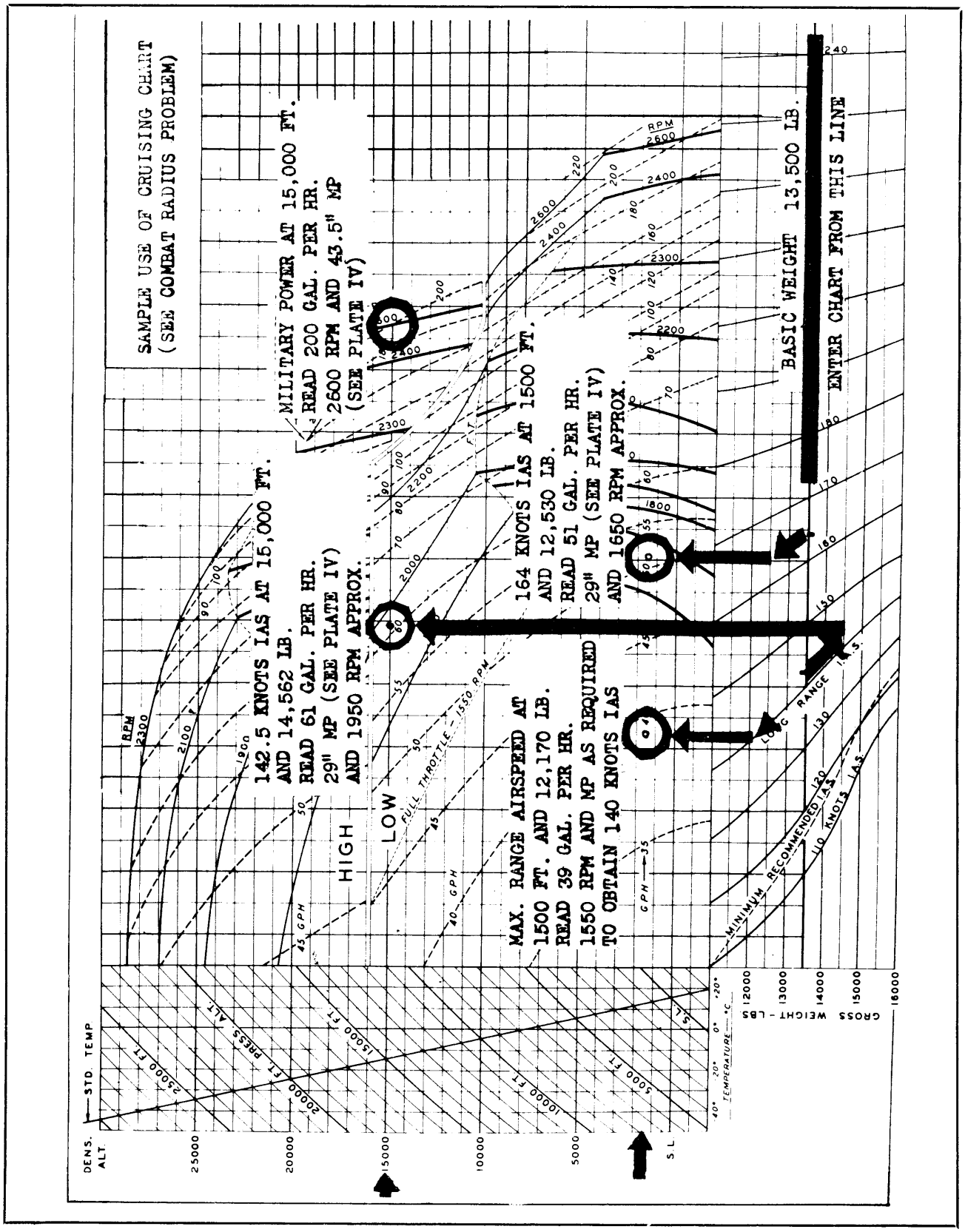


Plate III — Pilot's Operating Chart — Auto Lean Mixture

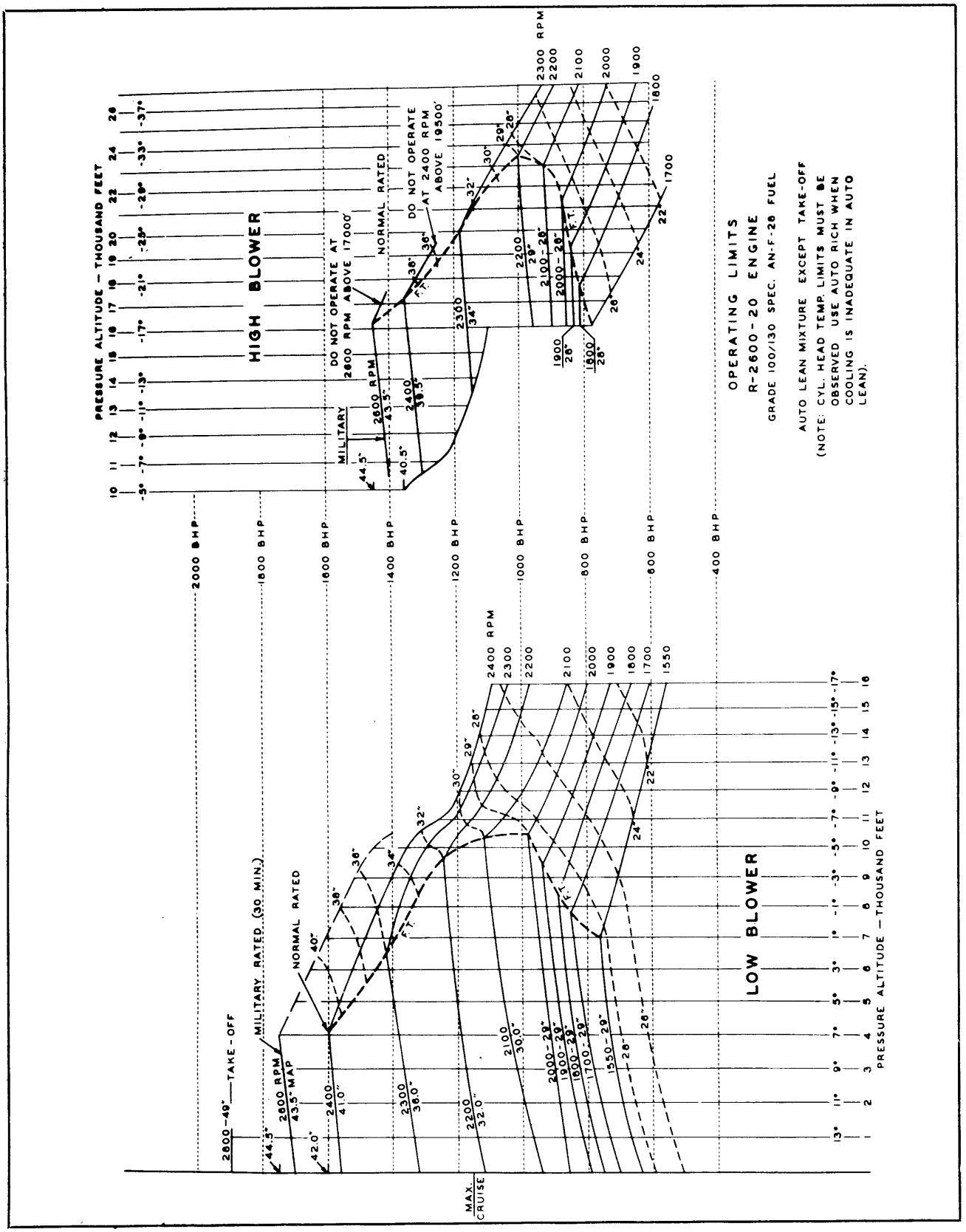


Plate IV — Engine Calibration Curve

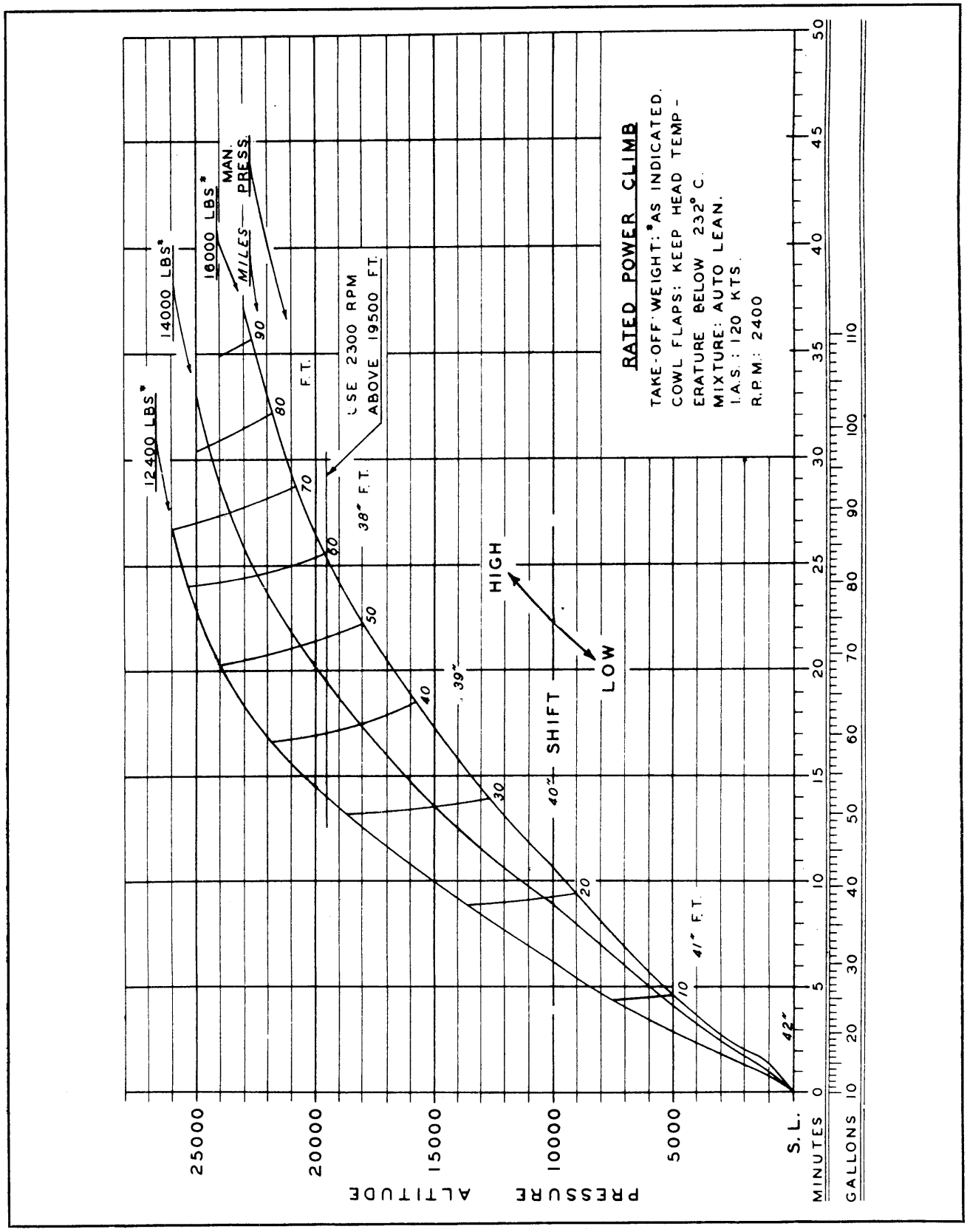


Plate V(A) — Climb Data

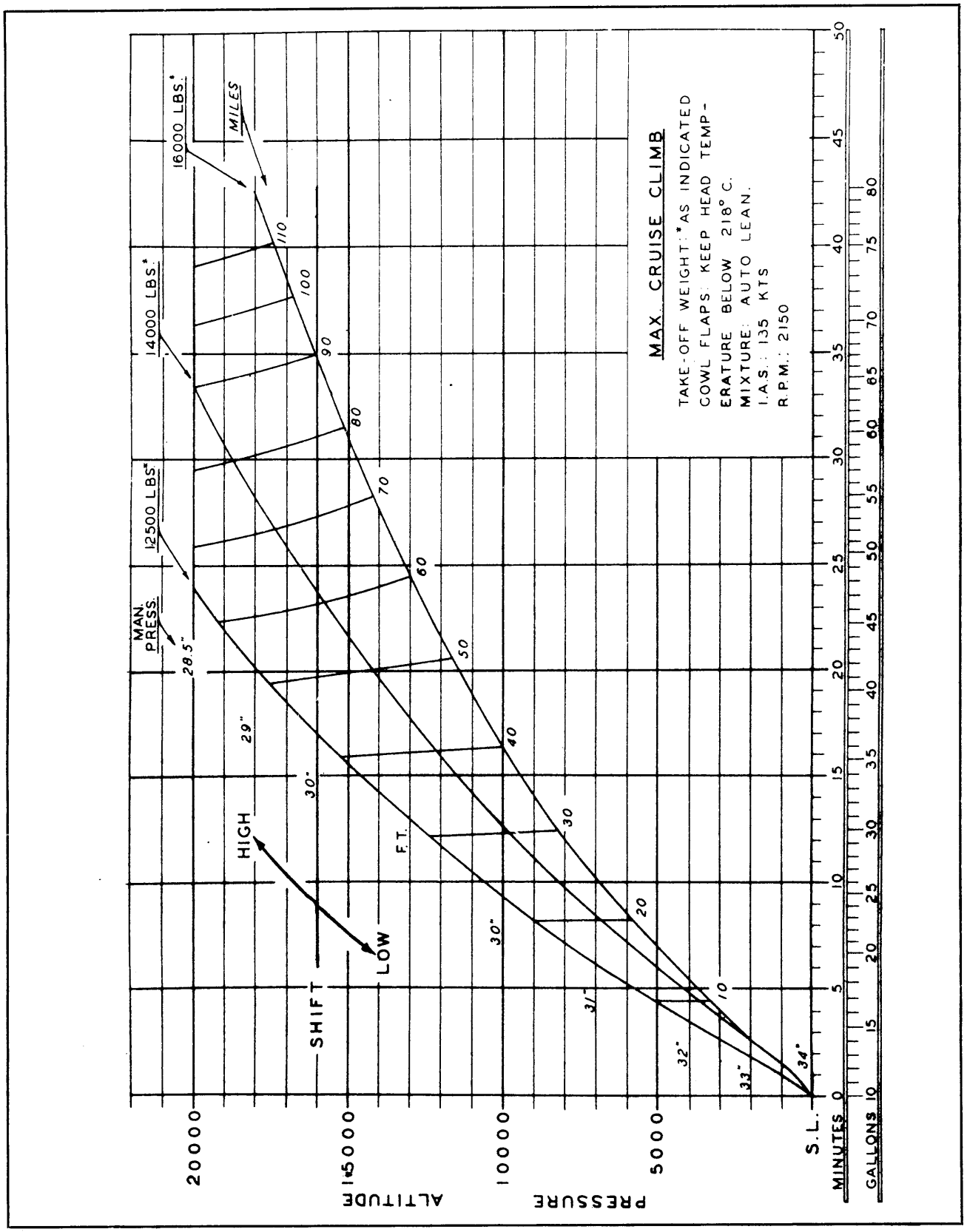


Plate V(A) — Climb Data

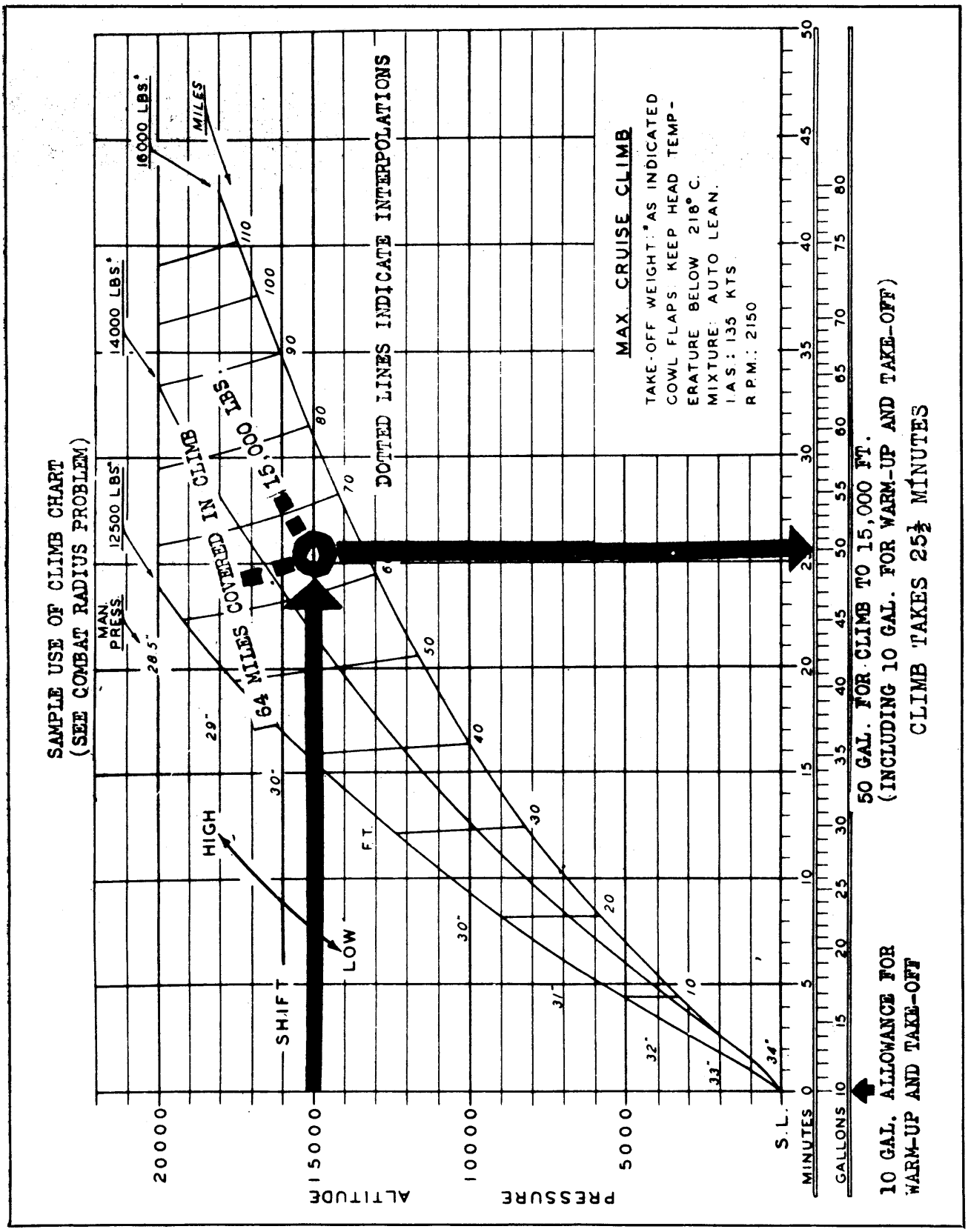


Plate V(C) — Climb Data

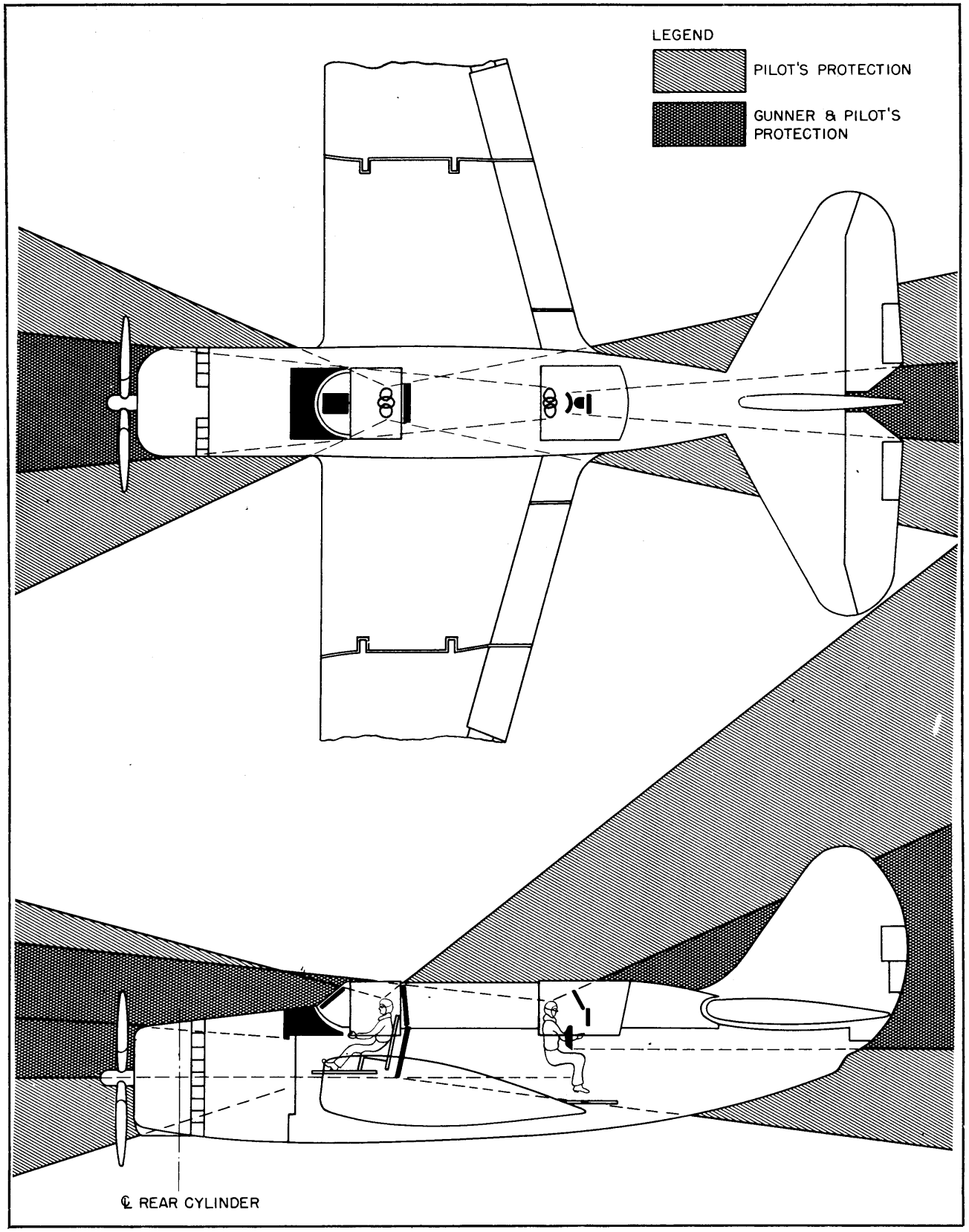


Figure 64 — Gunfire Protection