Pilot's Handbook

for

NAVY MODEL

AF-2S

AIRCRAFT

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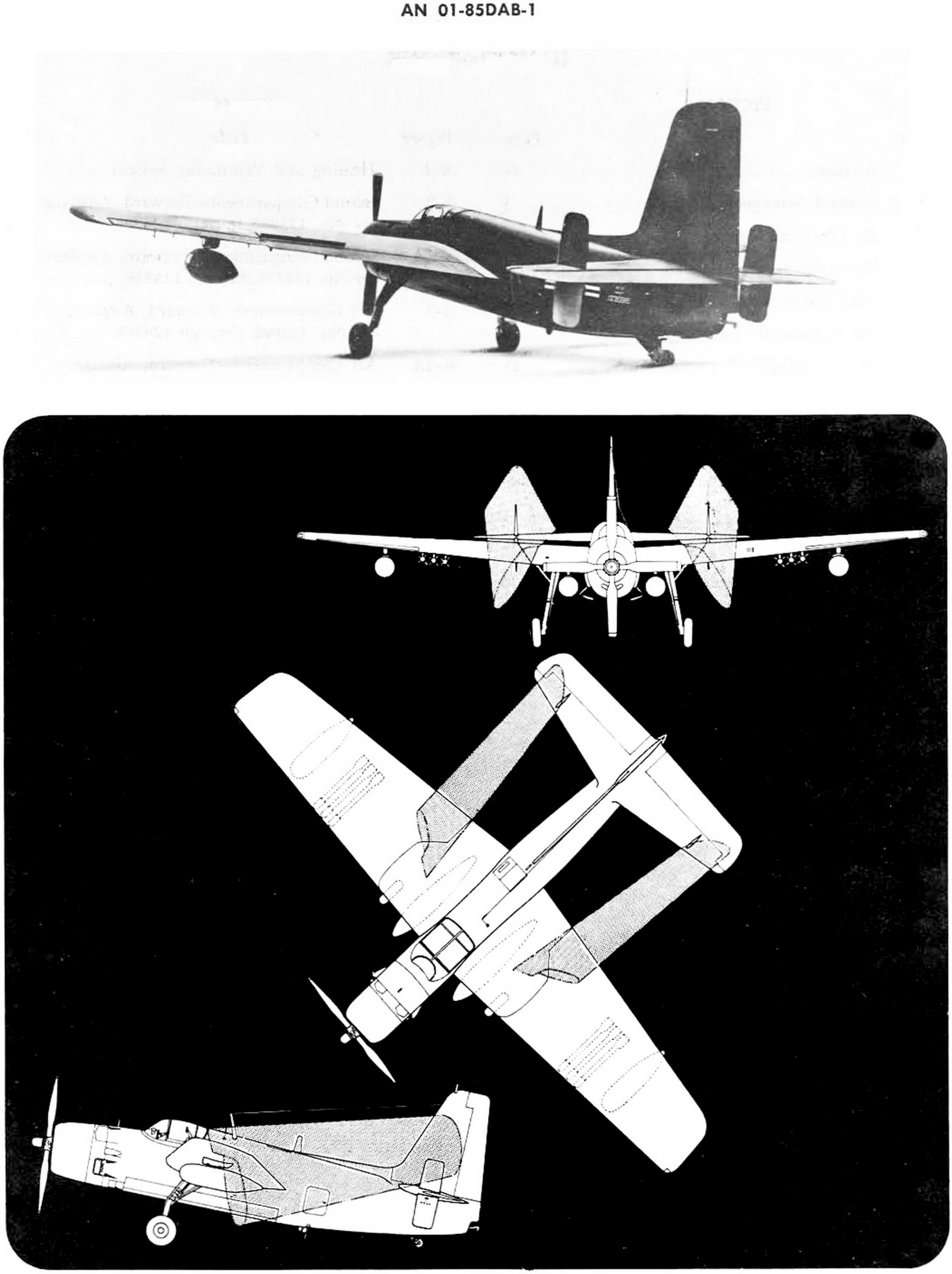
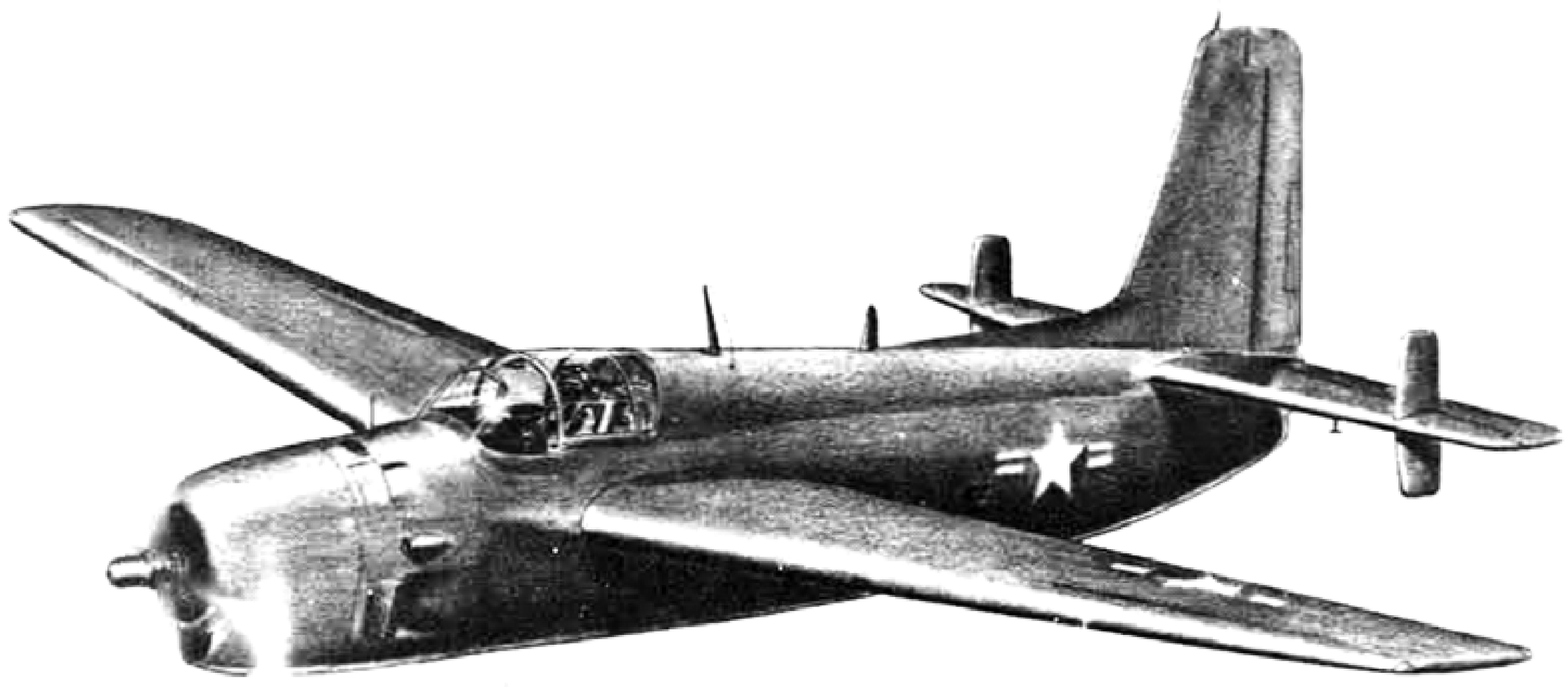


Figure A. Airplane

SECTION I
DESCRIPTION



1—1. AIRPLANE.

1—2. The model AF-2S airplane is a three-place, attack type, shore or carrier based landplane, equipped with provisions for catapult launching and arrested landing. The airplane is designed for anti-submarine warfare, is equipped for submarine attack and radar scouting missions, and is operated by a crew consisting of a pilot, a radar operator, and a sonobuoy operator-bombardier. Armament, radar and communication equipment are noted in Section IV. The airplane is equipped with an automatic pilot, and with a heating and ventilating system which furnishes temperature controlled air, as selected, to all crew compartments. Two 900 pound capacity external auxiliary (droppable) fuel tanks may be carried on bomb racks under the wing center section in addition to internal self-sealing tanks. Two engine-driven generators and four inverters supply power for the operation of electrical and electronic equipment. Electrically controlled hydraulic power operates the landing gear, wing flaps, wing folding, canopy, arresting hook raising mechanism, and bomb bay doors. The wheel brakes, flaperons, and rudder boost are operated by mechanically controlled hydraulic power. For general arrangement of the airplane, see figure 1–1.

1—3. The principal dimensions and approximate gross weights of the airplane are:

Principal Dimensions	
Span (Wings Spread)	60 ft
Span (Wings Folded)	26 ft 2 in.
Length (Ground Line)	42 ft 10 in.
Height (Three-point Position)	16 ft 8⅞ in.
Approximate Gross Weights	
Attack (Normal)—2520 lb fuel internal	20430 lb
Attack (Rockets)—2520 lb fuel internal	21310 lb
Attack (Overload)—2520 lb fuel internal, 900 lb fuel external	21550 lb
Attack (Maximum Fuel)—2520 fuel internal, 1800 lb fuel external	22640 lb

1—4. ENGINE.

1—5. GENERAL.

1—6. The airplane is powered by a Pratt and Whitney R-2800-48 engine equipped with a single stage, single-speed supercharger. The engine drives a four-bladed Hamilton Standard, constant speed, controllable pitch propeller. Ram air is supplied to the carburetor induction system and to the oil cooler from scoops located at the top and bottom, respectively, of the nose cowling.

1—7. ENGINE CONTROLS. The throttle, mixture and propeller pitch controls are mounted in a quadrant located on the pilot's left console. A friction control adjustment (figure 1—5, item 13) is provided on the inboard side of the quadrant. Turning the knob clockwise increases friction on the throttle and propeller rpm control levers. Operation of these controls is conventional.

1–8. THROTTLE. *(Figure 1–5, item 6.)* The throttle positions are aft "CLOSED" and full forward "OPEN". A spring detent is located at the normal rated power position. A folding handgrip is provided opposite the throttle take-off position for use during catapult launching. A two-position "ICS"-"RAD" spring loaded switch is provided on top of the throttle handgrip.

1–9. PROPELLER RPM CONTROL. *(Figure 1–5, item 11.)* The propeller rpm "P" control positions are aft to "DECREASE" rpm and full forward to "INCREASE" rpm. Moving the control mechanically controls the propeller governor which directs engine oil pressure (augmented by a booster pump within the governor) to the propeller pitch changing mechanism as required to regulate rpm.

1–10. MIXTURE CONTROL. *(Figure 1–5, item 14.)* The mixture control lever "M" positions are aft—"IDLE CUT-OFF", approximately two-thirds forward—"NORMAL", and full forward—"RICH". Notches are provided in the quadrant to hold the control lever in these positions.

1–11. CARBURETOR AIR SWITCH. The carburetor header alternate air door is controlled by a "CARB AIR" two-position switch (figure 1–6, item 36) located on the lower left side of the main instrument panel. The switch is moved to the "DIRECT" position to introduce ram air to the carburetor from an inlet at the top of the nose cowling. In the "ALTERNATE" position an electrically operated carburetor header door is opened, shutting off ram air and permitting protected warm air from behind the engine to enter the carburetor.

1–12. COWL FLAPS SWITCH. The cowl flaps are operated by electrically driven screw jacks and are controlled by a three-position switch (figure 1–6, item 36) located on the lower left side of the instrument panel. The switch is set to the "OPEN" or "CLOSED" position until the flaps have reached the desired position, then returned to the central off position. Limit switches prevent the actuating motor from burning out by automatically stopping the flaps when they reach the limit of their travel.

1–13. PRIMER AND STARTER SWITCHES. Primer and starter switches (figure 1–7, item 2) are located forward on the right console. When starting the engine, pushing the "CYL PRIMER" switch operates the primer solenoid valve. The auxiliary fuel pump must be on to supply fuel. Pressing the "STARTER" button energizes the direct cranking starter and the booster ignition circuit.

1–14. IGNITION SWITCH. The ignition switch (figure 1–6, item 1) located to the left of the instrument panel is marked "L", "R", "BOTH" and "OFF". The switch when placed in the "L" or "R" position is used to check the respective magnetos.

1–15. OIL SYSTEM.

1–16. GENERAL.

1–17. The engine has an oil system incorporating a 36-gallon tank, an automatic oil temperature control valve, an oil cooler provided with two electrically operated flaps, and an oil dilution system. Oil conforming to Spec MIL-O-6082, Grade 1100 during winter months and 1120 during summer months, is required. Oil temperature and pressure are indicated on the engine gage unit (figure 1–6, item 37) located on the lower left side of the instrument panel. The oil system is entirely automatic except for the operation of the oil cooler flaps.

1–18. NORMAL CONTROLS.

1–19. OIL COOLER FLAPS SWITCH. The electrically actuated oil cooler exit duct flaps, which regulate the flow of air through the oil cooler, are controlled by a two-position switch (figure 1–6, item 36) located on the lower left side of the instrument panel. Moving the "OIL COOLER FLAP" switch to the "OPEN" or "CLOSED" position as required controls oil temperature.

1–20. OIL DILUTION SWITCH. This momentary "ON-OFF" switch marked "OIL-DIL" (figure 1–7, item 2) is located forward of the starter and primer switches on the right console. A manually operated shut-off valve located in the engine accessory compartment, which must be opened by a crewman to make the oil dilution system operative, protects the oil system from inadvertent dilution. When the switch is set to "ON" a solenoid valve in the dilution system is opened and the auxiliary fuel pump is energized. With the manual shut-off valve open and the engine running, fuel then is introduced into the engine oil-in line to dilute the oil and minimize hard starting in cold weather.

1–21. FUEL SYSTEM.

1–22. GENERAL.

1–23. Fuel conforming to Spec MIL-F-5572, Grade 115/145, is carried in a self-sealing main fuselage tank of 1620 lb (270 gal) capacity, two internal self-sealing wing tanks of 450 lb (75 gal) capacity each, and two droppable tanks, carried under the wings, of 900 lb (150 gal) capacity each (figure 1–1). Total usable fuel without droppable tanks amounts to 2520 lb. During normal operation, the system pumps the fuel from either wing or droppable tank to the main tank by means of an electrically driven transfer pump, with all fuel to the engine being supplied from the main tank (figure 1–2). In event of transfer system failure, fuel from any tank may be routed directly to the engine, by-passing the transfer system. Fuel management is controlled by tank and system selector valves actuated mechanically by tank and system selector valve controls (figure 1–5, items 1 and 3). An engine-driven fuel pump serves to pressurize the fuel and an electrically operated auxiliary fuel pump is provided to augment the engine-driven pump to pressurize the fuel when the engine-driven pump is not operating. An electrically operated shut-off valve is included in the system (see paragraph 1–25 below). Two wing tank and one main tank capacitance type fuel quantity indicators are installed on the lower right side of the instrument panel. A fuel transfer system warning light and a fuel low level warning light are provided below the fuel quantity indicators on the instrument panel. See paragraph 2–10 for fuel management.

SERVICING DATA

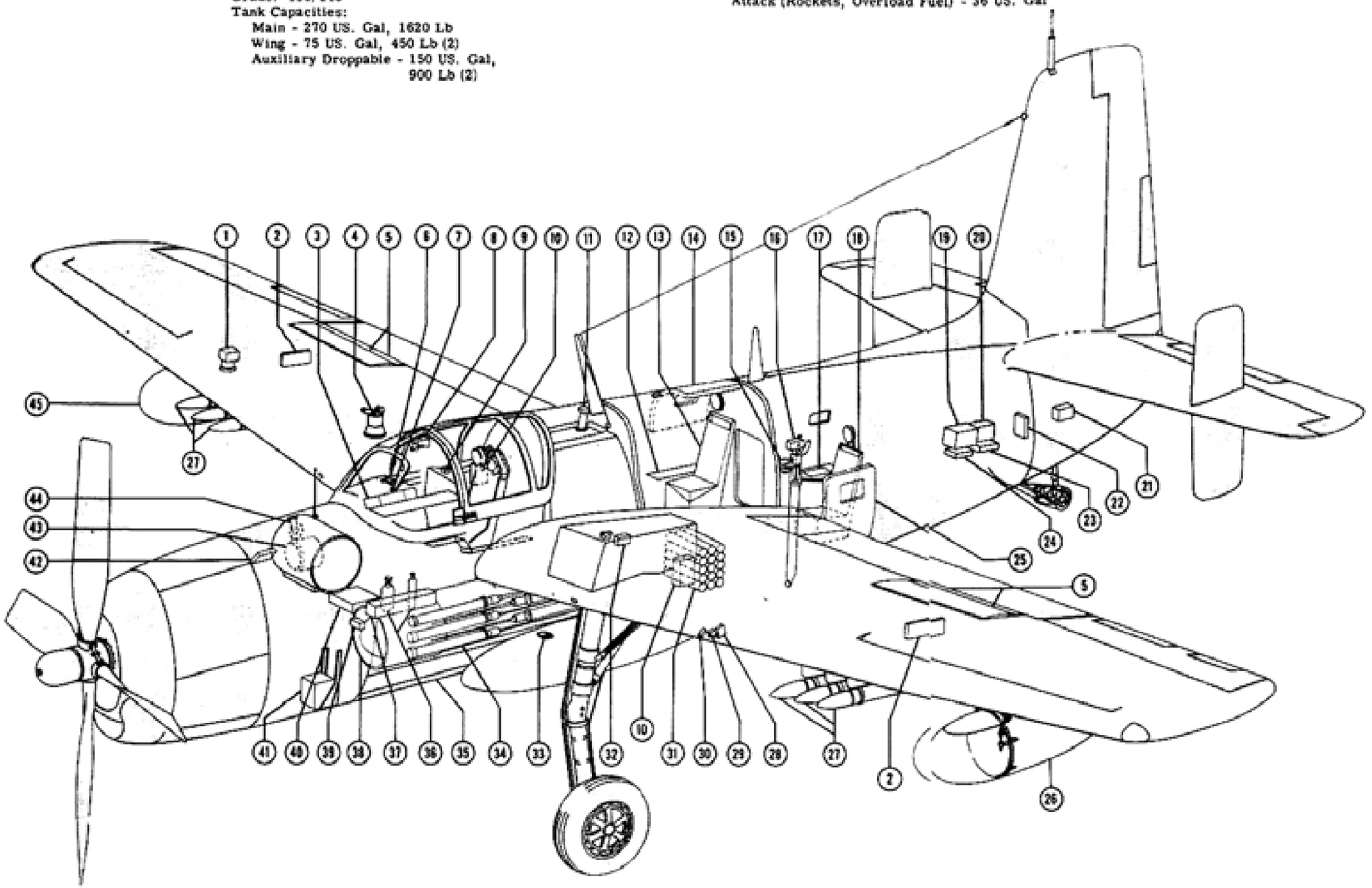
BATTERY
Add either distilled water, if available, or clean drinking water; NOT HIGHER THAN 3/8 INCH ABOVE PLATES.

FUEL
Spec: MIL-F-5572
Grade: 115/145
Tank Capacities:
Main - 270 US. Gal, 1620 Lb
Wing - 75 US. Gal, 450 Lb (2)
Auxiliary Droppable - 150 US. Gal, 900 Lb (2)

OIL
Spec: MIL-O-6082
Grade: Summer 1120, Winter 1100
Tank Capacity: 36 US. Gal
Quantities Carried:
Attack (Normal Fuel) - 23 US. Gal
Attack (Rockets, Normal Fuel) - 23 US. Gal
Attack (Overload Fuel) - 36 US. Gal
Attack (Rockets, Overload Fuel) - 36 US. Gal

HYDRAULIC FLUID
Spec: Navy 51-F-22
Commercial Designation: Hydrolube U-4
Reservoir Capacity: 2-3/4 US. Gal

EMERGENCY COMPRESSED AIR BOTTLES
Filling Pressure: 1800 - 2000 psi
(Use compressed air, only)



1. K-25A Camera
2. Wing Outer Panel Electrical Terminal Panel L/R
3. Radio Circuit Breaker Panel
4. Camera Flasher
5. Flaperon and Flaperette L/R
6. Rocket Sight
7. Electrical Circuit Breaker Panel
8. Stand-by Compass
9. Wing Fuel Tank Filler L/R
10. Wing Center Section Electrical Connector Box L/R
11. Main Fuel Tank Filler
12. Second Compartment Console
13. Radar Operator's Seat
14. Second Compartment Emergency Exit Hatch
15. Periscope
16. Bomb Sight
17. Aft Compartment Console
18. Bombardier's Seat
19. Automatic Pilot Servo Amplifier
20. Gyro Flux Gate Amplifier
21. Automatic Pilot Electrical Power Connector Box
22. Tail Section Electrical Terminal Panel
23. Automatic Pilot Rudder Servo and Disconnect
24. Amplifier Adapter
25. Main Fuselage Door
26. Searchlight
27. Rockets
28. Rocket Camera
29. Approach Light
30. Stall Warning Unit
31. Float Lights
32. Direct Current External Power Receptacle (Under right wing)
33. Auxiliary Droppable Fuel Tank Filler L/R
34. Sonobuoys
35. Bomb Bay
36. Canopy and Landing Gear Emergency Air Bottles
37. Bomb Bay Electrical Connector Box
38. Torpedo
39. Fire Wall Electrical Connector Box
40. Main Electrical Distribution Box
41. Storage Battery
42. Engine Electrical Connector Box
43. Hydraulic Fluid Reservoir
44. Oil Tank Filler
45. Radome AN/APS-31

Figure 1—1. General Arrangement

1–24. NORMAL CONTROLS.

1–25. SYSTEM SELECTOR VALVE CONTROL. This control (figure 1–5, item 3) has three positions; "NORMAL (MAIN)", "STANDBY (AUXILIARY TANKS)" and "OFF". In either of the former positions the electrical shut-off valve is open; in the latter the valve is closed. In the "NORMAL (MAIN)" position the transfer pump is energized, the "CHECK FUEL TRANSFER SYSTEM" warning light circuit is "armed", and the valve is positioned to route fuel from the tank selected by the "TANK SELECTOR VALVE" control (see paragraph 1–26) to the main tank, and thence to the engine. (Figures 1–2 and 2–2). In the "STANDBY (AUXILIARY TANKS)" position the control renders the transfer pump and warning light circuits inoperative, and the valve is positioned to route fuel from any selected tank directly to the engine, by-passing the transfer system. The control is set to the latter position only in event of failure of the electrical transfer system.

Note

The "FUEL TRANS" circuit breaker button on the pilot's right console must be in for operation of the fuel transfer system. For ground operation of the transfer system, the "BATTERY" switch must be set to "BAT" or external power connected. The control circuit for the electrically operated fuel shut-off valve is powered at all times and is independent of any switch or circuit breaker setting.

CAUTION

After the droppable and wing tanks have been emptied, using the standby system, the selector valve control must be reset to "NORMAL (MAIN)" in order to use the fuel remaining in the main tank.

In the "OFF" position, electrical circuits are completed to close the motor operated shut-off valve, as noted above, and all fuel flow to the engine is stopped.

1–26. TANK SELECTOR VALVE CONTROL. *(Figure 1–5, item 1.)* This control has four positions: "RIGHT DROP", "LEFT DROP", "RIGHT WING", and "LEFT WING". The control operates a selector valve to route fuel from the selected tank to the system selector valve. (Figure 1–2 and 2–2.)

1–27. AUXILIARY FUEL PUMP SWITCH. The "AUX FUEL PUMP" control (figure 1–6, item 36) is a two-position "ON-OFF" switch mounted on the lower left side of the instrument panel. In the "ON" position, the auxiliary fuel pump is energized, pressurizing the fuel supply to the engine-driven pump. The auxiliary pump is used to supply fuel to the engine during starting, in event of failure of the engine-driven pump, as a standby source during take-off and landing, to boost pressure when required at extreme altitude or at high power output, and when operating with the "SYSTEM SELECTOR VALVE" control set to "STANDBY (AUXILIARY TANKS)". The pump is also energized when the "OIL DIL" switch is set to "ON".

1–28. EMERGENCY CONTROLS.

1–29. DROP TANK RELEASE SWITCHES. Two switches (figure 1–5, item 20) equipped with guards are located aft on the left console, one controlling each drop tank. The switches are normally left in the "SAFE" position. Setting either switch to "RELEASE" jettisons the corresponding tank.

Note

The "FUEL TRANS" circuit breaker must be closed to energize the release circuits. In flight, in case both generators are inoperative the "BATTERY" switch must be set to "EMER" to power the release circuits.

1–30. FUEL INDICATORS.

1–31. FUEL QUANTITY INDICATORS. Three fuel quantity indicators calibrated in pounds are located on the main instrument panel (figure 1–6, item 27). The center indicator registers the quantity of fuel remaining in the main tank and the remaining two the quantities remaining in the left and right wing tanks. No gages are provided for the auxiliary (droppable) tanks.

1–32. FUEL PRESSURE INDICATOR. The engine gage unit (figure 1–6, item 37) on the lower left side of the instrument panel contains a fuel pressure indicator which registers fuel pressure at the carburetor.

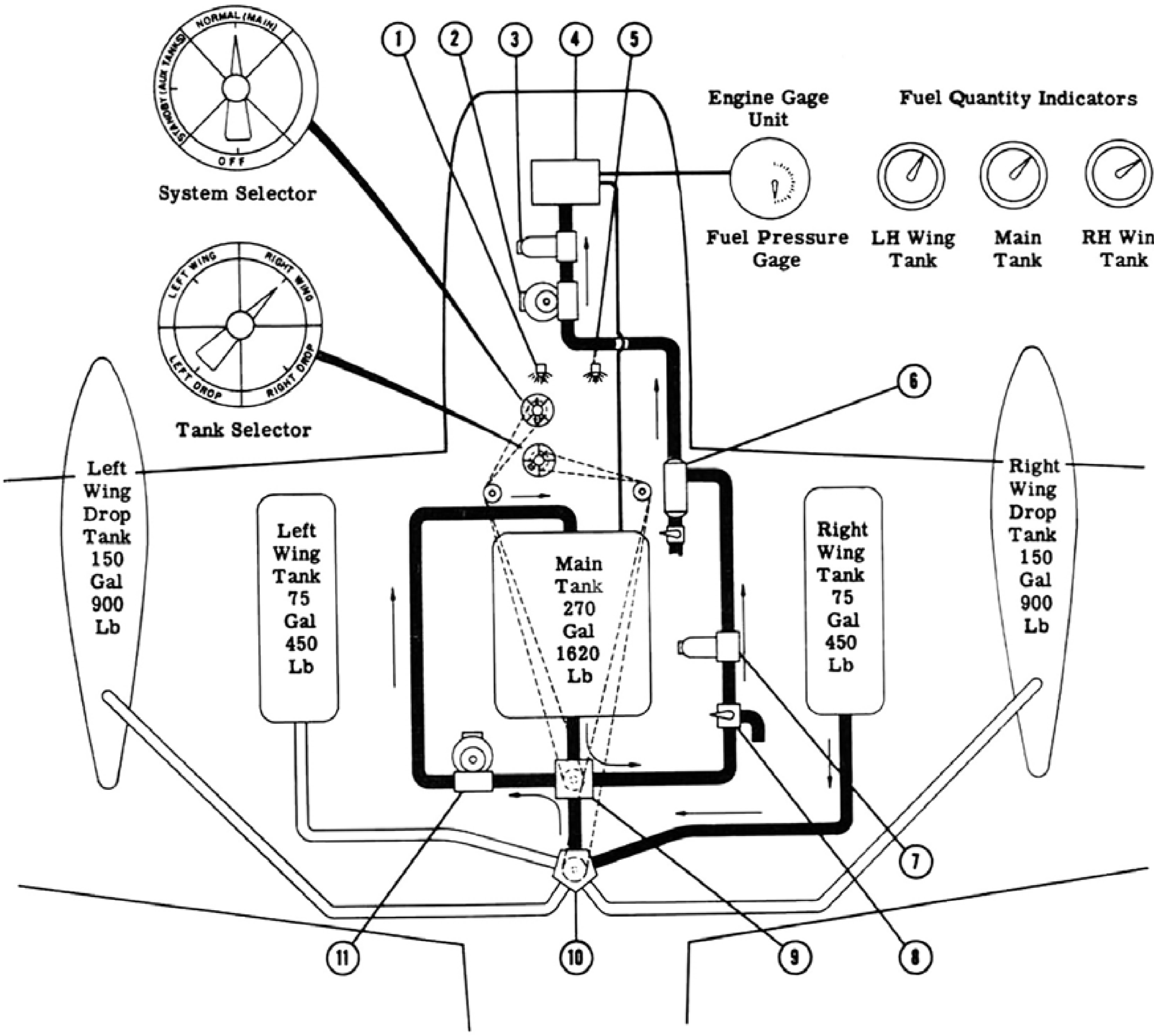
1–33. FUEL TRANSFER SYSTEM WARNING LIGHT. The "CHECK TRANSFER SYSTEM" red warning light is located on the main instrument panel (figure 1–6, item 30). The light glows when the transfer pump outlet pressure to the main tank falls below a preset value. This pressure will drop when the selected tank runs dry, or in case of malfunctioning of the transfer system.

1–34. FUEL LOW LEVEL WARNING LIGHT. The "270 POUND WARNING" light, located on the main instrument panel below the quantity gages (figure 1–6, item 31), glows when fuel in the main tank drops to the 270-pound level. No low-level warning lights are provided for the other tanks.

1–35. SURFACE CONTROLS.

1–36. GENERAL.

1–37. The surface controls are conventional with the exceptions of the flaperons and flaperettes and the rudder boost system. The flaperons and flaperettes are auxiliary control surfaces hinged to the wing upper surface, and are designed to decrease adverse yaw and increase rate of roll in aileron maneuvers. The flaperons are two rectangular flaps, attached to the wing surfaces at their leading edges by hinges, and located one on each wing outboard panel forward of the outboard flap and inboard of the aileron. The flaperettes are two smaller rectang-



1. Fuel Transfer Warning Light
2. Auxiliary Fuel Pump
3. Engine Driven Fuel Pump
4. Carburetor
5. Main Tank Warning Light
6. Fuel Strainer and Drain
7. Electric Fuel Shut-off Valve
8. Defueling Valve
9. System Selector Valve
10. Tank Selector Valve
11. Fuel Transfer Pump

Figure 1—2. Fuel System Diagram

ular flaps, attached by hinges at their leading edges to each flaperon upper surface near the flaperon trailing edge.

1–37A. The flaperons and flaperettes are hydraulically powered and are controlled by lateral motion of the control stick. Each flaperon and flaperette assembly operates singly; being raised in conjunction with upward travel of the adjacent aileron. Hydraulic pressure is admitted to the operating cylinder when the control stick is moved approximately one-half inch from the neutral position. Initial travel of the operating piston is confined to the flaperette only, elevating the flaperette to a maximum position of 90 degrees from the flaperon surface. Continued stick motion elevates the flaperon trailing edge to a maximum position of 40 degrees from the wing surface, depending on the amount of stick travel. The flaperette is held in the 90 degree position, in relation to the flaperon, throughout the travel of the flaperon, and is returned to the flush position only after the flaperon is returned to its flush position and the control stick is returned to neutral. The rudder boost system uses hydraulic power to assist in rudder deflection, lightening the pedal forces required. Both systems are normally operative at all times, but hydraulic power to both may be shut off by pulling up the "RUDDER BOOST AND FLAPERON" control on the pilot's left console.

1–37B. Control surfaces are further lightened by spring tabs in both ailerons and both elevators. Mechanically actuated controllable trim tabs are installed in the rudder, left aileron and both elevators. Fixed tabs are attached to the trailing edges of the right elevator and both ailerons.

1–38. CONTROL STICK AND RUDDER PEDALS. These standard controls are provided in the pilot's cockpit only and operate conventionally. The rudder pedals are adjusted by means of the "T" handle located below the instrument panel (figure 1–6, item 34).

1–39. CONTROL SURFACES GUST LOCK.

1–40. GENERAL. A gust lock system is provided to prevent damage to the control surfaces and control mechanism when the airplane is parked. A throttle lock actuated mechanically by the gust lock system prevents the throttle from being opened when the control surfaces are locked. In addition to locking the control surfaces at the hinges, the gust lock control lever locks the control stick.

CAUTION

The throttle must be closed before engaging the gust lock to prevent damage to the throttle linkage.

1–41. GUST LOCK CONTROL. *(Figure 1–5, item 12.)* Swinging the gust lock lever to the athwartship position locks all control surfaces, and also prevents opening the throttle, preventing any attempt to take off with the gust lock engaged. All control surfaces must be in neutral and the throttle closed before engaging the lock. The control lever is telescoping, and may be extended to engage a fitting attached to the base of the control stick, preventing motion of this unit. The control lever should be telescoped when stowed to prevent interference with the power plant controls friction adjusting knob. The gust lock may be engaged with the wings either spread or folded.

Note

Rocking the control stick and rudder pedals slightly about their neutral positions will assist the alignment of the gust lock pins with the holes provided in the control surfaces.

1–42. TRIM TAB CONTROLS. Mechanically operated trim tabs controllable from the pilot's cockpit are installed on the left aileron, elevators and rudder. The trim tab handwheels (figure 1–5, items 15, 16 and 17) are located on the left console aft of the engine controls quadrant. The controls are marked and operate conventionally. Tab position indicating indices are provided on the aileron and rudder tab handwheels and alongside the elevator handwheel.

1–43. WING FLAP CONTROL. The hydraulically operated (3000 psi system) wing flaps are actuated by a three-position "FLAPS" lever (figure 1–5, item 5) located on the left console outboard of the aileron tab control. The control nameplate is engraved "UP", "STOP", and "DOWN". Any desired flap deflection may be obtained by moving the lever to the "UP" or "DOWN" position until the desired deflection is obtained and then returning the lever to the central "STOP" position. The flaps may be operated also, in the event that the engine-driven pump is inoperative, by setting the "AUXILIARY HYDRAULIC PUMP" switch to "ON" and operating the "FLAPS" control.

1–44. WING FLAPS POSITION INDICATOR. An electrically operated flaps and wheels (landing gear) position indicator (figure 1–6, item 41) is located on the extreme left side of the instrument panel. (See paragraph 1–81.)

1–45. RUDDER BOOST AND FLAPERON CONTROL. *(Figure 1–45, item 2.)* The control, marked "RUDDER BOOST AND FLAPERON — PUSH DOWN FOR ON" is located on the pilot's left console. The control is normally left in the down or on position, but when pulled up shuts off hydraulic power to both systems.

Note

The rudder-boost and flaperon control must be in the down or on position for operation of the arresting-hook raising mechanism.

1–46. STALL WARNING SYSTEM.

1–47. GENERAL.

1–48. Warning of an impending stall is given automatically by an electrically operated warning system, consisting of a small tab on the leading edge of the left wing, and a "stick-shaker" motor mounted on the pilot's con-

trol stick. When a stall is impending, air flow over the wing leading edge causes the tab to operate a switch, completing the circuit to the "stick-shaker" motor. The motor drives an eccentrically mounted weight which vibrates the stick. The stall warning system is operative automatically when the airplane is airborne.

1—49. AUTOMATIC PILOT.

1—50. GENERAL.

1—51. The Pioneer Type P-1 automatic pilot holds the airplane on any desired magnetic course, returns the airplane to the selected course when displaced from that heading, and at the same time stabilizes the airplane in pitch and bank. The automatic pilot controls the airplane in automatic flight directionally through the gyro fluxgate compass (master direction indicator), for rate of turn through the turn and bank indicator, and laterally and longitudinally through the gyro horizon indicator. In addition, the airplane may be controlled manually through the automatic pilot by operating the controller on the pilot's right console. An "EMERGENCY AUTO PILOT DISCONNECT" control handle is located below the cockpit right sill.

1—51A. The automatic pilot requires both ac and dc, and is dependent upon the engine driven generators and the main inverter for operation. In airplanes ser No. 123088 through 124818, the "AUTO PILOT" circuit breaker on the electrical circuit breaker panel (figure 1–7, item 3) must be closed and the "WARNING AUTO PILOT OFF" warning light (figure 1–7, item 8) must be extinguished.

1—51B. In airplanes ser No. 124820 and subsequent, the "AUTO PILOT" and "MAIN INVERTER" circuit breakers on the cockpit electrical circuit breaker panel (figure 1–7, item 3) must be closed, the "INVERTER SELECTOR" switch on the interior lights panel must be set to "MAIN" and the adjacent "STAND-BY INVERTER IND." warning light must be extinguished.

Note

The automatic pilot cannot be powered from the stand-by inverter.

1—52. NORMAL CONTROLS.

1—52A. All normal controls (the power switch, clutch switch and controller) are located on a single panel on the pilot's right console (figure 1–7, item 22).

1—53. POWER SWITCH. Setting the "AUTO. PILOT" switch to "ON" initiates automatic pilot operation by applying direct current to the automatic pilot amplifiers.

1—54. CLUTCH SWITCH. Pushing in the knob marked "PUSH AUTO PILOT ON" (figure 1–7, item 22) engages the automatic pilot for flight operation.

Note

1.

After energizing the automatic pilot the amplifiers must warm up for two minutes before the clutch switch is operated.

2.

The gyro horizon indicator must be uncaged before the clutch switch can be engaged. Uncaging the gyro horizon indicator also uncages the gyro fluxgate compass.

1—55. CONTROLLER. This unit contains a turn control knob, a bank trim knob and a pitch control wheel. After the automatic pilot is engaged, actuating the turn control produces coordinated turns. Movement of the aileron trim wheel to the left or right produces a corresponding left or right bank. Movement of the elevator trim wheel up or down produces a corresponding nose up or nose down trim.

1—56. EMERGENCY CONTROL.

1—57. The "EMERGENCY AUTO PILOT DISCONNECT" control handle (figure 1–7, item 13) is mounted beneath the right canopy sill within easy reach of the pilot. In the event that normal electrical disengagement methods fail, pulling this control handle inboard disengages the automatic pilot servo clutches. Once the clutches are disengaged in flight they must be reset manually on the ground.

1—58. INDICATORS.

1—59. AUTOMATIC PILOT WARNING LIGHT—AIRPLANES SER NO. 123088 through 124818. This red warning light, marked "WARNING AUTO. PILOT OFF", is located outboard of the automatic pilot control panel (figure 1–7, item 8), and is equipped with a press-to-test switch and dimmer cap. Illumination of the light indicates failure of the main inverter and automatic shift to the fuel-gage and instrument-stand-by inverter, with consequent interruption of the power supply to the automatic pilot.

1—59A. STAND-BY INVERTER INDICATOR LIGHT—AIRPLANES SER NO. 124820 AND SUBSEQUENT. This red warning light, marked "STAND-BY INVERTER IND.", replaces the warning light described in paragraph 1–59, above, and is similarly equipped with a press-to-test switch and a dimmer cap. Illumination of the light indicates failure of the main inverter and automatic shift to the stand-by inverter, with consequent interruption of the power supply to the automatic pilot.

1—60. HYDRAULIC SYSTEM.

1—61. GENERAL. *(See Figure 1–3.)*

1—62. The hydraulic system is normally pressurized by an engine driven, variable volume pump, operating at an output pressure of 3000 psi. An electrically driven auxiliary pump is provided for emergency use in case of failure of the engine driven pump. The outlet connections in the hydraulic system reservoir are arranged to provide a reserve supply for the auxiliary pump, in case of loss of the normal supply through leakage. The system is designed to minimize the possibility of leakage, when the airplane is in the clean flight configuration, by automatically depressurizing that part of the system which serves those units used only in the take-off and

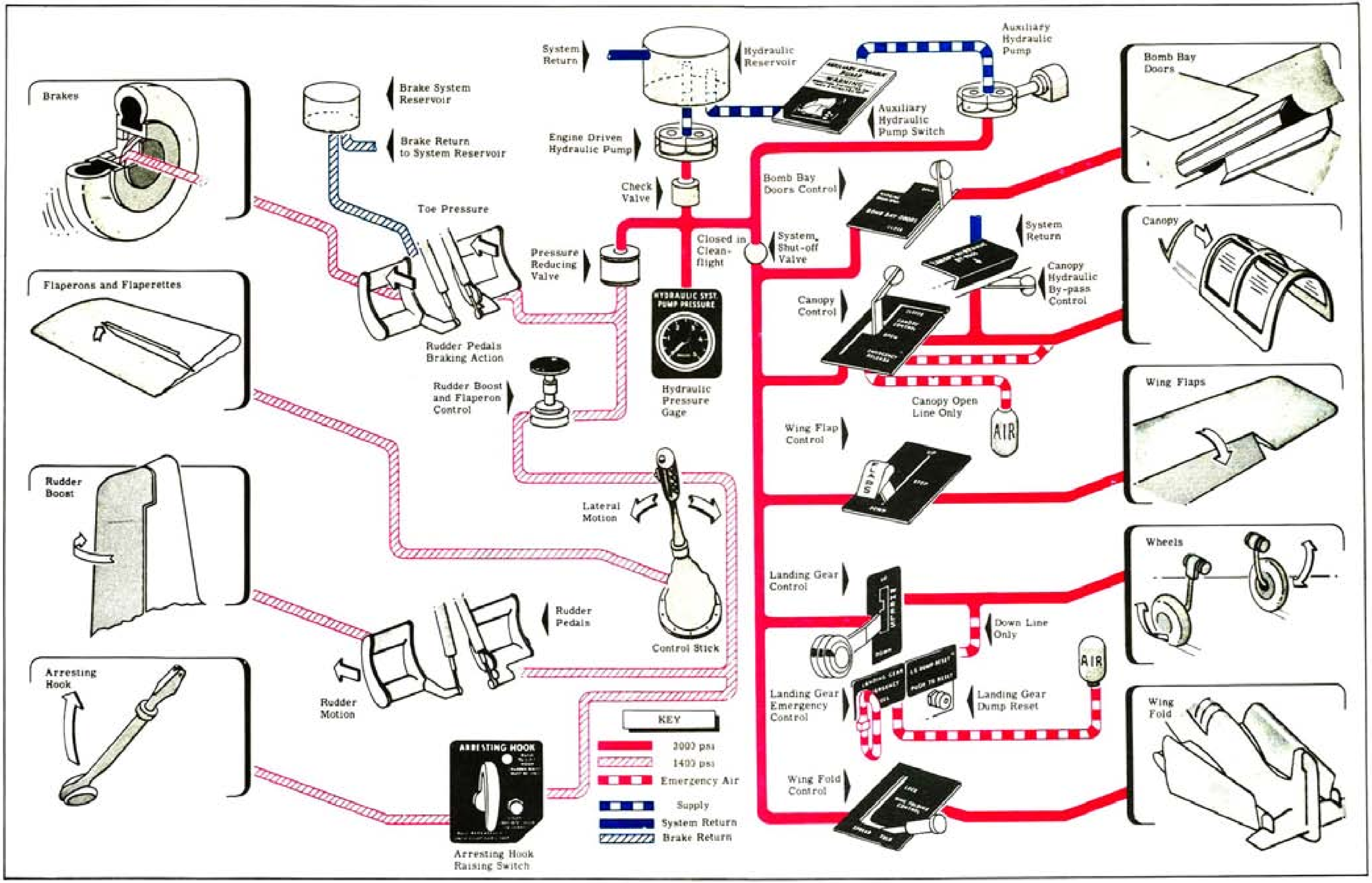


Figure 1–3. Hydraulic System Controls

landing configurations, such as the wing flaps and landing gear; and by reducing pressure to those units used in the clean flight configuration, such as the flaperons and rudder boost, to 1400 psi. In addition to the provision of the electrically driven pump for emergency operation of the hydraulic system, compressed air bottles may be released to open the canopy and lower the landing gear, in the event of complete failure of the hydraulic system.

1–63. 3000 PSI HYDRAULIC SYSTEM.

1–64. The landing gear, wing fold mechanism, bomb bay doors, wing flaps, and canopy are operated by full pump output pressure of 3000 psi. Pressure to the selector valves for these units is controlled by an electrically operated system shut-off valve, held in the open position by spring tension when the valve control circuit is de-energized. The valve is wired in series with limit switches actuated by the cockpit controls for the above units, and with a hydraulic flow switch. When the cockpit controls are moved to their clean flight positions following take-off—landing gear control to "UP", bomb bay door and canopy controls to "CLOSE", wing flaps control to "STOP" or "UP"—and hydraulic flow has stopped, a circuit is completed through the control limit switches and the hydraulic flow switch to close the system shut-off valve, preventing further unnecessary pressurization of the 3000 psi system. To ensure completion of the operating cycles of the hydraulic units, a time delay in the operation of the flow switch holds the shut-off valve open for a few seconds after flow has stopped.

1–64A. When the shut-off valve is closed, and no flow is required by the 1400 psi system, all pump output flow is by-passed back to the reservoir; but full pump pressure is maintained at all times to the system shut-off valve, the hydraulic system pressure gage, and to the pressure reducer valve for the 1400 psi system. (See paragraph 1–66.)

1–64B. Setting the cockpit controls to either lower the landing gear or flaps, or open the canopy or bomb bay doors, opens the circuit to the shut-off valve, which then returns to the open position by spring tension, restoring pressure to the corresponding selector valves and cylinders. In event of malfunctioning of the electrical circuit, all hydraulic units remain operable, since the shut-off valve remains open when the control circuit is open.

1–65. 1400 PSI HYDRAULIC SYSTEM.

1–66. The rudder boost mechanism, flaperons, wheel brake power-assist valves, and the arresting hook raising mechanism are operated by pump-output pressure reduced to 1400 psi. 3000 psi pressure is reduced by a pressure reducer valve with the relief valve, which is supplied with pressure when either the engine driven or auxiliary pump is operating. Pressure is supplied to the rudder boost mechanism, flaperons, and arresting hook raising mechanism through a normally open shut-off valve, operated by the "RUDDER BOOST AND FLAPERON" control on the pilot's left console, which may be raised to shut off power to these units. 1400 psi system pressure is supplied at all times, when 3000 psi system pressure is available, to the wheel brake power assist valves. An accumulator in the 1400 psi system dampens pressure surges; but due to large flow demands of the operated units will not sustain operating pressure for long periods.

1–67. PRESSURE GAGE. A hydraulic pressure gage, for the 3000 psi system only, is located on a shelf aft of the right console (figure 1–7, item 9). This gage registers system pressure from either the engine driven pump or the electrically driven auxiliary pump. The normal gage reading in flight is 2700 to 3000 psi. No gage is required for the 1400 psi system since the latter is pressurized at all times when pressure is available in the main system.

1–68. EMERGENCY HYDRAULIC SYSTEM.

1–69. GENERAL. When system pressure is not available, due to failure of the engine driven pump, any of the hydraulic units may be operated by electric auxiliary pump pressure. Use of this pump, however, is limited to three minutes, after which the pump must be allowed to cool for three minutes. In event of complete failure of the hydraulic system, air bottle pressure may be released to extend the landing gear and to open the canopy. (See paragraphs 1–77 and 1–119.)

1–70. ELECTRIC AUXILIARY HYDRAULIC PUMP ON-OFF SWITCH. The "AUXILIARY HYDRAULIC PUMP" "ON-OFF" switch (figure 1–7, item 9) is located on the shelf aft of the right console. Turning "ON" the switch starts the electric auxiliary hydraulic pump operating, providing the battery switch is on "BAT", or on "EMER." when the generators are inoperative. Both generators should also be cut in to carry the high electrical load on the battery when operating this pump.

CAUTION

Operation of this pump is limited to three minutes at a time, with an intervening period of three minutes. The primary function of the pump is for emergency use; not for ground testing of hydraulic equipment. For ground testing, an external hydraulic-power source should be used instead of the auxiliary pump.

1–71. LANDING GEAR.

1–72. GENERAL.

1–73. The retraction and extension of the main landing gear is hydraulically accomplished by the 3000 psi hydraulic system. The tail gear is not retractable, due to the long-stroke strut required for carrier landings. In event of failure of the engine driven hydraulic pump, the main gear can be lowered or raised by use of the electric auxiliary hydraulic pump, the normal control handle being used when pressure from either the engine driven or electric auxiliary pump is available. In case of complete failure of the hydraulic system or the normal

control, operation of an emergency control will release the contents of a high pressure air bottle to lower the main landing gear. For coordinated operation of the main landing gear, arresting hook and approach light, see paragraph 4–108.

1–74. NORMAL CONTROLS.

1–75. LANDING GEAR SELECTOR VALVE CONTROL. The "WHEELS" handle is located to the left of the instrument panel (figure 1–6, item 39). Operation of this two-position "UP-DOWN" control is conventional. A solenoid lock prevents the lever from being moved to "UP" when the weight of the airplane is on the gear.

1–76. TAIL WHEEL LOCK CONTROL. A tail wheel lock lever, located on the left console of the pilot's cockpit (figure 1–5, item 19), operates conventionally forward to "LOCK", aft to "UNLOCK".

CAUTION

The lever should be set to "UNLOCK" before towing the airplane to avoid shearing the lock pin.

1–77. EMERGENCY CONTROLS.

1–78. LANDING GEAR EMERGENCY CONTROL. The "LANDING GEAR EMERGENCY" control handle is located below the normal control (figure 1–6, item 40). When the handle is pulled aft the landing gear up locks are released, and a remote-controlled emergency dump valve is moved from the normal position and locked in the dump position. In this position, this valve releases the hydraulic fluid in the main landing gear up lines, and discharges a compressed air bottle into the main landing gear down lines; lowering the main gear, which locks automatically. Setting the normal control to "DOWN" before operating the emergency control is not necessary.

1–78A. LANDING GEAR DUMP RESET. The "L.G. DUMP RESET" control button is located adjacent to the "LANDING GEAR EMERGENCY" handle. When the emergency handle is pulled out, the reset control button will be pushed out slightly from the panel as the emergency dump valve locks in the dump position. When the reset control button is pushed in, the dump valve and the landing gear system will be restored to normal operation.

WARNING

The "WHEELS" control handle must be in the "DOWN" position before pushing the reset button.

1–78B. After the reset button is pushed in, the landing gear may be raised by moving the "WHEELS" control handle to "UP", provided that hydraulic pressure is available from either the engine driven or auxiliary pump.

WARNING

The landing gear emergency control cannot be used to lower the gear a second time.

1–79. In the event that the landing gear cannot be operated by the normal control due to failure of the engine driven pump, the gear may be operated by setting the "WHEELS" control to the required position and setting the "AUXILIARY HYDRAULIC PUMP" switch to "ON". (See paragraph 1–70.)

1–80. INDICATORS.

1–81. WHEELS AND FLAPS POSITION INDICATOR. (Figure 1–6, item 41.) An electrically operated wheels and flaps position indicator is located on the extreme left side of the instrument panel. The two landing gear elements are actuated by limit switches in the main gear up locks and down locks, and indicate the up-and-locked, down-and-locked, and intermediate positions of the main landing gear. The flaps element indicates the up, down and intermediate positions, and drops to show "OFF" when either the wheels or the flaps indicator circuit is interrupted, to indicate that the instrument is inoperative.

1–81A. WARNING LIGHT. A warning light in the translucent knob of the "WHEELS" handle glows when the landing gear is in any position other than up-and-locked or down-and-locked.

1–82. BRAKES. Two-rotor disc brakes on the main wheels are operated hydraulically by pressure on the rudder toe pedals. The brakes are operated by power-boost valves, served by the 1400 psi hydraulic system, connected to each pedal. Pedal pressure opens the boost valves, causing hydraulic-system pressure to boost the toe pressure exerted. The lines from the boost valves to the brakes are independent of the hydraulic system and are connected to a separate brake return reservoir so that in case of failure of the hydraulic system the brakes remain operable although requiring greater pedal pressure.

1–83. In event of failure of the engine driven pump, the brakes may be operated normally by switching on the electric auxiliary hydraulic pump.

1–84. ARRESTING HOOK.

1–85. GENERAL.

1–86. The arresting hook is attached to a carriage, mounted on rollers, which rides on a track in the fuselage tail section. Pulling and releasing the control handle repeatedly moves the carriage aft and extends the hook. Initial movement of the control handle illuminates an adjacent indicator light, which remains illuminated until the hook is fully extended and locked. After landing, depressing an adjacent push button switch raises the hook sufficiently to clear the arresting cables. The hook cannot be raised manually. The hook carriage is unlocked by the deck crew by pulling out a handle recessed in the left side of the fuselage tail section. The

hook is then pushed forward and locks automatically in the stowed position.

1–87. NORMAL CONTROLS.

1–88. ARRESTING HOOK CONTROL HANDLE. The "ARRESTING HOOK" control handle (figure 1–6, item 25) is located at the right of the instrument panel and is marked "PULL REPEATEDLY UNTIL LIGHT GOES OUT". Initial operation of the handle releases the hook uplatch and causes the adjacent indicator light to glow. Approximately four eight-inch pulls are required to extend and lock the arresting hook.

1–88A. HOOK RAISING SWITCH. The hook raising push button switch (figure 1–6, item 25) is located above the arresting hook handle and is marked "PUSH TO RAISE HOOK (RUDDER BOOST MUST BE ON)". Depressing the push button after an arrested landing operates a hydraulic mechanism which raises the hook sufficiently to clear the arresting cables.

Note

The flaperon and rudder boost must be on and hydraulic system pressure available to operate the hook raising mechanism.

1–88B. INDICATORS.

1–88C. HOOK POSITION INDICATOR LIGHT. The arresting hook indicator light (figure 1–6, item 24) is located at the right of the arresting hook control handle and is marked "LIGHT INDICATES HOOK UNLOCKED". The light glows upon initial operation of the arresting hook extension handle and remains illuminated until the hook is fully extended and locked.

1–89. WING FOLDING SYSTEM.

1–90. GENERAL.

1–91. The wing folding mechanism is operated by the 3000 psi hydraulic system and is controlled from the pilot's cockpit. The wings, when spread, are locked in position by two hydraulic pistons at each wing fold axis, which are extended through fittings attached to the center section and outboard panels. The hydraulic lock pistons are in turn locked by mechanically operated locking arms, also actuated by the cockpit control. Hydraulic double acting cylinders automatically interlock the inboard and outboard flaps when the wings are spread, and are automatically reversed to lock the inboard flap to the wing center section when folding the wings. The hydraulic system is arranged to prevent transmission of hydraulic power to the wing folding mechanism until the wing flaps are raised. A mechanical connection between the flaps control and the wing folding control automatically sets the flaps control to the full "UP" position when the wing folding control is set to the "FOLD" position.

1–92. NORMAL CONTROLS.

1–93. The "WING FOLDING CONTROL" is located at the aft end of the pilot's right console (figure 1–7, item 11). When the wings are spread, moving the control inboard from "LOCK" to "SPREAD" (see Note 1, below) disengages the mechanical locks; moving the control aft from "SPREAD" to "FOLD" withdraws the hydraulic pistons from the wing fittings and folds the wings. With the wings folded the wings are spread and locked hydraulically by moving the control forward from "FOLD" to "SPREAD"; moving the control outboard to "LOCK" re-engages the mechanical locks.

WARNING

To prevent possible damage to the mechanical lock linkage when spreading the wings, do not attempt to move the control handle outboard to the "LOCK" position until five seconds after the wings are fully spread, thus ensuring that sufficient time has elapsed for the hydraulic lock pistons to seat fully.

Note

1.

In airplanes ser No. 124804 and subsequent, the control nomenclature is revised, the "SPREAD" position being changed to "SPREAD & LOCK", and the "LOCK" position being changed to "LOCK-LOCK". Operation of the control is unchanged.

2.

When using the auxiliary hydraulic pump (engine driven pump inoperative) to fold the wings, the wings must be assisted by the deck crew through the neutral position.

1–94. INDICATORS.

1–95. Red warning flags appear above the wings at the folding axes when the safety pins are withdrawn and remain raised until the wings are spread and locked.

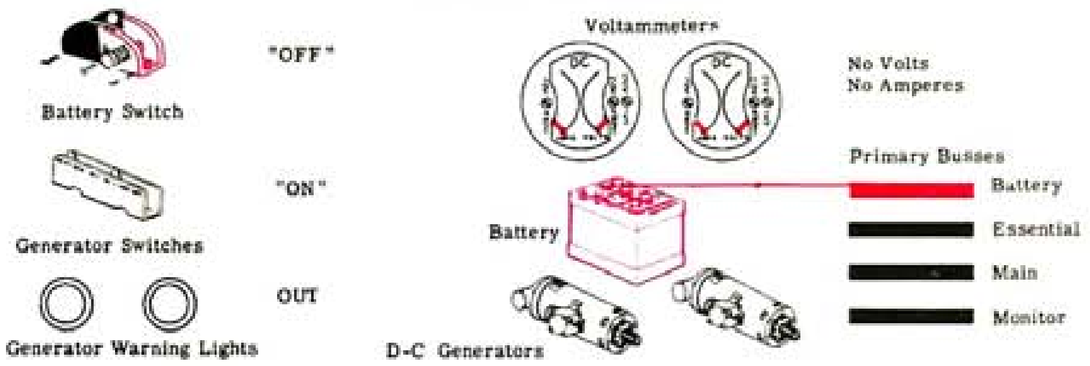
1–96. ELECTRICAL SYSTEM.

1–97. DIRECT CURRENT SYSTEM.

1–98. GENERAL. The direct current installation is a 24 volt, single-wire system, supplied by two 300 ampere, engine driven generators, and a 34 ampere-hour storage battery. Power from these sources is distributed through four primary busses; the battery, main, monitor, and essential busses. The battery bus is energized by the battery at all times. With the battery switch set to "BAT", the main bus is energized on the ground (landing gear extended) by the battery until one or both generators become operative. In flight (landing gear retracted), and with the battery switch set to "BAT", the main bus is energized by the generators. With the battery switch set to "EMER", as in the event of failure of both engine driven generators, the main bus is energized by the battery. The essential bus is energized by the battery when the battery switch is set to either "BAT" or "EMER", with the generators inoperative, or, by either or both generators when operative. The monitor bus is energized only from the generators, and becomes de-

AIRPLANE ON DECK

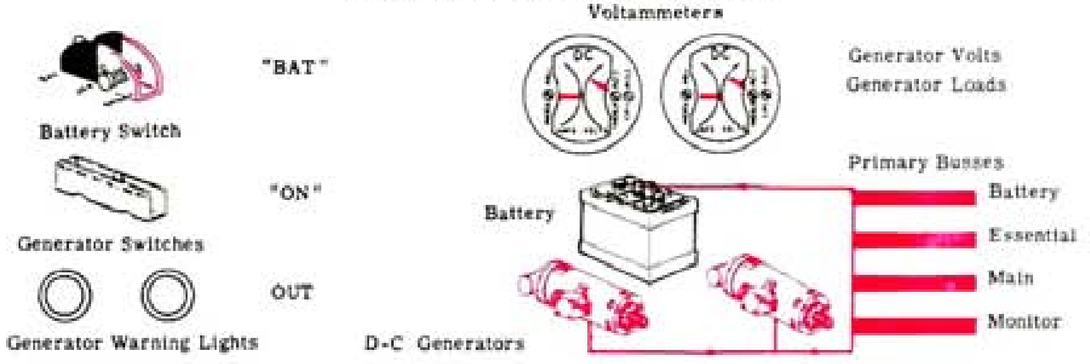
NORMAL "AT REST" CONDITION



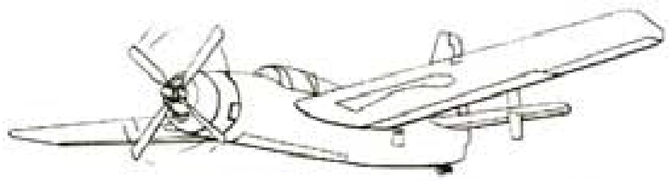
PRESTART CONDITION

With external power connected, all buses are energized as with generators charging. Voltammeters will indicate external power voltage - no amperes.

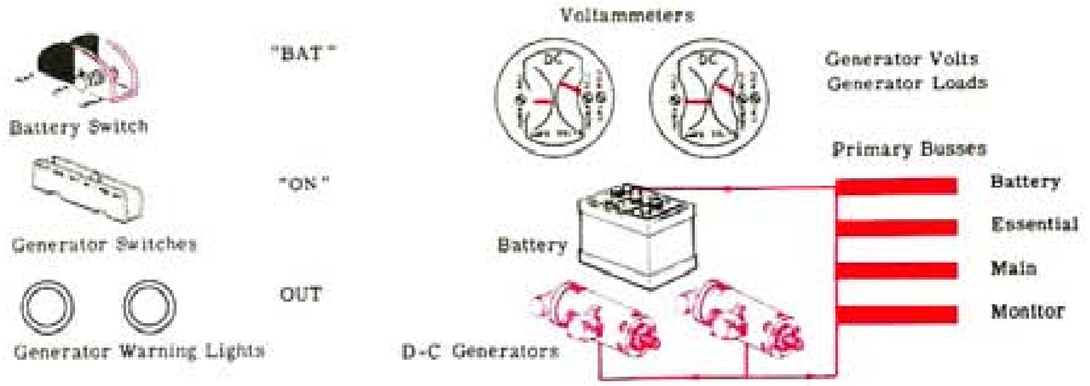
ENGINE RUNNING-GENERATORS CHARGING



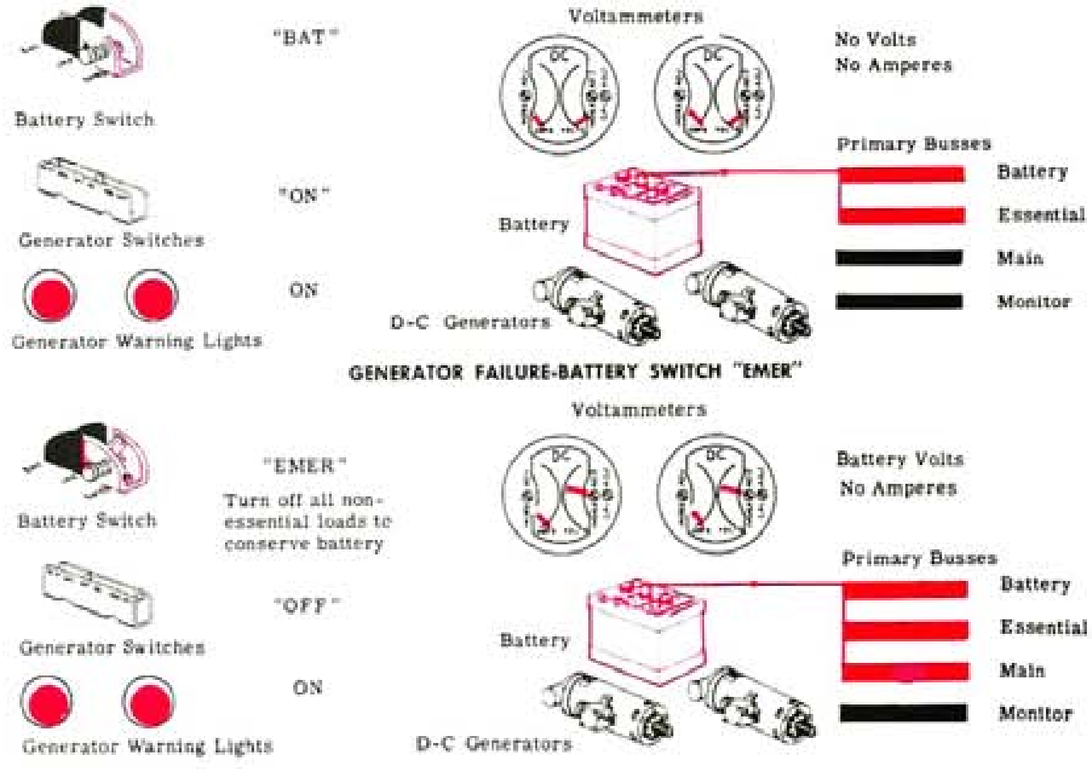
AIRPLANE AIRBORNE



NORMAL FLIGHT CONDITION



GENERATOR FAILURE-BATTERY SWITCH "BAT"



GENERATOR FAILURE-BATTERY SWITCH "EMER"

Figure 1—4. (Sheet 1 of 2 Sheets) Electrical System

BATTERY BUS

External Canopy Control (Auxiliary Hydraulic Pump)

IFF Detonator Circuits

Fuel Shut-off Valve

ESSENTIAL BUS

Stall Warning Motor

Cockpit Lights

Cockpit Instrument Lights

Generator Warning Lights

Engine Gage Unit (Oil Temperature Indicator)

Outside Air Temperature Indicator

Wheels and Flaps Position Indicator

Fuel Gage and Instruments - Stand-by Inverter (Airplanes Ser No. 123088 through 124818)
Normal Condition - Main (Automatic Pilot) Inverter in Operation - Stand-by Inverter Powers Fuel Quantity Gage.
Emergency Condition - Main (Automatic Pilot) Inverter Inoperative - Stand-by Inverter Powers Fuel Quantity Gage and Electrical Flight Instruments.

Stand-by Inverter (Airplanes Ser No. 124820 and Subsequent)
Normal Condition - Main Inverter in Operation - Stand-by Inverter Inoperative.
Emergency Condition - Main Inverter Inoperative - Stand-by Inverter Powers Fuel Quantity Gage and Electrical Flight Instruments.

MAIN BUS

Starter

Booster Ignition

Primer

Oil Dilution

Auxiliary Fuel Pump

Cowl Flaps

Oil Cooler Flaps

Carburetor Alternate Air

Fuel Transfer

Auxiliary Hydraulic Pump

Arresting Hook Raising Valve

Hydraulic System

Landing Gear Lock Solenoid

Landing Gear Warning Light

Exterior Lights

Approach Light

Arresting Hook Indicator Light

AN/AVQ-2 Searchlight

Signal Lamp

Second and Aft Compartment Instrument Lights

Second and Aft Compartment Interior Lights

Heating and Ventilating System

Pitot Heat

Stall Warning Switch Heat

External Auxiliary Fuel Tank Release

K-25A Camera and D-1 Flasher

AN-N-6A Gun (Rocket) Camera

MK 8 Mod 8 Rocket Sight

Rocket Arming and Firing

MK 23 Mod 6 Bomb Sight

Bomb Sight Inverter

MAIN BUS

Bomb Bay Doors Warning Light

Sonobuoys

Radio Master

R-23A/ARC-5 Radio Range Receiver

AN/ARC-1A VHF Transmitter-Receiver

AN/ARC-1A VHF Transmitter-Receiver

AN/ARR-2A Navigation Receiver

AN/AIC-4 ICS

AN/APN-1 Radio Altimeter

AN/APX-2 and AN/APX-6 DC IFF

Main (Automatic Pilot) Inverter Power Supply (Airplanes Ser No. 123088 through 124818)

Automatic Pilot AC

Electrical Flight Instruments

Electronics Inverter (Controlled from Second Compartment) Power Supply (Airplanes Ser No. 123088 through 124818)

AN/ARR-31 Sonobuoy Receiver

AN/APX-2 AC IFF

AN/APX-6 AC IFF

AN/APS-31A Search Radar

AN/ARR-27 Radar Relay Receiver

K-25A Camera and D-1 Flasher Positioner

AN/AVQ-2 Searchlight Positioner

Aft Main Inverter (Controlled from Cockpit) Power Supply (Airplanes Ser No. 124820 and Subsequent)

Automatic Pilot AC

Electrical Flight Instruments

Fuel Quantity Gage

AN/APS-31A Search Radar

AN/APX-2 AC IFF

AN/ARR-27 Radar Relay Receiver

MAIN BUS

Forward Main Inverter (Controlled from Second Compartment) Power Supply (Airplanes Ser No. 124820 and Subsequent)

AN/APS-31A Search Radar

AN/ARR-26 Sonobuoy Receiver

AN/ARR-27 Radar Relay Receiver

AN/APX-6 AC IFF

K-25A Camera and D-1 Flasher Positioner

AN/AVQ-2 Searchlight Positioner

K-25A Camera and D-1 Flasher Positioner

AN/AVQ-2 Searchlight Positioner

MONITOR BUS

Utility Receptacles

AN-N-6A Gun (Rocket) Camera Heat

AN/ARC-2 HF Transmitter-Receiver

13A-3-J or VRW-7 Wire Recorder

AN/APS-31A Search Radar

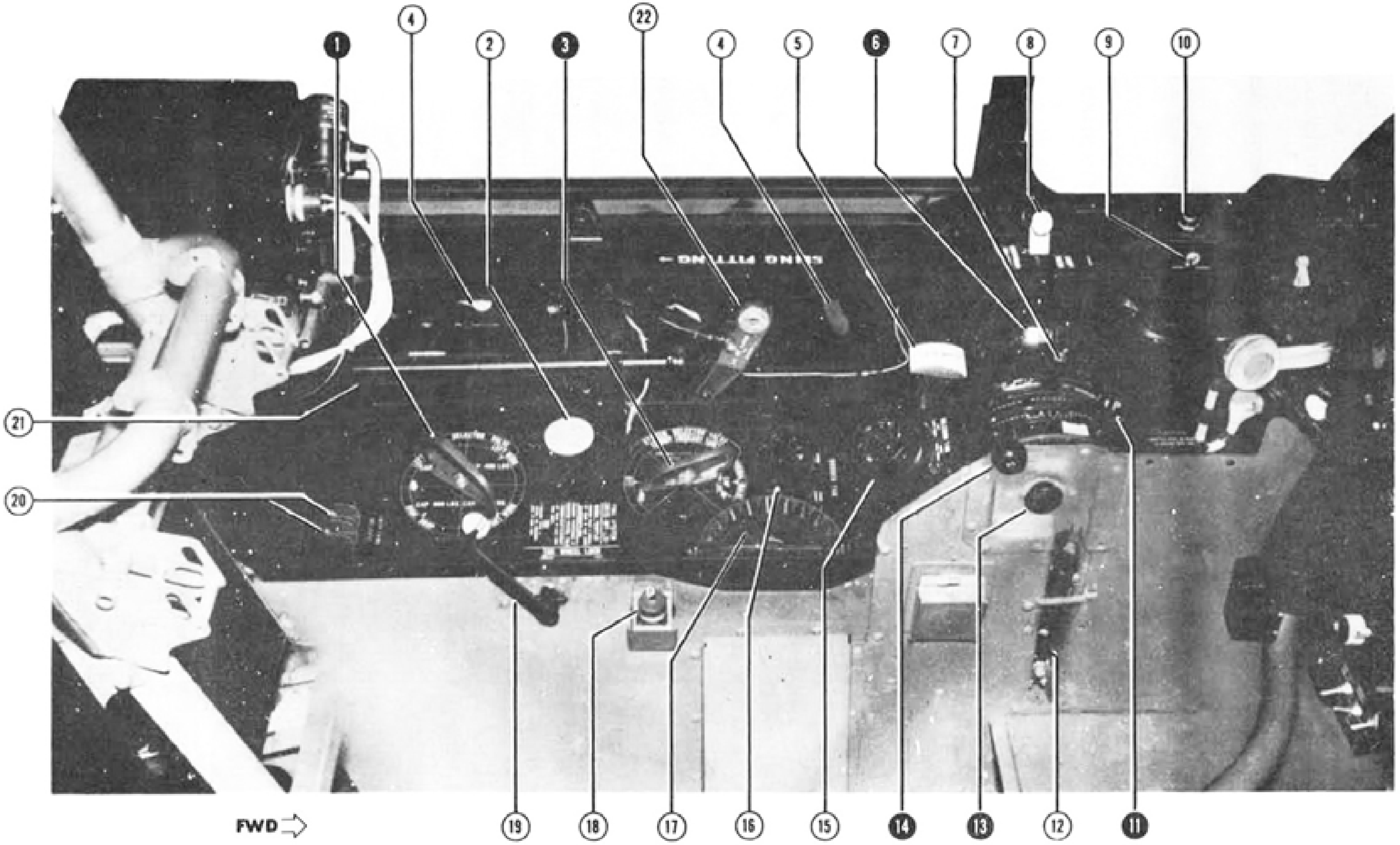
Main (Automatic Pilot) Inverter Control

Electronics Inverter Control

Aft Main Inverter Control

Forward Main Inverter Control

Figure 1—4. (Sheet 2 of 2 Sheets) Electrical System



1. Fuel Tank Selector Valve Control
2. Rudder Boost and Flaperon Control
3. Fuel System Selector Valve Control
4. Canopy Hydraulic By-pass Control Forward Location - Airplane ser No. 123088 - 124188 incl, Aft Location Airplane ser No. 124190 and subs.
5. Wing Flap Control
6. Throttle Lever and ICS-RAD Switch
7. Sonobouy Release Button
8. Canopy Control and Emergency Release
9. Bombardier Override Switch
10. Torpedo Ready for Release Indicator Light
11. Propeller RPM Control Lever
12. Gust Lock Lever
13. Controls Quadrant Friction Adjustment
14. Mixture Control Lever
15. Aileron Trim Tab Control
16. Rudder Trim Tab Control
17. Elevator Trim Tab Control
18. Utility Receptacle
19. Tail Wheel Lock Control
20. Drop Tank Release Switches
21. Auxiliary Cockpit Ventilating Air Outlet Tube
22. Bail-out Warning Bell Handle - Airplane ser No. 124190 and subs.

Figure 1–5. Pilot's Cockpit–Left Side

energized when the generators are inoperative. The equipment served by these busses is shown in figure 1–4. All circuits are protected from overloads by circuit breakers. Pin jacks are provided at the bottom of the instrument panel for connecting a precision voltmeter and precision ammeters for test purposes. An external d-c power receptacle is provided in the fuselage under the right wing root.

1–99. NORMAL CONTROLS.

1–100. BATTERY SWITCH. *(Figure 1–7, item 2.)* The battery switch is equipped with a guard and is located forward on the pilot's right console. The switch has three positions – "OFF", "BAT", and "EMER." Setting the switch to "OFF" disconnects the battery from all circuits with the exception of the IFF detonator circuits, the canopy external control circuit and the fuel shut-off valve circuit, which are powered at all times. On the ground, setting the switch to "BAT" (generators inoperative) powers all primary busses except the monitor bus (figure 1–4). With the generators producing current, either on the ground or airborne, all primary busses are powered by the generators when the battery switch is set to "BAT"; but when the airplane is airborne, in the event of failure of both generators, the battery and essential busses only will be powered from the battery when the switch is set to "BAT". For operation of the electrical system with the battery switch set to "EMER", see paragraph 1–103. When external power is connected, the setting of the battery switch is immaterial in that all primary busses will be powered with the switch at any setting.

1–101. GENERATOR SWITCHES. The "RIGHT GEN" and "LEFT GEN" switches (figure 1–7, item 2) are two-position "ON-OFF" toggle type units, located forward on the right console adjacent to the battery switch. Setting either switch to "OFF", as in the event of fire or abnormal voltage conditions, disconnects the corresponding generator from the system.

1–102. EMERGENCY CONTROLS.

1–103. BATTERY SWITCH. Setting the battery switch to "EMER", following generator failure, permits operation of any equipment served by the main bus from the storage battery.

CAUTION

Turn off all unnecessary equipment powered from the main bus before setting the switch to "EMER" in order to prevent prematurely discharging the battery.

1–104. CIRCUIT BREAKERS. Push button reset type circuit breakers, located on a sloping panel (figure 1–7, items 1 and 3) outboard of the pilot's right console, and on the radar operator's and the bombardier's consoles, operate automatically to protect the various electrical circuits from overloads. When the cause of an overload has been ascertained and corrected the circuit breaker may be reset by depressing the button. The appropriate unit or circuit should be switched off (if a switch is provided) when the circuit breaker continues to open when reset.

1–105. INDICATORS.

1–106. VOLTAMMETERS. Two voltammeters (figure 1–6, item 20) are located on the right side of the instrument panel. The voltmeter elements in both instruments indicate voltage at the main bus. The ammeter elements in the left and right instruments indicate load on the left and right engine driven generators, respectively. Battery (or external power) voltage, only, is indicated when neither generator is supplying power to the electrical system.

KEY TO FIGURE 1-6.

1. Ignition Switch.
2. Radio Altimeter Low Limit Indicator.
3. Radio Altimeter.
4. Tachometer Indicator.
5. Manifold Pressure Gage.
6. Altimeter.
7. Airspeed Indicator.
8. Rocket Sight.
9. Gyro Horizon Indicator.
10. Directional Gyro (Master Direction) Indicator.
11. Climb Indicator.
12. Turn and Bank Indicator.
13. Radio Altimeter Altitude Limit Switch.
14. Elapsed Time Clock.
15. Generator Warning Lights (2).
16. Pilot Directional Indicator (PDI).
17. PDI Raising Control.
18. Outside Air Temperature Indicator.
19. ID-162A/APS-31 Radar Repeat Indicator
20. Voltammeters (2).
21. Precision Voltmeter and Ammeter Pin Jacks.
22. Accelerometer.
23. Air Conditioning Control Panel
    Left to Right—Air Inlet Control Switch, Heater Start Switch and Temperature Control Rheostat.
24. Arresting Hook Warning Light.
25. Arresting Hook Control.
26. Arresting Hook Raising Switch.
27. Fuel Quantity Indicators. Left to Right - Left Wing Tank Main Tank, and Right Wing Tank.
28. "B" Button (Rocket Camera "Manual" Control).
29. "RP" Button (Rocket Projectiles and Rocket Camera "Normal" Control)
30. Fuel Transfer System Warning Light.
31. Fuel Low Level Warning Light.
32. Gunsight Control Panel.
    Top - Rheostat, Bottom - Lamp Switch.
33. Armament Switches -
    Left to Right - Armament Master, Arming and Rocket Camera Switches
34. Rudder Pedal Adjustment Handle.
35. Rocket Station Selector.
36. Power Plant Switches.
    Left to Right - Auxiliary Fuel Pump, Oil Cooler Flap, Cowl Flap, and Carburetor Air Switches.
37. Engine Gage Unit.
38. Cylinder Head Temperature Indicator.
39. Landing Gear Selector Control.
40. Landing Gear Emergency Control.
41. Wheels and Flaps Position Indicator.

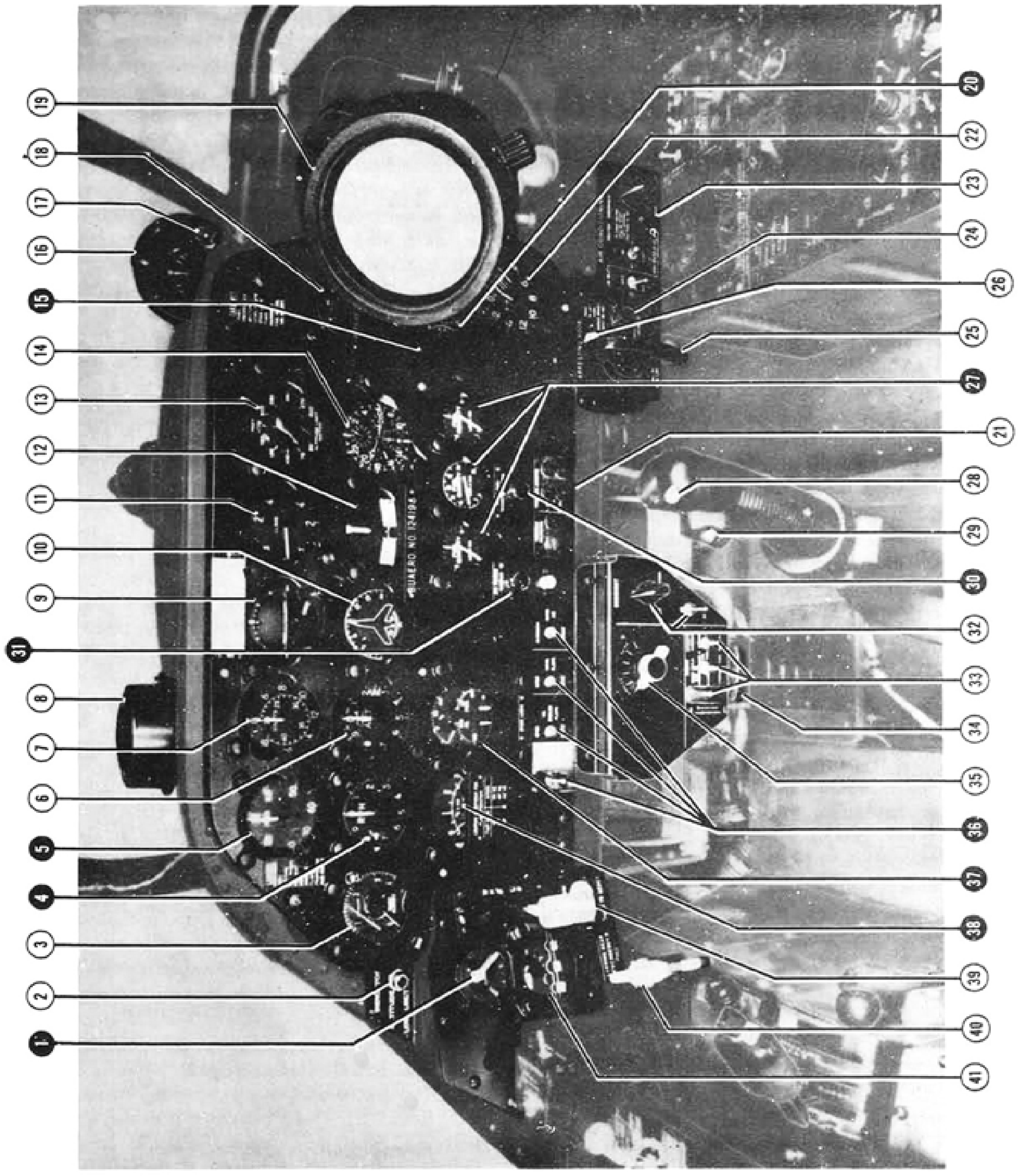


Figure 1—6. Pilot's Cockpit—Forward

1–107. GENERATOR WARNING LIGHTS. Two lights (figure 1–6, item 15), placarded "GENERATOR WARNING LIGHT", "RIGHT" and "LEFT" are located on the right of the instrument panel, and glow when the corresponding generator switch is set to "OFF", when engine speed is below generator cut-in speed, or upon failure of the corresponding generator. An automatic dimmer circuit, controlled by the "INTERIOR LIGHTS" rheostat, is provided in airplanes ser No. 124778 and subsequent. Turning the rheostat from the "OFF" position dims the lights. The interior lights toggle switch should be set to "FLIGHT INST" for minimum panel illumination.

1–108. ALTERNATING CURRENT SYSTEM.

1–109. GENERAL. Alternating current is supplied by four d-c powered inverters. Power supply to these inverters and the equipment powered therefrom is shown in figure 1–4.

1–110. INVERTERS SYSTEM—AIRPLANES SER No. 123088 THROUGH 124818. The main inverter is powered by the d-c generators only through the "AUTO. PILOT" circuit breaker on the pilot's right console, and supplies a-c power to the automatic pilot and to the electrical flight instruments. The stand-by inverter is powered from the essential bus through the "INSTRUMENTS INVERTER" circuit breaker on the same panel, and normally supplies power to the electronic fuel quantity gage system only. In case of failure of the d-c generators or main inverter, however, the stand-by inverter will remain energized by the battery through the essential bus, and, through the automatic operation of an inverter changeover switch, will also provide power for the electrical flight instruments. No power switches are provided for the main and stand-by inverters; the operation of these units is automatic except for operation of a test switch (paragraph 1–110C) provided to test the reliability of the inverter changeover switch and the automatic pilot warning light (paragraph 1–59). The electronics inverter is powered from the monitor bus through a thermal overload switch, which is in turn controlled by a remote indicating push button reset circuit breaker located on the second compartment console (paragraph 1–110E). A bomb sight inverter is powered from the main bus through the "BOMB SIGHT" circuit breaker on the aft compartment console and the power switch on the bomb sight control unit (paragraph 4–33).

1–110A. INVERTERS SYSTEM—AIRPLANES SER NO. 124820 AND SUBSEQUENT. The aft main inverter is powered by the d-c generators only through the "MAIN INVERTER" circuit breaker on the pilot's right console and supplies a-c power to the automatic pilot, electronic fuel gage system, and the electrical flight instruments. The stand-by inverter is powered from the essential bus through the "STAND-BY INVERTER" circuit breaker, located on the pilot's right console, and is inoperative when the main inverter is in operation. In case of failure of the d-c generator system or of the main inverter, an inverter automatic changeover switch functions to energize the stand-by inverter from the battery by way of the essential bus, and to transfer the fuel quantity gage system and electric flight instruments electrical loads thereto. This automatic transfer will be indicated by the illumination of the "STAND-BY INVERTER IND." warning light on the pilot's right console (paragraph 1–59A). Since ac is supplied to the automatic pilot by the main inverter only, the automatic pilot will become inoperative under this condition. The stand-by inverter may be selected manually, also, through the operation of an "INVERTER SELECTOR" switch in the cockpit (paragraph 1–110F). The forward main inverter is similarly powered by the d-c generator system and is controlled by a "MAIN INVERTER" selector switch in the second compartment (paragraph 1–110G). The bomb sight inverter is powered from the main bus through the "BOMB SIGHT" circuit breaker on the third compartment console and the power switch on the bomb sight control unit.

1–110B. NORMAL CONTROLS.

1–110C. STAND-BY INVERTER TEST SWITCH—AIRPLANES SER NO. 123088 THROUGH 124818. This switch is a push button unit, placarded "FLIGHT INST. STAND-BY INVERTER TEST SWITCH" and located on the pilot's cockpit right console (figure 1–7, item 8), which provides a means for testing the reliability of the inverter automatic changeover switch. Pressing the switch cuts out the main inverter, which normally powers the automatic pilot and the electric flight instruments, and transfers the electrical flight instrument loads to the stand-by inverter. Since the automatic pilot can be powered by the main inverter only, the power supply to the automatic pilot will be interrupted and the "WARNING AUTO. PILOT OFF" light, located adjacent to the test switch, will glow evidencing satisfactory operation of the inverter automatic changeover switch.

1–110D. EMERGENCY CONTROLS.

1–110E. INVERTER REMOTE CONTROL CIRCUIT BREAKER — AIRPLANES SER NO. 123088 THROUGH 124818. D-c power is supplied to the electronics inverter through a remote control circuit breaker, which consists of a thermal overload switch and a relay. The relay is normally energized through a push button circuit breaker and an emergency operation momentary toggle switch, both located on the "INVERTER REMOTE CONTROL CIRCUIT BREAKER" panel on the second compartment console. (See figure 4–2, item 24.) The push button circuit on the console will open when an overload in the d-c power supply to the inverter causes the thermal overload switch in the remote control circuit breaker to open. For emergency operation of the equipment supplied from this inverter (see figure 1–4), the thermal overload switch may be bypassed and the inverter temporarily restored to operation by holding the emergency operation toggle switch on the console panel in the "EMERG. OPER." position.

1–110F. INVERTER SELECTOR SWITCH — AIRPLANES SER NO. 124820 AND SUBSEQUENT. The "INVERTER SELECTOR" switch is a two position "MAIN-STAND-BY" unit located on the pilot's right console, and is guarded in the normal "MAIN" position by a hinged guard. The switch provides a means of manually selecting the stand-by inverter in case of failure of the main inverter, as indicated by illumination of the adjacent "STAND-BY INVERTER IND." warning light. Raising the hinged guard and setting the switch to "STAND-BY" will extinguish the warning light, showing that the stand-by inverter is producing a-c power.

1–110G. MAIN INVERTER SELECTOR SWITCH—AIRPLANES SER NO. 124820 AND SUBSEQUENT. The "MAIN INVERTER" selector switch is a two position "ON-OFF" switch type circuit breaker, located on the second compartment console, which controls the forward main inverter. The switch is normally "ON"; if overloads trip the switch to 'OFF", power cannot be restored to the electronic equipment powered by this inverter by holding the switch in the "ON" position if the overload still exists.

1–110H. INDICATORS.

1–110J. A red warning light on the pilot's right console (figure 1–7, item 8) will glow in case of failure of the main inverter to warn the pilot that the automatic pilot is inoperative. (See paragraphs 1–59 and 1–59A.)

1–111. MISCELLANEOUS EQUIPMENT AND CONTROLS.

1—112. SEATS. All seats are equipped with headrests, armrests and lap-type safety belts with adjustable shoulder harnesses and inertia reels. The harnesses can be locked or unlocked by levers located on the sides of the seats. Each seat is suitable for use with a QFS seat-type parachute and a type PK-2 pararaft kit. Only the pilot's seat is provided with a mechanical means of vertical adjustment. The adjustment control is located on the right side of the seat.

1–112A. PILOT'S SEAT. The back of the pilot's seat is adjustable to tilt forward through a range of 10 degrees, in increments of two degrees. The headrest is provided with a screw-type adjustment. The seat is adjustable vertically through a range of five and one-half inches. The tilt and height adjustment locking levers are located at the right side and are moved aft to unlock. The harness inertia reel locking lever is at the left side of the seat.

1–112B. SHOULDER - HARNESS INERTIA - REEL LOCK CONTROL. A two-position (locked-unlocked) shoulder-harness inertia-reel lock control is located on the left side of all seats. Detent latches are provided for positively retaining the control handle at either position of the quadrant. By pressing on the top of the control handle, the latch is released and the control handle may then be moved from one position to the other. The handle is also spring loaded toward the locked position. When the control is in the unlocked (aft) position, the reel harness cable will be released to permit leaning forward; however, the reel harness cable will automatically lock when an impact force of two to three g's is encountered. When the reel is locked in this manner, it will remain locked until the control handle is moved to the locked position and then returned to the unlocked position. When the control is in the locked position, the reel harness cable is manually locked to prevent leaning forward. The control handle should be left in the locked position except during straight and level flight. This provides an added safety precaution over and above that of the automatic safety-lock.

1—113. PERSONNEL FURNISHINGS. Relief tubes and ash receivers are provided in convenient positions for the pilot and crew. Chart cases are provided in the pilot's cockpit and the second compartment. A food rations container, also, is provided in the pilot's cockpit.

1—114. CANOPY SYSTEM.

1—115. GENERAL. The canopy may be operated to open or shut either by the 3000 psi hydraulic system or manually. In an emergency, high pressure air is provided to operate the canopy. The emergency canopy controls in the cockpit are duplicated on the exterior for canopy operation from outside.

1—116. NORMAL CONTROLS.

1—117. CANOPY CONTROLS. The "CANOPY CONTROL" handle, (figure 1—5, item 8) is located on the left sill in the pilot's cockpit adjacent to the windshield bow. The handle is moved aft to "OPEN" and forward to "CLOSE" the canopy hydraulically. Aft of "OPEN" there is an "EMERGENCY RELEASE" position for air-pressure operation of the canopy (see paragraph 1—120). Airplanes ser No. 124190 and subsequent are equipped with a "CANOPY" external control handle, recessed in the left fuselage skin below the canopy rail, which is linked to the control in the pilot's cockpit. The handle is pulled out and then rotated either clockwise to close the canopy or counterclockwise to open the canopy hydraulically. Limit switches in the external control assembly automatically energize the electric auxiliary hydraulic pump, regardless of the position of the battery switch, to provide power for canopy operation.

1—118. CANOPY HYDRAULIC BY-PASS. To make the canopy "freewheel", a "CANOPY HYDRALIC BY-PASS" control is provided under the cockpit sill to the left of the pilot (figure 1–5, item 4). Pulling this lever aft opens a by-pass in the hydraulic cylinder lines allowing the canopy to be pushed forward and aft manually. Airplanes ser No. 123088 to 124188, inclusive, are equipped with an external "CANOPY RELEASE" handle, recessed in the fuselage left skin below the cockpit rail, which is linked to the by-pass lever in the cockpit. Pulling the handle out moves the by-pass lever to the open position.

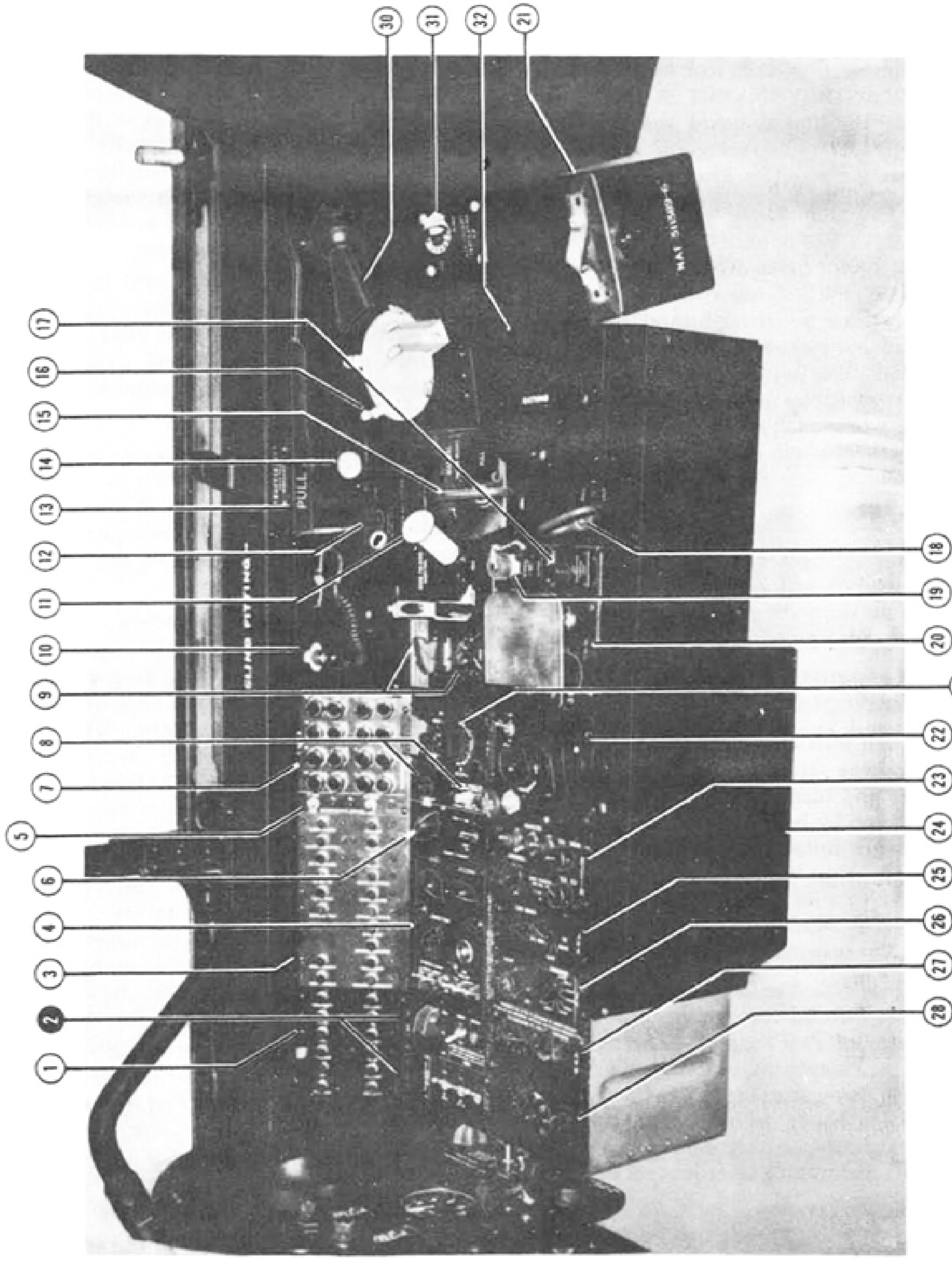


Figure 1—7. Pilot's Cockpit—Right Side

KEY TO FIGURE 1-7
(Sheet 2 of 2 Sheets)

1. Radio Circuit Breaker Panel
2. Power Console Panel
   Front Row, Left to Right—Radio Master, Oil Dilution, Pitot Heat, and Right Generator Switches
   Rear Row, Left to Right—Starter, Primer, Battery, and Left Generator Switches
3. Electrical Circuit Breaker Panel
4. Exterior Lights Console Panel
5. Spare Float Lights Release Switches
6. Interior Lights Console Panel
7. Sonobuoy Release Indicator Lights
8. Standby Inverter Test Switch and Automatic Pilot Warning Light
9. Auxiliary Hydraulic Pump Switch and Hydraulic System Pressure Gage
10. Utility Light
11. Wing Folding Control
12. Bomb Bay Door Warning Light
13. Automatic Pilot Emergency Disconnect Control
14. Bomb Bay Doors Control
15. Manual Torpedo Release Control
16. Signal Light Stowage Clips
17. Bomb Bay Low Temperature Warning Light
18. Bomb Bay Temperature Control
19. Signal Light Receptacle
20. IFF Control Panel—C-114/APX-2
21. Signal Light Filter Case
22. Automatic Pilot Control Console Panel
23. Mixer Radio and Interphone Selection Control Console Panel—C-510/AIC-4
24. Chart Case
25. VHF Radio Control Console Panel—C-115/ARC-1
26. HF Radio Control Console Panel—C-245/ARC-2
27. NAVIG Radio Control Console Panel—C-116/ARR-2A
28. RECVR Radio Control Panel—C-125/ARC-5
29. IFF Control Panel—C-544/APX-6, Airplanes Ser No. 123110 and Subsequent
30. Auxiliary Cockpit Ventilating Air Face Outlet
31. Auxiliary Cockpit Ventilating Air Control
32. Food Rations Container

1—116. NORMAL CONTROLS.

1—117. CANOPY CONTROLS. The "CANOPY CONTROL" handle, (figure 1—5, item 8) is located on the left sill in the pilot's cockpit adjacent to the windshield bow. The handle is moved aft to "OPEN" and forward to "CLOSE" the canopy hydraulically. Aft of "OPEN" there is an "EMERGENCY RELEASE" position for air-pressure operation of the canopy (see paragraph 1—120). Airplanes ser No. 124190 and subsequent are equipped with a "CANOPY" external control handle, recessed in the left fuselage skin below the canopy rail, which is linked to the control in the pilot's cockpit. The handle is pulled out and then rotated either clockwise to close the canopy or counterclockwise to open the canopy hydraulically. Limit switches in the external control assembly automatically energize the electric auxiliary hydraulic pump, regardless of the position of the battery switch, to provide power for canopy operation.

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Note

Both the external "CANOPY RELEASE" and the "CANOPY HYDRAULIC BY-PASS" levers must be restored to their normal positions: otherwise the by-pass valve will remain open and no pressure will be available for operation of any hydraulic equipment.

1—119. EMERGENCY CONTROLS.

1—120. CANOPY CONTROL. For emergency operation in the event of hydraulic failure, the normal control (figure 1—5, item 8) is moved outboard and aft to the "EMERGENCY RELEASE" position. This releases high pressure air into the actuating cylinder to open the canopy.

1—121. EXTERNAL RELEASE. An external "EMERGENCY CANOPY RELEASE" tab, red and white striped, in the fuselage skin to the left of the cockpit operates the normal control to the "EMERGENCY RELEASE" position from outside the airplane. This is accomplished by a simple spring and lever arrangement.

Note

The canopy may be operated hydraulically through use of the electric auxiliary hydraulic pump and the normal canopy control.

CAUTION

The canopy should not be operated hydraulically after using the emergency air system until the system has been reset by the ground crew.

1–121A. CANOPY OPEN INERTIA LOCK—AIRPLANES SER NO. 124200 AND SUBSEQUENT. A canopy inertia lock, mounted on the cockpit right sill automatically engages the canopy when the airplane is subjected to an aft deceleration of 3g or more. The lock may be engaged manually by pushing in the forward end of a fitting in the inboard face of the lock housing until the fitting engages the lock arm, and may be disengaged by pushing in the aft end of the fitting.

CAUTION

If the lock is engaged manually, it must be disengaged before attempting to close the canopy in order to prevent extensive damage.

KEY TO FIGURE 1-7

1. Radio Circuit Breaker Panel
2. Power Console Panel
   Front Row, Left to Right—Radio Master, Oil Dilution, Pitot Heat, and Right Generator Switches
   Rear Row, Left to Right—Starter, Primer, Battery, and Left Generator Switches
3. Electrical Circuit Breaker Panel
4. Exterior Lights Console Panel
5. Spare Float Lights Release Switches
6. Interior Lights Console Panel
7. Sonobuoy Release Indicator Lights
8. Stand-by Inverter Test Switch and Automatic Pilot Warning Light—Airplanes Ser No. 123088 through 124818. Inverter Selector Switch and Stand-by Inverter Indicator Light—Airplanes Ser No. 124820 and Subsequent
9. Auxiliary Hydraulic Pump Switch and Hydraulic System Pressure Gage
10. Utility Light
11. Wing Folding Control
12. Bomb Bay Door Warning Light
13. Automatic Pilot Emergency Disconnect Control
14. Bomb Bay Doors Control
15. Manual Torpedo Release Control
16. Signal Light Stowage Clips
17. Bomb Bay Low Temperature Warning Light
18. Bomb Bay Temperature Control
19. Signal Light Receptacle
20. IFF Control Panel—C-114/APX-2
21. Signal Light Filter Case
22. Automatic Pilot Control Console Panel
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24. Chart Case
25. VHF Radio Control Console Panel—C-115/ARC-1
26. HF Radio Control Console Panel—C-245A/ARC-2
27. NAVIG Radio Control Console Panel—C-116/ARR-2A
28. RECVR Radio Control Panel—C-125/ARC-5
29. IFF Control Panel—C-544/APX-6, Airplanes Ser No. 123110 and Subsequent
30. Auxiliary Cockpit Ventilating Air Face Outlet
31. Auxiliary Cockpit Ventilating Air Control
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Note

Both the external "CANOPY RELEASE" and the "CANOPY HYDRAULIC BY-PASS" levers must be restored to their normal positions: otherwise the by-pass valve will remain open and no pressure will be available for operation of any hydraulic equipment.

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Note

The canopy may be operated hydraulically through use of the electric auxiliary hydraulic pump and the normal canopy control.

CAUTION

The canopy should not be operated hydraulically after using the emergency air system until the system has been reset by the ground crew.

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CAUTION

If the lock is engaged manually, it must be disengaged before attempting to close the canopy in order to prevent extensive damage.

1–121B. EMERGENCY EQUIPMENT.

1–121C. FIRST AID KITS. First aid kits are provided in the pilot's cockpit and in the second compartment. (See figure 3–1.)

1–121D. BAIL-OUT WARNING BELL—AIRPLANES SER NO. 124190 AND SUBSEQUENT. A warning bell on the left side of the second compartment is operated by a control on the left side of the pilot's cockpit. (See figure 1–5, item 22, and figure 4–2, item 4.)

1–122. OPERATIONAL EQUIPMENT.

1–123. The following operational equipment is installed in the airplane; for information refer to Section IV:

a. K-25A Camera and F2A-1a Flasher
b. Searchlight
c. Armament
d. Sonobuoys
e. Float Lights
f. Heating and Ventilating Equipment
g. Lighting Equipment
h. Electronic Equipment

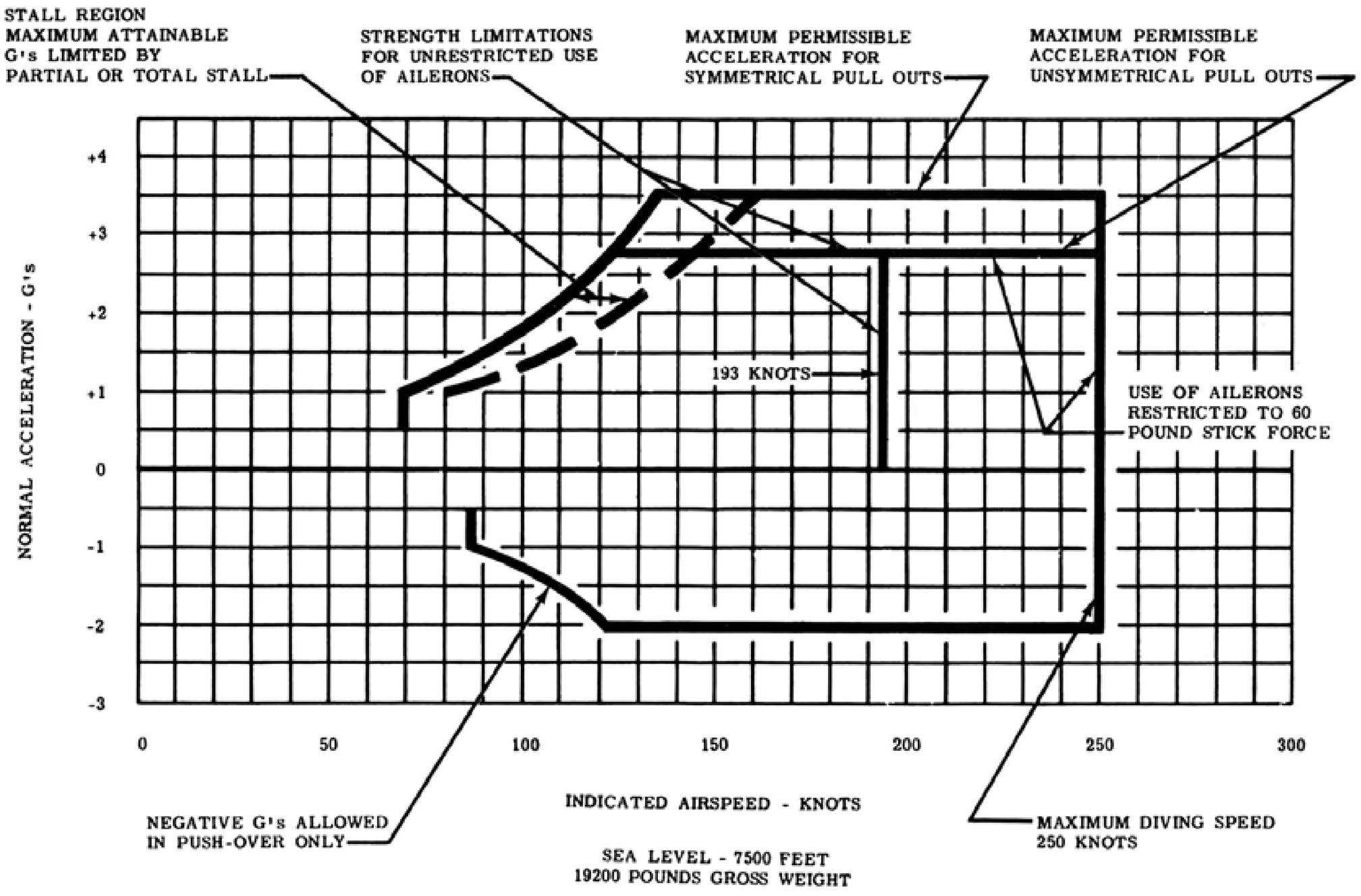


Figure 2—1. Operating Flight Strength Diagram

SECTION II

NORMAL OPERATION INSTRUCTIONS

2–1. BEFORE ENTERING THE COCKPIT.

2–2. NOTE THE FOLLOWING FLIGHT LIMITATIONS AND RESTRICTIONS.

2–3. FLIGHT LIMITATIONS. These are limitations which, to date, have not been confirmed by contractor's flight tests or approved by the Bureau of Aeronautics. *Any temporary restrictions noted on cockpit placards supersede these limitations.*

a. Prohibited Maneuvers—Intentional spins and inverted flight are prohibited.

b. Aileron Maneuvers—Steady rolls at speeds up to 250 knots IAS are permissible. Abrupt rolls shall not be performed at speeds above 193 knots IAS. The limit load factor for aileron maneuvers shall not exceed 2.67g.

c. Rudder Maneuvers—No abrupt rudder maneuvers are permitted. Full steady rudder pedal deflection is permitted at speeds up to 197 knots IAS. At speeds above 197 knots IAS the pedal force must not exceed that required for full deflection at 197 knots IAS.

d. Diving Speed—Limited to 250 knots IAS in combination with limit load factors not to exceed 3.5g for symmetrical pull-out, or not to exceed 2.67g for unsymmetrical pull-out.

2–4. LIMITING AIR SPEEDS FOR WING FLAP AND LANDING GEAR EXTENSION.

a. Flaps, 10° .....175 knots IAS
b. Flaps, 20° .....157 knots IAS
c. Flaps, 26° (Full Down) ....142 knots IAS
d. Landing Gear (Normal) ...175 knots IAS
e. Landing Gear (Emergency) .140 knots IAS

2–5. CATAPULTING AND ARRESTED LANDINGS. Catapulting and arrested landings are not permitted until authorized by the Bureau of Aeronautics.

2–5A. ENGINE SPEED. Maximum diving rpm is limited to 3120 for 30 seconds.

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

2–6. WEIGHT AND BALANCE. The pilot shall obtain the take-off weight and balance and the anticipated landing gross weight and balance before entering the airplane. Loading data are furnished in the Handbook of Weight and Balance Data, AN 01-1B-40.

2–7. PILOT INSPECTION OF AIRCRAFT EXTERIOR. The pilot should make a complete circuit of the airplane, checking each of the following:

a. Wings—For loose access plates, external aileron locks removed, pitot cover removed and wing lock flags retracted (wings spread and locked).

b. Landing gear—Proper shock strut inflation, proper tire inflation, wheels chocked and arresting hook stowed.

c. Accessory compartment—Excessive oil leaks and loose fasteners or loose cowl panels.

d. Tail—External rudder and elevator locks removed, rudder and elevators for freedom of movement and inspect fabric for tears.

e. Tail compartment—Baggage in tail compartment for security and tail compartment door closed.

Note

Check the yellow sheet for flight condition of the airplane.

2–7A. ACCESS TO COCKPIT. Recessed steps and handgrips are provided on the left and right sides of the fuselage, aft of the wing trailing edge, for access to the pilot's cockpit and the second compartment hatch, respectively. In airplanes ser No. 123114 and subsequent, a retractable stirrup replaces the bottom step on both sides. To open the canopy, airplanes ser No. 123088 through 124188, pull out the canopy release handle, located below the canopy left rail, and slide the canopy open; on airplanes ser No. 124190 and subsequent, pull out the canopy handle, same location, and rotate counterclockwise, energizing the electric auxiliary hydraulic pump to open the canopy.

WARNING

To prevent personal injury, warn all personnel clear of hydraulically operated units before operating the control on airplanes ser No. 124190 and subsequent; since energizing the auxiliary hydraulic pump may operate other units, depending upon the setting of the cockpit controls.

2–8. ON ENTERING THE PILOT'S COCKPIT.

a. Set the canopy hydraulic by-pass control to the closed (forward) position.

b. Release and swing the gust lock control lever into the side of the console.

c. Adjust the seat vertically to desired position. Adjust seat back to give desired degree of straightness. Adjust headrest to give desired support. Adjust and then unlock the shoulder harness to allow freedom of movement. Connect radio gear.

d. Adjust rudder pedals. Check pedals and stick for free movement and full throw. Watch control surfaces for proper direction of throw.

e. Rudder boost and flaperon control—pushed down to on.

f. Drop tank switches–"SAFE".

g. Fuel tank selector–On either drop tank if carried, otherwise either wing tank.

h. Fuel system selector–"NORMAL (MAIN)".

i. Tail wheel lock control–"UNLOCK".

j. Check tab controls for free movement and full throw. Watch tabs for proper direction of throw.

k. Throttle control–"CLOSED".

l. Propeller rpm control–"INCREASE".

m. Mixture control–"IDLE CUT-OFF".

n. Ignition switch–"OFF".

o. Armament master switch–"OFF".

p. Connect external power source when available.

q. Battery switch–"BAT". When using external power, all circuits will be energized with the switch at any position.

r. Auxiliary fuel pump–"OFF".

s. Oil cooler flaps switch–"OPEN".

t. Cowl flaps switch–operate flaps to full open.

u. Carburetor air switch–"DIRECT".

v. Altimeter–set.

w. Gyro horizon indicator–uncage.

x. Clock–set.

y. Fuel quantity indicators–check fuel quantity.

z. Accelerometer–set to zero.

aa. Radio master switch—"ON".

ab. Pitot heater switch—"OFF".

ac. Generator switches—"ON".

ad. Exterior lights master switch—"OFF".

ae. Interior lights switch—"OFF".

af. Auxiliary hydraulic switch—"OFF".

ag. Automatic pilot power switch—"OFF".

ah. All circuit breaker buttons-in. In airplanes ser No. 123088 through 124818, the inverter remote control circuit breaker, second compartment console, must be closed to supply power to the electronics inverter.

ai. Inverter selector switch (airplanes ser No. 124820 and subsequent)–"MAIN". The main inverter switch, second compartment console (airplanes ser No. 124820 and subsequent) must be set to "ON".

aj. Check controls for armament and electronic equipment. (See Section IV, paragraphs 4–17 and 4–112.)

Note

If an external d-c power source is not plugged in, the radar equipment cannot be checked until the engine is running and both generators have cut in.

2–9. SPECIAL CHECK FOR NIGHT FLIGHTS.

a. Battery switch–"BAT".

b. Interior lights adjusted to best light.

c. Ground crew check for proper operation of all exterior lights.

2–10. FUEL SYSTEM MANAGEMENT.

2–11. NORMAL PROCEDURE. *(Figures 1–2 and 2–2.)*

a. Set system selector to "NORMAL (MAIN)". (Transfer system operating automatically, engine drawing fuel from main tank, main fuel shut-off valve open).

Note

The battery switch must be set to "BAT" and the fuel transfer circuit breaker button on the right console must be in for operation of the fuel transfer system. The fuel shut-off valve circuit is powered at all times.

b. Set tank selector to tank from which fuel is to be transferred to the main tank.

WARNING

The contents of the external auxiliary drop tanks must be transferred to the main tank first. The transfer system will not operate unless at least one wing tank contains fuel, since the transfer circuits will be interrupted by the wing tank float switches.

2–12. PROCEDURE IF TRANSFER SYSTEM FAILS.

a. Set system selector to "STANDBY (AUXILIARY TANKS)".

b. Set auxiliary fuel pump switch to "ON".

c. Set tank selector consecutively to each droppable or wing tank until empty.

d. When droppable and wing tanks have run dry, set system selector to "NORMAL (MAIN)" to use the fuel remaining in the main tank.

2—13. Carburetor vapor return may feed back into the main tank at approximately 10 gals/hour at high power.

2—14. STARTING ENGINE.

2—15. Note manifold pressure gage reading before starting engine, to use as reference for power and magneto checks.

a. Throttle—Approximately 1/8 open (to limit speed to 800-1000 rpm).

b. Auxiliary fuel pump—"ON".

c. Turn engine over with starter. Watch propeller motion. If any sign of hesitation or stoppage occurs, disengage starter, turn off auxiliary fuel pump and investigate. Do not prime until step e. below.

d. After propeller has turned through four revolutions, turn ignition on "BOTH". (Determine revolutions by counting 16 blades.)

e. Prime while cranking—intermittently if engine is warm, continuously if cold.

f. After engine fires, move mixture control lever out of "IDLE CUT-OFF" to "RICH", using prime as required until engine is running smoothly. (Do not pump throttle.)

Note

If the engine stops firing due to over-priming (black smoke from stacks) move the mixture control to "IDLE CUT-OFF" immediately and continue cranking until the engine starts. (Limit continuous cranking to one minute, then allow starter to cool at least one minute.)

g. After engine starts, adjust throttle to 600-800 rpm, watching for oil pressure rise.

CAUTION

If oil pressure does not register on gage almost immediately, stop engine and investigate.

h. After oil pressure shows, readjust throttle to 1000 rpm.

Note

1.

If a start is not made within a reasonable time investigate to determine the cause.

2.

For emergency instructions in case of fire see paragraph 3—2.

i. Disconnect the external power supply. The battery switch must be set to "BAT".

2—16. WARM-UP.

2—16A. Operate at 1000 rpm until oil temperature rises to 30° C.

2—17. GROUND TEST.

2—18. IGNITION SWITCH CHECK. Switch to "L" and back to "BOTH", switch to "R" and back to "BOTH", switch to "OFF" momentarily and back to "BOTH". A slight rpm drop when operating on either "L" or "R" and complete cutting-out of the engine at the "OFF" position indicates proper connection of the ignition leads.

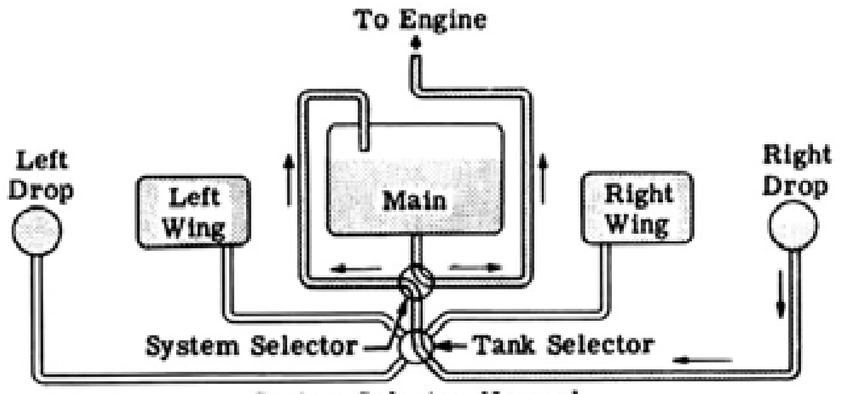
Note

The following power plant checks must be made with a minimum oil inlet temperature of 30°C and with the carburetor air switch in the "DIRECT" position.

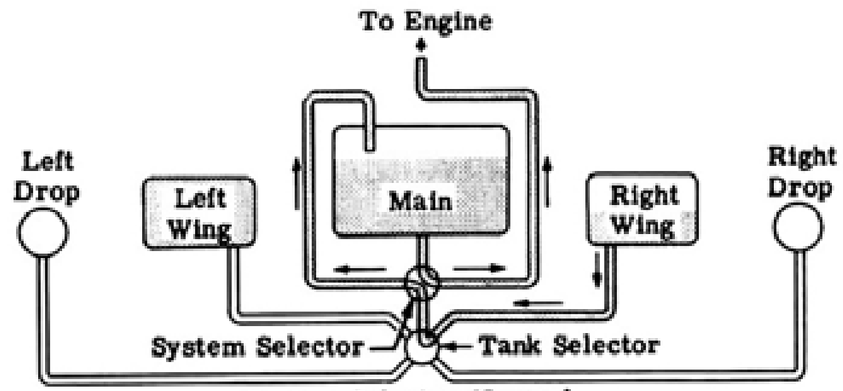
2—19. POWER CHECK. Open the throttle until the manifold pressure is equal to the field barometric pressure (as indicated by the manifold pressure gage before engine start). Speed will be approximately 2200 rpm. When the rpm for the manifold pressure equivalent to field barometric pressure is once established, variation of altitudes among various fields will not change the rpm.

2—20. MAGNETO CHECK. Check the magnetos at 2200 rpm and 30 in. Hg manifold pressure at sea level (use manifold pressure equal to the field barometric pressure at fields at higher altitudes). Switch ignition from "BOTH" to "L" and back to "BOTH", and from "BOTH" to "R" and back to "BOTH". Allow rpm to stabilize on "BOTH" before switching to the other magneto. Normal drop-off in either "L" or "R" position is 50 to 75 rpm; maximum is 100 rpm. Maximum difference in drop-off between "L" and "R" is 40 rpm.

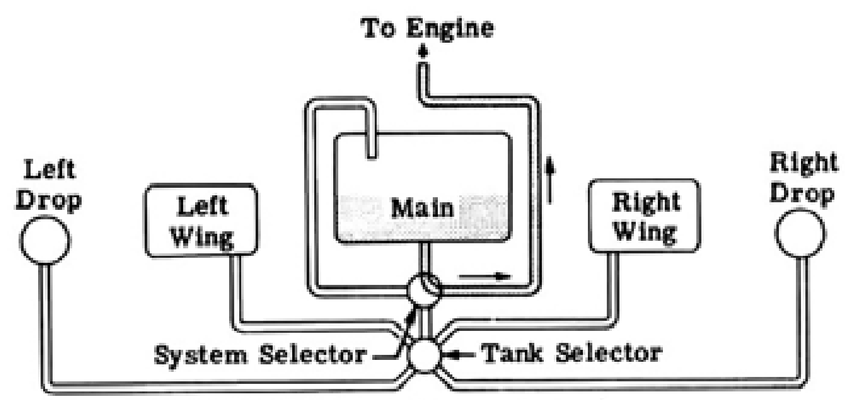
NORMAL
FOR TAKE-OFF, LANDING AND CRUISING



System Selector-Normal
Tank Selector-Any Sequence Of Drop Tanks

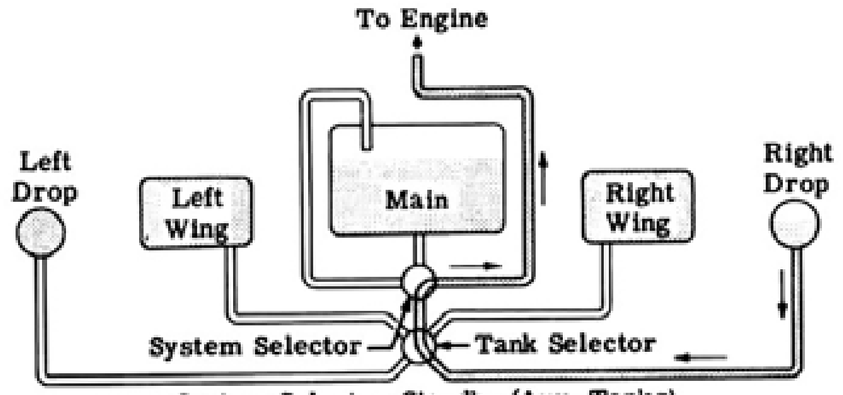


System Selector-Normal
Tank Selector-Any Sequence Of Wing Tanks

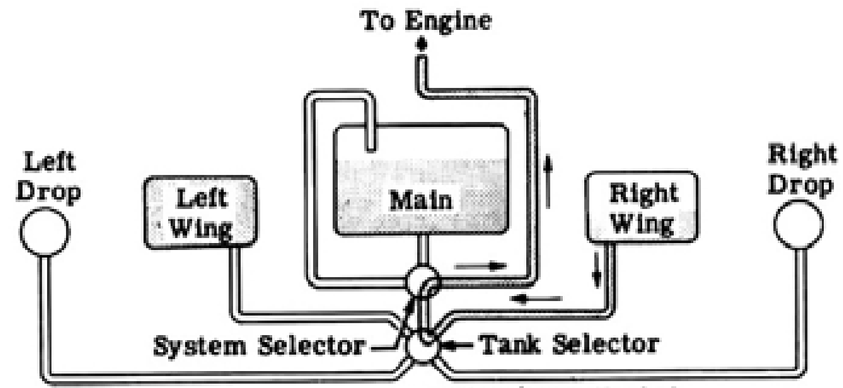


System Selector-Normal
Tank Selector-Any Position

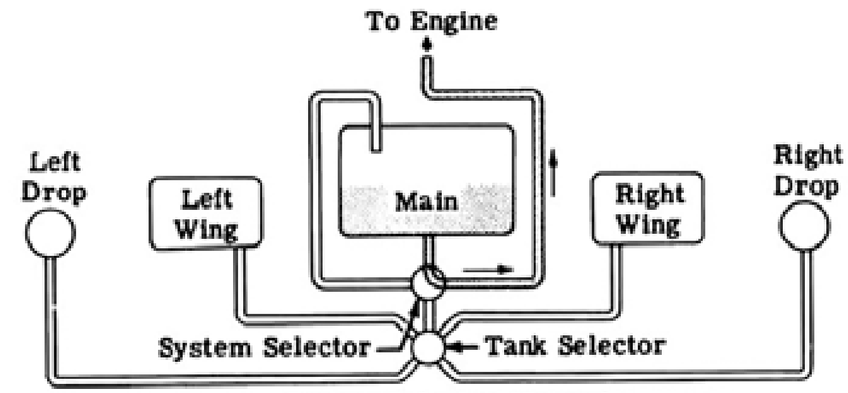
STAND-BY
FOR USE IN CASE OF TRANSFER SYSTEM FAILURE



System Selector-Standby (Aux. Tanks)
Tank Selector-Any Sequence Of Drop Tanks



System Selector-Standby (Aux. Tanks)
Tank Selector-Any Sequence Of Wing Tanks



System Selector-Normal
Tank Selector-Any Position

Figure 2–2. Fuel System—Courses of Fuel Flow

2–21. IDLE MIXTURE CHECK. Idle at 450-500 rpm, move the mixture control slowly toward "IDLE CUT-OFF", and observe the tachometer. Note any rpm changes carefully. Return the mixture control to the "RICH" position before the engine dies. When a rise of approximately 10 rpm is observed before normal drop-off the "IDLE MIXTURE" strength is correct. When a greater rpm rise is noted, the mixture is too rich; when a lesser rise, or no rise, is noted the mixture is excessively lean. A momentary drop in manifold pressure of .02 in. Hg may be used as an indication of a 10 rpm rise in speed.

Note

This check should be made in relatively still air and at stabilized idling cylinder head temperatures. A strong wind or abnormal temperatures will affect the rpm change.

2–22. FUEL PRESSURE CHECK. Increase speed to 2200 rpm. Fuel pressure (with the auxiliary fuel pump "OFF") should be 22 ± 1 psi.

2–23. OIL PRESSURE CHECK. At 2200 rpm, oil pressure should be 85-90 psi at an oil inlet temperature of 60° C.

Note

Do not exceed 232°C cylinder head temperature before take-off. To prevent heat damage to seals, gaskets, ignition components and similar units, 200°C or less is desirable for all ground operations.

2–24. PROPELLER GOVERNING CHECK. Move the propeller rpm control lever several times through the complete range from full "INCREASE" to full "DECREASE". Engine rpm should change accordingly due to propeller pitch change. This procedure will also bleed any air entrapped in the propeller control oil lines.

2–25. COWL FLAPS CHECK. Check operation. After check, leave flaps in full "OPEN" position.

2–26. OIL COOLER FLAPS CHECK. Check operation (with ground crewman). After check, leave switch in "OPEN" position.

2–27. CARBURETOR AIR CHECK. Set switch to "ALTERNATE" and note drop in manifold pressure. After check, leave switch in "DIRECT" position.

2–28. WINGS. Move control forward to spread and lock wings, then outboard to secure hydraulic lock pins with mechanical locking arms. Check retraction of red flag at each wing fold axis.

CAUTION

To prevent damage to the locking arm linkage, allow five seconds after wings are spread fully before moving control handle outboard.

2–29. HYDRAULICS CHECK. The hydraulic gage should indicate a pressure of 2700-3000 psi. Check the operation of the flaperon and rudder-boost system, and of the wing flaps and position indicator. The operation of the arresting-hook raising mechanism may be checked but the hook must be restowed by the ground crew.

Note

The operating speed of the hydraulic units is dependent on engine speed; for operation at normal speed the engine speed should be 1000 rpm or above.

2–30. AUTOMATIC PILOT CHECK.

a. With the gyro-horizon indicator uncaged and the automatic-pilot clutch switch in the off (raised) position, set the automatic-pilot power switch to "ON" and allow the amplifiers to warm up for two minutes.

b. Center the turn control knob in the detent position and center the pitch trim control and the bank trim adjustment on the controller.

c. Engage the automatic pilot by pushing in the clutch switch.

d. Operate the pitch trim wheel, the bank trim wheel and the turn control through their respective control ranges. The aircraft's control surfaces should be deflected in proportion to the degree of movement set into the corresponding controls on the controller. In each case check that the direction of control produced by the controller adjustment wheels and knob corresponds to the direction of deflection of the control surfaces.

e. Disengage the automatic pilot by pulling out the clutch switch; then check disengagement by operating the controller and watching the aircraft control surfaces.

f. If it is desirable, turn "OFF" the automatic pilot power switch.

2–31. RADIO CHECK. Turn on the radio master switch and check equipment to be used during the flight. (See paragraph 4–139.)

2–32. ELECTRICAL CHECK.

a. At 1000 rpm check the closing of the reverse current cut-out by slowly increasing the engine rpm. At approximately 1100 rpm, the voltmeters should indicate 26.5 volts, the ammeters should indicate a current, and the generator warning light extinguish, indicating that the generator cut-out relay is operating satisfactorily.

b. To check the operation of the voltage regulator, increase the engine rpm. The voltage should rise to approximately 28.0 volts and remain at this value regardless of a further increase in rpm.

c. If the reverse current cut-out fails to close between 26.0 and 27.0 volts or the regulator voltage is not maintained at 28.0 volts, correct the trouble before proceeding further.

d. In airplanes ser No. 123088 through 124818, depress the flight instrument stand-by inverter test switch momentarily. The automatic pilot warning light should

glow, indicating that the inverter automatic changeover switch is operating satisfactorily. To test the same automatic switch in airplanes ser No. 124820 and subsequent, pull the main inverter circuit breaker on the pilot's right console. The stand-by inverter indicator light should glow, indicating satisfactory operation of the inverter automatic changeover switch. Set the inverter selector switch to "STAND-BY". The stand-by inverter indicator light should extinguish, indicating that the stand-by inverter is supplying a-c power. Return the switch to "MAIN" and push in the main inverter circuit breaker.

2–33. CANOPY. Check the hydraulic operation of the canopy. The canopy by-pass control must be in the closed position for operation of the hydraulic system.

WARNING

To prevent the canopy sunshade from striking the head or headrest the seat should be lowered until the eye level matches the height of the white lines painted on the windshield bow before attempting to close the canopy.

2–34. TAXIING.

a. Unlock tail wheel.

b. Hold brakes, remove chocks and check operation of each brake.

c. Use "S" turns for improving visibility during taxiing.

2–35. BEFORE TAKE-OFF.

2–36. CHECK-OFF LIST.

a. Canopy open.

b. Fuel pressure—22 ± 1 psi.

c. Auxiliary fuel pump—"ON".

d. Propeller—"INCREASE RPM" (2800).

e. Mixture—"RICH".

f. Flaps—Full "DOWN" for minimum run.

g. Tail wheel—"LOCKED" for land, "UNLOCK" for carrier.

h. Tabs—Aileron—0
Elevator—2°-4° nose down.
Rudder—1 mark right.

i. Shoulder straps and safety belts—"LOCKED".

2–37. CATAPULT CHECK-OFF LIST.

a. Canopy open.

b. Shoulder straps and safety belts "LOCKED". (All personnel).

c. Place back and head firmly against seat and headrest.

d. Place feet against rudder pedals, with legs stiff.

e. Brace right arm.

f. Wing flaps—Full "DOWN".

g. Adjust tab control settings as required.

h. Friction of throttle and propeller levers should be sufficient to prevent controls from moving.

i. Brace the throttle by holding the catapult grip and the throttle together.

2–38. TAKE-OFF.

2–39. NORMAL. Release brakes, and open throttle to obtain maximum of 2800 rpm at 62.5 in. Hg manifold pressure. See figure A–6 for take-off performance versus take-off gross weights.

2–40. CROSS-WIND TAKE-OFF. Normal cross-wind take-off procedure shall be used. At low speeds, direction can be held by using the airplane brakes carefully until the rudder action becomes effective. In take-off, the airplane should be held on the ground until it is certain that sufficient speed has been obtained for sustained flight.

2–41. MINIMUM TAKE-OFF RUN. The minimum take-off is obtained with the flaps in the full "DOWN" position. To obtain optimum performance in take-off, hold the brakes applied, open the throttle to obtain a maximum of 30 in. Hg manifold pressure, release brakes, and open throttle to obtain a maximum of 2800 rpm and 62.5 in. Hg manifold pressure.

2–42. AFTER TAKE-OFF.

a. When the airplane is airborne and at a safe altitude set the landing-gear selector handle to the up position. Approximately five seconds are required to retract the gear.

b. Check the wheels and flaps position indicator to ensure that the gear is up and locked. The warning light in the "WHEELS" handle should extinguish.

c. Wing flaps "UP" (figure A-2). Do not retract flaps until a safe altitude has been reached. (Retract in increments.)

d. After a safe altitude has been reached turn "OFF" the auxiliary fuel pump.

e. Close canopy.

WARNING

To prevent the canopy sunshade from striking the head or headrest, lower the seat until the eye level matches the white lines painted on the windshield bow before attempting to close the canopy.

2–43. CLIMB.

a. Refer to figure A–6 for recommended IAS and power settings to be used during climb, and for rate of climb and fuel consumption.

b. Do not exceed cylinder head temperature of 260°C maximum; 200°C or less desired.

c. Do not exceed an oil temperature of 98°C maximum, 30°C minimum.

d. When the desired altitude has been attained, level off and reduce power to that desired for cruising.

e. Close cowl flaps.

f. Close oil cooler flaps.

2–44. DURING FLIGHT.

2–45. See figure A-7 for range, recommended power settings and changes in gross weight. See figure A-4 for engine operating data. Climb with the cowl flaps and oil cooler shutters open, and cruise with the cowl flaps and oil cooler shutters closed.

2–46. STABILITY. This information will be supplied when available.

2–47. POWER CONTROL. Procedure for changing power conditions is conventional.

2–48. AUTOMATIC PILOT OPERATING PROCEDURE.

2–49. BEFORE ENGAGING AUTOMATIC PILOT.

a. Attain a safe altitude and manually trim the airplane for straight and level flight. Establish the attitude with the flight instruments.

b. Automatic pilot power switch — "OFF".

c. Center the turn control knob in the detent position and center he pitch trim control and the bank trim adjustment on the controller.

2–50. ENGAGING AUTOMATIC PILOT.

Note

The automatic pilot may be engaged during moderate climbs, glides and turns, and will maintain the attitude of the airplane at the time of the engagement. However, engagement in such attitudes may result in insufficient trim adjustment being available at the controller to return the airplane to level flight.

a. Erect the gyros in the remote compass transmitter and the gyro horizon indicator (vertical gyro) by first caging, then uncaging the gyro horizon indicator.

b. Automatic pilot power switch — "ON". Allow the automatic pilot amplifiers two minutes to warm up.

c. Push in the clutch switch to engage the automatic pilot.

d. After the automatic pilot is engaged, check the flight instruments. Carefully trim the airplane for straight and level flight by turning the necessary adjustments on the controller.

CAUTION

Do not adjust the trim tabs while the automatic pilot is engaged.

e. To climb, turn the pitch trim control counterclockwise — "UP".

f. To dive, turn the pitch trim control clockwise — "DOWN".

g. To trim bank, turn the bank trim adjustment clockwise to raise the left wing; counterclockwise to raise the right wing.

h. To turn, move the tufn control knob out of its central position either to the left or right until the desired heading is obtained. To return to straight flight, center the turn control knob.

Note

The recommended limits for maneuvering the airplane with the automatic pilot engaged are pitch ± 40° and bank 60°.

i. After any sudden change in load, disengage the automatic pilot by pulling the clutch switch out, retrim the airplane in manual flight and then re-engage the automatic pilot.

Note

Generally, when using the automatic pilot the airplane should be retrimmed in manual flight every hour.

2–51. DISENGAGING AUTOMATIC PILOT.

a. Pull the clutch switch up to disengage the automatic pilot.

b. Turn "OFF" the automatic pilot power switch if the system is not to be used any further.

Note

Caging the gyro-horizon indicator also disengages the automatic pilot. Uncaging the indicator will not re-engage the automatic pilot.

2–52. EMERGENCY DISENGAGING OF AUTOMATIC PILOT. See paragraphs 1–57 and 3–35.

2–53. STALLS.

2–54. Accelerated stalls in excess of 2.0g should be avoided until further data is available.

2–55. SPINS.

2–56. Intentional spins are prohibited.

2–57. PERMISSIBLE ACROBATICS.

2–58. Abrupt rolls at speeds up to 193 knots IAS and steady rolls at speeds up to 250 knots IAS are permissible. All other acrobatics are prohibited.

2–59. DIVING.

2–60. Maximum permissible diving speed is 250 knots IAS. (Observe temporary restrictions noted on cockpit placards.) Maximum permissible engine speed is 3120 rpm for a maximum of 30 seconds.

2–61. NIGHT FLIGHT.

2–62. Conventional.

2–63. APPROACH.

2–63A. If flying on instruments, call approach control to obain instructions for entering control area. Upon entering control area call on assigned frequency for

landing instructions. Instruct the crewman in the aft compartment to remove and stow the sonobuoy-receiver antenna, and to install the plug in the antenna support.

a. Propeller – 2400 rpm.

b. Mixture – "RICH".

c. Auxiliary fuel pump switch—"ON".

d. Carburetor air switch – "DIRECT".

e. Cowl flaps switch – position dependent on temperature.

f. Rudder boost and flaperon control – on.

g. Arresting hook—(carrier) pull handle repeatedly (approximately four eight inch strokes). The adjacent indicator light will glow upon initial operation of the handle, and will extinguish when the hook carriage is down and locked.

h. Tail wheel control – "LOCKED" (land) – "UNLOCKED" (carrier).

i. Canopy control – "OPEN".

j Landing gear control – "DOWN" (at an airspeed below 175 knots).

k. Wing flap control – Full "DOWN" (at an airspeed below 142 knots IAS) for carrier circle and final approach.

l. Trim tabs-

Aileron—as required for lateral trim.
Elevator—dependent on cg position.
Rudder—dependent on power.

m. Have crew fasten safety belts and shoulder harnesses.

n. Recommended approach speed, power on – 75 to 80 knots IAS (approx) for carrier operation, 90 to 100 knots for land operation. (Figure A-2).

2–64. LANDING.

2–65. NORMAL LANDINGS.

2–66. SHORE LANDINGS. Use flaps as required. Full flaps should normally be used. Lesser flap settings result in increased landing speed, and hence increased ground run.

2–67. CARRIER LANDINGS. Lower the arresting hook. Full flaps should be used for all carrier landings. Standard carrier approach and landing procedure should be followed.

2–68. AFTER LANDING.

a. Arresting hook raising switch (carrier)—depress to raise hook clear of cables.

b. Flap control—"UP" upon completion of landing roll.

c. Propeller rpm control—full "INCREASE RPM".

d. Cowl flaps switch—"OPEN".

e. Oil cooler flaps switch—"OPEN".

Note

The propeller rpm control and the cowl flaps and oil cooler flaps switches must be in the above positions for all taxiing.

f. Auxiliary fuel pump switch—"OFF".

2–69. SPECIAL LANDINGS.

2–70. CROSS-WIND LANDING. Use normal procedure.

2–71. MINIMUM RUN LANDING. This information will be suppied when available.

2–72. EMERGENCY LANDING PROCEDURES. Refer to paragraph 3–12.

2–73. STOPPING ENGINE.

CAUTION

Idle the engine until cylinder head temperature has dropped to 200°C (392°F).

a. Throttle – "CLOSED".

b. Mixture control—"IDLE CUT-OFF".

c. Ignition switch—"OFF" (after engine stops).

d. Cowl flaps switch—must be left at "OPEN" until engine cools (minimum of 15 minutes).

e. Fuel system selector valve control—"OFF".

2–74. OIL DILUTION. See Section V, paragraph 5–9.

2–75. BEFORE LEAVING THE AIRPLANE.

a. Swing down gust lock control lever and attach to the control stick (figure 2–3).

b. Set all electrical switches except the generator switches to off.

c. Cage the gyro horizon indicator.

2–76. MOORING. *(See figures 2–4 and 2–5.)*

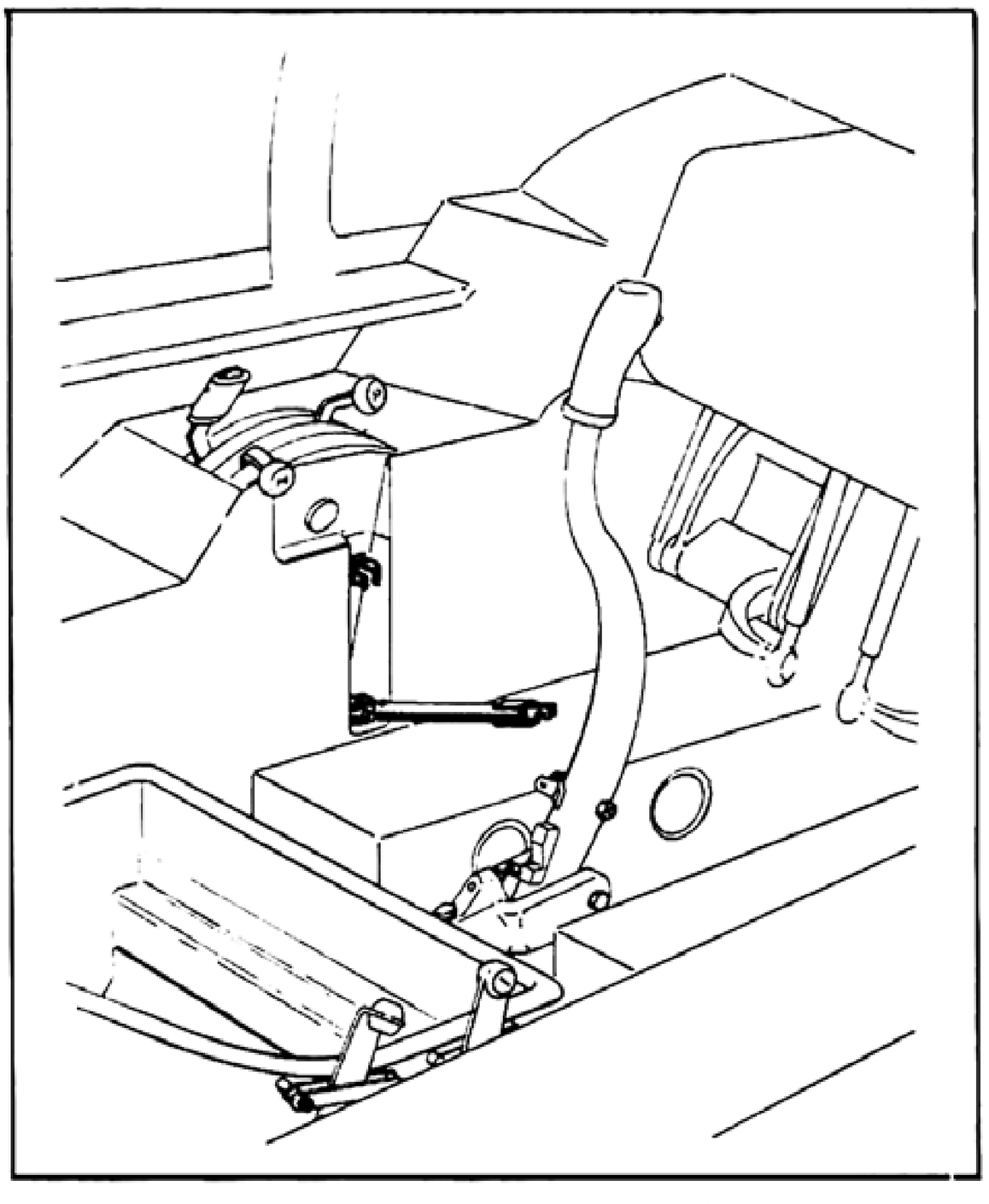


Figure 2–3. Surface Controls Gust Lock

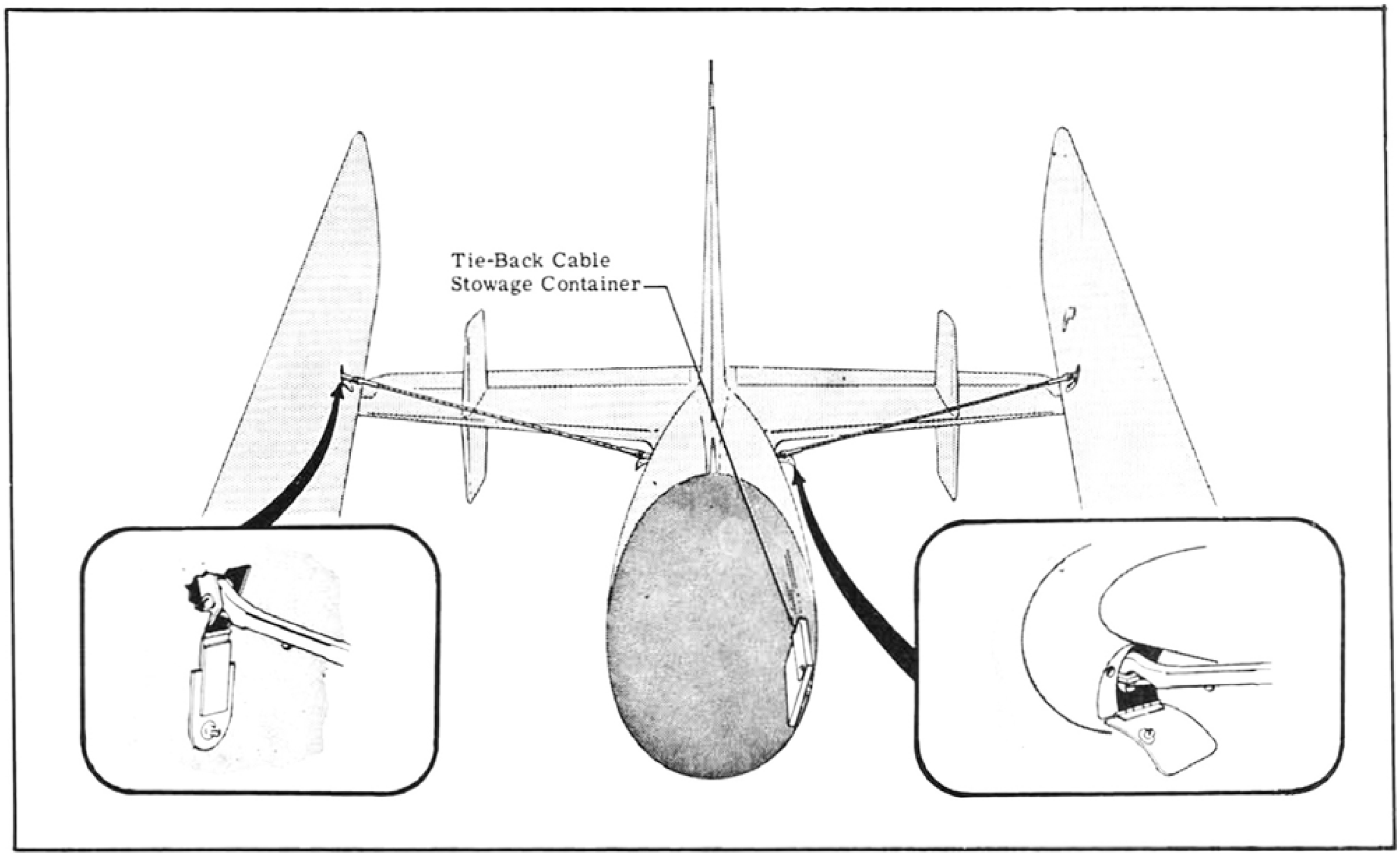


Figure 2—4. Wing Tie-back Cables

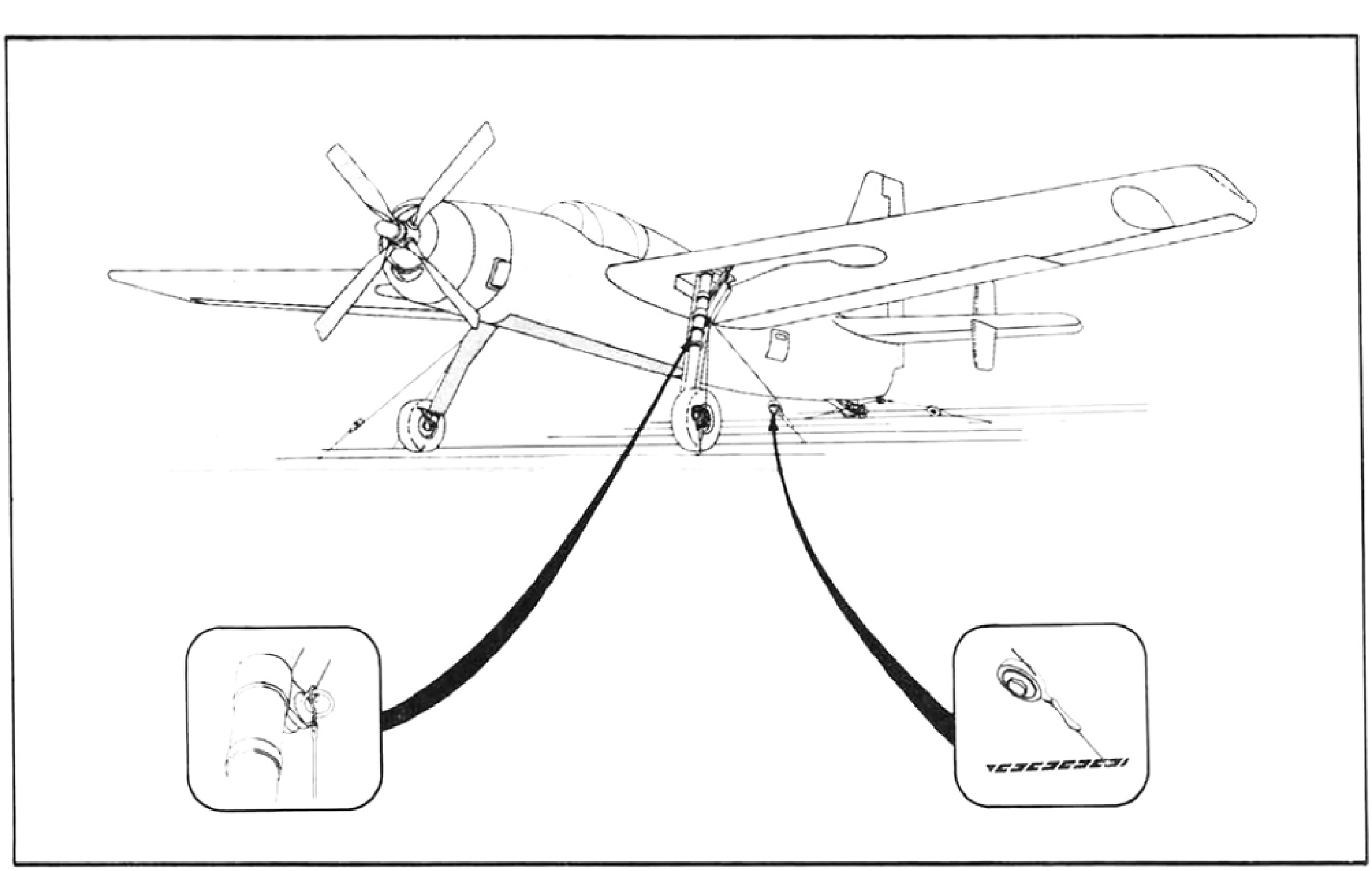


Figure 2—5. Mooring Diagram

SECTION III
EMERGENCY OPERATING INSTRUCTIONS

3—1. FIRE.

3—2. ENGINE FIRES. The procedures to be followed in case of engine fire during ground operation or in flight are similar. An outside portable fire extinguisher should be used to quench fires during ground operation. In flight, it is left to the pilot's discretion whether to bail out, altitude permitting, or to attempt to extinguish fires by means of the following procedure:

a. Propeller rpm control — "DECREASE".
b. Throttle–"CLOSED" simultaneously with step a.
c. Mixture control—"IDLE CUT-OFF".
d. Auxiliary fuel pump switch — "OFF".
e. Fuel system selector — "OFF".
f. Cowl flap switch–"OPEN".
g. Ignition switch–"OFF".

3—3. ELECTRICAL FIRE. If possible, determine the faulty circuit and shut off by operating the appropriate switches or circuit breakers. Otherwise, set the battery and generator switches to "OFF". Land as quickly as possible.

3—4. WING FIRE.

a. Turn off all circuits involving the wing electrical wiring.

b. Set fuel tank selector valve to wing or drop tank on opposite wing.

c. Side-slip the airplane away from the flame as an attempt to extinguish fire, and land as soon as possible. Jettison the external tanks when warranted by the severity of the fire.

3—5. FUSELAGE FIRES. See paragraph 3—3.

3—6. ENGINE FAILURE DURING TAKE-OFF.

a. Throttle — "CLOSED".
b. Mixture control — "IDLE CUT-OFF"
c. Ignition switch — "OFF".
d. Auxiliary fuel pump switch — "OFF".
e. Fuel system selector valve — "OFF".
f. Battery and generator switch — "OFF".

3—7. ON GROUND. Apply brakes.

3—8. IN AIR. Land straight ahead, wheels "DOWN" when runway is available, otherwise, wheels "UP".

3—9. ENGINE FAILURE IN FLIGHT. Nose airplane down to maintain flying speed. Check the following possible causes:

a. Fuel pressure failure. Switch auxiliary fuel pump "ON". In case of a previous failure of the fuel transfer system and subsequent operation on the standby system, set the tank selector valve control to a tank containing fuel in case the previously selected tank has run dry.

b. Mixture control. Reset control to "RICH". Setting to "RICH" by-passes the altitude metering device in the carburetor.

c. If the engine does not start after completing the above operations, land as quickly as possible.

3—10. BAIL-OUT.

3—11. See figure 3—1 for location of emergency exits. To jettison the rear door pull inboard the emergency-release handle located forward of the door frame.

WARNING

To avoid striking the tail structure the radar operator must use the rear exit door rather than the second-compartment hatch.

a. Order crew on ICS to jettison rear door and bail out; all crewman must acknowledge. In airplane ser No. 124190 operate the bail-out warning bell handle repeatedly.

b. Open canopy.

c. When time permits, transmit estimated position and operate IFF per standard procedure before leaving cockpit.

3—12. FORCED LANDING.

a. Order crew to open second compartment hatch, jettison rear door, and secure safety belts and harnesses–all harness locking levers in "LOCK" position. All crewmen must acknowledge.

b. When time permits, transmit estimated position and operate IFF per standard procedure.

c. Open canopy, secure harness and safety belt–harness locking lever in "LOCK" position.

d. Set battery switch to "EMER" if generators are inoperative to power hydraulic-system, and tank-jettison circuits.

e. Set auxiliary-hydraulic-pump switch to "ON" in case of hydraulic-pressure failure. (See paragraph 3—28.)

f. Jettison external fuel tanks.

g. Release external armament in safe condition.

h. Release bomb-bay armament in safe condition.

i. Close bomb-bay doors.

j. Flaps-control lever–full "DOWN" for final approach.

k. Wheels control lever–"DOWN" when certain landing can be made on hard, smooth surface; "UP" for soft ground.

l. Throttle–"CLOSED".

m. Mixture control lever–"IDLE CUT-OFF".

n. Battery, generator, and ignition switches–"OFF" for crash landing.

3–13. DITCHING.

3–14. Ditching procedure is essentially the same as for forced landing; except that the landing gear MUST be up and the fuselage rear door closed. All crewmen must use the second-compartment hatch since this exit will be above the water level and gives easy access to the wing. Make a power-stall touch-down (when power is available) with wing flaps full down.

WARNING

The bomb-bay doors must be closed before touch-down on water. Failure to close the doors will result in excessive impact loads on the bomb-bay aft bulkhead and consequent immediate flooding of the aft compartment.

3–15. FUEL SYSTEM EMERGENCY OPERATION.

3–16. TO REGAIN LOST SUCTION. Turn auxiliary fuel pump switch "ON".

3–17. TRANSFER SYSTEM FAILURE.

a. Auxiliary fuel pump switch – "ON".

b. System selector valve control – "STANDBY (AUXILIARY)".

c. Tank selector valve control – set to any tank containing fuel. When using the standby system, tanks may be selected in any order.

CAUTION

After the droppable tanks have been emptied the system selector valve control must be reset to "NORMAL (MAIN)" in order to use fuel remaining in the main tank.

3–18. JETTISONING EXTERNAL TANKS.

a. Tank selector valve – set to wing tank containing fuel.

b. Drop tank jettison switches – "RELEASE".

WARNING

In case both engine-driven generators are inoperative the battery switch must be set to "EMER" to energize the external auxiliary (droppable) tanks release circuits, since these circuits are supplied with power from the main bus.

Note

Limiting air speeds and aircraft handling technique during jettisoning operation will be supplied when available.

3–19. LANDING GEAR EMERGENCY OPERATION.

3–20. Reduce air speed to 150 knots IAS or below. Pull the emergency handle located below the landing-gear selector valve control. This action releases the up locks and discharges the contents of a compressed-air bottle to lower the gear, which locks automatically.

CAUTION

To prevent damage to the adjacent instruments do not allow the handle to snap back against the panel.

3–20A. LANDING GEAR DUMP RESET. To raise the landing gear, following the use of the emergency air-bottle control, push the landing gear dump reset control. The landing gear selector control must be in the "DOWN" position before pushing in the reset button. Move the selector control to "UP" after the reset button is pushed in. Hydraulic pressure must be available from either the engine driven or auxiliary electric hydraulic pump.

CAUTION

The emergency (air bottle) control cannot be used a second time to lower the landing gear.

3–21. WING FLAPS EMERGENCY OPERATION.

3–22. Switch on the auxiliary hydraulic pump and operate the wing flap control.

3–23. BRAKE EMERGENCY OPERATION.

3–24. Switch on the auxiliary hydraulic pump and operate the brakes.

3–25. CANOPY EMERGENCY OPERATION.

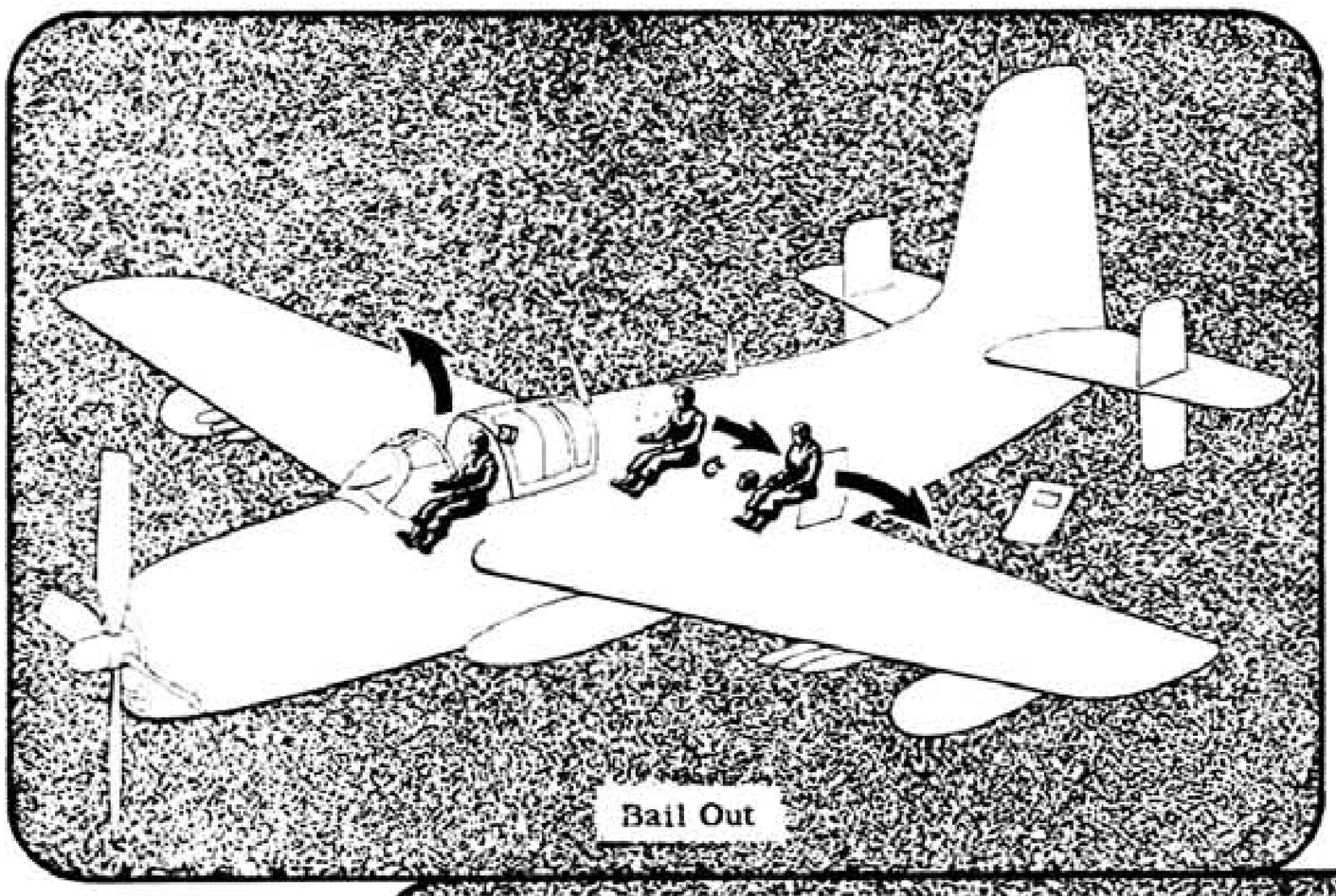
3–26. Move canopy control outboard and aft, releasing high pressure air into the canopy cylinder to open the canopy.

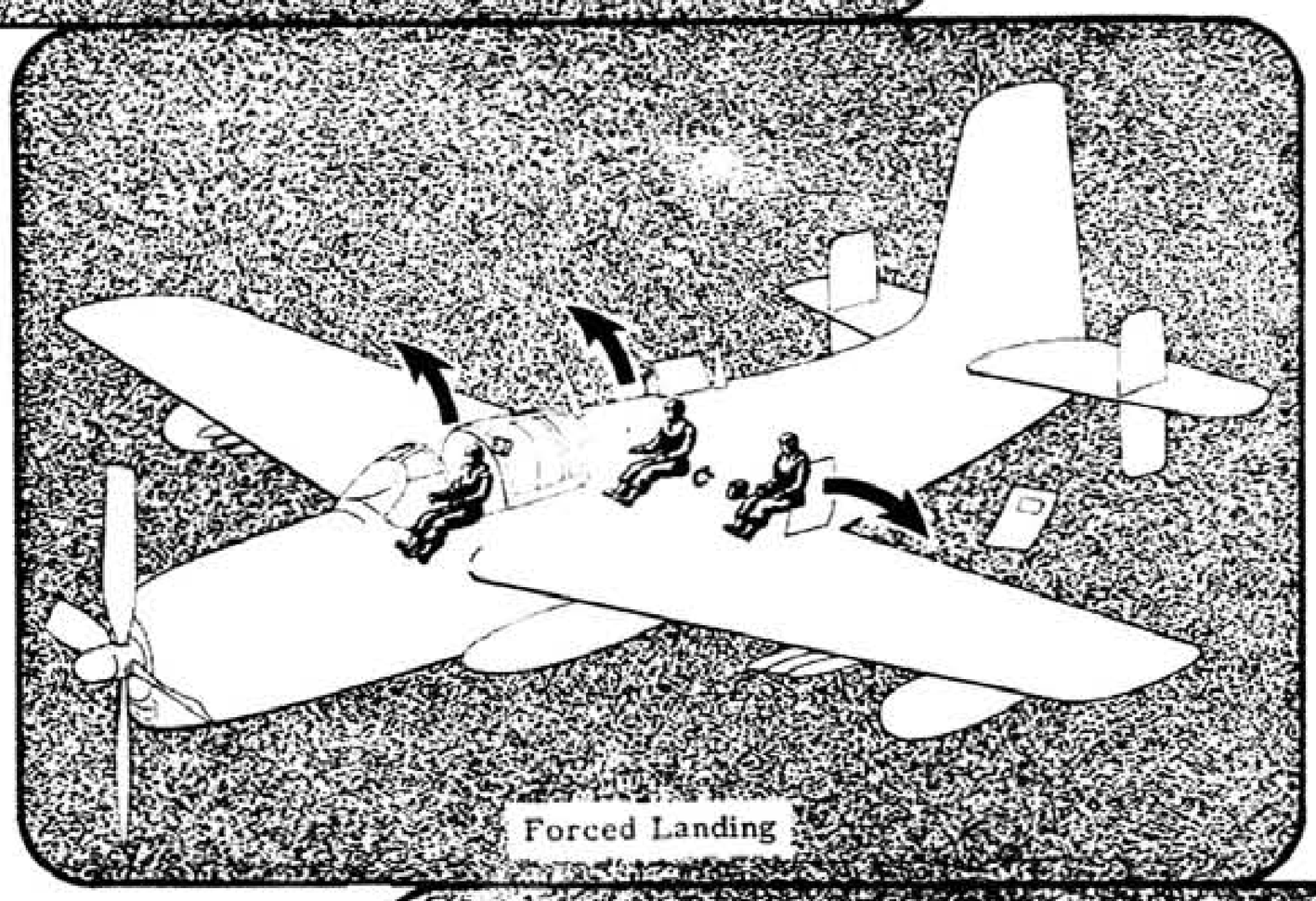
3–27. HYDRAULIC SYSTEM EMERGENCY OPERATION.

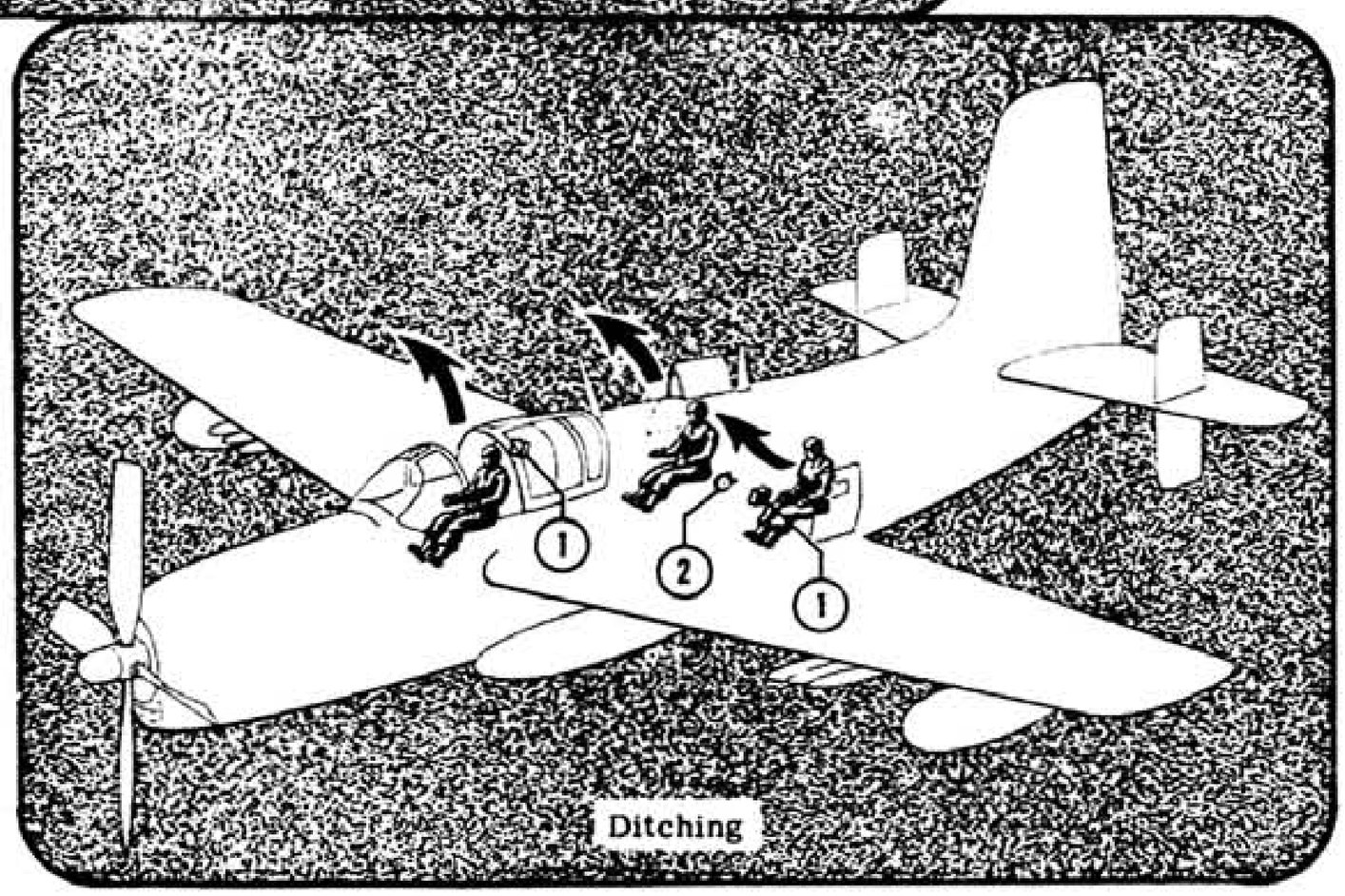
3–28. When system pressure is not available, any of the hydraulic units may be operated by switching on the electric auxiliary hydraulic pump.

Note

In event of failure of the normal hydraulic system due to complete loss of hydraulic fluid from the normal system, the canopy and landing gear should be operated by the emergency (air-bottle) controls rather than by the auxiliary pump; thus retaining the reserve fluid supply of the wing flaps and wheel-brake-boost cylinders.







NOTE

Pilot's and crew's seats are designed to accommodate seat type parachutes, pararaft kits, back pans and seat pans.

1. First Aid Kit
2. Bail Out Warning Bell (Ser No. 124191 and Subs)

Figure 3—1. Emergency Exits and Equipment

3–29. ELECTRICAL SYSTEM EMERGENCY OPERATION.

3–30. In case of generator failure or abnormal voltage, set corresponding generator switch to "OFF". In case of complete failure of generator system and use of equipment powered from the main bus is required, set battery switch to "EMER."; turning off all unnecessary equipment by operating the appropriate switches and circuit breakers (figure 1–4). In airplanes ser No. 123088 through 124818, an emergency operating switch is provided on the second compartment console for emergency operation of the main inverter which powers certain electronic equipments (figure 1–4). In case overloads have opened the remote control circuit breaker adjacent to the switch, and temporary operation of this inverter is indispensable, hold the switch in the "EMER. OPER." to restore power to the inverter. In airplanes ser No. 124820 and subsequent, if the "STAND-BY INVERTER IND." warning light on the pilot's right console glows, set the adjacent inverter selector switch to "STAND-BY". The warning light will be extinguished with the switch in this position when the stand-by inverter is supplying a-c power to the fuel quantity gage and electrical flight instruments.

3–31. CIRCUIT BREAKERS. Circuit breakers which protect each circuit from sustained overload are located on a sloping panel outboard of the console and on the radar operator's and bombardier's consoles. Press to reset. Switch off the circuit if the breaker continues to open.

3–32. IFF EMERGENCY OPERATION.

3–33. To transmit on either the AN/APX-2 or the AN/APX-6 equipment, both a-c and d-c power supplies are required.

a. In airplanes ser No. 123088 through 124818, the inverter remote control circuit breaker, second compartment console, must be closed to supply a-c power. In airplanes ser No. 124820 and subsequent, the main inverter switch, second compartment console, must be set to "ON" to supply a-c power.

b. In case of failure of both generators, the battery switch must be set to "EMER" to supply both a-c and d-c power.

3–33A. To fire destructors in either equipment, the IFF "D" circuit breaker, pilot's radio circuit breaker panel, must be closed.

Note

The destructor circuits are powered when the IFF "D" circuit breaker is closed, regardless of any other circuit breaker or switch setting.

3–33B. AN/APX-2 EQUIPMENT. In airplanes ser No. 123088 through 123108, the IFF D-C and IFF A-C circuit breakers, pilot's radio circuit breaker panel, must be closed. In airplanes ser No. 123110 and subsequent, the APX-2 DC and APX-2 AC circuit breakers, same location, must be closed.

a. On the C-114/APX-2 control, pilot's right console, depress guard marked PUSH, rotate selector switch to "EMERGENCY".

b. To destroy transmitter-receiver unit, raise red guard marked DESTRUCT, and set switch to "ON".

3–33C. AN/APX-6 EQUIPMENT—AIRPLANES SER NO. 123110 AND SUBSEQUENT. The APX-6 DC and APX-6 AC circuit breakers, pilot's circuit breaker panel, must be closed.

a. On the C-544/APX-6 control, pilot's right console, press red dial stop and rotate MASTER selector to "EMERGENCY".

b. To explode destructors within the equipment, raise the switch guard labeled DESTRUCT and raise the switch handle to the "ON" position.

WARNING

Do not fire the destructors unless the AN/APX-6 equipment is in danger of falling into enemy hands. When in doubt of the security of the area in which you are *forced* to land, fire the destructors.

c. If destructors were fired during the flight, notify your Commanding Officer.

3–34. AUTOMATIC PILOT.

3–35. If electrical disengagement methods fail, pull the automatic pilot emergency disconnect handle to disengage the system mechanically.

3–36. ARMAMENT.

3–37. Emergency release of the torpedo or mine is accomplished by operating the "MANUAL TORPEDO RELEASE" handle located aft of the pilot's right console.

a. Bomb bay doors control — "DOORS OPEN".

b. Manual torpedo release — pull.

SECTION IV
OPERATIONAL EQUIPMENT

4—1. K-25A CAMERA AND FLASHER.

4—2. GENERAL.

4—3. A Fairchild Type K-25A electrically-operated camera and an Edgerton Type F2A-1a Flasher are mounted vertically in the right wing (figure 1–1). Both units may be rotated electrically 45° toward the trail position by operation of a remote control. The camera and flasher operate in unison, the flasher operation being synchronized with the camera shutter. Exposures are made at the rate of three frames per second, and the camera contains film for 55 frames or for approximately 20 seconds operation. The camera and flasher controls may be set to operate both units through a preset timed cycle of 10 seconds maximum duration, with operation commencing automatically, with release of the torpedo or mine. Untimed operation may also be selected, with camera and flasher operation starting when required by the bombardier, and continuing until the operating circuits are interrupted manually, or until all film has been exposed. In the latter case the operating circuits will be interrupted automatically. All controls for the camera and flasher are located in the bombardier's compartment, and consist of two toggle switches and a positioner control, mounted on a "CAMERA & FLASHER" control panel on the console, and a camera timing control unit mounted immediately above the console.

4—4. NORMAL CONTROLS.

4—5. POWER SWITCH. The "POWER" switch is a two-position "ON-OFF" toggle type unit, mounted on the "CAMERA & FLASHER" panel. Setting the switch to the "ON" position supplies power for all circuits.

4—6. SELECTOR SWITCH. The "SELECTOR" switch is a three-position "AUTO-OFF-MANUAL" toggle-type unit, also mounted on the "CAMERA & FLASHER" panel. Setting the switch to "AUTO" prepares the control circuits for automatic operation of the camera and flasher through a preset period, upon release of the bomb bay armament. Setting the switch to "MANUAL" starts operation of both units through the same preset period, with the selector switch closing the control circuits in place of the bomb bay armament release circuit. Setting the switch to "OFF" interrupts both the automatically- and manually-controlled circuits.

4—7. CAMERA AND FLASHER POSITIONER CONTROL. A camera and flasher "POSITIONER" control is also installed on the "CAMERA & FLASHER" panel. The control consists of a pointer knob and an engraved scale, the scale being calibrated in degrees of camera and flasher travel from the "RETRACTED" position at the zero end of the scale to the "TRAILING ANGLE" position at the 45° end of the scale. Setting the pointer knob to any position on the scale operates the camera and flasher unit to the corresponding position.

Note

To provide power for the positioner circuits for the camera, flasher, and searchlight, in airplanes ser No. 123088 through 124820, the "INVERTER REMOTE CONTROL CIRCUIT BREAKER" on the second compartment console must be closed. In airplanes ser No. 124820 and subsequent, the "MAIN INVERTER" switch, same location, must be at "ON" to power these circuits.

CAUTION

To avoid damage to the D-1 flasher lamp housing when the wings are folded the positioner control must be secured in the "RETRACTED" position after operation.

4—8. TIMING CONTROL UNIT.

4—9. TIMING CONTROL UNIT SELECTOR SWITCH. The selector switch is a two-position "TIMED NORMAL OPERATION – UNTIMED RUNAWAY CAMERA" toggle-type unit. Setting the switch to the first position prepares the electrical circuits in the control unit to operate the camera and flasher for a preset period when the circuit to the control units is closed, either by release of the bomb bay armament or by setting the "SELECTOR" switch on the "CAMERA & FLASHER" panel to the "MANUAL" position. Setting the switch to the "UNTIMED RUNAWAY CAMERA" position closes the operating circuits to both units immediately, overriding the "SELECTOR" switch on the "CAMERA & FLASHER" panel. In this position of the timing control unit selector switch the camera and flasher will continue to operate until all film has been exposed, after which the circuits will be interrupted automatically.

4—10. TIMING CONTROL UNIT POINTER KNOB. The timing mechanism is controlled by a pointer knob operating through a scale calibrated in half-second increments from "0" to "10" seconds. Setting the pointer knob to any position prepares the timing mechanism to hold the control circuits closed for the selected period. The selector switch must be set to the "TIMED NORMAL OPERATION" position to make the timing mechanism operative.

4—11. INDICATORS.

4—12. TIMING CONTROL UNIT BLINKER LIGHT. This unit is inoperative in the AF-2S airplane installation.

4–13. OPERATION.

4–14. TIMED OPERATION.

a. Timing control unit pointer knob – as required.

b. Timing control unit selector switch – "TIMED NORMAL OPERATION".

c. Positioner control – desired camera and flasher position.

d. Camera and flasher selector switch – "AUTO".

e. Camera and flasher power switch – "ON". The camera and flasher will then operate for the preset period either when the bomb bay armament is released, or when the selector switch on the camera and flasher control panel is set to the "MANUAL" position.

4–15. UNTIMED OPERATION.

a. Camera and flasher power switch – "ON".

b. Timing control unit selector switch – "UNTIMED RUNAWAY CAMERA". Camera and flasher operation will commence and continue until either the control unit selector switch is returned to the "TIMED NORMAL OPERATION" position, or until all film has been exposed. In the latter case, all circuits will be interrupted automatically.

4–16. SEARCHLIGHT.

4–16A. GENERAL.

4–16B. A type AN/AVQ-2 carbon-arc searchlight is carried on a bomb rack under the left wing outer panel. The searchlight lamp is controlled in elevation and azimuth by positioning motors in the searchlight nacelle; which are in turn controlled by the position of the bomb-sight periscope. The system is designed to illuminate the searchlight lamp when a trigger switch on the periscope right handle is pressed.

4–16C. NORMAL CONTROLS.

4–16D. SEARCHLIGHT SWITCH. The "SEARCHLIGHT" switch is a two-position "OFF-START" toggle switch on the aft compartment console. (See figure 4-3, item 32.) Setting the switch to "START" supplies power to the searchlight-lamp and the positioner-control circuits. The switch must remain in the "START" position for one minute before the lamp circuit is triggered. Returning the switch to "OFF" interrupts all circuits.

4–16E. TRIGGER SWITCH. The searchlight trigger switch is located on the periscope right handgrip. Pressing this switch illuminates the searchlight. Releasing the trigger extinguishes the arc and shields the carbons to conceal the afterglow.

4–16F. INDICATORS.

4–16G. SEARCHLIGHT INDICATOR. *(Figure 4–3, item 17.)* The searchlight indicator mounted on a vertical panel at the right of the bomb sight, is an instrument for indicating the direction and degree of movement of the searchlight lamp in azimuth and elevation. Two dials are used, the one for elevation markings and the other for azimuth. The indicator is automatically brought into operation when the searchlight switch is set to "START" and the amplifier tubes have warmed. (One-minute warm-up period).

4–16H. OPERATION.

4–16J. PRELIMINARY. The following switches must be turned on and the following circuit breakers closed to supply power for searchlight operation.

a. Generator switches (pilot's cockpit)–both "ON".

b. Armament-master switch (pilot's cockpit)–"ON".

c. Inverter remote control circuit breaker button, airplanes ser No. 123088 through 124818, (second compartment console)—in. Airplanes ser No. 124820 and subsequent, main inverter switch type circuit breaker (second compartment console)—"ON".

d. Bomb-sight circuit-breaker button (aft-compartment console)–in.

e. Searchlight circuit-breaker button (aft-compartment console)–in.

f. Searchlight a-c power circuit-breaker button (aft-compartment console)–in.

g. Searchlight-remote-control circuit-breaker button (aft-compartment console)–in.

4–16K. ON SIGHTING TARGET.

a. Searchlight switch–"START". The searchlight switch must be at "START" for one minute before triggering the arc.

b. PDI switch–"ON" to transmit periscope and searchlight azimuth to the pilot's direction indicator.

c. Bomb-sight control-unit power switch–"ON" to power the searchlight-arc-trigger circuit.

d. Trigger switch–depress to trigger searchlight arc.

CAUTION

Operation of the searchlight arc is limited to one-half minute at a time; with an intervening period of four and one-half minutes.

CAUTION

If during operation, the light should go off by itself, immediately release the trigger switch. Wait several seconds, then squeeze the trigger switch again. If the light keeps going off, do not attempt to operate the searchlight again until the plane is landed and a new positive carbon inserted.

4–17. ARMAMENT.

4–18. GENERAL. A MK 34 or MK 41 torpedo, or a MK 24 mine, may be carried in the bomb bay, together with 16 AN/SSQ-2 sonobuoys and a rack containing 18 MK 5 and two MK 6-2 floatlights. A MK 35 torpedo may be loaded upon removal of the floatlight rack. The bomb bay occupies the lower part of the fuselage between the engine compartment firewall and the forward bulkhead of the third compartment, and is fitted with hydraulically operated doors. In airplanes ser No. 124778 and subsequent, an inspectio.. window in the

lower part of the aft compartment forward bulkhead and a light in the bomb bay, controlled by a switch adjacent to the inspection window, are provided. The torpedo or mine is released electrically by a bomb sight in the third compartment or, in an emergency, may be released by operation of a manual control in the pilot's cockpit.

4—19. NORMAL CONTROLS.

4—20. BOMB BAY DOORS CONTROL. *(Figure 1–7, item 14.)* The "BOMB BAY DOORS" control is located aft of the pilot's right console. The control positions are placarded "DOORS OPEN" and "DOORS CLOSED".

Note

To prevent reverse flow of exhaust gas from the bomb bay through the heating and ventilating system when the "AIR INLET" switch on the "AIR CONDITIONING" panel is set to "CLOSE" and the bomb bay doors are opened, the rammed air inlet valve is automatically turned to the full open position as the doors are opened.

4–21. ARMAMENT MASTER SWITCH. *(Figure 1–6, item 33.)* The "ARMAMENT MASTER" switch is a two position "ON-OFF" switch type circuit breaker, located on the armament control panel below the pilot's instrument panel. With the landing gear retracted, setting this switch to "ON" supplies power to all armament circuits except the mine or torpedo arming and release circuits. With the bomb bay doors open the latter circuits also will be powered with this switch in the "ON" position.

Note

To prevent inadvertent release of any armament when the landing gear is extended, the "ARMAMENT MASTER" switch type circuit breaker will automatically go to the "OFF" position when the landing gear is extended.

4–22. ARMING SWITCH. *(Figure 1–6, item 33.)* The "ARMING" switch is a three-position toggle-type unit, located adjacent to the "ARMAMENT MASTER" switch. This switch controls the circuits to the torpedo or mine arming units and to the rocket nose arming solenoids, when the "ARMAMENT MASTER" switch is set to "ON". Setting the "ARMING" switch to the "ARMED—NOSE & TAIL" (upper) position energizes the torpedo or mine arming solenoids and the rocket nose arming solenoids. In the "SAFE-TAIL" (central) position, both the bomb bay arming solenoids and the rocket nose arming solenoids are deenergized, and the torpedo or mine may be released in a "safe" condition. In the "ARMED-TAIL" (bottom) position, the mine or torpedo arming solenoids are energized but the rocket nose arming solenoids are deenergized.

WARNING

With the "ARMAMENT MASTER" switch set to "ON", the rocket firing circuits are powered and will be closed if the release button on the control stick is depressed, regardless of the setting of the "ARMING" selector switch. This also applies to the "tail arming" of the rockets, since the tail fuzes will become armed automatically after the rockets are fired. Selection of the "ARMED-NOSE & TAIL" position will cause instantaneous ignition of the explosive charge upon impact of the rocket; selection of any other position will cause ignition of the explosive charge, also, through the rocket tail fuze, but after an extremely short time delay. If desired, the rocket firing circuits can be safetied with the "ARMAMENT MASTER" switch set to "ON", by pulling out the "ROCKETS" circuit breaker button on the pilot's right console.

4–23. BOMBARDIER OVERRIDE SWITCH. *(Figure 1–5, item 9.)* The "BOMBARDIER OVERRIDE" switch is a two-position toggle-type unit located on the pilot's cockpit left sill. The switch positions are marked "OVERRIDE" and "NORMAL". Setting the switch to "OVERRIDE" interrupts the release circuit to the torpedo, or mine. Setting the switch to "NORMAL" restores the release circuit, provided the bomb bay doors are open and the torpedo or mine is armed.

4—24. EMERGENCY CONTROLS.

4—25. MANUAL TORPEDO RELEASE. *(Figure 1—7, item 15.)* A "MANUAL TORPEDO RELEASE" handle marked "PULL" is located at the aft end of the pilot's right console, and provides an emergency release for the torpedo or mine in case of failure of the normal release electrical circuits.

Note

A mechanical lock prevents operation of the manual release when the bomb bay doors are closed. To prevent accidental release of the shackles on the ground, a plunger on the left side of the bomb bay may be pushed in to lock the manual release.

4—26. INDICATORS.

4—27. BOMB BAY DOOR WARNING LIGHTS. A "WARNING DOORS OPEN" red light on the pilot's "BOMB BAY DOORS" control, and a "BOMB BAY DOOR OPEN" red warning light located below the bomb sight, glow when the bomb bay doors are open fully.

4–28. TORPEDO READY INDICATOR LIGHTS. Two "TORPEDO READY FOR RELEASE" red warning lights one installed on the "BOMBARDIER OVERRIDE" switch housing on the cockpit left sill and the

other located below the bomb sight, glow when the bomb sight control unit power switch is set to "ON", provided that the bomb bay doors are open, the armament master switch is set to "ON", the arming switch is set to either bomb bay "ARMED" position, and the bombardier override switch is set to "NORMAL"

4–29. BOMB SIGHT.

4–30. GENERAL.

4–31. The bomb sight system MK 23 includes a MK 23 Mod 6 bomb sight, a bomb sight control unit MK 10 Mod 0, and an inverter, designated bomb sight power supply MK 13 Mod 0. The bomb sight is mounted on the head of a MK 41 Mod 3 periscope in the aft compartment, the bomb sight control unit is located on the right side of the aft compartment, and the inverter is installed in the bomb bay. Vacuum power for the operation of a pneumatic release switch in the bomb sight is provided by a small venturi exteriorly mounted on the right side of the airplane. The periscope, the lower end of which protrudes from the fuselage, is used to establish the line of sight for the bomb sight.

4–31A. The periscope and searchlight are electrically interconnected so that the searchlight follows motion of the periscope in both azimuth and elevation (see paragraph 4–16B). Azimuth bearing of the periscope is transmitted electrically to a pilot's direction indicator (PDI) mounted above the pilot's main instrument panel. Controls for setting estimated ground speed and altitude, for selection of the proper nomograph for the armament carried, and a dimmer switch controlling illumination of the nomograph and associated indices, are located on the bomb sight. The bomb sight arming switch is located on the periscope right handgrip, as is the trigger switch for the searchlight. The microphone switch on the periscope left handgrip is not used on these airplanes. All other controls are located on the bomb sight control unit.

4–31B. BOMB SIGHT THEORY. The bomb sight automatically computes the correct time of mine or torpedo release for low level attacks made at altitudes between 50 and 500 feet, at speeds between 120 and 300 knots. The azimuth solution to the attack problem is solved by flying a collision course, since the sight provides a range solution only. The bomb sight is essentially an instrument which measures the angular rate at which the line of sight from the airplane to the target moves as the airplane flies toward the target in the attack run. The angle formed between the flight path and the line of sight, or angle of depression, will be small when the airplane is distant from the target, and will become larger as the distance closes, reaching a maximum of 90 degrees as the airplane passes over the target. The rate at which the line of sight must be rotated by the bombardier, in order to hold the cross hairs on the target, as the distance closes, will be very slow at first and will increase as the airplane nears the target. The location of the correct point of release will depend on the altitude and ground speed of the airplane and the aerodynamic characteristics of the armament. These data are set into the sight by the bombardier. The mechanism of the sight measures the angular tracking rate, detects the angular rate which corresponds to the proper point of release, and closes the release circuits to the mine or torpedo shackle at the proper instant.

4–32. NORMAL CONTROLS.

4–32A. DIMMER SWITCH. A dimmer switch, located on the right side of the bomb sight housing, turns on a lamp which illuminates the nomograph and height index, and also controls the intensity of illumination.

4–32B. HEIGHT ADJUSTMENT KNOB. Turning this knob, located on the left side of the bomb sight housing at the top corner, permits setting the height index for the altitude at which the attack run is to be made.

4–32C. NOMOGRAPH INDEXING KNOB. This knob, located on the forward face of the bomb sight housing, is pulled out and then rotated to select the proper nomograph for the armament carried, and is then pushed in to lock.

4–32D. NOMOGRAPH ADJUSTING KNOB. Turning this knob, located on the left side of the bomb sight housing, permits rotating the nomograph disc to align the height index spot with the velocity curve on the nomograph which corresponds to the ground speed at which the attack is to be made.

4–33. POWER SWITCH. The two-position "ON-OFF" bomb sight power switch is located on the MK 10 Mod 5 bomb sight control unit mounted above the bombardier's console, and is equipped with a hinged guard. Setting the power switch to "ON" supplies power to the torpedo-ready-for-release indicator lights and to the bomb sight inverter, which then supplies a-c to the bomb sight gyroscope. Power is also supplied to the torpedo or mine release circuits, and, when the K-25A camera power switch and selector switch are set to "ON" and "MANUAL", respectively (paragraphs 4–5 and 4–6), to the camera and flasher circuits. The torpedo or mine release circuits and the camera and flasher circuits will then be triggered automatically by the bomb sight.

Note

In airplanes ser No. 123088 through 124818, the "INVERTER REMOTE CONTROL CIRCUIT BREAKER" on the second compartment console must be closed for operation of the positioner circuits for the K-25A camera, flasher and searchlight. In airplanes ser No. 124820 and subsequent, the "MAIN INVERTER" selector switch on the second compartment console must be at "ON" to power the same circuits.

4–34. TEST SELECTOR SWITCH. A two-position toggle-type "TEST-BOMB" switch on the bomb sight control unit is used to interrupt the bomb bay armament arming and release circuits in order to test the operation

of the bomb sight. Setting the switch to "TEST" prevents release of the bomb bay armament when testing the bomb sight operation. Setting the switch to "BOMB" restores the arming and release circuits.

4–35. VACUUM PETCOCK. A manually operated petcock adjacent to the bomb sight control unit opens and closes a line from an externally mounted venturi to the control unit. The petcock is open when the petcock handle is in line with the vacuum line.

4–36. ARMING SWITCH. A push button switch, located on the periscope right handle, arms the bomb bay armament release circuits. The switch is depressed and must be held to arm the bomb sight, which completes the release circuits. If this switch is not held closed, the stores cannot be released even though the bomb sight circuit has been completed.

4–37. PILOT'S DIRECTION INDICATOR SWITCH. The "PDI" switch is a two-position "ON-OFF" switch located on the bombardier's console. When the switch is set to "ON" the azimuth of the periscope will be transmitted to the pilot's direction indicator.

4–38. INDICATORS.

4–39. BOMB SIGHT UNIT TEST LIGHT. A test light on the bomb sight control is illuminated when the push button on the periscope right handle is depressed, indicating that all circuits are functioning correctly. The control unit power switch must be set to "ON" and the "TEST BOMB" switch set to "TEST".

4–40. TORPEDO READY INDICATOR LIGHTS. See paragraph 4–28.

4–41. PILOT'S DIRECTION INDICATOR. The pilot's direction indicator (PDI) is mounted on the top deck of the instrument panel cowling at the right of the rocket projectile sight. The indicator is retractable and is stowed when not in use. Pulling a release handle marked "PDI PULL" located at the right of the instrument panel raises the indicator to the erect position. The PDI is controlled by the periscope and indicates the required course to the target to the pilot, when the "PDI" switch on the bombardier's console is set to "ON".

4–42. OPERATION.

4–43. PRELIMINARY.

a. Set the power switch to "ON" and permit the gyro to attain operating speed. The switch should be set to "ON" at least 15 minutes before entering the attack run.

Note

When in an area where a target may be sighted the power switch should be left in the "ON" position.

b. When the gyro has attained operating speed turn on the vacuum petcock.

c. Set the test selector switch to "TEST".

d. Press the arming push button on the periscope handle and track an imaginary target. Illumination of the bomb sight control unit test light indicates satisfactory operation of all circuits. Repeat this test two or three times. This test has a desirable effect in that occasional operation of the sight improves its accuracy. After completing the test turn off the vacuum petcock to prevent drawing dust into the sight housing.

e. Adjust the rheostat of the MK 23 Mod 6 sight so that the reticle is visible against the background and the nomograph is illuminated.

f. Pull out the nomograph indexing knob, then rotate to select the proper nomograph for the bomb bay armament carried. Push in the indexing knob to lock the nomograph disc in position..

g. Rotate the height adjustment knob to select the altitude at which the attack run is to be made.

h. Rotate the nomograph adjusting knob to match the velocity curve on the nomograph which is nearest the airplane's speed with the height index spot.

Note

The speed used should be estimated ground speed.

4–44. ON SIGHTING TARGET.

a. Turn the vacuum petcock on.

b. Check the test selector switch. The switch should be in the "BOMB" position.

c. Check the altitude, speed, and stick length settings. At the beginning of the bombing run, the reticle pip is placed on the target and tracking commences. As soon as smooth tracking is accomplished the arming push button, located on the right handle, is depressed. The switch is held depressed while tracking the target until the bomb bay armament is released, which occurs automatically at the proper instant. At the end of the bombing run the petcock is turned off.

Note

The vacuum petcock should be closed at all times except when in the bombing run, or when testing, to avoid drawing dust into the sight unit housing.

4–44A. MAKING ATTACK RUN.

4–44B. PILOT.

a. Set armament master switch to "ON".

b. Set arming switch to "ARMED-NOSE & TAIL" to arm torpedo or mine and to arm rocket nose fuzes. Set to "ARMED-TAIL" to arm torpedo or mine. Rocket base fuzes will be armed after rockets are launched regardless of switch position.

c. Open bomb bay doors. Bomb bay doors warning lights, pilot's cockpit and aft compartment, will glow when doors are fully open.

d. Set bombardier override switch to "NORMAL". Provided that the power switch and test selector switch, bomb sight control unit, are set to "ON" and "BOMB", respectively, the "TORPEDO READY FOR RELEASE" warning lights, pilot's cockpit and third compartment, will glow.

Note

To break off attack and prevent the bomb sight from releasing the mine or torpedo, return the bombardier override switch to "OVERRIDE".

e. Operate "PULL PDI" handle to raise pilot's direction indicator above windshield deck.

4—44C. BOMBARDIER.

a. Turn vacuum petcock on, in line with tubing.

b. Check setting of test selector switch—must be at "BOMB".

c. Check setting of bomb sight power switch—must be at "ON".

WARNING

The power switch must be set to "ON" 15 minutes before entering the attack run in order for the bomb sight gyroscope to attain the required operating speed for bomb sight accuracy.

d. Check selection of proper nomograph for armament carried; check setting of bomb sight height index and nomograph adjusting knobs for attack altitude and ground speed.

e. Set "PDI" switch on console to "ON" to transmit periscope azimuth to pilot's direction indicator.

f. Track target through periscope, keeping cross hairs on target.

g. When smooth tracking is obtained, depress arming push button on periscope right handgrip, and hold depressed until the bomb sight releases the torpedo or mine. If this switch is not held closed, the torpedo or mine cannot be released, even though the bomb sight circuit has been completed.

h. After release of the torpedo or mine, turn vacuum petcock off.

4—45. ROCKETS.

4—46. GENERAL.

4—47. Three Aero 14A combination bomb racks and rocket launchers are mounted under each wing outboard panel and may be loaded with six five-inch HVAR or HPAG rockets. The controls for arming and selecting the rockets are located on the armament control panel, below the pilot's instrument panel; with the exception of the release button on the control stick.

4—48. NORMAL CONTROLS.

4—48A. ARMAMENT MASTER SWITCH. *(Figure 1–6, item 33.)* This switch must be set to "ON" to supply power to the rocket firing and nose arming circuits, as well as for other armament circuits. For further information on this switch, see paragraph 4–21.

WARNING

The rocket firing circuits will be powered when this switch is set to "ON" with the landing gear retracted.. Inadvertent pressure on the control stick release button will then complete the firing circuit, regardless of the setting of the "ARMING" switch (paragraph 4–49).

4–49. ARMING SWITCH. This switch provides for arming the rocket nose fuze, when desired, and has no other function in rocket arming or firing. The rocket base fuze will become armed after the rocket is fired, regardless of the setting of this switch. With the armament master switch (paragraphs 4–21 and 4–48A) set to "ON", setting the "ARMING" switch to the "ARMED-NOSE & TAIL" (upper) position will arm the nose fuzes when the rockets are launched, The nose fuze will then detonate the rocket head charge upon impact. Setting the switch to any other position will cause the explosive charge to be detonated a fraction of a second after impact, through the operation of the base fuze.

WARNING

Regardless of the setting of the "ARMING" switch, the rockets cannot be fired in a safe condition.

4–50. ROCKET STATION SELECTOR. *(Figure 1–6, item 35.)* The MK 2 Mod 0 rocket-station selector is located on the armament control panel. The selector positions are numbered "1" to "6". Setting the selector to the number "1" permits firing a single rocket each time the release button on the control stick is depressed. Initial setting of the selector to "4" permits firing two rockets, one from each wing, each time the release button is depressed.

Note

The rockets cannot be fired in train. The release button must be released before the station selector will progress to the next position. The rockets cannot be fired in salvo.

4–51. OPERATION.

a. Armament master switch—"ON". The arming and rockets circuit breakers must be closed and the landing gear retracted.

WARNING

The rockets will then be launched, with either the nose or base fuzes, or both, armed when the control stick release button is depressed.

b. Arming switch — "ARMED-NOSE & TAIL" to launch rockets with nose fuzes armed; "SAFE-TAIL" or "ARMED-TAIL" for base fuzes only to operate.

c. Rocket station selector—set to "1" to fire singles; set to "4" to fire pairs.

d. Rocket release button—depress and release. The button must be released and again depressed to launch the next rocket or pair of rockets.

4—52. ROCKET SIGHT.

4—53. GENERAL.

4—54. A MK 8 Mod 8 illuminated rocket sight is mounted above the instrument panel (figure 1—6, item 8). The sight is provided with a two-filament lamp for projecting the reticle image on the glass reflector. One filament serves for normal use; the second may be switched on in case of failure of the first. The glass reflector may be adjusted to depress the line of sight for low-altitude bombing operations by turning a dial on the left side of the sight. On MK 8 Mod 8 sights installed on airplanes ser No. 124192 and subsequent, the reflector assembly and setting dial are eliminated; the reticle image being projected on a ground glass windshield.

4—55. NORMAL CONTROLS.

4—56. RHEOSTAT. *(Figure 1-6, item 32.)* A "GUN SIGHT" rheostat is located on the armament control panel. Moving the rheostat knob from the "OFF" position completes the power and reticle lamp circuits. Continued movement of the knob to the "BRIGHT" end of the scale increases the brilliance of the reticle image.

4—57. EMERGENCY CONTROLS.

4—58. GUN SIGHT LAMP SWITCH. *(Figure 1-6, item 32.)* A two-position "ON - ON ALT" switch at the right of the armament control panel controls the circuits to the two-filament reticle image lamp. The switch is normally set to "ON". Setting the switch to "ON ALT", in case of failure of one filament, will energize the alternate filament.

4—59. OPERATION.

a. Armament master switch — "ON".

b. Lamp switch — normally "ON"; "ON ALT." in event of failure of light.

c. Gun sight rheostat — move from "OFF" to energize circuits, move towards "BRIGHT" to increase reticle image brilliance.

4—60. ROCKET CAMERA. An AN-N-6A gun camera, used in conjunction with the rocket projectiles, is mounted in the leading edge of the left wing outboard panel. The camera is controlled by a toggle switch on the armament control panel, and by the button at the top of the control stick grip (used for bomb release in other airplanes) or the rocket firing button on the left side of the control stick grip.

4—61. NORMAL CONTROLS.

4—62. ROCKET CAMERA SWITCH. *(Figure 1-6, item 33.)* At three-position, toggle-type, "ROCKETS CAMERA" switch on the armament control panel is placarded "NORMAL", "OFF", and "MANUAL". When the switch is set to "NORMAL" the camera will be operated when the rocket firing button is depressed. The camera may be operated independently of rocket firing by setting the selector switch to "MANUAL" then pressing the button at the top of the control stick grip. Setting the switch to "OFF" interrupts all circuits.

4—63. OPERATION.

4—64. NORMAL OPERATION WHEN FIRING ROCKETS.

a. Rocket camera switch—"NORMAL".

b. Control stick rocket firing button—press to fire rockets and start camera. Camera will operate only while button is held down.

4—65. MANUAL OPERATION.

a. Rockets camera switch — "MANUAL".

b. Button at top of control stick—press and hold to operate camera.

4—66. ROCKET FIRING PROCEDURE.

a. Armament master switch—"ON". Arming, rockets, and gun sight circuit breakers must be closed and landing gear retracted.

b. Arming switch—"ARMED-NOSE & TAIL" to arm nose fuzes for instantaneous detonation on impact and to arm torpedo or mine; "SAFE-TAIL" to release torpedo or mine unarmed and for delayed detonation of rocket heads after impact; "ARMED-TAIL" to arm torpedo or mine and for delayed detonation of rockets.

c. Rocket station selector—"1" to fire singles; "4" to fire pairs.

d. Gun sight lamp switch—normally "ON".

e. Gun sight rheostat—turn from "OFF" for gun sight power and reticle lamp circuits. Adjust as required for desired reticle image brilliance.

Note

If reticle lamp does not illuminate set gun sight lamp switch to "ON ALT".

f. Rocket camera switch—"NORMAL".

g. Bomb bay doors—open to drop torpedo or mine.

h. Bombardier override switch — "NORMAL" for mine or torpedo release; "OVERRIDE" to prevent mine or torpedo release with doors open.

i. Control stick rocket release button—depress to fire rockets and start AN-N-6a camera. Button must be released and redepressed to fire next rocket or pair of rockets. Camera will operate only while release button is held down.

4—67.—4—74. DELETED.

4—75. FLOAT LIGHTS.

4—76. GENERAL.

4—77. Provisions are made in the bomb bay for the installation of a release rack loaded with 18 MK 5 and two MK 6-2 float lights. The float lights are released electrically by switches in the pilot's cockpit. Two selector switches control the release of two spare MK 5 float

lights and two spare MK 6-2 units. The 16 remaining MK 5 float lights are released automatically upon release of the sonobuoys.

4–78. NORMAL CONTROLS.

4–79. SPARE FLOAT LIGHTS RELEASE SWITCHES. *(Figure 1–7, item 5.)* Two three-position toggle switches, placarded "SPARE FLOATLIGHTS", "MK 6-2" and "MK 5" are located forward of the "SONOBUOY RELEASE" indicator lights on the sloping panel outboard of the pilot's right console. The switch positions are placarded "OFF", "#1", and "#2". Setting either switch to the "#1" or "#2" position releases the corresponding float light, providing the bomb bay doors are open and the sonobuoy "MASTER" switch is set to "ON".

4–80. OPERATION.

a. Bomb bay doors control – "OPEN".

b. Sonobuoy master switch – "ON".

c. Spare float lights release switches – select float lights as required.

Note

The armament master switch need not be set to "ON" to release the spare float lights.

4–81. HEATING AND VENTILATING SYSTEM.

4–82. GENERAL. *(See figure 4–1.)*

4–83. Rammed air is led from a scoop projecting from the right side of the engine cowling to a gasoline fired surface combustion heater. From the heater, the air is ducted to a windshield defroster, to foot registers and directional face nozzles located in the pilot's cockpit and in both crew compartments, and, when the heater is in operation, to the bomb bay. Air flow through these ducts is controlled by an electrically actuated butterfly valve in the intake duct, by control valves incorporated in the foot registers and face nozzles, and by a shut-off valve in the duct leading from the heater to the bomb bay.

4–84. Since air flow through the heater is dependent on ram, the heater controls are arranged to prevent operating the heater until the airplane is airborne and the landing gear retracted. The heater is turned on by operation of a switch in the cockpit, and is set for the desired temperature increase by operation of an adjacent temperature control knob. The heater is thereafter automatically controlled thermostatically by a balance circuit; which is actuated by the temperature control in the cockpit and the heat sensitive elements shown in figure 4–1—the outside air reset element, the heater hi-lo discharge element, and two thermister units located in the exit air duct in the aft compartment overhead. This balance circuit maintains the selected temperature by automatically shutting off fuel and ignition to the heater when cabin temperature exceeds the selected valve, and automatically restarting the heater when the temperature falls below the selected value. An overheat switch in the control circuit automatically shuts off the heater in case of any malfunctioning resulting in excessive temperatures.

4–85. The bomb bay is ventilated by a flow of rammed air, led from a scoop at the left side of the engine cowling through a shut-off valve at the firewall. When heat is required in the bomb bay, as indicated by the illumination of a warning light in the cockpit, operation of a cockpit control routes warm air from the heater to the bomb bay outlet, and simultaneously closes the valve at the firewall to shut off the flow of unheated ventilating air. The heater, of course, must be in operation.

4–86. An additional source of unheated ventilating air is supplied to the cockpit by an auxiliary system, which leads rammed air from an opening in the leading edge of the right wing to an air outlet tube and to a directional face nozzle, located on the left and right sides of the cockpit, respectively. Air flow through this auxiliary system is regulated by a manually controlled valve, operated from the pilot's cockpit.

4–87. NORMAL CONTROLS.

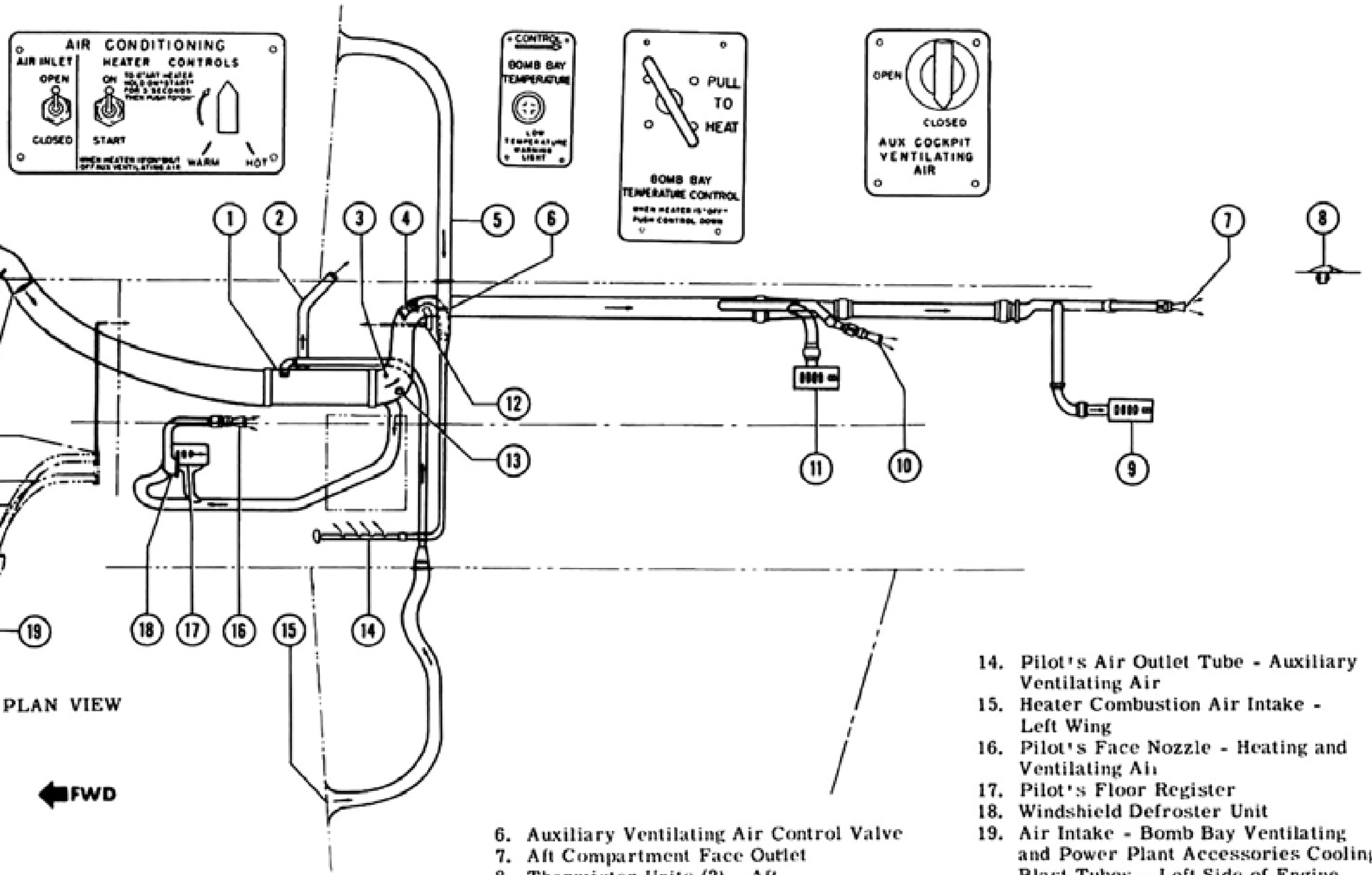
4–88. AIR INLET CONTROL SWITCH. *(See figure 1–6, item 23.)* The butterfly valve in the rammed air duct to the heater is controlled by a two position "ON-OFF" "AIR INLET" switch on the "AIR CONDITIONING" panel, located below the pilot's instrument panel to the right. Setting the switch to "OPEN" or "CLOSE" moves the butterfly valve to the full open or full closed position, respectively, when the heater switch is set to "OFF".

Note

To prevent reverse flow of exhaust gas from the bomb bay through the heating and ventilating system when the "AIR INLET" switch is at "CLOSE" and the bomb bay doors are opened, the rammed air inlet valve is automatically turned to the full open position as the doors are opened.

4–89. HEATER START SWITCH. *(See figure 1–6, item 23.)* The surface combustion heater is controlled by a "START—ON—OFF" toggle switch on the "AIR CONDITIONING" panel, located below the pilot's instrument panel to the right. Holding the switch to "START" for three seconds, then moving the switch to "ON", starts the heater; provided that cabin temperature is below the selected temperature. Setting the switch to "ON" also moves the butterfly valve in the rammed air duct to the heater to an intermediate position, regardless of the setting of the "AIR INLET" switch, to reduce air flow through the heater. The heater will remain in operation until the heater start switch is returned to "OFF", or until rising temperature unbalances the control circuit. When the switch is returned to "OFF", the air inlet butterfly valve will return to the position corresponding to the "AIR INLET" switch setting.

4–90. TEMPERATURE CONTROL RHEOSTAT. *(See figure 1–6, item 23.)* The temperature control rheostat is located on the "AIR CONDITIONING" panel below the pilot's instrument panel to the right, and operates through a range marked "WARM" to "HOT". The



1. Surface Combustion Heater
2. Heater Exhaust
3. Heater Discharge Hi-Lo Element
4. Pilot's Face Nozzle - Auxiliary Ventilating Air
5. Auxiliary Ventilating Air Intake - Right Wing
6. Auxiliary Ventilating Air Control Valve
7. Aft Compartment Face Outlet
8. Thermister Units (2) - Aft Compartment Exit Air Duct
9. Aft Compartment Floor Register
10. Second Compartment Face Outlet
11. Second Compartment Floor Register
12. Bomb Bay Temperature Control Valve and Duct to Bomb Bay
13. Overheat Switch
14. Pilot's Air Outlet Tube - Auxiliary Ventilating Air
15. Heater Combustion Air Intake - Left Wing
16. Pilot's Face Nozzle - Heating and Ventilating Air
17. Pilot's Floor Register
18. Windshield Defroster Unit
19. Air Intake - Bomb Bay Ventilating and Power Plant Accessories Cooling Blast Tubes - Left Side of Engine Cowling
20. Bomb Bay Ventilating Air Tubes (2)
21. Shut-off Valve at Firewall
22. Heater Air Intake Control Valve
23. Outside Air Reset Element
24. Air Intake to Heater - Right Side of Engine Cowling

Figure 4—1. Heating and Ventilating System

heater control circuit automatically maintains temperature at the value selected on this control.

4–90A. AUXILIARY VENTILATING AIR CONTROL. *(See figure 1–7, item 31.)* Air flow through the auxiliary system is regulated by a butterfly valve, manually controlled by an "AUX. COCKPIT VENTILATING AIR" knob, located aft of the pilot's right console. The control operates through a range marked "OPEN" to "CLOSED". Any intermediate position may be selected. The control should be in the "CLOSED" position when the heater is in operation.

4–91. BOMB BAY TEMPERATURE CONTROL. *(See figure 1–7, item 18.)* Heat to the bomb bay is controlled by a "BOMB BAY TEMPERATURE CONTROL" handle, located aft of the pilot's right console. The control handle is marked "PULL TO HEAT". Pulling the control opens a shut-off valve in the duct from the heater to the bomb bay, and also shuts off the flow of unheated ventilating air from the scoop on the left side of the engine cowling to the bomb bay.

Note

When the heater start switch is set to "OFF" the "BOMB BAY TEMPERATURE CONTROL" handle should be pushed down.

4–92. INDICATORS.

4–93. BOMB BAY LOW TEMPERATURE WARNING LIGHT. *(See figure 1–7, item 17.)* The "BOMB BAY TEMPERATURE LOW TEMPERATURE WARNING LIGHT" is located aft of the pilot's right console. The light is equipped with a "PRESS TO TEST" feature and a dimmer rheostat. The light glows red when the bomb bay temperature falls to $1\pm2°C$ ($33\pm3°F$), warning the pilot to operate the adjacent "BOMB BAY TEMPERATURE CONTROL".

4–94. OPERATION.

4–95. UNHEATED VENTILATING AIR.

a. With the "COCKPIT HEATER" circuit breaker (figure 1–7, item 3) closed, set the "AIR INLET" switch to "OPEN".

b. Regulate air flow to desired volume at face nozzles and foot registers.

c. For additional ventilating air to cockpit, set "AUX. COCKPIT VENTILATING AIR" control for desired air flow.

d. Push "BOMB BAY TEMPERATURE" control down for bomb bay ventilation.

4–96. HEATED AIR.

a. With "COCKPIT HEATER" circuit breaker closed, hold heater start switch to "START" for three seconds, then set to "ON". The auxiliary cockpit ventilating air control should be set to "CLOSED".

Note

1.

Airplane must be airborne, gear retracted, and cabin temperature below selected temperature for heater operation.

2.

Fuel pressure, as indicated on the engine gage unit, will drop momentarily when the heater is turned on, and also as the heater cycles to maintain the selected temperature.

b. Set temperature control rheostat to required temperature.

c. When bomb bay low temperature warning light glows, pull up bomb bay temperature control. Heater must be on.

4–97. LIGHTING SYSTEM.

4–98. INTERIOR LIGHTING. The pilot's cockpit is lighted by two hooded lamps over the left console, one lamp over the switch panel at the bottom left of the instrument panel, and two lamps over the right console. The rearmost light above the right console is equipped with a coiled cord and may be pulled out and used as a utility light. An "INTERIOR LIGHTS" switch and rheostat (figure 1-7, item 6) on the right console controls these lights as well as the instrument panel lights. The switch has the following positions: "ALL INST", "FLIGHT INST", and "CPT & INST".

4–99. The second cockpit is equipped with one spot light over the right console and two instrument panel lights, controlled by rheostats on the console. There is also a utility light with the following features: a coiled cord, a focus switch for spot or broad beam, a rheostat for intensity, a red light filter, and an "ON-OFF" switch.

4–100. The rear compartment is lighted by two lamps located above the console and a utility lamp with a coiled cord. All are controlled by rheostats on the console. A dome light in the ceiling is controlled by a switch forward of the rear entrance door.

4–101. EXTERIOR LIGHTS. The "EXTERIOR LTS" control panel located on the pilot's right console (figure 1-7, item 4) contains all switches for controlling the exterior lighting.

4–102. CONTROLS.

4–103. ON-OFF SWITCHES. The three "ON-OFF" toggle switches, starting at the left and mounted in a line at the top of the panel, respectively are used to turn on the red and green wing tip running lights, the one top and two fuselage side lights, the one white and one yellow tail light, two formation lights on the top surface of the wing, two vertical flood lights which illuminate the fin and two flood lights which illuminate the underside of the stabilizer. In airplanes ser No. 124778 and subsequent, all four floodlights are deleted and the floodlight switch is not used.

4–104. BRILLIANCE CONTROL. A three-position, rotary, "BRILLIANCE" control switch is located just below the toggle switches, on the right side of the control panel. This switch controls the brightness of all the exterior lights in degrees of intensity: "DIM", "MEDIUM", and "BRIGHT".

4—105. MASTER SWITCH. A four-position rotary "MASTER" switch, located in the lower left corner of the panel has the following positions: "OFF", "CODE", "FLASH" and "STEADY".

a. "OFF". In this position all lights are out even though their respective switches are turned "ON".

b. "CODE". With their respective switches "ON" the wing tip running lights and the tail lights will burn steadily. With the "FUSELAGE" switch "ON" the three fuselage lights will automatically flash in code one of 12 letters that may be chosen by the code selector switch. With the "FUSELAGE" switch "OFF" the fuselage lights may be flashed manually with the key (see paragraph 4—106) to send a message in code.

c. "FLASH". With the "WING" and "TAIL" switches "ON" the red and green wing lights and the white tail light will flash together, with the latter alternating with the yellow tail light, at a flashing rate of 40 times per minute. The fuselage lights will burn steadily when turned on and may be flashed manually with the key when turned off.

d. "STEADY". With the "WING", "TAIL", and "FUSELAGE" switches "ON" the red and green wing lights, the yellow and white tail lights and the three fuselage lights will burn steadily. In the "OFF" position the fuselage lights will remain out but may be flashed manually with the code key.

4—106. CODE KEY. This key is located on the left side of the panel aft of the row of toggle switches. Code messages can be tapped out on the fuselage lights by the use of this key when the master switch is in the "STEADY", "FLASH", or "CODE" position, and the "FUSELAGE" switch is "OFF". An indicator light, located above the key, flashes the signal being transmitted by the key and the fuselage lights. It serves the operator as a visual check that the message is going out correctly. The indicator light is marked "OFF FOR KEY".

4—107. CODE SELECTOR SWITCH. The "CODE" selector switch is placed to the right of the master switch and is used to flash out in code on the fuselage lights any one of the 12 letters of the alphabet that is selected. It is used only when the "MASTER" switch is set on "CODE".

4—108. APPROACH LIGHT. The approach light is automatic. It is on steady when both the landing gear and arresting hook are extended and it flashes when the landing gear is extended but the hook is not. The light is off when the landing gear is retracted. The exterior lights "MASTER" switch must be turned to any one of its "ON" positions in order for the approach light to flash. The steady signal is independent of the exterior light "MASTER" switch. The approach light may be turned on for field carrier landing practice or "bounce drill" by operating the "APP. LT. HOOK BY-PASS" switch in the aft compartment. This switch is a two-position "ON-OFF" toggle-type unit and, when set to "ON" with the "BATTERY" switch set to "BAT" and the "EXTERIOR LTS" circuit breakers in, illuminates the approach light steadily, regardless of the position of the arresting hook and landing gear. The switch must be set to "OFF" to restore the approach light system to normal operation. In airplanes ser No. 123110 and subsequent the "APP.LT. HOOK BY-PASS" switch is a two-position momentary switch, spring loaded to the normal "OFF" position. When this switch is set to "ON", with the arresting hook stowed, the "BATTERY" switch set to "BAT" and the "EXTERIOR LTS" circuit breakers closed, the approach light will be illuminated continuously; until either the "BATTERY" switch is set to "OFF" or the arresting hook extended.

4—109. ELECTRONIC EQUIPMENT.

4—110. TABLE OF ELECTRONIC EQUIPMENT.

Type	*Designation*	*Use*	*Range*	*Primary Operator*
VHF Transmitter-Receiver	AN/ARC-1A	Ten-Channel, Two-Way Voice Communication	Line of Sight	Pilot
HF Transmitter-Receiver	AN/ARC-2	Eight-Channel, Two-Way Voice, CW & MCW Communication	Long Range	Pilot
Range Receiver	R-23A/ARC-5	Navigation (Radio Range)	150 Miles	Pilot
Navigation Receiver	AN/ARR-2A	Navigation for Homing	Line of Sight	Pilot
Interphone Amplifier	AM-40/AIC	Intercommunication	None	All
Radio Interphone Controls	AN/AIC-4	Interphone & Radio Selection	None	All
Extension Cord	CX-922/AR	Microphone and Headphone Plug		All

Type	*Designation*	*Use*	*Range*	*Primary Operator*
Wire Recorder	13-A-3-J or VRW-7	Recording Sonobuoy & ICS	None	Bombardier (airplanes ser No. 123088 through 124208) Radar Operator (airplanes ser No. 124778 & subs.)
Sonobuoy Receiver (airplanes ser No. 123088 through 124208)	AN/ARR-31	Receive Sonobuoy Signals	10 Miles	Bombardier
Sonobuoy Receiver (airplanes ser No. 124778 and subs.)	AN/ARR-26	Receive Sonobuoy Signals	10 Miles	Radar Operator
Sonobuoy	AN/CRT-1B or AN/SSQ-2	Automatic Transmission of Underwater Sound Signals	10 Miles	Released by Pilot
IFF Equipment	AN/APX-2	Identification		Pilot or Radar Operator
IFF Equipment (airplanes ser No. 123110 and subs.)	AN/APX-6	Identification		Pilot
Radio Altimeter	AN/APN-1	Measure Terrain Clearance	0 to 4000 ft	Pilot
Radar (airplanes ser No. 123088 through 124208)	AN/APS-31	Search Radar	200 Miles	Radar Operator
Radar (airplanes ser No. 124778 and subs.)	AN/APS-31A	Search Radar	200 Miles	Radar Operator
Radar Relay Receiver (airplanes ser No. 124778 and subs.)	AN/ARR-27	Receive and Display Coded Radar Signals Transmitted by AN/ART-26 Radar Relay Transmitter	Line of Sight	Bombardier

4–111. CONTROLS. All equipment is remotely controlled with the exception of the sonobuoy receiver system AN/ARR-31.

Equipment	*Control Identification*	*Location*
AN/ARC-1A	VHF	Pilot's Right Console
AN/ARC-2	HF	Pilot's Right Console
R-23A/ARC-5	RECVR	Pilot's Right Console
AN/ARR-2A	NAVIG	Pilot's Right Console
AN/AIC-4	MIXER	Pilot's Right Console
AN/APX-2	IFF (C-114/APX-2)	Pilot's Right Console
AN/APX-6 (airplanes ser No. 123110 and subs.)	IFF (C-544/APX-6)	Pilot's Right Console
Microphone Switch	ICS-RADIO	On top of throttle
AN/APN-1	RADIO ALTITUDE Indicator	Pilot's Instrument Panel
AN/APN-1	ALTITUDE LIMIT SWITCH	Pilot's Instrument Panel
AN/APS-31 or AN/APS-31A	Indicator—ID-162A/APS-31	Pilot's Instrument Panel
AN/AIC-4	C-174/AIC-4	Radar Operator's Right Side
AN/APX-2	C-56A/APX-2	Radar Operator's Right Side

Equipment	*Control Identification*	*Location*
Microphone Foot Switch		Adjacent to Radar Operator's Right Foot
AN/APS-31 (airplanes ser No. 123088 through 124208)	C-289A/APS-31 and Indicator—ID-162A/APS-31	Second Compartment
AN/APS-31A (airplanes ser No. 124778 and subs.)	C-729/APS-31A and Indicator—ID-162A/APS-31	Second Compartment
AN/ARR-26 (airplanes ser No. 124778 and subs.)	C-610/ARR-26	Second Compartment
AN/ARR-27 (airplanes ser No. 124778 and subs.)	C-532/ARR-27 and Indicator—IP-41/ARR-27	Second Compartment
AN/ARR-31 (airplanes ser No. 123088 through 124208)	R-332/ARR-31	Directly Forward of and Facing Bombardier
Telegraph Key		Bombardier's Control Console
AN/AIC-4	C-174/AIC-4	Right Side of Bombardier
Microphone Foot Switch (ICS and Radio)		Adjacent to Bombardier's Left Foot.
Recording Foot Switch		Adjacent to Bombardier's Right Foot (airplanes ser No. 123088 through 124208) Adjacent to Radar Operator's Left Foot (airplanes ser No. 124778 and subs.)

4–111A. ELECTRONIC SYSTEM A-C, D-C POWER SUPPLY.

4–111B. GENERAL. In addition to the electronic equipment requiring only dc, some equipments require both ac and dc. For ground operation and testing electronic equipment, a source of d-c power must be connected at the external power receptacle when the engine driven d-c generators are not operating. With an external source of d-c power plugged in or with the d-c generators charging (engine running), d-c power will be available automatically to operate the equipment.

4–111C. A-C POWER SUPPLY — AIRPLANES SER NO. 123088 THROUGH 124818. A-c power from the inverter will be available automatically to operate the AN/ARR-31 or AN/ARR-26, AN/APX-2, AN/APX-6, AN/APS-31 or -31A and AN/ARR-27 equipments when an external source of d-c power is plugged in or when the d-c generators are charging. In an emergency, if the REMOTE CONTROL CIRCUIT BREAKER, on the second compartment console, opens, power may be restored to the above a-c powered equipments by holding the emergency operation toggle switch, adjacent to the circuit breaker, in the "EMER. OPER." position.

4–111D. A-C POWER SUPPLY — AIRPLANES SER NO. 124820 AND SUBSEQUENT. In these airplanes two inverters supply the a-c power for the electronic equipment. These inverters operate only when an external source of d-c power is plugged in, or when the engine driven d-c generators are charging. The inverter supplying three phase a-c power to the AN/APS-31A, AN/ARR-27 and AN/APX-2 equipments is controlled by the INVERTER SELECTOR switch on the pilot's right console. This switch must be set at its "MAIN" guarded position. The second inverter supplying single phase a-c power to the AN/APS-31A, AN/ARR-26 and AN/APX-6 equipments is controlled by the MAIN INVERTER switch-type circuit breaker on the second compartment console. This switch must be set at its "ON" position.

Note

Electronic equipment powered by the main inverter that is controlled by the INVERTER SELECTOR switch is not energized when this switch is set at its "STAND-BY" position.

4–112. UPON ENTERING THE COCKPIT.

4–113. PILOT.

a. Plug the microphone and headset cords into the jack and cord assembly hanging at the top of the pilot's seat.

b. Throw battery switch to "BAT" position and throw RADIO MASTER switch to "ON" position to energize all equipment except the AN/ARC-2 system. Then turn pilot's C-245A/ARC-2 HF console control knob to "PILOT ON" to energize AN/ARC-2 equipment.

4–114. RADAR OPERATOR AND BOMBARDIER. Plug microphone and headset cords into jack stowed above and to right of each seat.

4–115. OPERATION OF INTERPHONE.

4–116. PILOT. Set throttle switch, at top of throttle lever, to "ICS" position and talk into microphone.

4–117. RADAR OPERATOR. Turn C-174/AIC-4 control box TRANSMIT selector switch to "ICS" position, press microphone foot switch, and talk into microphone.

4–118. BOMBARDIER. Turn C-174/AIC-4 control TRANSMIT selector switch to "ICS", press left microphone foot switch, and talk into microphone.

Note

Volume of ICS received at each station may be adjusted by rotating respective ICS VOL knob.

4–119. OPERATION OF INDIVIDUAL RECEIVERS.

4–120. VHF RECEIVER (PART OF AN/ARC-1A).

a. Pilot – operate MIXER control RECEIVER switch to "VHF" and VHF control CHAN SEL to desired channel. For simultaneous reception on GUARD and any main channel operate VHF control GUARD BOTH MAIN T/R selector to "BOTH". For reception on GUARD or any main channel alone operate on GUARD or MAIN T/R as the case may be.

b. Radar operator and bombardier – operate C-174/AIC-4 control RECEIVER selector to "VHF".

4–121. HF RECEIVER (PART OF AN/ARC-2).

a. Pilot – operate pilot's HF console control CHANNEL SELECTOR to desired channel and MIXER console control RECEIVER switch to "HF".

b. Radar operator and bombardier – operate C-174/AIC-4 control RECEIVER selector to "HF".

4–122. RANGE RECEIVER (R-23A/ARC-5). Pilot—rotate pilot's RECVR console SENS knob until normal background noise is heard and turn tuning crank until desired range station is tuned in.

4–123. NAVIGATION RECEIVER (AN/ARR-2A). Pilot – on the NAVIG console control, set the PITCH control to "NAV", turn CHAN SEL to desired channel. Advance the SENS control to produce a usably weak signal, or if the desired signal cannot be heard, to produce a fairly strong background noise. Adjust the PITCH control to produce a pleasing audible tone. If necessary readjust the SENS control to produce a usably weak signal (if the signal is too strong, an accurate course indication cannot be obtained).

4–123A. SONOBUOYS—AIRPLANES SER NO. 123088 THROUGH 124208, EXCLUDING 123092 AND 123100.

4–123B. GENERAL.

4–123C. Sixteen type AN/CRT-1B or AN/SSQ-2 sonobuoys may be carried on MK 8 bomb shackles in the bomb bay. The sonobuoys are loaded in the order of their radio frequencies and are released singly in that order. The release circuits are so arranged that a MK 5 floatlight is released simultaneously with each sonobuoy. All controls are located in the pilot's cockpit.

4–123D. NORMAL CONTROLS.

4–123E. SONOBUOY MASTER SWITCH. The sonobuoy MASTER switch is a two-position toggle-type unit located at the right of the SONOBUOY RELEASE indicator lights (figure 1–7, item 7). Setting the switch to "ON" with the bomb bay doors open, arms the sonobuoy and floatlight release and indicator light circuits.

4–123F. SONOBUOY RELEASE SWITCH. *(Figure 1–5, item 7.)* The SONOBUOY RELEASE switch is a push button unit located on the pilot's left console outboard of the engine controls quadrant. Pressing and releasing the push button releases one sonobuoy and one floatlight.

4–123G. INDICATORS.

4–123H. SONOBUOY INDICATOR LIGHTS. *(Figure 1–7, item 7.)* Sixteen indicator lights numbered "1" to "16", are located on the SONOBUOY RELEASE panel outboard of the right console. The lights glow when the sonobuoy MASTER switch is set to "ON" and are extinguished when the corresponding sonobuoys are released.

4–123J. OPERATION.

a. BOMB BAY DOORS CONTROL—"OPEN".

b. SONOBUOY MASTER switch—"ON".

c. SONOBUOY RELEASE button—press and then release to drop sonobuoys.

Note

The armament master switch need not be set to "ON" to release the sonobuoys.

4–123K. SONOBUOYS—AIRPLANES SER NO. 123092, 123100, 124778 AND SUBSEQUENT.

4–123L. GENERAL.

4–123M. Sixteen type AN/CRT-1B or AN/SSQ-2 sonobuoys may be carried on MK 8 bomb shackles in the bomb bay. The sonobuoys are loaded in the order of their radio frequencies and are released singly in that order. The release circuits are so arranged that, if desired, a MK 5 floatlight is released simultaneously with each sonobuoy. All controls are located in the pilot's cockpit.

4–123N. NORMAL CONTROLS.

4–123P. SONOBUOY MASTER SWITCH. The sonobuoy MASTER SWITCH is a two position toggle type switch located on the SONOBUOY RELEASE panel on the pilot's right console. Setting the switch to "ON" with the bomb bay doors open and the SONOBUOYS and/or FLOATLIGHTS selector switches "ON" arms the sonobuoy and/or floatlight release circuits.

4–123Q. SONOBUOY AND FLOATLIGHT SELECTOR SWITCHES. These switches are "ON"—"OFF" toggle type switches mounted on the SONOBUOY RELEASE panel on the pilot's right console. The SONO-

BUOYS and FLOATLIGHTS switches provide the pilot with the option of dropping a sonobuoy with or without a floatlight or dropping a floatlight without a sonobuoy. Placing these switches "ON" with the bomb bay doors open and the sonobuoy MASTER switch "ON" arms the sonobuoy and floatlight release circuits.

4–123R. SONOBUOY STATION SELECTOR. This unit is located on the right side of the pilot's seat. It consists of a rotary selector switch with numbered positions of which only "1" through "16" are utilized. The numbers on the selector correspond to the sequence in which the sonobuoys are released. Placing the switch to "1" permits the release of the first sonobuoy. When the number one sonobuoy is released, the STATION SELECTOR switch will automatically move to the "2" setting which prepares the circuit for releasing the number two sonobuoy. The switch will operate similarly until the 16 sonobuoys are released. This unit also serves to indicate the number of sonobuoys released and the number of the sonobuoys ready to be released.

4–123S. SONOBUOY RELEASE SWITCH. The SONOBUOY RELEASE switch is a push button unit located on the pilot's left console outboard of the engine control quadrant. Pressing and releasing the push button releases one sonobuoy and one floatlight provided that the sonobuoy MASTER, the SONOBUOYS, and the FLOATLIGHTS switches are "ON".

4–123T. OPERATION.

a. STATION SELECTOR—"1".

Note

1.

Check that the STATION SELECTOR switch is rotated to its extreme counterclockwise position when starting the sonobuoy release sequence at number one.

2.

Sonobuoys may be released in numerical sequence or in any varied sequence provided that the remaining sonobuoys are at the bottom position of their respective columns as listed in the following table. For example, after sonobuoy number one has been released, four and seven can be released in that sequence, or if desired, sonobuoys one, two, three, nine, ten and eleven can be released in any sequence.

RELEASE SEQUENCE

Column I	*Column II*	*Column III*	*Column IV*	*Column V*	*Column VI*
7		8	15		16
4	6	5	12	14	13
1	3	2	9	11	10

b. BOMB BAY DOORS control—"DOORS OPEN".

Note

The ARMAMENT MASTER switch need not be set to "ON" to release sonobuoys.

c. Sonobuoy MASTER switch—"ON".

d. SONOBUOYS switch—"ON".

e. FLOATLIGHTS switch—"ON" (if desired).

f. SONOBUOY RELEASE button—press and release.

Note

1.

After the MK 8 bomb shackles have been reloaded, before releasing any sonobuoys, reset the STATION SELECTOR to its extreme counterclockwise position.

2.

The switch on the floatlights STATION SELECTOR located in the bomb bay on the floatlight rack must be set to its extreme counterclockwise position by the ground crew after reloading the floatlights.

4–123U.—4–123W. DELETED.

4–124. SONOBUOY RECEIVER EQUIPMENT (AN/ARR-31)—AIRPLANES SER NO. 123088 THROUGH 124208.

4–124A. STARTING AND STOPPING THE EQUIPMENT.

a. To start the equipment push in the SONO circuit breaker on the pilot's electronic circuit breaker panel on the right console in airplanes ser No. 123088 through 123108, or on the bombardier's circuit breaker panel in airplanes ser No. 123110 through 124208.

b. To stop the equipment pull out the circuit breaker.

4–124B. OPERATION OF THE SONOBUOY RECEIVER EQUIPMENT.

a. Start equipment.

b. After the airplane has taken off, remove the antenna plug which is in the floor and to the left of the periscope by twisting the handle counterclockwise one quarter of a turn.

CAUTION

The sonobuoy receiver antenna can be installed in flight only, as it does not have clearance when the airplane is on the ground. Prior to landing, the antenna must be removed and stowed in the receptacle aft of the compartment door. The antenna plug must then be installed in place of the antenna.

c. Install the sonobuoy receiver antenna in the floor receptacle and secure by twisting the handle clockwise one-quarter turn.

d. On the bombardier's C-174/AIC-4 intercommunication control, set the RECEIVER selector to "SONO".

e. After allowing several minutes for warm-up, set the controls on the sonobuoy receiver, R-332/ARR-31, as follows: AFC switch–"ON". Dimmer knob-rotate for desired illumination. BAND SWITCH selector "1" for

AN/CRT-1B sonobuoy reception; "2" for AN/SSQ-2 sonobuoy reception. TUNING crank–turn to color or number of desired sonobuoy.

f. Audio signal from selected sonobuoy will be heard in headphones when receiver is tuned properly.

g. Pilot may listen to sonobuoy receiver by setting the SONO-OUT switch on his MIXER control panel to "SONO".

Note

Volume of VHF, HF and sonobuoy receivers at each station may be adjusted by rotating control RADIO or RADIO VOL. knob at respective stations. Pilot's RADIO volume control does not affect the volume of range and navigation receiver signals.

4–125. SIMULTANEOUS OPERATION OF RECEIVERS. At pilot's station – any combination of receivers may be monitored by operating the appropriate MIXER console RECEIVER switch or the appropriate SENS control.

4–126. WIRE RECORDER (13-A-3-J or VRW-7)—PREPARATION FOR USE.

a. Open the cover and place a loaded spool on the left shaft with the wire feeding off the top.

b. Place an empty take-up spool on the right shaft.

c. Thread the wire over and around the upper guide pulley, through the recorder head groove, over and around the lower guide pulley, and under and around the take-up spool. Fasten the wire to the shank of the spool with transparent adhesive tape in order to prevent the wire from slipping.

d. Loosen the spool latch on the take-up spool and turn the spool in a counterclockwise direction by hand for several turns to make sure that the wire is firmly attached to the spool and that the supply spool follows.

e. Close the cover of the recorder head down over the wire. Close the latches to lock both spools on their shafts. Close cover over spools and recorder head, making sure it is locked securely by catches.

4–127. OPERATION OF WIRE RECORDER—AIRPLANES SER NO. 123088 THROUGH 124208.

a. Sonobuoy record – set controls for monitoring sonobuoy receiver at comfortable phone volume and depress bombardier's RECORD foot switch.

b. Bombardier's ICS record – operate bombardier's C-174/AIC-4 control TRANSMIT selector to "ICS", depress RADIO microphone and RECORD foot switches and talk into microphone.

c. Pilot ICS record – request bombardier via ICS to depress RECORD foot switch and talk into microphone.

Note

Bombardier's C-174/AIC-4 control ICS VOL knob should be adjusted for comfortable audio level before any ICS recording.

4–127A. OPERATION OF WIRE RECORDER—AIRPLANES SER NO. 124778 AND SUBSEQUENT.

a. Sonobuoy record—set controls for monitoring sonobuoy receiver at comfortable phone volume and depress radar operator's recording foot switch.

b. Radar operator's ICS record—operate radar operator's C-174/AIC-4 control TRANSMIT selector to "ICS", depress microphone and recording foot switches and talk into microphone.

c. Pilot ICS record—request radar operator via ICS to depress recording foot switch, set throttle microphone switch to ICS and talk into microphone.

Note

Radar operator's C-174/AIC-4 control ICS VOL knob should be adjusted for comfortable audio level before any ICS recording.

4–128. OPERATION OF TRANSMITTERS.

Note

These instructions are subject to local limitations regarding radio silence.

4–129. VHF TRANSMITTER (PART OF AN/ARC-1).

a. On the pilot's VHF console control operate the rotary selector switches as follows: for transmission on any one of the nine main channels, use position "MAIN T/R" or "BOTH" and rotate the channel switch to the desired channel; for transmission on the GUARD channel use position "GUARD". The position of the CHANNEL SELECTOR switch need not be considered.

b. At desired station operate RADIO-ICS control TRANSMIT and RECEIVER selector switches to "VHF" position.

c. Operate appropriate microphone switch and talk into microphone. Appropriate microphone switches are as follows: pilot–"RAD" position on throttle switch, radar operator – foot switch, bombardier – "RADIO" foot switch.

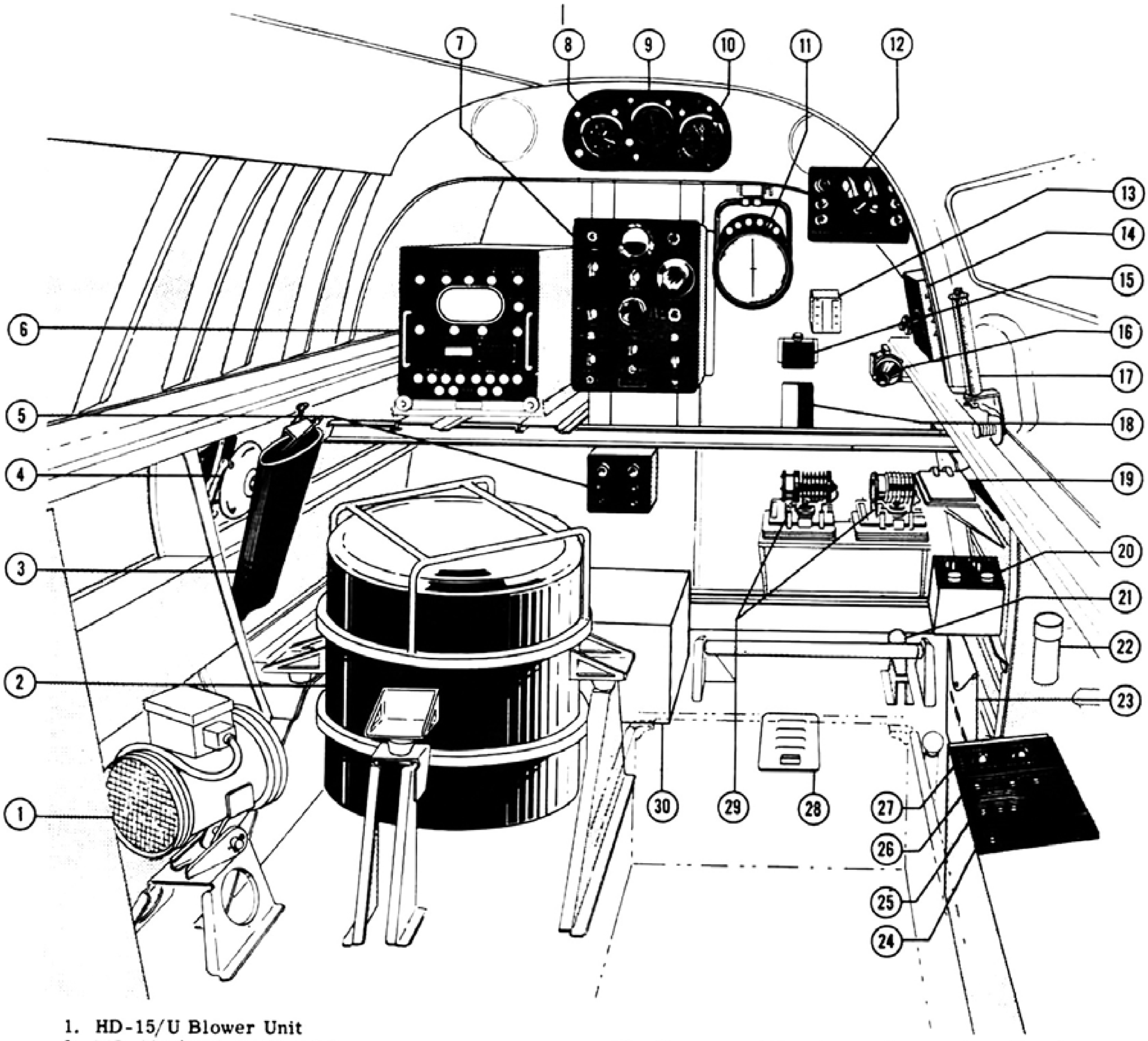
4–130. HF TRANSMITTER (PART OF AN/ARC-2).

a. Select desired channel by rotating pilot's HF console CHANNEL selector.

b. At desired station operate RADIO-ICS control TRANSMIT and RECEIVER selectors to "HF" position.

c. Operate appropriate microphone switch as in paragraph 4—115, and talk into microphone.

d. For bombardier to transmit on CW or MCW call pilot and tell him to rotate the RT-91/ARC-2 transmitter EMISSION selector switch to "CW" or "MCW", the CHANNEL selector to desired channel, and the POWER switch to "ON". Operate telegraph key. In airplanes 124778 and subsequent, bombardier may transmit on cw or mcw by means of the HF EMISSION SEL switch aft of the telegraph key after requesting pilot to select desired channel on HF control panel.

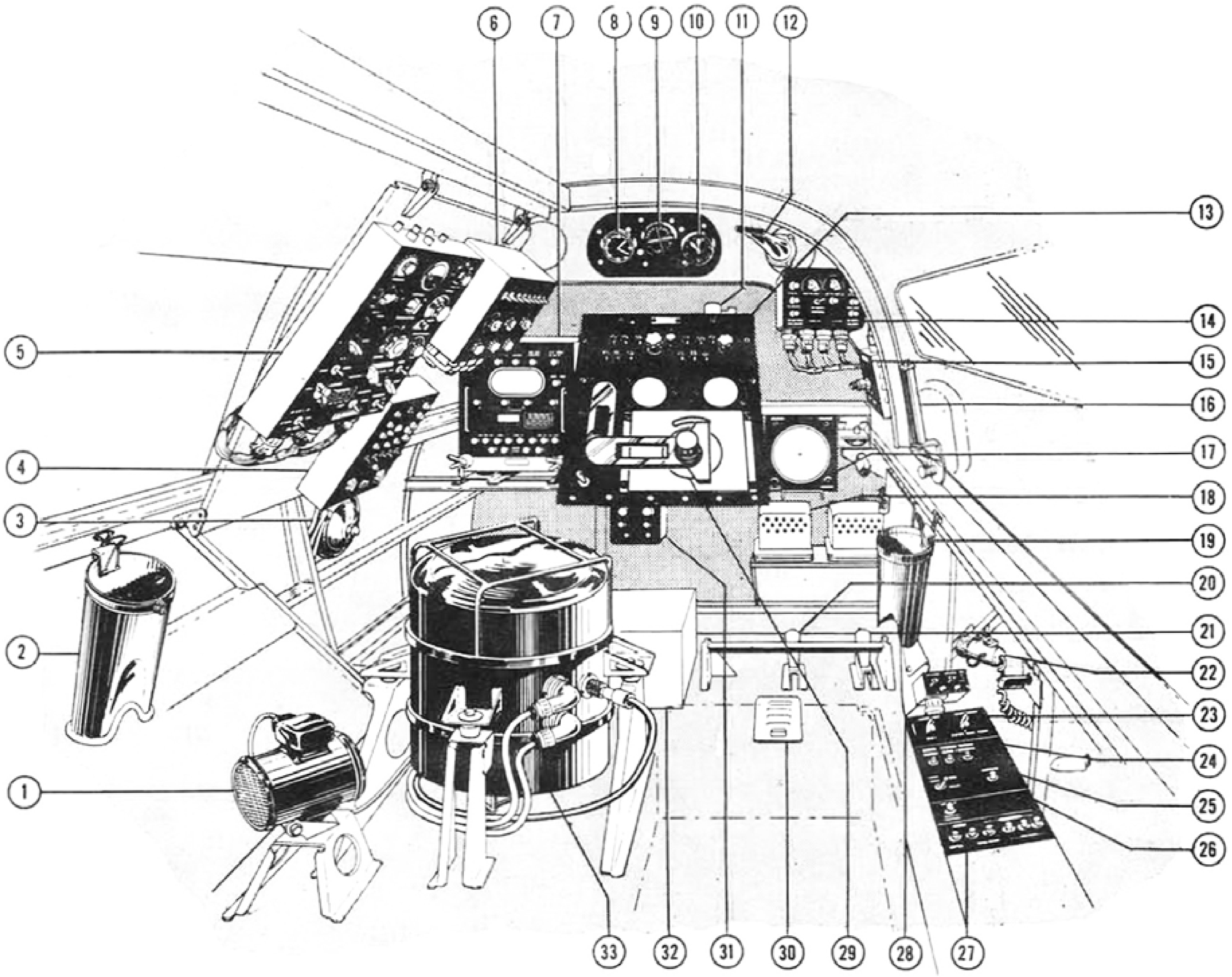


1. HD-15/U Blower Unit
2. MD-60A/APS-31 Modulator
3. MX-511/APS-31 Visor
4. Bail-out Warning Bell
5. AN/APS-31 Radar Relay Box
6. SN-36A/APS-31 Synchronizer
7. C-289A/APS-31 Control Unit
8. Altimeter
9. Compass Repeat Indicator
10. Elapsed Time Clock
11. ID-162A/APS-31 Indicator
12. C-56A/APX-2 IFF Control
13. Automatic Pilot Transformer
14. TF-106A/U Variable Auto-transformer (AN/APS-31 Equipment)
15. J-164/APS-31 Junction Box
16. Heating and Ventilating System Face Nozzle
17. Hatch Locking Lever
18. A-C Terminal Panel
19. Writing Pad Holder
20. C-174/AIC-4 Radio - ICS Control Unit
21. Radio (Microphone) Foot Switch
22. Utility Light
23. Map Case
24. 115 Volt A-C Utility Receptacle Circuit Breaker
25. Electrical Circuit Breaker Panel
26. Radar Circuit Breaker Panel
27. Interior Lights Control Panel
28. Heating and Ventilating System Floor Register
29. D-C Voltage Regulators
30. Type D-1 Power Unit (Type F2A-1a Flasher)

NOTE

The CX-922/AR microphone cord assembly, 13A-3-J wire recorder, and SA-3A/A IFF impact switch, not shown in this illustration, are mounted on the aft bulkhead of this compartment.

Figure 4—2. Second Compartment—Forward, Airplanes Ser No. 123088 through 124208



1. HD-15/U Blower Unit
2. MX-511/APS-31 Visor
3. Bail-out Warning Bell
4. C-532/ARR-27 Radar Receiver Control Box
5. C-729/APS-31A Search Radar Control Box
6. C-610/ARR-26 Sonobuoy Receiver Control Box
7. SN-36A/APS-31 Search Radar Synchronizer
8. Altimeter
9. Compass Repeat Indicator
10. Elapsed Time Clock
11. PP-44/ARR-27 Radar Relay Receiver Power Supply
12. Heating and Ventilating System Face Nozzle
13. PT-108/ARR-26 Sonobuoy Receiver Indicator - Plotter Housing
14. C-56A/APX-2 IFF Control Box
15. TF-106A/APS-31 Search Radar Variable Autotransformer
16 Hatch Locking Lever
17. IP-41/ARR-27 Radar Receiver Range Azimuth Indicator
18. D-C Voltage Regulators
19. MX-927/ARR-27 Visor
20. Record Foot Switch
21. Radio (Microphone) Foot Switch
22. Utility Light
23. Instrument and Console Lights Control Panel
24. Lights and Utility Receptacle Circuit Breaker Panel
25. Radar Circuit Breaker and Main Inverter Switch Breaker Panel
26. Utility Receptacle - 115 Volts AC
27. Radar Relay Receiver and Sonobuoy Receiver Circuit Breaker Panel
28. C-174/AIC-4 Radio - ICS Control Box
29. ID-162A/APS-31 Search Radar Indicator
30. Heating and Ventilating System Floor Register
31. AN/APS-31A Search Radar Relay Box
32. Type D-1 Power Unit (Type F2A-1a Flasher)
33. MD-60A/APS-31 Search Radar Modulator

NOTE

The CX-922/AR microphone and cord assembly, 13A-3-J or VRW-7 wire recorder, and SA-3/A IFF impact switch, not shown in this illustration, are mounted on the compartment aft bulkhead.

Figure 4—2A. Second Compartment—Forward, Airplanes Ser No. 124778 through 124848

Note

In airplanes ser No. 123088 through 124208 selection of voice, cw or mcw transmission may be made from the EMISSON switch on the face of the RT-91/ARC-2 transmitter-receiver behind and to the right of the pilot's seat provided the POWER switch on this unit is set at "ON". In airplanes ser No. 124778 and subsequent, selection of voice, cw or mcw transmission may be made from the HF EMISSION SEL switch on the pilot's HF control panel provided the ON-OFF switch on this panel is set at "ON".

4—131. OPERATING PRECAUTIONS.

4—132. The LF REC-NORMAL switch on the face of the RT-91/ARC-2 HF transmitter-receiver must be in the "NORMAL" position when radio silence tuning is employed and must be in the "LF REC" position for operation of the R-23/ARC-5 range receiver.

4—133. To turn the AN/ARC-2 HF equipment off, *press* whichever rotary ON-OFF or POWER switch is in the "ON" position. DO NOT ATTEMPT TO *ROTATE* THIS SWITCH TO THE "OFF" POSITION.

4—134. In the event that emergency shut-down of any particular equipment is required, pull out (off) the associated circuit breaker.

4—135. When operating the transmitters, allow at least one minute for the vacuum tubes to heat after turning the battery and radio master switches "ON" before operating any microphone switch or telegraph key.

4—136. EMERGENCY OPERATION.

4—137. In the event of failure of the AN/AIC-4 control system the following equipments may be locally operated by the following crew members, providing phone extension cords and microphones are available.

VHF (AN/ARC-1)–Radar operator and bombardier.

HF (AN/ARC-2)–Pilot.

RANGE (AN/ARC-5)–Pilot.

NAVIGATION (AN/ARR-2A)–Pilot.

SONOBUOY RECEIVER (AN/ARR-31)–Radar operator and bombardier.

WIRE RECORDER (13-A-3-J)–Radar operator and bombardier.

4—138. PILOT'S CHECK-OFF LIST.

4—139. BEFORE TAKE-OFF.

a. Radio Master switch – "ON".

b. Transmitter and receiver channels set or tuned to control tower frequency, and associated radio-ICS control switches selected.

c. Call control tower for clearance.

4—140. AFTER LANDING. Radio Master switch – "OFF".

4—141. IFF, RADIO ALTIMETER, AND RADAR EQUIPMENT.

4—142. IFF EQUIPMENT.

4—142A. AN/APX-2 EQUIPMENT.

4—142B. PURPOSE.

4—142C. The two basic purposes of the equipment are to enable the aircraft in which it is installed:

a. To identify itself as friendly when it is challenged by appropriately equipped air, ship, and ground forces.

b. To challenge appropriately equipped aircraft and ships for identification.

4—142D. Two supplementary purposes of the equipment are to enable the aircraft in which it is installed:

a. To serve as a beacon on which other appropriately equipped aircraft can "home".

b. To navigate by means of beacons—a purpose that will normally require the use of associated equipment, such as the radar equipment.

4—142E. OPERATION.

a. To start the equipment—rotate the pilot's IFF control selector switch clockwise away from the "OFF" position and set it in the desired operating position.

b. Turn radar operator's C-56/APX-2 control code SELECTOR switch to channel "1". Unless otherwise directed leave code SELECTOR switch on channel "1".

c. To operate the "G" band—Place pilot's IFF control switch to "CONT" for continuous operation or "TEMPRY" for momentary operation.

d. For distress operation—rotate pilot's IFF control selector switch to extreme right, past guard marked PUSH, to "EMERGENCY" position.

e. To destroy transmitter-receiver unit—raise red guard cover marked "DESTRUCT" and place switch in "ON" position.

f. Further operating procedures—consult existing regulations covering operation of IFF equipment.

4—142F. AN/APX-6 EQUIPMENT—AIRPLANES SER NO. 123110 AND SUBSEQUENT.

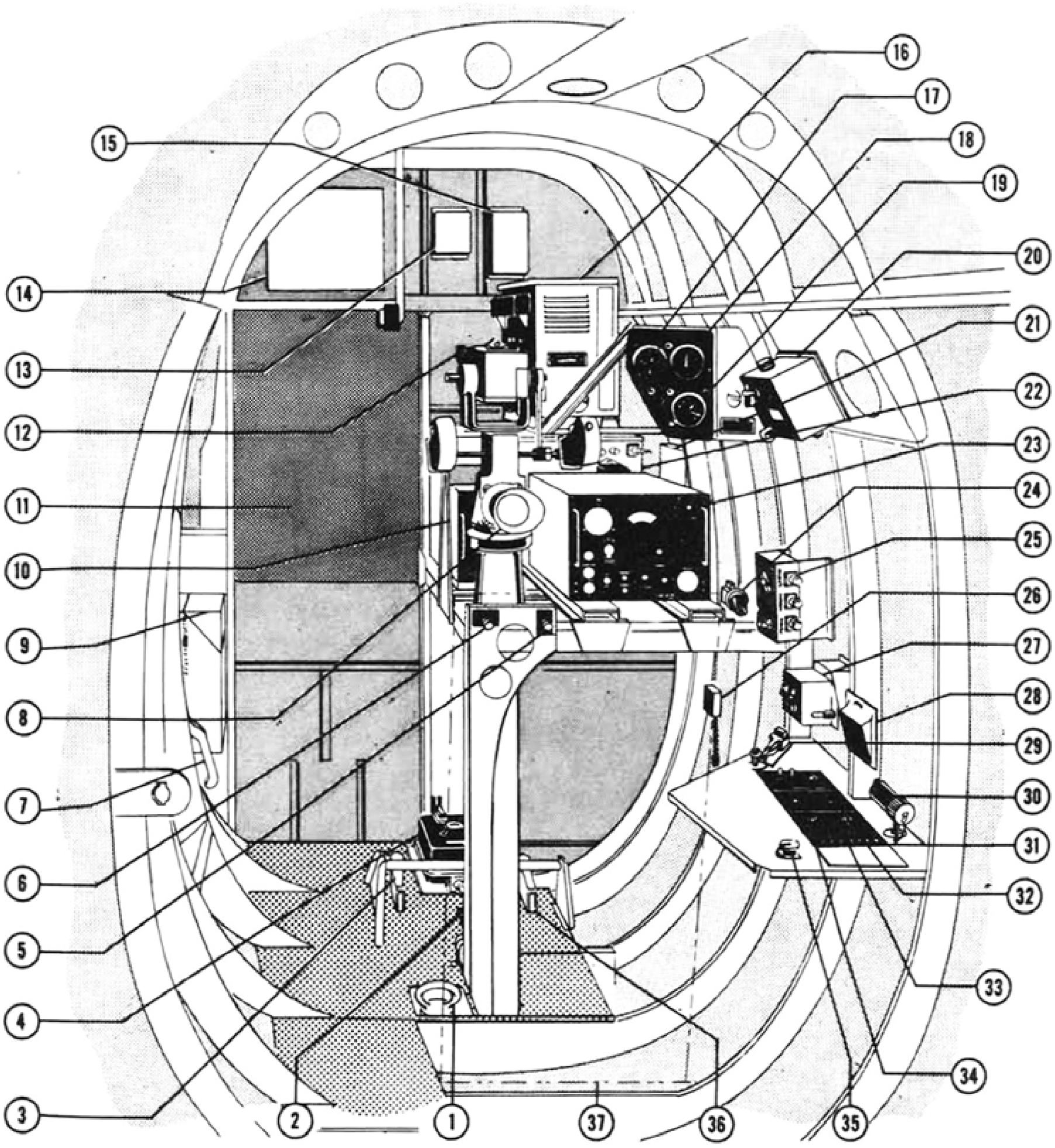
4—142G. PURPOSE.

4—142H. The Radar Identification Set AN/APX-6 is an airborne transpondor and is one of several equipments which may be operated together to provide a system of electronic identification and recognition. The purposes of the AN/APX-6 are:

a. To identify the airplane in which it is installed as friendly when correctly challenged by an interrogator-responsor associated with friendly shore, shipboard and airborne radars.

b. To permit surface tracking and control of aircraft in which it is installed.

4—142J. Functionally, the AN/APX-6 receives challenges, which are initiated by an interrogator-responsor, and transmits replies back to the interrogator-responsor, where the replies are displayed, along with the associated radar targets, on the radar indicators. When a radar target is accompanied by a proper IFF reply, as transmitted by an AN/APX-6, that target is considered friendly.

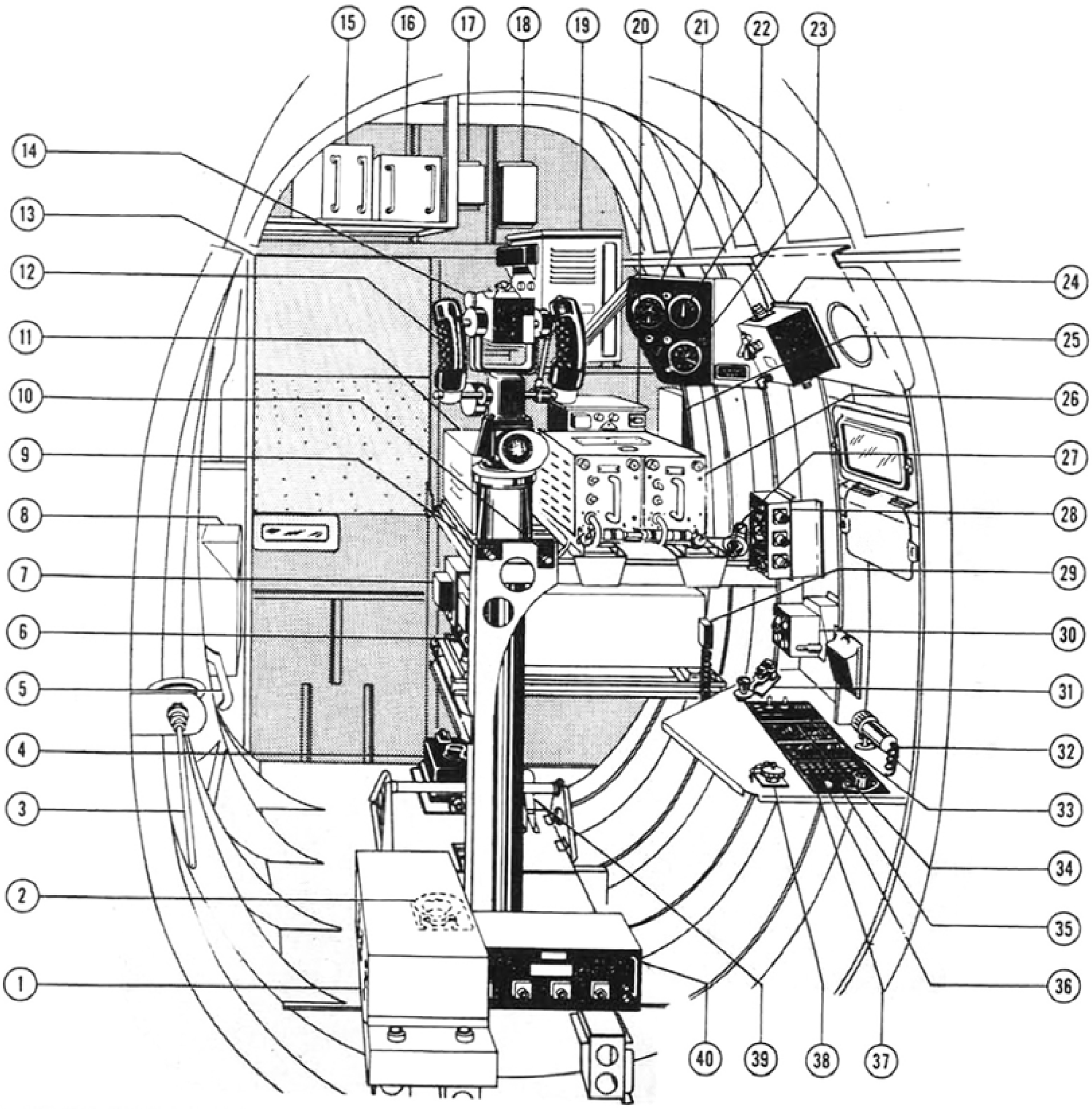


1. AT-3A/ARR-3 Sonobuoy Receiver Antenna (Installed)
2. Heating and Ventilating System Floor Register
3. Record (Wire Recorder) Foot Switch
4. CN-51/APS-31 Gyroscope Unit
5. Torpedo Ready-for-Release Indicator Light
6. Bomb Bay Door - Open Indicator Light
7. Door Emergency Jettison Lever
8. MK 41 Mod 3 Periscope
9. First Aid Kit
10. PP-32/AR Sonobuoy Receiver Power Supply
11. Passageway to Radar Operator's Compartment
12. MK 23 Mod 6 Bomb Sight
13. F-65/A Antenna Filter
14. Searchlight Amplifier
15. F-66/A Antenna Filter
16. RT-82/APX-6 IFF Transmitter-receiver
17. Searchlight Indicator
18. Air Speed Indicator
19. Altimeter Indicator
20. MK 10 Mod 0 Bomb Sight Control Box
21. Radio Terminal Panel
22. RT-24A/APX-2 IFF Transmitter-receiver
23. R-332/ARR-31 Sonobuoy Receiver
24. Heating and Ventilating System Face Nozzle
25. K-25A Camera Timer Control
26. CX-922/AR Microphone and Headset Cord Assembly
27. C-174/AIC-4 ICS Control
28. Ash Receiver
29. Telegraph Key
30. Utility Light
31. Electric Circuit Breaker Panel
32. Searchlight Switch Panel
33. Interior Lights Control Panel
34. Camera and Flasher Control Panel
35. Electric Utility Receptacle
36. Radio (Microphone) Foot Switch
37. Bombardier's Seat

NOTE

The RT-7/APN-1 radio altimeter, transmitter-receiver and RT-18A/ARC-1 VHF transmitter-receiver, not shown on this illustration, are located in the aft section of this compartment.

Figure 4—3. Aft Compartment—Forward, Airplanes Ser No. 123088 through 124208



1. RT-18A/ARC-1 VHF Transmitter-Receiver
2. AT-3A/ARR-3 Sonobuoy Receiver Antenna (Installed)
3. AT-3A/ARR-3 Sonobuoy Receiver Antenna (Stowed)
4. CN-51/APS-31 Search Radar Gyroscope Unit
5. Door Emergency Jettison Lever
6. KY-42/ARR-27 Radar Relay Receiver Video Decoder
7. R-267/ARR-27 Radar Relay Receiver
8. First Aid Kit
9. Bomb Bay Door - Open Indicator Light
10. Torpedo Ready-for-Release Indicator Light
11. PP-389/ARR-27 Radar Relay Receiver Power Supply
12. MK 41 Mod 3 Periscope
13. Passageway to Second Compartment
14. MK 23 Mod 6 Bomb Sight
15. Searchlight Amplifier
16. PP-468/ARR-26 Sonobuoy Receiver Power Supply
17. F-65A Antenna Filter
18. F-66A Antenna Filter
19. RT-82/APX-6 IFF Transmitter-Receiver
20. RT-24A/APX-2 IFF Transmitter-Receiver
21. Searchlight Indicator
22. Airspeed Indicator
23. Altimeter Indicator
24. MK 10 Mod 0 Bomb Sight Control Box
25. Radio Terminal Panel
26. R-316/ARR-26 Sonobuoy Receiver
27. Heating and Ventilating System Face Nozzle
28. K-25A Camera Timer Control Box
29. CX-922/AR Microphone Cord Assembly
30. C-174/AIC-4 ICS Control Box
31. Telegraph Key
32. Utility Light
33. Camera and Flasher Control Panel
34. Searchlight Switch Panel
35. Interior Lights Control Panel
36. Electric Circuit Breaker Panels
37. HF Emission Selector Switch and A-C Utility Receptacle Panel
38. D-C Utility Receptacle
39. Radio (Microphone) Foot Switch
40. RT-7/APN-1 Radio Altimeter Transmitter-Receiver

Figure 4—3A. Aft Compartment—Forward, Airplanes Ser No. 124778 through 124848

4–142K. OPERATION.

4–142L. All controls required for operation of the AN/APX-6 equipment are located on Radar Set Control C-544/APX-6. This unit is located on the pilot's right console. (See figure 1–7, item 29.) Operation is as follows:

a. To turn equipment on, rotate MASTER selector to "NORM".

b. To indicate emergency or distress, press red dial stop and rotate MASTER selector to "EMERGENCY".

c. To maintain the equipment ready for instant use but inoperative, rotate the MASTER selector to "STDBY".

d. The detent position labeled "LOW" or the MASTER selector should not be used except upon proper authorization.

e. The switches labeled MODE 2 and MODE 3 should be set to their "OUT" positions unless otherwise directed by proper authority.

f. To explode destructors within the equipment, raise the switch guard labeled DESTRUCT and raise the switch handle to the "ON" position.

WARNING

Do not fire destructors unless the AN/APX-6 is in danger of falling into enemy hands. When in doubt about the security of the area you are forced to land in, fire the destructors.

g. To secure the equipment, rotate the MASTER selector to "OFF".

h. If destructors were fired during the flight, notify your Commanding Officer.

4–143. OPERATION OF RADIO ALTIMETER (AN/APN-1).

a. Rotate pilot's RADIO ALTITUDE indicator ON switch in a clockwise direction. After an interval of approximately one minute, the pointer of the indicator should move from its sub-zero position, indicating that the equipment is in operation.

b. Set the RANGE switch of indicator for required low or high range.

WARNING

The high range is not calibrated for and must not be used at altitudes below 400 feet. Under conditions of poor visibility always use low range when flying at an altitude below 600 feet.

c. Set the ALTITUDE LIMIT SWITCH for the desired preset altitude (altitude of reference for limit indicator operation).

4–144. OPERATION OF AN/APS-31 AND AN/APS-31A SEARCH RADAR.

Note

1.

Operation of the AN/APS-31 and -31A systems is identical except as noted in the following operating procedure.

2.

AN/APS-31 uses a C-289A/APS-31 control unit, and AN/APS-31A, a C-729/APS-31A control unit.

4–145. PRELIMINARY SETTING OF CONTROLS. Before starting the equipment, the POWER control should be in the "OFF" position. Make the following settings of controls:

a. Turn the MASTER BRILL and MKR BRILL controls on the indicator to their extreme counterclockwise position.

b. On airplanes ser No. 123088 through 124208, turn the GAIN control on the control unit to "0". On airplanes ser No. 124788 and subsequent, turn the CONTRAST-GAIN control to "0" for linear receiver operation and to "10" for logarithmic receiver operation.

c. Turn screwdriver BIAS control on the indicator to its extreme counterclockwise position.

d. Place GYRO switch in "CAGE" position.

e. Set MARKER control to "0" position, and DELAY switch to "NORM" position. Set TILT switch at "0" position, or to its optimum setting, provided that this setting is known.

f. Place SLOW-FAST switch in "SLOW" position, and pulse switch in "SHORT" position.

g. Place AFC-MAN switch in "AFC" position, and set RANGE control at position "10". Turn SCAN switch to position "1" and, on airplanes ser No. 123088 through 124208, set the ANTI-CLUTTER switch to "OFF". On airplanes ser No. 124788 and subsequent set the FUNCTION switch to "LOG" for logarithmic receiver operation.

Note

For linear receiver operation set the FUNCTION switch to "LIN". To reduce clutter and jamming effects for logarithmic or linear reception set the FUNCTION switch to "LOG FTC" or "LIN FTC" respectively.

h. Turn MAG CUR control on variable auto-transformer to about ¾ of its total range.

4–146. STARTING EQUIPMENT AND CHECKING OPERATION. Start equipment according to the following procedure:

a. Turn METER switch to "LINE" position.

b. Turn POWER switch to "STANDBY" position, and check that the line voltage is indicated somewhere within the green area marked on the meter face.

c. On airplanes ser No. 123088 through 124208, adjust the BIAS control on the indicator in a clockwise direction until the sweep lines are plainly visible on the indicator screen, then rotate the BIAS control in a counterclockwise direction until the sweep lines are barely visible. On airplanes ser No. 124788 and subsequent, for linear receiver operation, with the CONTRAST-GAIN control at "10" and the MASTER BRILL rotated fully clockwise, adjust the BIAS control until the sweep lines become invisible.

d. On airplanes ser No. 123088 through 124208, turn the GAIN on the control unit to position "5" and rotate the MASTER BRILL control on the indicator in a clockwise direction until noise appears on the indicator screen. On airplanes ser No. 124788 and subsequent, turn the GAIN control to position "5".

e. Adjust MKR BRILL control in a clockwise direction until the range markers appear at a desirable brilliance.

f. Check FOCUS control to see that the sweep lines and range markers appear sharp and clear. No further adjustment of this control should be necessary.

g. Place METER switch in "MAG" position, turn SCAN switch to position "2", and place POWER switch in "RUN" position. Adjust MAG CUR control on variable auto-transformer for 6 ma magnetron current, as read on the 0-20 scale of the meter.

CAUTION

PULSE switch must be in "SHORT" position and RANGE control below 60 for three minutes after magnetron current is indicated on meter. Failure to do this may cause damage to equipment.

h. Turn MAG CUR control back to zero, and place PULSE switch to "LONG"; adjust MAG CUR control on variable auto-transformer for 13.5 milliamperes, as read on the 0-20 scale of the meter mounted on the control unit. (If magnetron current is unsteady, turn MAG CUR control down until steady.) Turn MAG CUR control back down to zero, and place PULSE switch in "BEACON" position. Adjust MAG CUR to give 13.5 milliamperes on meter.

CAUTION

It is possible when switching from short pulse to long or beacon pulses, that the equipment will operate unstably. Therefore, when changing setting of PULSE switch, turn MAG CUR to zero, set PULSE switch, then adjust MAG CUR to proper value.

i. Set PULSE switch to "SHORT", and METER switch to "XTAL". The crystal current should be approximately 0.6 milliamperes, as read on the 0 to 1 scale of the meter, and should hold steady at this point. At this time, signals should appear on the indicator screen. If no signals appear on the indicator, observe if alternate bright and dull sectors are visible on the indicator while the crystal current is unsteady and varies in a pulsating manner. This condition is caused by the afc circuit not locking in, and further adjustment of the afc circuit is necessary.

j. Turn POWER switch to "STANDBY" set PULSE switch to "LONG", and POWER switch to "RUN". Crystal current should be approximately 0.6 ma on the 0 to 1 scale and should hold steady at this point. Signals should appear on the indicator screen.

Note

Crystal current may vary in flight ±0.1 ma about the nominal value of 0.6 ma.

k. Turn PULSE switch to "BEACON". The meter should read between 0.125 and 1.0 ma on the 0 to 1 scale and hold steady.

l. Return PULSE switch to "SHORT", place AFC-MAN switch at "MAN", and adjust TUNING control for best signals. No difference should be observed in the signals as seen on the indicator, and the crystal current should be approximately the same as it was in "AFC" position. If any difference between "AFC" and "MAN" positions is observed, adjustment of the equipment is necessary.

m. Set POWER switch to "STANDBY", PULSE switch to "LONG", and set POWER switch to "RUN". Repeat step l. with PULSE switch set at "LONG".

n. Place PULSE switch at "BEACON", with AFC-MAN switch to "MAN". Observe the setting of the TUNING control. Vary TUNING control slightly while observing the meter, to determine whether the control was set for maximum crystal current. If it is impossible to adjust the TUNING control for maximum crystal current within the range of this control in either "SHORT", "LONG", or "BEACON" positions of PULSE switch, adjustment of the equipment is necessary.

o. Check MARKER control by rotating it from 300 degrees through 0 to 60 degrees, and observe that a luminous line (azimuth-marker line) appears on the indicator, moving from left to right, and disappears as the MARKER control is rotated beyond 60 degrees.

p. On airplanes ser No. 123088 through 124208, set RANGE control at "SEARCH 0-200" and PULSE switch to "LONG". Vary DELAY control from "MIN" to "MAX" position and observe that the DELAY marker line varies from the bottom to the top of the indicator screen and that range marker lamps "50" and "D" are illuminated. On airplanes ser No. 124778 and subsequent, set RANGE control at "SEARCH 0-200" and PULSE switch to "LARGE". With the ALT. DEL-TD switch at the "TD" position, vary DELAY control from "MIN" to "MAX" position while observing that the TD marker varies from 0 to 200 miles and that the 50 mile range marker lamp is illuminated.

q. Set RANGE control at "10"; place DELAY control in "OC" position and observe that a blank area approximately 1.5 nautical miles in range, from the previ-

ous starting of the sweep, appears on the indicator screen. Return DELAY control to "NORM" position. Equipment is now ready for normal search operation.

Note

Pilot's indicator operation is same as radar operator's.

4–147. OPERATION OF RADAR RELAY RECEIVER (AN/ARR-27).

Note

This equipment can be used only when the AN/APS-20C search radar and AN/ART-26 radar relay transmitter equipments installed in AF-2W or other aircraft are operating.

a. On the C-532/ARR-27 control unit, set the ON-OFF switch to "ON".

b. Wait approximately 30 seconds for a display to appear on the IP-41/ARR-27 range azimuth indicator and then set the ANT switch to its number "1" position.

c. Set the RANGE switch to the "200 MI" position. This provides five 40-mile range markers on the indicator screen. Change the switch setting to the "50 MI" position (five 10-mile range markers provided) if a shorter range is needed.

d. Set the MAN GAIN — AUTO switch to its "AUTO" position. The switch should be left in this position during the entire time the equipment is in tactical operation.

e. Set the CHANNEL selector switch to the frequency corresponding to the frequency upon which the AN/ART-26 equipment is transmitting.

f. Hold the TUNE switch in either the up or down position until maximum needle deflection is observed on the TUNE FOR MAXIMUM meter above the switch.

g. On the IP-41/ARR-27 range azimuth indicator set the controls as follows:

FOCUS control—turn the milled wheel protruding from the right side of the indicator case until the thinnest possible trace on the indicator screen is obtained.

SCALE ILLUMINATION control—turn knob until desired amount of light illuminating the radial azimuth scale is obtained.

BIAS control—turn screw driver adjustment until desired intensity of the range sweep trace in the absence of range marks or target indications is obtained.

RANGE MARK INTENSITY control — turn screw driver adjustment until the desired range marker intensity is obtained.

BRILLIANCE control—turn control knob to regulate the video gain within the indicator and to adjust for the desired intensity contrast between target indications and background on display.

h. Set the FTC — NORMAL switch on the C-532/ARR-27 control unit to its "NORMAL" position except when interference or jamming is intense.

Note

For interfering or jamming signals having relatively low frequencies (less than approximately 5000 cps) the switch may be set to its "FTC" (fast time constant) position to make response of the video portion of the equipment negligible to these frequencies, thus reducing the jamming effect of the interfering signals.

SECTION V
EXTREME WEATHER OPERATION

5—1. COLD WEATHER.

5—2. GENERAL. The most important single factor for successful cold weather operation is the proper oil dilution in preparation for the next engine start. (See paragraph 5—9 for oil dilution procedure.)

5—3. PREFLIGHT.

a. Unfasten the engine cover as necessary (do not remove) and insert two heater ducts into the lower part of the engine cowling. Direct hot air flow for the most uniform heating of the cylinders. Place one heater duct in the engine accessory compartment. Allow engine to warm up approximately 30 minutes to five hours depending on the intensity of coldness and percentage of oil dilution.

b. Remove all ice and snow or frost from propeller, wings and tail surfaces. This is extremely important. Any alteration of the aerodynamic surface contours will decrease lift and increase the stalling speed.

c. Check to see that all static air orifices, the pitot head orifice, fuel tank vents, etc., are clear.

d. Check to see that the tires are not frozen to the ground. Thaw out the brakes by directing heater ducts against them.

e. Clean the shock struts and check them for proper inflation. Remove any ice or snow from all landing gear actuating cylinders.

Note

If possible, the aircraft battery should be left in a warm place when not in use. Extreme cold lowers the battery's available output and it may be destroyed if allowed to freeze.

5—4. PRESTARTING.

a. Check engine stiffness by attempting to pull propeller through by hand, to determine whether sufficient heat has been applied to thaw out engine.

b. Remove external heater ducts and engine cover and check cowling.

c. Pull propeller through several revolutions.

5—5. STARTING ENGINE.

a. Open cowl flaps.

b. Prime engine depending on severity of cold.

c. Check carburetor air control switch for "DIRECT" position.

d. Start engine in the normal way as described in paragraphs 2—8 and 2—14.

e. If engine does not start, the most likely cause, provided that the fuel and ignition systems are functioning properly, is: that the engine is not turning over fast enough, or there is moisture condensation on the spark plug electrodes due to the cold. Remove one spark plug from each cylinder and dry electrodes. Try to start the engine immediately after installing the spark plugs.

f. If, after starting engine, backfiring occurs, continue to prime until the engine runs smoothly. If the engine fails to start due to over priming (flooded), place the mixture control in the "IDLE CUT-OFF" position, open the throttle fully and crank the engine over for about five seconds with the switch off to clear out the engine. Then repeat the normal starting procedure.

g. Check the oil pressure after the engine has started. If the oil pressure does not come up after 30 seconds, shut down immediately and investigate.

h. Check the lines to the oil pressure gage. Check the oil system for blown lines or a cracked oil cooler. Check the oil tank for quantity. Direct an external heat duct beneath the sequence valve around the oil-in line drain valve to loosen any congealed oil and to melt any ice that may have formed.

i. If oil pressure remains high, idle at a low rpm until the temperature is high enough to allow the pressure to drop.

j. Warm up the engine with carburetor air switch in the "ALTERNATE" position after engine is firing smoothly. This permits preheated air to assist vaporization and combustion. Be sure to switch back to "DIRECT" before take-off.

k. Check the instruments for proper operation.

l. Operate the wing flaps through at least one cycle.

m. Check all controls and tabs for proper operation.

n. When the engine is warm, run a complete magneto check and check the propeller for governing.

5—6. TAKE-OFF.

a. If the runway is slippery maintain direction by the use of the rudder alone. Adjust the cowl and oil cooler flaps to maintain the desired operating temperatures.

b. If icing conditions are encountered, set carburetor air switch to "ALTERNATE" and turn pitot heat "ON".

c. The heating system should not be operated until the airplane is airborne.

5—7. FLIGHT. Check the manifold pressure and engine operation in general for any sign of carburetor icing.

5—8. LANDING.

a. Power approaches are recommended at all times to prevent the cylinder head temperature from falling too

low. Carburetor alternate air should be used if icing conditions prevail.

b. Do not operate the brakes until the airplane is on the ground.

c. If runways are icy, use brakes with extreme caution.

d. Before shutting down the engine, dilute oil in accordance with paragraph 5—9.

e. Park aircraft in the most sheltered spot and install all covers. Keep the wheels on canvas or boards to prevent the tires from freezing to the ground. Tie down aircraft if high winds are anticipated.

5—9. OIL DILUTION. Difficult starting during cold weather operation is minimized by use of the oil dilution feature during the previous stopping of the engine.

CAUTION

The manually operated oil dilution shut-off valve in the accessories compartment must be opened to dilute the oil.

a. Operate engine at 1000 rpm.

b. Turn oil dilution switch to "ON".

c. Run engine at 1000 rpm for four minutes when using grades 1100 or 1120 oil.

d. Move mixture control to "IDLE CUT-OFF" position.

e. Hold oil dilution switch "ON" until engine stops.

CAUTION

Close and safey-wire the manually operated oil dilution valve in the accessories compartment after operation is completed.

5—10. TROPICS.

5—11. GENERAL. Aircraft engines require less priming and warm-up time prior to take-off in hot climates. The brakes should be used as little as possible to minimize the chances of damaging brakes and tires from the extreme heat generated. The air density is low in hot climates, requiring longer take-off runs than in normal temperatures.

5—12. PREFLIGHT.

a. Check the tires for blisters or deterioration. Remove all dust protection covers.

b. Be careful not to overprime.

c. Open cowl and oil cooler flaps fully for all ground operation.

d. Although the ground temperatures are high, do not take off until engine temperatures are up to normal. Avoid long periods of ground running if possible.

5—13. FLIGHT.

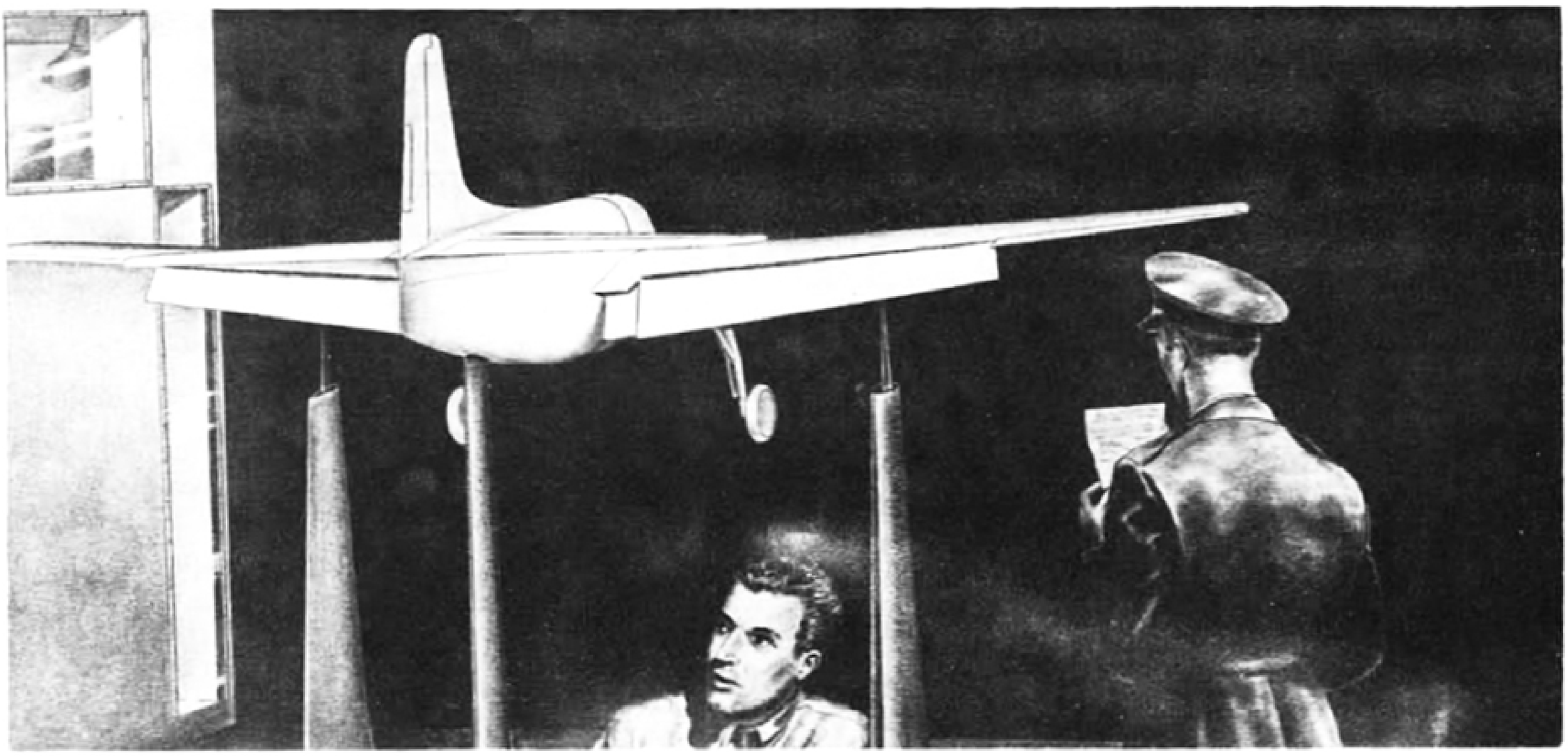
a. Remember that a longer ground run will be necessary for take-off than for normal weather operation.

b. Take off with all cowl flaps full open. During the climb, adjust cowl flaps for the desired cylinder head temperature. Keep oil cooler flaps open until cruising altitude is reached.

c. Climb at the specified speed as steeper climbs at lower air speeds may cause excessive engine temperatures. If the engine continues to overheat in a climb, reduce the climb angle and reduce power. Set the cowl flaps to the full open position. The mixture control lever must remain in the "RICH" position until cruising altitude is attained.

APPENDIX I

OPERATING CHARTS



A—1. FLIGHT CHARTS.

A—2. GENERAL. The charts in this Appendix contain information required for all flights within the operating range of the airplane. The performance data given in these charts is based on caluculations and is therefore subject to revision as further information becomes available. Fuel flows have been increased 15 per cent in calculating all airplane operating data.

A—3. TAKE-OFF, CLIMB AND LANDING CHART. Data given under "TAKE-OFF DISTANCE" is for optimum take-off, using take-off power and full flap deflection of 26 degrees. "CLIMB DATA" is based on normal rated (maximum continuous) power with zero flap deflection. Landing gross weight should be computed carefully before using the best IAS approach figures under "LANDING DISTANCE".

A—4. FLIGHT OPERATION INSTRUCTION CHARTS. These charts provide data for planning flight missions and tabulate ranges attainable versus fuel quantities available for cruising, and give power settings, speeds, and fuel flows at various altitudes. Column I shows power settings, air speeds, and fuel flow based on 100 per cent normal rated (maximum continuous) power. Columns II, III, and IV show progressively greater attainable ranges for decreased power settings, fuel flows, and air speeds. Column V tabulates power settings, fuel flow and air speeds for maximum range.

a. Subtract fuel allowances not available for cruising when using the range attainable figures. See figure A—6 for warm-up, take-off and climb fuel allowances.

b. Use chart (figure A—7 sheet 1 or sheet 2) only when the airplane gross weight is within the limits specified under "CHART WEIGHT LIMITS" in the title blocks. When the decreasing fuel load reduces the gross weight to a value within the weight limits included in the operating chart for the lower weight range (figure A—7), use the operating data in the corresponding column of the chart.

c. Air speeds given in any column of either chart are average speeds for the range between the listed weight limits. As fuel loads decrease below the maximum given on the chart, air speeds will rise accordingly above the average values.

CAUTION

The ranges given in the operating charts do not include allowances for wind, navigational errors or deviations from search missions for sonobuoy drop circles. See paragraph A—6 for a sample flight planning problem of a typical search triangle and sonobuoy trap circle.

A–5. FLIGHT PLANNING.

A–6. SAMPLE PROBLEM.

A–7. Determine the amount of fuel required for a 400 nautical mile search triangle at 5000 feet altitude and at the velocity for maximum range, interrupted when the radar detects a target 20 miles from the flight path. The target is then trapped by sonobuoys (five mile diameter trap) and sunk. These operations are performed at normal rated (maximum continuous) power. The airplane then returns at velocity for maximum range to the search triangle (allow 25 miles), and resumes the search mission.

A–8. SOLUTION. Assume that the fuel required will not exceed 2520 pounds, basing this assumption on a comparison of the range versus fuel load figures given in figure A–7. Note that the maximum fuel load given on sheet 2 is 2520 pounds; therefore, use this chart in determining level flight fuel consumption, air speed and power settings. Use the maximum gross weight of 20132 pounds, stated in "CHART WEIGHT LIMITS" (figure A–7, sheet 2), in determining climb fuel consumption from figure A–6, TAKE-OFF CLIMB AND LANDING CHART.

a. From figure A–6, Climb Data at 5000 feet:

Fuel used, from sea level	185 lb

b. From figure A–7, Sheet 2, Column V:

Distance–V max range (400 miles + 25 miles)	425 miles
V max range	134 knots
Time–V max range $\frac{\text{distance (425 miles)}}{\text{V max range (134 knots)}}$	3.17 hr
Fuel flow–V max range	385 lb/hr
Fuel used–V max range fuel flow x time (358 lb/hr x 3.17 hr)	1220 lb

c. From figure A–7, sheet 2, Column I:

Distance–V max continuous, from flight path to target and sonobuoy run (see paragraph A–7) diameter x pi (5 miles x 3.14) = 16 miles, 16 miles + 20 miles	36 miles
V max continuous	228 knots
Time, V max continuous $\frac{\text{distance 36 miles}}{\text{V max continuous 228 knots}}$	.158 hr
Fuel flow, max continuous	1602 lb/hr
Fuel used, V max continuous fuel flow x time (1602 lb hr x .158 hr)	263 lb

d. Adding a. b. and c:

Total fuel required (no reserve)	1668 lb
10% reserve	167 lb
Total fuel required to complete the mission including 10% reserve	1835 lb

The fuel required to complete the mission can be contained in the internal tanks.

Note

1.

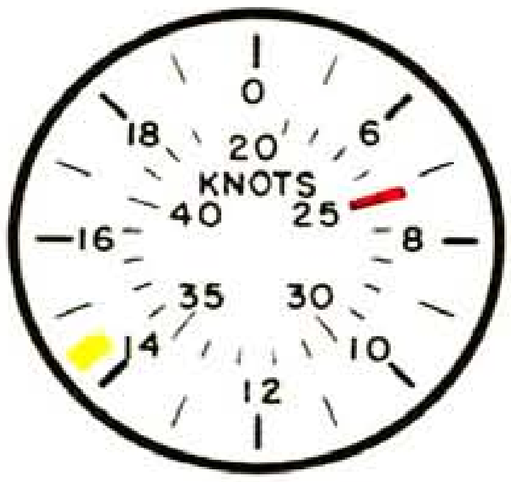
V max range is true air speed for maximum range.

2.

V max continuous is true air speed for normal

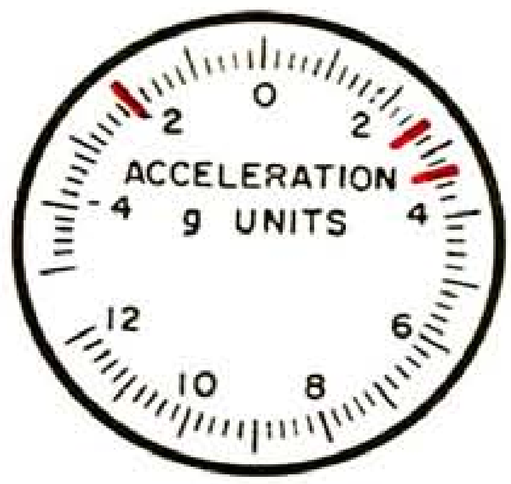
IAS (KNOTS)	CORRECTION	
	AIRSPEED CORRECTION (KNOTS)	ALTITUDE CORRECTION AT SEA LEVEL (FEET)
FLAPS AND LANDING GEAR DOWN		
75	- 2½	- 17
80	- 2½	- 18
90	- 2½	- 21
100	- 2½	- 23
FLAPS AND LANDING GEAR UP		
90	+2	+17
120	+2	+20
160	+2	+30
200	+2	+36
240	+2	+44
260	+2	+50

Figure A—1. Airspeed Correction Table



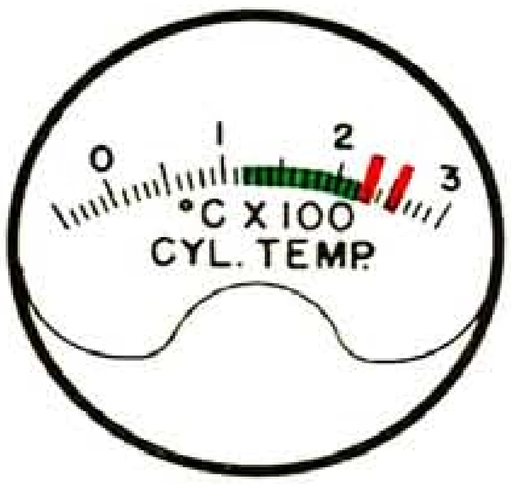
AIR SPEED INDICATOR

142 Knots	Maximum - Full Flaps (Landing Gear: Normal Extension - 175 Knots, Emergency Extension - 140 Knots)
250 Knots	Maximum Diving



ACCELEROMETER

3.5 G	Maximum at Design Gross Weight (Symmetrical Pull-outs)
2.67 G	Maximum at Design Gross Weight (Rolling Pull-outs)
-2 G	Maximum at Design Gross Weight (Push-overs only)



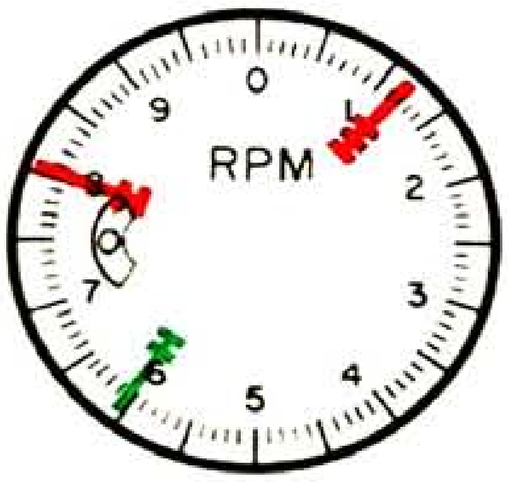
CYLINDER HEAD TEMPERATURE GAGE

120-232°C	Normal
232°C	Maximum at Normal Cruise or Normal Rated (Maximum continuous) Power
260°C	Maximum at Military Power (Limited to 30 Minutes) and Take-off Power (Limited to 5 Minutes)

HYDRAULIC PRESSURE GAGE

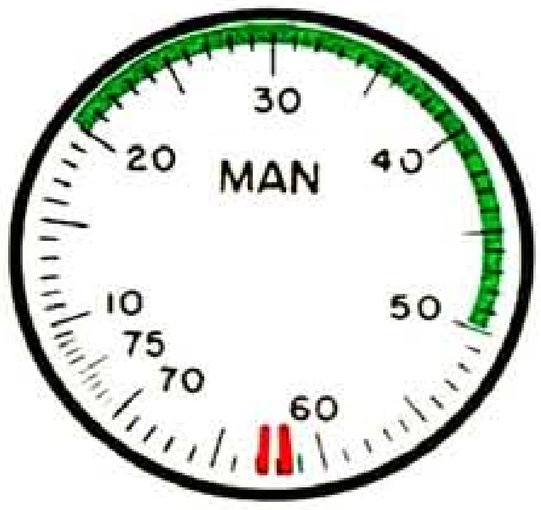
2700 - 3000 PSI	Normal
- 3250 PSI	Maximum

Figure A—1A. (Sheet 1 of 2 Sheets) Instrument Dial Markings



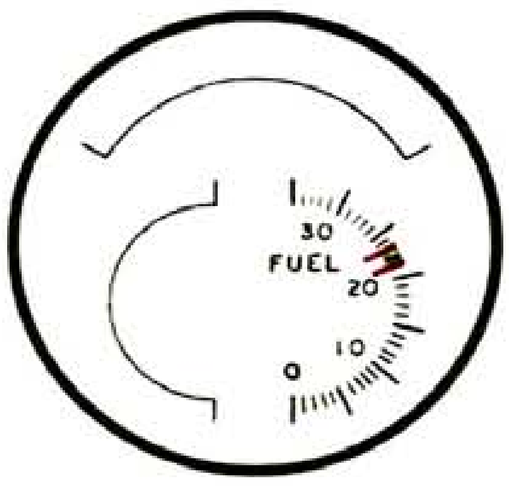
TACHOMETER

	2600 RPM	Maximum Continuous Power (operation above this rpm Limited)
	2800 RPM	Military Power (Limited to 30 Minutes)
	2800 RPM	Take-off Power - Rich Mixture (Limited to 5 Minutes)
	3120 RPM	Maximum Permissible Diving Speed (Limited to 30 Seconds)



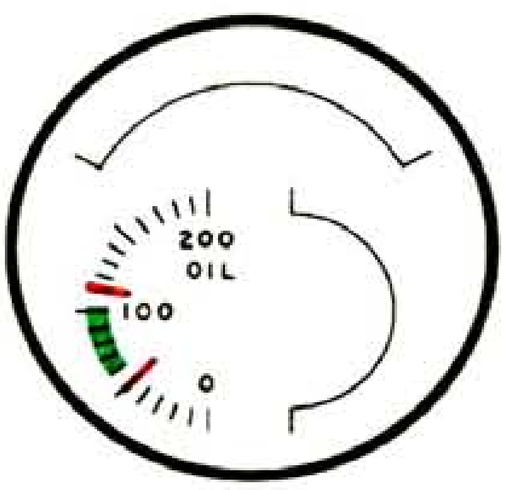
MANIFOLD PRESSURE GAGE

	20 In.	Minimum for Prolonged Flight - Normal Mixture
	50 In.	Maximum Continuous Power - Normal Mixture (operation above this Pressure Limited)
	61.5 In.	Military Rated Power (SL) - Normal Mixture (Limited) to 30 Minutes)
	62.5 In.	Take-off Power (SL) - Rich Mixture (Limited to 5 Minutes)



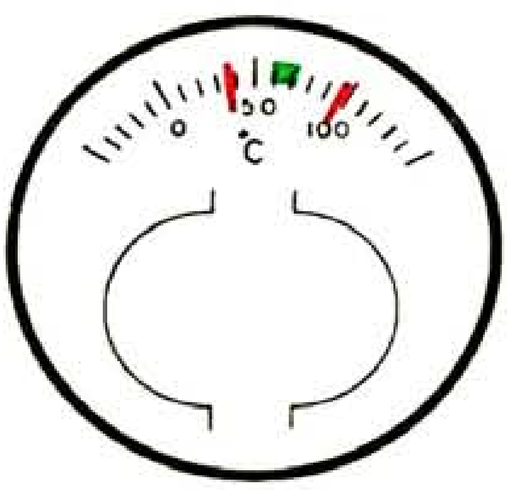
FUEL PRESSURE

	21 PSI	Minimum
	21 - 23 PSI	Normal
	23 PSI	Maximum



OIL PRESSURE

	50 PSI	Minimum for Flight (Minimum Idling - 25 psi)
	60 - 100 PSI	Continuous Operation
	110 PSI	Maximum



OIL TEMPERATURE

	40°C	Minimum
	60-75°C	Desired
	98°C	Maximum

Figure A-1A. (Sheet 2 of 2 Sheets) Instrument Dial Markings

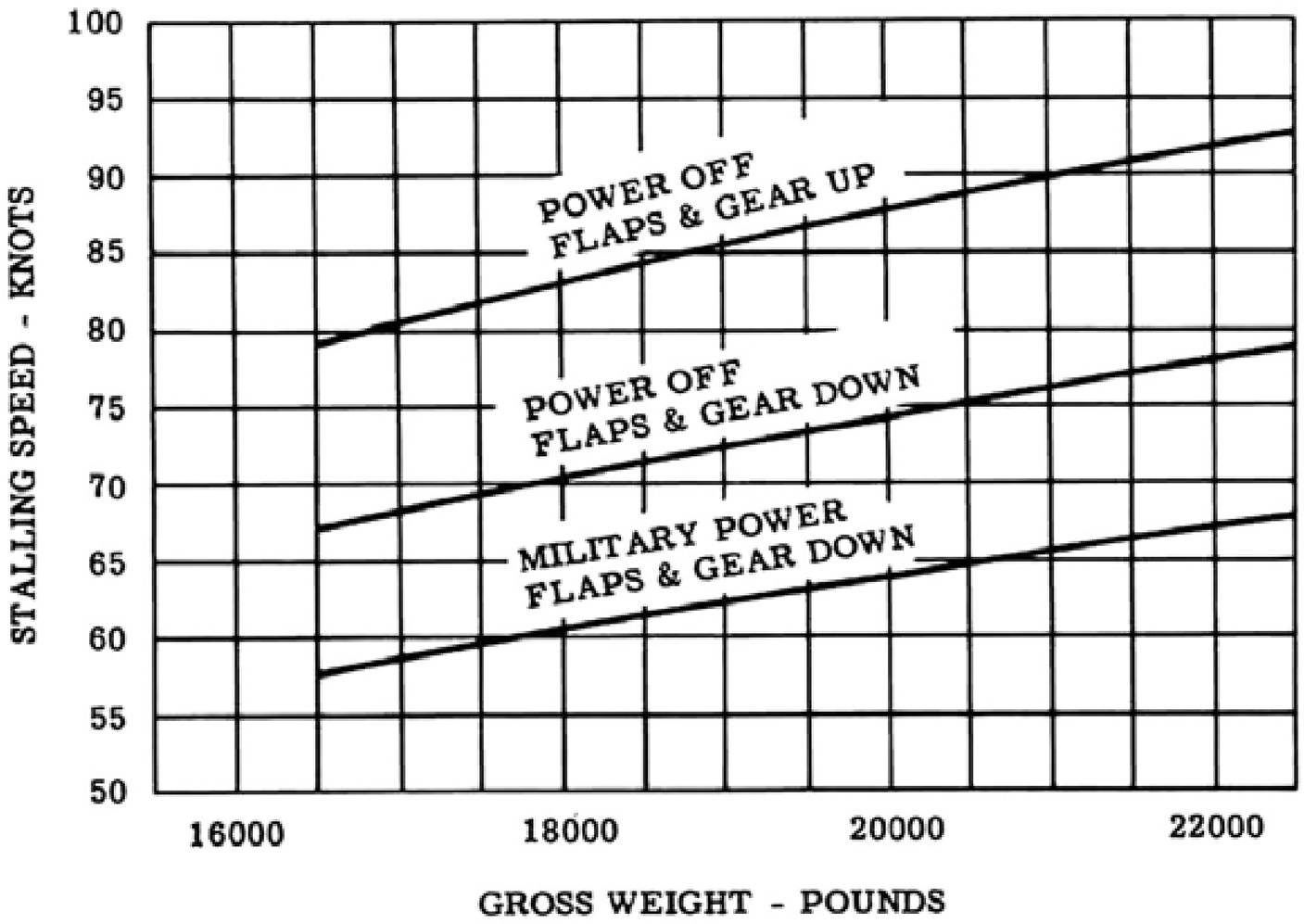


Figure A—2. Stalling Speed vs Gross Weight

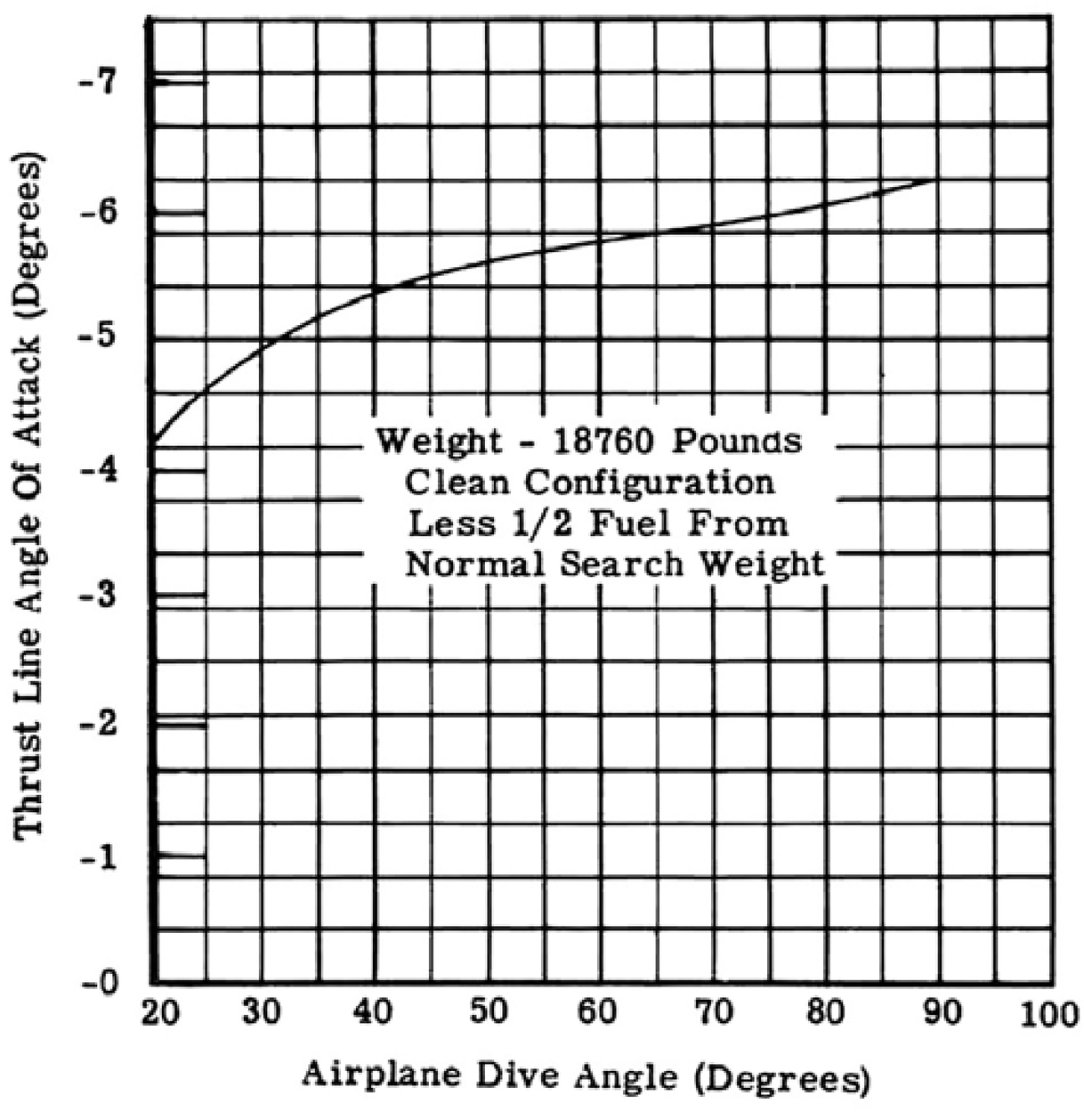


Figure A—3. Dive Angle vs Angle of Attack Curves

POWER PLANT CHART

AIRCRAFT MODEL: AF-2S

PROPELLER: HAMILTON STANDARD-4 BLADED-6557A-8

ENGINE MODEL: R-2800-48 PRATT & WHITNEY

GAUGE READING	FUEL PRESS.	OIL PRESS.	OIL TEMP.			
DESIRED	22	85	60°C to 75°C			
MAXIMUM	23	110	98 C			
MINIMUM IDLING	21 14	50 25				

MAXIMUM PERMISSABLE DIVING RPM: 3120
MINIMUM RECOMMENDED CRUISE RPM: (3)

OIL GRADE: (S) 1120 (W) 1100
FUEL GRADE: 115/145 (7)

WAR EMERGENCY (COMBAT EMERGENCY)			MILITARY POWER (NON-COMBAT EMERGENCY)			OPERATING CONDITION			NORMAL RATED (MAXIMUM CONTINUOUS)			MAXIMUM CRUISE (NORMAL OPERATION)		
NONE			30 MINUTES 260°			TIME LIMIT MAX. CYL. HD. TEMP.			UNLIMITED 232°			UNLIMITED 232°		
			NORMAL (6) 2800			MIXTURE R. P. M.			NORMAL (6) 2600			NORMAL (6) 2200		
MANIF. PRESS.	SUPER-CHARGER	FUEL (2) LB/MIN	MANIF. PRESS.	SUPER-CHARGER (4)	FUEL (2) LB/MIN	STD. TEMP. °C	PRESSURE ALTITUDE	STD. TEMP. °F	MANIF. PRESS.	SUPER-CHARGER (4)	FUEL (2) LB/HR	MANIF. PRESS.	SUPER-CHARGER (4)	FUEL (2) LB/HR
						-55.0 -55.0 -55.0	40,000 FT. 38,000 FT. 36,000 FT.	-67.0 -67.0 -67.0						
						-52.4 -48.4 -44.4	34,000 FT. 32,000 FT. 30,000 FT.	-62.3 -55.1 -48.0						
			F.T.		10.6	-40.5 -36.5 -32.5	28,000 FT. 26,000 FT. 24,000 FT.	-40.9 -33.7 -26.5	F.T.		540	F.T.		356
			F.T. F.T. F.T.		12.0 13.5 15.5	-28.6 -24.6 -20.7	22,000 FT. 20,000 FT. 18,000 FT.	-19.4 -12.3 - 5.2	F.T. F.T. F.T.		600 680 750	F.T. F.T. F.T.		400 430 462
			F.T. F.T. F.T.		18.0 20.5 22.8	-16.7 -12.7 - 8.8	16,000 FT. 14,000 FT. 12,000 FT.	2.0 9.1 16.2	F.T. F.T. F.T.		840 980 1100	F.T. F.T. 32.8		498 538 558
			F.T. F.T. F.T.		24.5 27.2 30.0	- 4.8 - 0.8 3.1	10,000 FT. 8,000 FT. 6,000 FT.	23.4 30.5 37.6	F.T. F.T. 50.0		1260 1390 1400	33.2 33.8 34.2		
			62.5 62.5 62.5		31.5 31.0 30.5(5)	7.1 11.0 15.0	4,000 FT. 2,000 FT. SEA LEVEL	44.7 51.8 59.0	50.0 50.0 50.0		1400 1390 1390(5)	34.9 35.7 36.4		(5)

GENERAL NOTES

(1) LBS/MIN: APPROXIMATE POUNDS PER MINUTE PER ENGINE.
(2) LBS/HR: APPROXIMATE POUNDS PER HOUR PER ENGINE.
F.T. MEANS FULL THROTTLE OPERATION.

FOR COMPLETE CRUISING DATA SEE APPENDIX I
NOTE: TO DETERMINE CONSUMPTION IN GALLONS DIVIDE BY 6. RED FIGURES ARE PRELIMINARY SUBJECT TO REVISION AFTER FLIGHT CHECK.

TAKE-OFF CONDITIONS: 2300 BHP 2800 RPM 260 C HEAD TEMP
RICH MIXTURE. (MAX 5 MIN) MANIF PRESS 62.5 IN. HG.

CONDITIONS TO AVOID: NONE

SPECIAL NOTES

(3) Mirimum RPM is based on generator cut-out speed plus 100 RPM.
(4) Single stage, single speed.
(5) Fuel consumption data are based on estimated values contained in the engine specification and are therefore subject to a possible ± 5% variation from values obtained in actual flight.
(6) If cylinder temperature limits cannot be maintained move mixture to RICH.
(7) Following limits are to be observed when using 100/130 fuel:
T.O. and Military — 56 in. Hg. 2800 RPM RICH for T.O.
NORMAL for Military,
NORMAL RATED — 47 in. Hg. 2600 RPM, NORMAL
MAX CRUISE — 44 in. Hg. 2600 RPM, NORMAL
Same as for 115/145 fuel.
(8) Max. cruise is defined as the maximum continuous power that can be used and still have the carburetor meter at the most economical fuel-air ratio. Higher powers up through normal rated may be used for continuous cruising but the fuel-air ratio becomes progressively richer resulting in greatly increased fuel consumption with a consequent marked reduction in range.

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Engine Spec N-8132-B dtd Dec. '49, Engine Calibration Curve No. 7398-1 dtd May '49, and
DATA AS OF NOV. 50 BASED ON PWA Specific Operating Instructions 01.91 dtd June '49

Figure A—4. Power Plant Chart

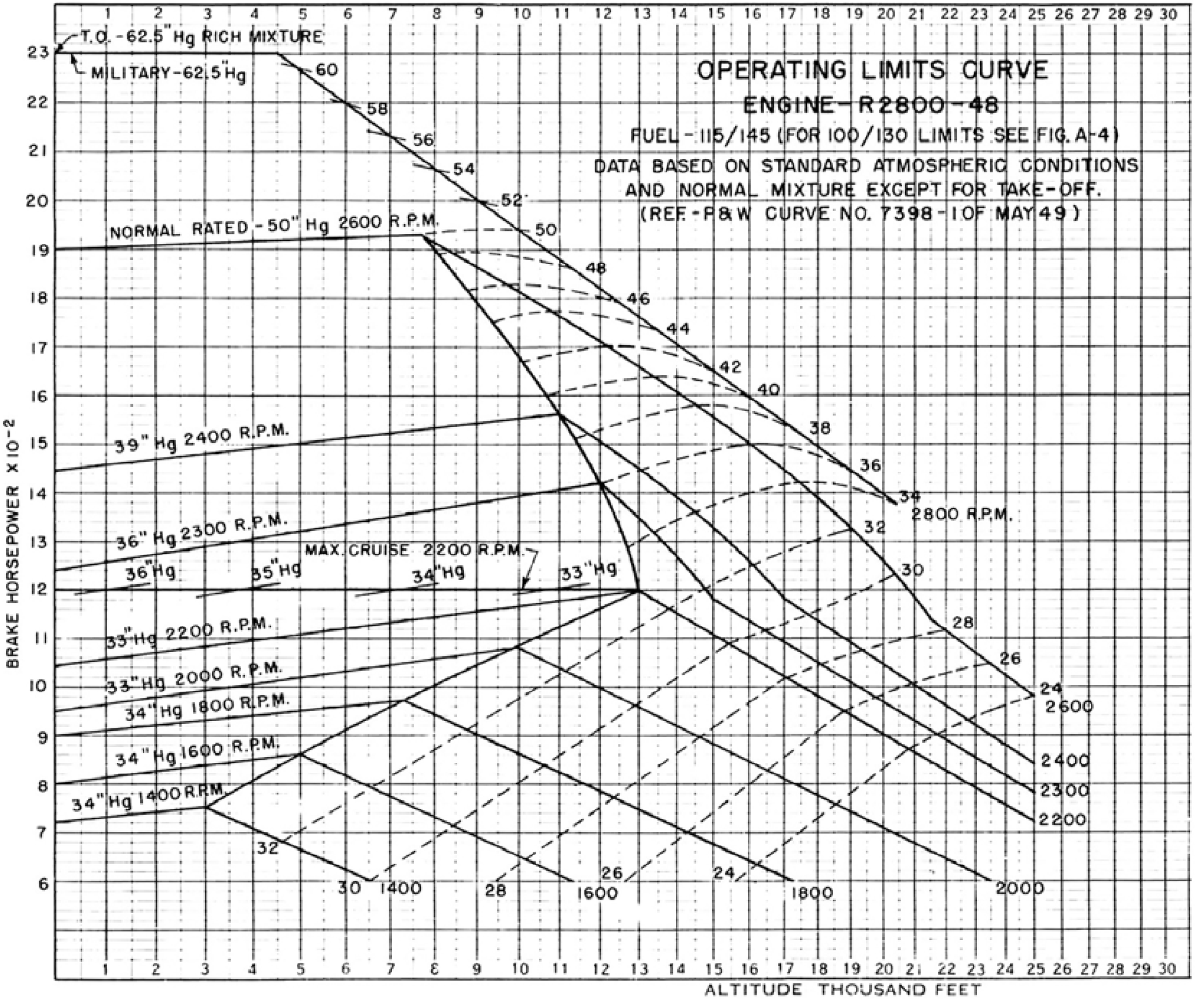

Figure A–5. Engine Operating Limits Curve

AIRCRAFT MODEL: AF-2S

TAKE-OFF, CLIMB & LANDING CHART

ENGINE MODEL: R-2800-48

TAKE-OFF DISTANCE FEET

GROSS WEIGHT LB.	HEAD WIND M.P.H.	HEAD WIND KTS.	HARD SURFACE RUNWAY: AT SEA LEVEL GROUND RUN	AT SEA LEVEL TO CLEAR 50' OBJ.	AT 3000 FEET GROUND RUN	AT 3000 FEET TO CLEAR 50' OBJ.	AT 6000 FEET GROUND RUN	AT 6000 FEET TO CLEAR 50' OBJ.	SOD-TURF RUNWAY: AT SEA LEVEL GROUND RUN	AT SEA LEVEL TO CLEAR 50' OBJ.	AT 3000 FEET GROUND RUN	AT 3000 FEET TO CLEAR 50' OBJ.	AT 6000 FEET GROUND RUN	AT 6000 FEET TO CLEAR 50' OBJ.	SOFT SURFACE RUNWAY: AT SEA LEVEL GROUND RUN	AT SEA LEVEL TO CLEAR 50' OBJ.	AT 3000 FEET GROUND RUN	AT 3000 FEET TO CLEAR 50' OBJ.	AT 6000 FEET GROUND RUN	AT 6000 FEET TO CLEAR 50' OBJ.
20132	0	0	1022	1935	1110	2080	1395	2500	1064	1980	1161	2130	1390	2550	1171	2085	1250	2230	1465	2690
	11.5	10	765	1459	840	1570	1030	1920	796	1480	880	1610	1070	1960	877	1559	950	1681	1180	2070
	23.0	20	533	1010	600	1130	752	1400	554	1030	627	1152	780	1425	616	1085	680	1205	864	1510
	34.5	30	338	640	390	733	501	932	352	652	410	753	519	950	386	687	443	785	574	1005
22334	0	0	1380	2640	1470	2800	1810	3460	1431	2695	1549	2880	1880	3530	1609	2865	1691	3025	2115	3770
	11.5	10	1049	2000	1132	2160	1413	2700	1090	2045	1190	2220	1445	2750	1222	2180	1303	2350	1650	2940
	23	20	745	1425	824	1570	1048	2005	774	1460	865	1610	1084	2040	868	1549	950	1694	1225	2183
	34.5	30	490	938	554	1054	726	1387	510	955	584	1084	752	1410	571	1019	640	1140	847	1510

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

OPTIMUM TAKE-OFF WITH 2800 RPM. AND 37-1/2° FLAPS

DATA AS OF 9-30-49 BASED ON: CALIBRATED ENGINE CURVE

CLIMB DATA

GROSS WEIGHT LB.	AT SEA LEVEL: BEST I.A.S. MPH	BEST I.A.S. KTS	RATE OF CLIMB F.P.M.	DIST. IN HAUT. MILES	LB FUEL USED	AT 5000 FEET: BEST I.A.S. MPH	BEST I.A.S. KTS	RATE OF CLIMB F.P.M.	DIST. IN HAUT. MILES	FROM SEA LEVEL TIME MIN.	FROM SEA LEVEL LB FUEL USED	AT 10,000 FEET: BEST I.A.S. MPH	BEST I.A.S. KTS	RATE OF CLIMB F.P.M.	DIST. IN HAUT. MILES	FROM SEA LEVEL TIME MIN.	FROM SEA LEVEL LB FUEL USED	AT 15000 FEET: BEST I.A.S. MPH	BEST I.A.S. KTS	RATE OF CLIMB F.P.M.	DIST. IN HAUT. MILES	FROM SEA LEVEL TIME MIN.	FROM SEA LEVEL LB FUEL USED	AT 20000 FEET: BEST I.A.S. MPH	BEST I.A.S. KTS	RATE OF CLIMB F.P.M.	DIST. IN HAUT. MILES	FROM SEA LEVEL TIME MIN.	FROM SEA LEVEL LB FUEL USED	AT ___ FEET: BEST I.A.S. MPH	BEST I.A.S. KTS	RATE OF CLIMB F.P.M.	DIST. IN HAUT. MILES	FROM SEA LEVEL TIME MIN.	FROM SEA LEVEL FUEL USED
20132	150	130	1560	0	92	144	127	1495	7.2	3.3	185	137	119	1365	15.8	7.0	276	130	113	1030	25.7	11.21	350	128	111	808	40.7	17.3	426						
22334	140	122	1235	0	92	144	127	1160	8.9	4.2	211	137	119	1050	19.2	8.7	320	130	113	725	32.4	14.3	419	128	111	525	55.8	23.8	538						

POWER PLANT SETTINGS: CLIMB POWER: 2600 RPM, 50 IN. HG MAXIMUM (SEE FIGURE A-4)

FUEL FLOWS INCREASED 15 PER CENT

DATA AS OF 9-30-49 BASED ON: CALCULATED VALUES, CALIBRATED ENGINE CURVE

FUEL USED (US. LB) INCLUDES WARM-UP & TAKE-OFF ALLOWANCE

LANDING DISTANCE FEET

GROSS WEIGHT LB.	BEST IAS APPROACH: POWER OFF MPH	POWER OFF KTS	POWER ON MPH	POWER ON KTS	HARD DRY SURFACE: AT SEA LEVEL GROUND ROLL	AT SEA LEVEL TO CLEAR 50' OBJ.	AT 3000 FEET GROUND ROLL	AT 3000 FEET TO CLEAR 50' OBJ.	AT 6000 FEET GROUND ROLL	AT 6000 FEET TO CLEAR 50' OBJ.	FIRM DRY SOD: AT SEA LEVEL GROUND ROLL	AT SEA LEVEL TO CLEAR 50' OBJ.	AT 3000 FEET GROUND ROLL	AT 3000 FEET TO CLEAR 50' OBJ.	AT 6000 FEET GROUND ROLL	AT 6000 FEET TO CLEAR 50' OBJ.	WET OR SLIPPERY: AT SEA LEVEL GROUND ROLL	AT SEA LEVEL TO CLEAR 50' OBJ.	AT 3000 FEET GROUND ROLL	AT 3000 FEET TO CLEAR 50' OBJ.	AT 6000 FEET GROUND ROLL	AT 6000 FEET TO CLEAR 50' OBJ.
18242	107	94	103	89	1320	2100																
20132	113	98	108	94	1435	2250																

DATA AS OF 10-28-49 BASED ON: CALCULATED VALUES

LEGEND

I.A.S. : INDICATED AIRSPEED
M.P.H. : MILES PER HOUR
KTS. : KNOTS
F.P.M. : FEET PER MINUTE
DIST. : DISTANCE
HAUT. : NAUTICAL

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

Figure A—6. Take-off, Climb and Landing Chart

AUFMC-528 8-1-48

AIRCRAFT MODEL(S)

ENGINE(S): AF-2S R-2600-48

FLIGHT OPERATION INSTRUCTION CHART

CHART WEIGHT LIMITS: 19014 TO 24334 POUNDS

EXTERNAL LOAD ITEMS

2-900 LB DROP TANKS

NUMBER OF ENGINES OPERATING:

LIMITS	RPM	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL LB/HR
WAR EMERG.							
MILITARY POWER	2800	62.5		NORM.	30 MIN	260°	1886

FOR DETAILS SEE POWER PLANT CHART (FIG. A-6)

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING[2] MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER POUND (MI./LB) (NO WIND), POUNDS PER HR (LB/HR) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND)[1].

COLUMN I RANGE IN AIRMILES STATUTE	COLUMN I RANGE IN AIRMILES NAUTICAL	FUEL U.S. LB	COLUMN II RANGE IN AIRMILES STATUTE	COLUMN II RANGE IN AIRMILES NAUTICAL	COLUMN III RANGE IN AIRMILES STATUTE	COLUMN III RANGE IN AIRMILES NAUTICAL	COLUMN IV RANGE IN AIRMILES STATUTE	COLUMN IV RANGE IN AIRMILES NAUTICAL	FUEL U.S. LB	COLUMN V RANGE IN AIRMILES STATUTE	COLUMN V RANGE IN AIRMILES NAUTICAL
			SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING[1]								
656	569	4320	1125	976	1252	1088	1340	1162	4320	1580	1370
639	554	4200	1092	949	1220	1060	1300	1128	4200	1535	1330
593	514	3900	1015	880	1132	982	1210	1050	3900	1425	1235
548	475	3600	938	814	1043	906	1117	966	3600	1315	1140
502	435	3300	860	745	958	831	1023	889	3300	1208	1048
456	396	3000	781	678	870	755	930	807	3000	1095	950
410	356	2700	704	611	784	680	837	726	2700	986	855
365	317	2400	625	542	697	605	744	646	2400	877	761
319	277	2100	547	474	610	529	651	565	2100	767	665
274	238	1800	469	407	522	452	558	484	1800	568	492

MAXIMUM CONTINUOUS R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. LB/HR	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	PRESS ALT. FEET	(.26 STAT. (.226 NAUT.) MI./LB) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. LB/HR	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	(.29 STAT. (.252 NAUT.) MI./LB) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. LB/HR	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	(.31 STAT. (.269 NAUT.) MI./LB) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. LB/HR	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	PRESS ALT. FEET	MAXIMUM AIR RANGE R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. LB/HR	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.
						40000 35000 30000																				40000 35000 30000							
2600	37.3	NORM	1052	252	219	25000 20000 15000	2550	36.2	NORM	945	246	213	2460	34.3	NORM.	816	237	206	2390	33.0	NORM.	735	228	198	25000 20000 15000	2130	29.4	NORM.	551	190	165
2600	46.2	NORM.	1450	257	223	10000	2300	38.5	NORM.	920	239	208	2300	36.0	NORM.	789	229	185	2280	34.2	NORM.	709	220	191	10000	1900	32.4	NORM.	500	180	156
2600	50.0	NORM.	1630	254	221	5000	2300	39.2	NORM.	876	228	198	2280	36.2	NORM.	738	214	186	2240	34.8	NORM.	664	206	179	5000	1800	31.7	NORM.	428	160	139
2600	50.0	NORM.	1595	242	210	S.L.	2300	40.2	NORM.	830	216	188	2270	36.5	NORM.	703	204	177	2210	36.0	NORM.	630	196	170	S.L.	1800	32.0	NORM.	410	150	130

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP TAKE-OFF & CLIMB (SEE FIG. A-6) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
(2) FUEL FLOWS INCREASED 15 PER CENT

EXAMPLE

AT 22124 LB. GROSS WEIGHT WITH 3900 LB OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 211 LB.) TO FLY 1030 STAT. AIRMILES AT 5000 FT. ALTITUDE MAINTAIN 2080 RPM AND 39.7 IN. MANIFOLD PRESSURE NORMAL MIXTURE POSITION, TANKS CARRIED ALL THE WAY.

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
LB/HR: US LB PER HOUR
TAS : TRUE AIRSPEED
KTS.: KNOTS
S.L.: SEA LEVEL
NORM.: NORMAL

DATA AS OF 10-12-49 BASED ON: ENGINE AND CALCULATED DATA

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

AAFMC-538 4-1-49

AIRCRAFT MODEL(S)

ENGINE(S): AF-23 R-2800-48

FLIGHT OPERATION INSTRUCTION CHART

CHART WEIGHT LIMITS: 17612 TO 20132 POUNDS

EXTERNAL LOAD ITEMS

NUMBER OF ENGINES OPERATING:

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL LB/HR
WAR EMERG.							
MILITARY POWER	2800	62.5		NORM.	30 MIN	260°	1886

FOR DETAILS SEE POWER PLANT CHART (FIG. A-4)

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING[1] MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER POUND (MI./LB) (NO WIND), POUNDS PER HR. (LB/HR) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND).[1]

COLUMN I		FUEL	COLUMN II		COLUMN III		COLUMN IV		FUEL	COLUMN V	
RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES	
STATUTE	NAUTICAL	LB	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	LB	STATUTE	NAUTICAL
			SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING[1]								
404	351	2520	732	635	832	721	907	787	2520	1100	954
385	334	2400	697	605	793	689	865	750	2400	1045	906
361	313	2250	654	567	743	645	810	702	2250	980	850
336	292	2100	610	529	694	601	755	655	2100	915	794
312	270	1950	567	492	644	558	701	609	1950	849	736
288	250	1800	522	453	594	516	647	561	1800	784	680
264	229	1650	479	416	545	472	594	515	1650	718	623
240	208	1500	435	377	495	430	539	468	1500	653	566
216	188	1350	392	340	446	387	486	422	1350	588	510
192	167	1200	348	302	396	344	432	375	1200	523	454
168	146	1050	305	264	347	301	378	328	1050	457	396

MAXIMUM CONTINUOUS						PRESS	(.29 STAT. (.252 NAUT.) MI./LB)						(.33 STAT. (.286 NAUT.) MI./LB)						(.36 STAT. (.312 NAUT.) MI./LB)						PRESS	MAXIMUM AIR RANGE					
R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. LB/HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. LB/HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. LB/HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. LB/HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. LB/HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KTS.
						40000																			40000						
						35000																			35000						
						30000																			30000						
						25000																			25000						
						20000																			20000						
2600	37.3	NORM.	1052	269	234	15000	2520	34.3	NORM.	807	263	228	2410	33.5	NORM.	765	252	219	2320	32.0	NORM.	662	238	206	15000	2100	28.7	NORM.	517	210	182
2600	45.2	NORM.	1450	275	239	10000	2300	37.8	NORM.	875	264	221	2300	34.5	NORM.	734	242	210	2210	33.0	NORM.	634	228	198	10000	1800	28.7	NORM.	390	170	148
2600	50.0	NORM.	1630	269	234	5000	2300	38.4	NORM.	825	239	207	2250	35.8	NORM.	686	226	196	2120	33.8	NORM.	590	212	184	5000	1700	30.0	NORM.	368	160	139
2600	50.0	NORM.	1595	256	222	S.L.	2270	39.2	NORM.	770	223	194	2200	36.5	NORM.	643	212	184	2040	35.8	NORM.	565	203	176	S.L.	1700	30.0	NORM.	290	150	130

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. A-6) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
(2) FUEL FLOWS INCREASED 15 PER CENT

EXAMPLE

AT 19988 LB. GROSS WEIGHT WITH 2100 LB OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 276 LB) TO FLY 694 STAT. AIRMILES AT 10000 FT. ALTITUDE MAINTAIN 2250 RPM AND 35.8 IN. MANIFOLD PRESSURE NORMAL MIXTURE POSITION.

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
TAS: TRUE AIRSPEED
NORM: NORMAL
KTS: KNOTS
S.L.: SEA LEVEL
LB/HR: U.S. LBS PER HOUR

DATA AS OF 12-8-49 BASED ON: ENGINE AND CALCULATED DATA

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