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PILOT'S FLIGHT OPERATING INSTRUCTIONS

FOR

ARMY MODELS

RP-47B & C and P-47D & G

AIRPLANES

BRITISH MODEL

THUNDERBOLT

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NOVEMBER 20, 1943

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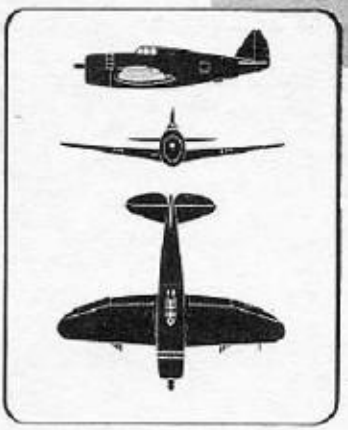


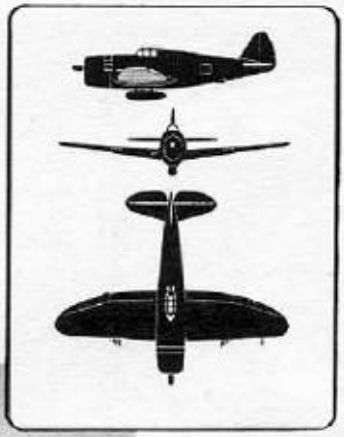
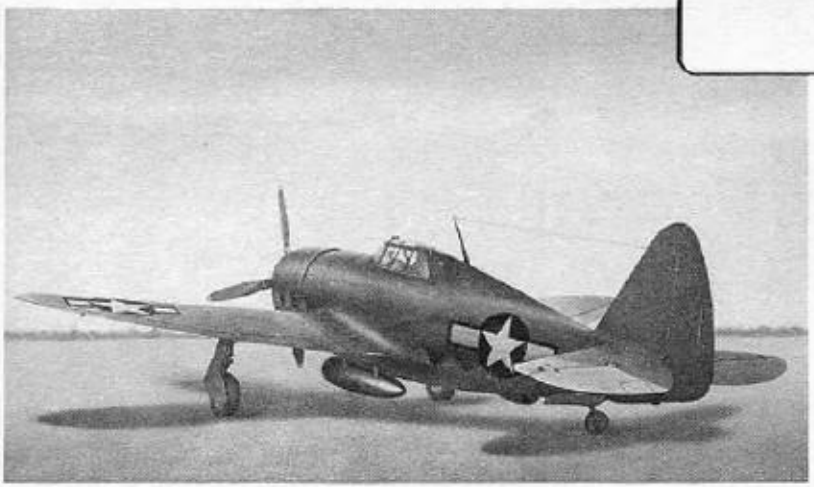


Figure 2—Three-quarter Rear View of the RP-47C, P-47D and P-47G Airplane



SECTION I
DESCRIPTION

1. AIRPLANE.

a. GENERAL.—The models RP-47B, RP-47C, P-47D, and P-47G are low-wing, single-place, all-metal monoplanes, each powered with a 2000-horsepower R-2800 series engine. The engine drives a four-bladed propeller. Hydraulically operated landing gear, wing flaps, tail wheel, and brakes are provided. The approximate overall dimensions are as follows:

Length—RP-47B: 34 feet, 10 inches; RP-47C, P-47D, P-47G: 35 feet, 7 inches; Height—12 feet, 8 inches; Span—40 feet, 9-$\frac{7}{16}$ inches.

b. ACCESS TO AIRPLANE.—A step and handholds are provided on the fuselage on the left side of the airplane. The canopy is unlatched by pressure on a small lever on the forward edge of the canopy, allowing it to slide back. Several locking positions are provided.

c. FUEL AND OIL.

(1) Fuel: Specification No. AN-VV-F-781, Amendment No. 5. Octane: grade 100.

NOTE

If Amendment No. 4 is used, take-off and military power manifold pressure *must be reduced 10 percent.*

(2) Oil: Specification No. AN-VV-O-446. Viscosity: grade 1120. (For cold-weather operation, use grade 1100 with oil dilution, if necessary.)

d. PILOT PROTECTION.

(1) ARMOR.—Front and rear armor protection for direct right angle hit is provided for the pilot. Enemy fire originating within the areas graphically illustrated in figure 4 will not reach the pilot.

(2) CRASH PROTECTION.—A crash protector is incorporated just aft of the pilot for turn-over protection, and a welded crash skid is installed in the under side of the fuselage.

e. MOORING PROVISIONS.—Lugs for mooring the airplane are provided in the lower side of each wing ahead of spar 1, just outboard of the landing-gear leg and are usually concealed inside the wing. They are made available for use by pulling open the door marked "TIE-DOWN" and then pulling out the lugs. Lashing down the tail may be done by inserting a rope through either the lift or the tail wheel yoke.

2. POWER PLANT.

a. The R-2800-21 engine is a twin-row, 18-cylinder, supercharged, air-cooled engine. There are both geared

Figure 3—Canopy Latch Release

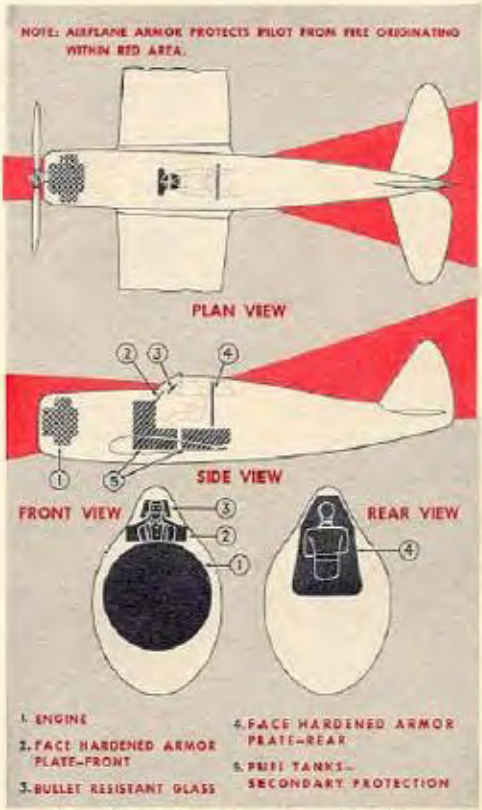
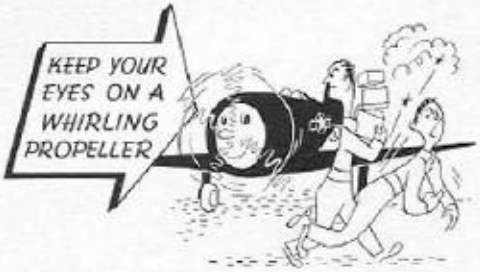


Figure 4—Angles of Personnel Protection



and turbine superchargers; the turbine-driven supercharger is a separate and remotely installed unit. A control on the throttle quadrant opens and closes the waste gates, permitting variation in speed of the turbine-driven unit.

b. On P-47D-5-RE and subsequent airplanes, water injection is provided to permit limited operation at considerably above rated military power.

3. PROPELLER.

The propeller is a four-bladed Curtiss electrically controlled, constant speed, multi-position propeller.

4. OPERATIONAL EQUIPMENT.

a. AIRPLANE CONTROLS.

(1) COCKPIT SEAT.—The seat may be adjusted for height by lifting the lock release handle on the right side of the seat (figure 5), and raising or lowering the seat as desired. To lock the seat in position, release the locking handle and "jiggle" the seat slightly in a vertical direction until its spring-loaded locking device definitely snaps into position. The seat is equipped with the standard shoulder harness with the spring-release or lock control on the left side.

(2) AILERON AND ELEVATOR.—Conventional.

(3) FLIGHT CONTROLS LOCK.—The control stick and rudder pedals may be locked by means of a small red lever located at the base of the control stick. Push stick forward, reach down and pull red knob up and back so that the tongue aft of the red knob swings aft and down over a small hook on the forward side of the control stick. At the same time, the forward

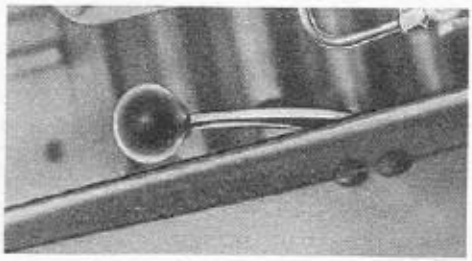


Figure 5—Seat Adjustment Lever

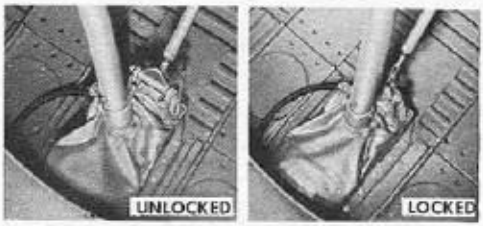


Figure 6—Flight Control Lock

part of the knob assembly swings up and forward, pushing a long slender rod forward which clamps the two rudder pedals in position.

(4) RUDDER CONTROL.—Conventional pedals, hinged from the top, are equipped with conventional toe brakes. Each rudder pedal may be adjusted to desirable length by first pushing outboard on the spring-loaded adjustment lock (figure 7) which will permit the rudder pedal to float free on its hinge. After moving pedal to desired location, release the lock and "jiggle" the pedal slightly to allow the locking pin to snap into position. *Always adjust both pedals to the same length.*

(5) ELEVATOR TRIM TAB CONTROL.—Trim tabs may be adjusted in flight by a crank on the box on the left side of the cockpit. (See figure 9-3.) Rotate clockwise for nose down. Their extreme effectiveness renders this a source of danger, and care must be exercised to see that the trim tab wheel is rotated in the correct direction to produce the desired effect.

(6) RUDDER TRIM TAB CONTROL.—This tab may be adjusted in flight by turning the knob (figure 9-1) on the left side of the cockpit. Rotate knob clockwise for right rudder.

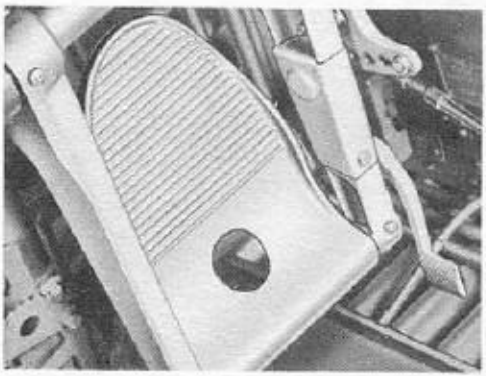
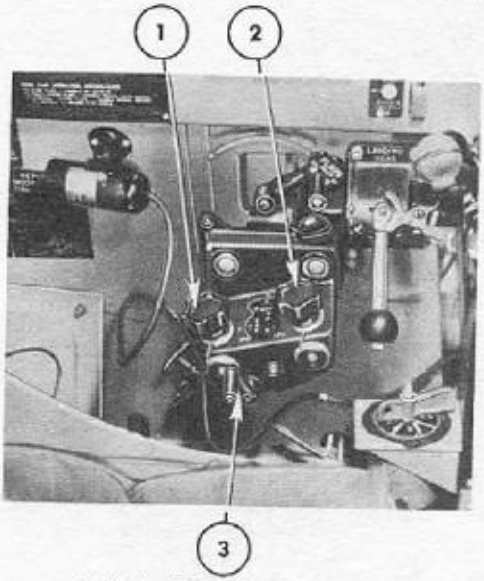


Figure 7—Rudder Pedal Adjustment Lever



1. Rudder Trim Tab Control Knob
2. Aileron Trim Tab Control Knob
3. Elevator Trim Tab Control Crank

Figure 8—Trim Tab Controls—RP-47C, P-47D, and P-47G

(7) AILERON TRIM TAB CONTROL.—The left aileron trim tab only is adjustable. It may be adjusted in flight by turning wheel (figure 9-4) clockwise for right wing down.

CAUTION

The aileron and rudder trim tab wheels on early airplanes do not work in the same plane as the controls they operate, and a danger exists that pilots may turn these controls in the wrong direction.

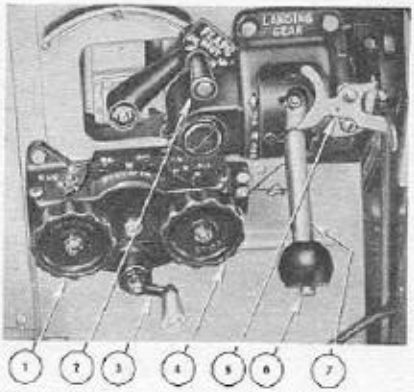
(8) LANDING GEAR CONTROL.

(a) The landing gear may be operated by means of either the engine-driven hydraulic pump or by the emergency hand pump.

(b) An indicator showing position of the wheels is mounted on the instrument panel. (See figure 29-1.) The usual warning horn indicates gear up when throttle is closed. The throttle arm controls a horn shut-off switch. If shut-off switch is thrown out, it will automatically be closed whenever the throttle is opened.

WARNING

On RP-47C-1 and subsequent C, P-47D, and P-47G airplanes, the landing gear and wing flap indicator (figure 29-1), and the warning horn have been removed. On the RP-47-C-2 and subsequent Model C and P-47D and



1. Rudder Tab Control
2. Flap Control
3. Elevator Tab Control
4. Aileron Tab Control
5. Landing Gear Safety Catch
6. Landing Gear Control Lever Button
7. Landing Gear Control Lever

Figure 9—Trim Tab, Landing Gear and Wing Flap Controls RP-47B

P-47G airplanes, the warning light goes on when the selector handle is placed in the "UP" position and remains on until the landing gear is in uplock position. When the landing gear selector handle is moved to "DOWN," or the throttle is pulled back to a position which will not provide sufficient power for level flight, the light will go on and will remain on until the landing gear is in the DOWN LOCKED position.

RP-47C-1 airplanes have a system which operates as follows: with selector handle in "UP" position the light goes on and may go out before gear is in uplock position. Therefore, the pilot has no assurance that the landing gear is fully retracted. In the "DOWN" position, the warning light will act as in subsequent models.

(9) WING FLAP CONTROL.—The wing flaps are actuated by engine hydraulic pressure with provision for emergency hand-pump operation. They are actuated by means of the flap control switch (figure 9-2). The pressure on the flaps is equalized by means of the hydraulic equalizer valve located on the floor to the right of the pilot's seat. (See figure 10.) This valve insures that the two flaps come down or go up together.

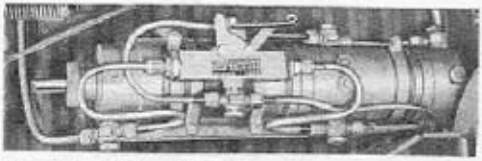


Figure 10—Hydraulic Equalizer Valve—(Equalizer Discontinued on P-47D-10 and subsequent models.)

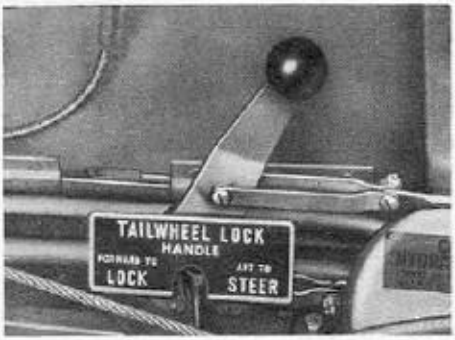


Figure 11—Tail Wheel Lock

(10) TAIL WHEEL LOCK.—The retractable tail wheel may be locked or operated as a free swivel for taxying by means of a lever on the floor at the right of the pilot's seat. When the lever is placed in the forward position, the tail wheel is locked. When the tail wheel is lowered after flight, it automatically falls into the lock position. Early models have provisions for a steerable tail wheel.

(11) HEATING AND VENTILATING CONTROLS.—Fresh air is controlled by a push-pull control (figure 12) on the right side of the cockpit. Adequate heat is supplied by the hot-air type defroster which has a control (figure 13) mounted on the right side of the cockpit just behind the windshield.

(12) FUEL SYSTEM. *(See figures 24 and 25.)*

(a) TANKS.

1. There are two self-sealing tanks installed in the fuselage under and forward of the floor of the pilot's compartment. The main tank has a capacity of 205 U.S. (171 Imperial) gallons. The auxiliary tank has a capacity of 100 U.S. (83 Imperial) gallons, making a total capacity of 305 U.S. (254 Imperial) gallons.

Figure 12—Cockpit Ventilator Control

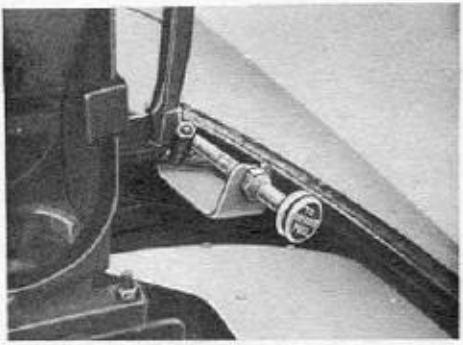


Figure 13—Defroster Control

2. There is a fuel level warning lamp for the main tank. It will come on when approximately 40 U.S. (33 Imperial) gallons remain in the tank. On airplanes previous to P-47D-5RE a fuel system including a "Reserve" supply is used. On these airplanes when the "Main" supply is exhausted, the amount of fuel remaining for "Reserve" will vary between 2 and 20 gallons depending upon the attitude of the airplane during run-out on main.

3. On all models, due to the inaccuracy of the main tank, fuel level gage, a safe known reserve of 10 U.S. gallons should be kept in the auxiliary tank.

(b) BELLY TANK.

1. P-47D-2-RE and subsequent airplanes hang either a 75 U.S. (63 Imperial) gallons or a 150 U.S. (125 Imperial) gallons belly tank from a standard Army type B-7 shackle. The tank may be released by an upward pull on the T-type "TANK RELEASE" control handle located on the left side of the cockpit mounted on the same bracket as the gun bay heat control.

2. A 200 U.S. (166 Imperial) gallons external tank can be installed on the RP-47C through P-47D-2-RE airplanes underneath the fuselage fastened

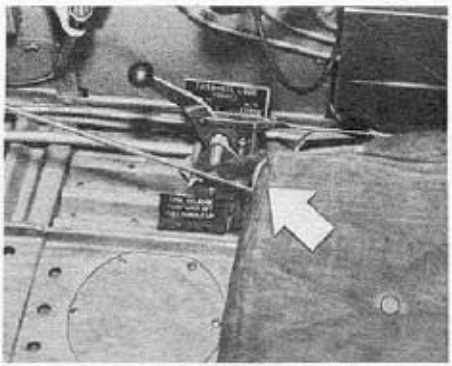


Figure 14—Belly Tank Release, RP-47C, P-47D, and P-47G

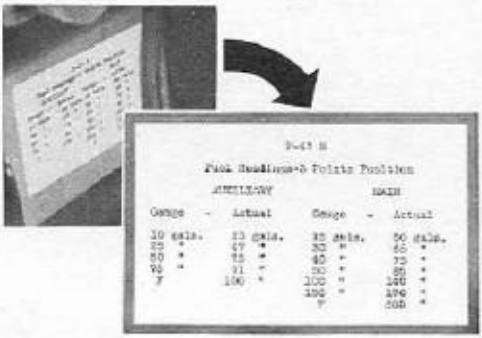


Figure 15—Fuel Correction Card, RP-47B

to a released mechanism built into the crash skid. After fuel has been exhausted from the external tank, the tank may be released by pushing the lock aft and pulling upon the release handle located to the right of the pilot's seat.

(c) WING TANKS.—To provide sufficient fuel for long range ferrying, some P-47D-5-RE and later airplanes may be equipped to use either 150 U.S. (125 Imperial) gallons or 300 U.S. (247 Imperial) gallons wing tanks. Hung from Standard Army type B-10 shackles just outboard of the landing-gear legs on each wing, the tanks may be released by an upward pull on the Army T-type control handle located on the left side of the cockpit aft of the main switchbox.

(d) FUEL GAGE.—An electrically operated compound gage (figure 29-14) is provided. It reads correctly only when the airplane is in flying position. A three-point correction card is posted near the gage (figure 15) for determining the quantity of fuel aboard when the airplane is on the ground. Due to the inherent design, the main fuel gage is not accurate below about 20 gallons.

(e) FUEL SELECTOR VALVE.

1. On P-47D-5-RE and subsequent airplanes, the fuel selector valve is conventional with four positions, "MAIN ON," "AUXILIARY ON," "BELLY TANK ON," and "OFF." When turning valve, be sure to feel that the valve seats itself in the new position.

2. Those airplanes equipped to use external wing tanks have an additional fuel selector valve in the floor of the cockpit. It has two positions only "RIGHT WING TANK" and "LEFT WING TANK." To draw fuel from the wing tanks, turn the main fuel selector valve to "BELLY TANK ON."

3. Models prior to P-47D-5-RE have no "BELLY TANK ON" position on the fuel selector cock.

4. To operate airplanes up to P-47D-2-RE on belly tank, control switch on main switch box must be in the "ON" position, and the fuel selector valve must be in the "OFF" position. The external tank system is automatically turned off when the fuel selector cock is turned to any position other than "OFF" regardless of the position of the belly tank fuel control switch.

(f) FUEL PUMPS.

1. Fuel is supplied by means of a pump mounted directly on the engine, assisted by an electrically operated, variable-speed booster pump on the sump of each fuel tank and a constant-speed booster pump in the line between the external tank inlet and selector cock. The booster pumps are turned on automatically by means of a rotary switch mounted on the fuel valve control shaft when the fuel valve is turned to the "MAIN," "AUXILIARY," and "BELLY," positions respectively.

2. When either variable speed booster pump is turned on by placing the fuel cock in the "MAIN" or "AUXILIARY" position, the speed of that pump is controlled by the booster pump emergency rheostat which is located on the switch panel. This control has no "OFF" position. When turned to the extreme counterclockwise position marked "START AND ALTITUDE" the pump operates at its normal speed. Turning the knob clockwise increases the pump speed and therefore, the delivery pressure. Minimum pressure is 16 pounds per square inch; maximum is 17 pounds per square inch; idling is 7 pounds per square inch.

a. If the engine driven fuel pump fails during high altitude flights, turn emergency fuel boost to full clockwise position. If this does not give sufficient fuel pressure, decrease supercharger control lever until normal fuel pressure is obtained. If it is necessary to use emergency fuel boost at high altitudes, pressure should be checked and readjusted in descending as fuel pressure will increase with decreasing altitude.

b. If the engine driven fuel pump fails at take-off or during low altitude flights, turn emergency fuel boost to full clockwise position. Maintain full power. It is not necessary to decrease the supercharger control lever setting.

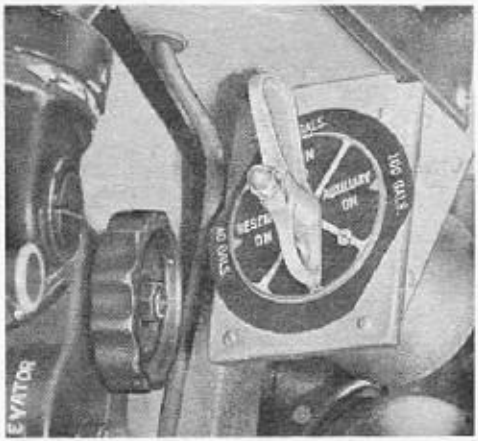


Figure 16—Fuel Selector Valve

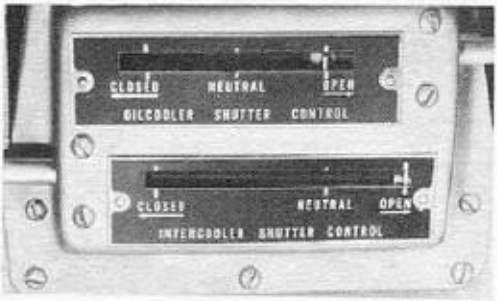
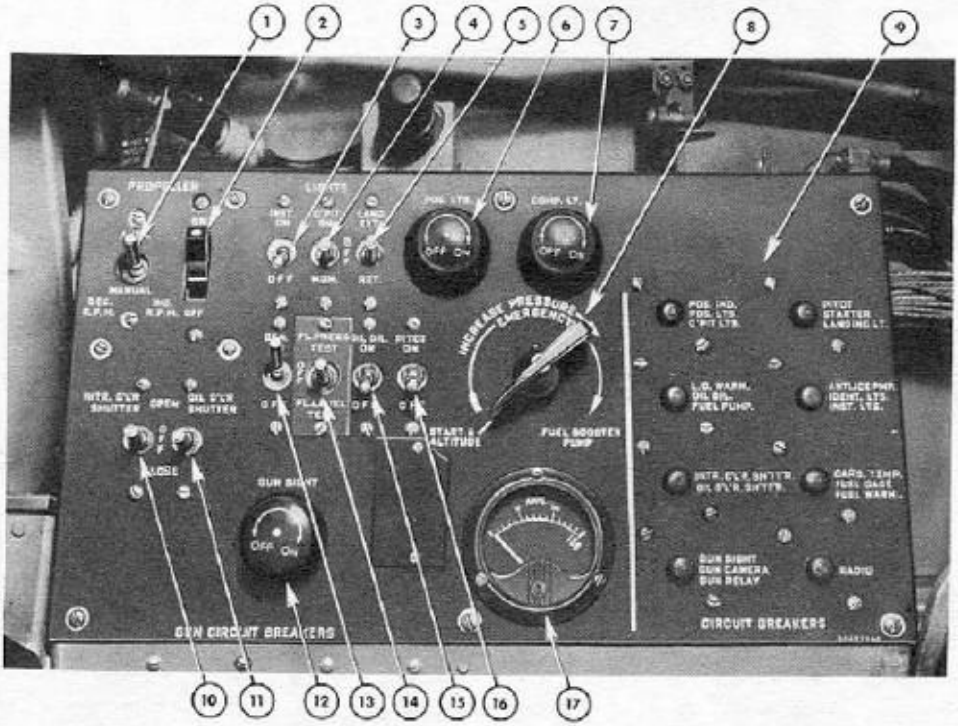


Figure 17—Oil Cooler and Intercooler Shutter Indicators

(13) OIL SYSTEM *(See figure 27).*

(a) TANK.—The oil tank is located in the upper part of the engine compartment with a filler on the left end of the tank and is accessible through the cowl door marked "OIL." The total capacity of the tank is 28 U.S. (23 Imperial) gallons, of which 19 U.S. (16 Imperial) gallons is normal and the rest overload. The normal capacity is obtained by filling the tank until oil drips from the normal level pet cock (figure 27-3) on the left end of the tank below the filler.

(b) OIL COOLERS.—Two oil coolers are installed, one on each side in the lower part of the engine compartment. Adjustable split doors are located in the



1. Automatic-Manual Propeller Control Switch "Increase-Decrease" rpm Manual Control Switch
2. Propeller Control Breaker Switch
3. Instrument Light Switch
4. Cockpit Light Switch
5. Landing Light Switch
6. Position Lights Control
7. Compartment Lights Control
8. Electric Fuel Pump Rheostat
9. Circuit Breakers
10. Intercooler Shutter Switch
11. Oil Cooler Shutter Switch
12. Gun Sight Light Rheostat
13. Generator Switch
14. Fuel Warning Light Test Switch
15. Oil Dilution Switch
16. Pilot Tube Heat Switch
17. Ammeter

Figure 18—Main Switch Box, RP-47B

exit ducts and are electrically operated and controlled from the cockpit by a switch (figure 18-11) on the main switch box. Shutter position indicators are located on the left side of the cockpit above the wing flap control handle. (See figure 17.)

(c) INTERCOOLERS.—The heat of compression due to the turbine supercharger is removed from the inlet carburetor air by an intercooler. The intercooler exit is provided with sliding shutters, which are controlled by an electric switch on the main switch panel. (See figure 18-10.)

(d) OIL PRESSURES.

Maximum: 90 pounds per square inch.
Minimum: 60 pounds per square inch.
Idling: 25 pounds per square inch.
Desired: 75 to 85 pounds per square inch.

(e) OIL DILUTION.—Provisions are made for oil dilution for cold-weather starting or for emergency operation. The oil dilution switch (figure 18-15) is located on the main switch panel.

(14) COWL FLAPS.—A control handle (figure 44) on the small panel at the right end of the instrument panel operates the cowl flaps. Pull it to open flaps and push to close. Intermediate settings can be obtained by releasing the knob when the desired opening has been reached. The knob will automatically return to neutral and the cowl flaps will remain in the intermediate position.

(15) LIGHTS.

(a) COCKPIT LIGHTS.—The ignition switch (figure 29-13) must be turned to "BAT" before any lights will function.

NOTE

On RP-47C, P-47D, and P-47G airplanes, the master battery switch (figure 30-18) must be turned "ON."

Two fluorescent lights (figure 29-2), one on each side of the cockpit, and a light above the switch box (figure 35-8) provide extra illumination. On the P-47G airplane, the fluorescent lights (figure 19-B) have been eliminated and fluorescent and white light is furnished by two spotlights, one on each side of the cockpit. Switches (figures 18-3 and 18-4) are located on the main switch box.

(b) LANDING LIGHT.—A landing light is provided in the left wing. After the switch (figure 18-5) has been turned "ON," the light will not glow until after the landing light mechanism has extended the lamp to its operating position. Do not operate the light at speeds in excess of 200 mph, or for a longer period than necessary.

(c) IDENTIFICATION LIGHTS. (P-47B AIRPLANE ONLY.)—The identification light switches (figure 20) are mounted on the aft end of a small box to the right of the pilot just above the radio controls. The box also has a keying button on top.

(16) CANOPY.—The sliding canopy is provided with kick-out panels which are released by moving the handles marked "EMERGENCY RELEASE." Spoilers for use at very high speeds are provided to aid the pilot in opening the canopy. The spoilers are operated by pulling the small wire ring on the right forward side of the canopy. Normal operation is by means of the latch at the top front. (See figure 37.) Canopies on P-47D-15 and up are jettisonable.

(17) PARKING BRAKE.—To park, pull parking brake handle (figure 21) and depress the pedals. To release, depress the pedals.

b. ENGINE CONTROLS.

(1) THROTTLE.—Additional supercharging for this engine is furnished by an exhaust-driven turbine supercharger. The engine is controlled by the conventional throttle, propeller, and mixture controls. The supercharger is controlled by a control located outboard of the throttle. On RP-47C and subsequent models, the throttle, supercharger control, and propeller control are so made that they can all be pushed forward by use of the throttle alone. When properly adjusted,

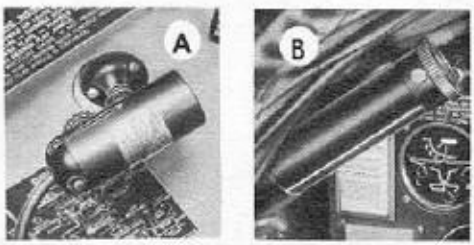


Figure 19 A & B—Spot and Fluorescent Lights

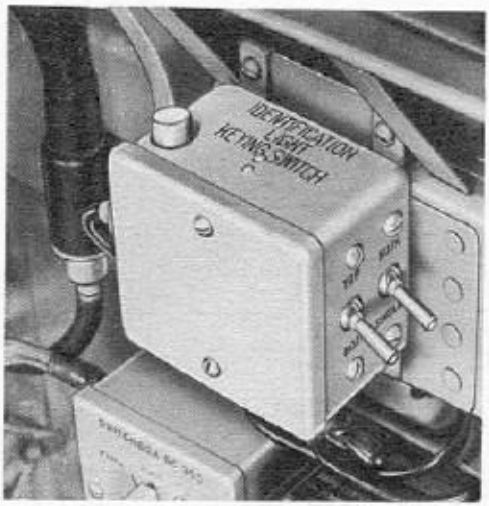


Figure 20—Identification Light Switches, RP-47B

Figure 21—Parking Brake Control Handle

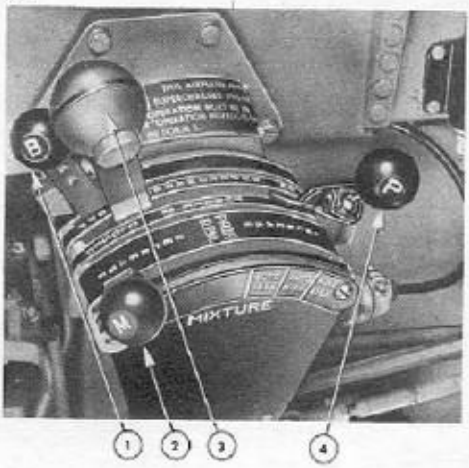


Figure 22—Throttle Quadrant (Sheet 1 of 2 Sheets)

this position should give about 52 inches Hg and 2700 rpm at altitudes up to 25,000 feet. It may be necessary to push past the stop to obtain full power above 25,000 feet. When the controls are connected, the supercharger control will come back as the throttle is retarded, but the propeller control will remain at the farthest advanced position. Rpm must be reduced by pulling the propeller control back.

(2) WATER INJECTION CONTROL. — A system of water injection is provided to safeguard the engine from detonation during operation at emergency military power. When required the system is activated by a toggle switch located on the throttle control knob.

(3) MIXTURE CONTROL. — Four positions: "IDLE CUT-OFF," "AUTO-LEAN," "AUTO-RICH," and "FULL RICH."

(4) PROPELLER CONTROLS.

(a) "ON"—"OFF" switch (figure 18-2).

(b) Selector switch (figure 18-1) with positions for "AUTO," "INC. RPM," and "DEC. RPM."

(c) Governor lever (figure 22-4) on throttle quadrant.

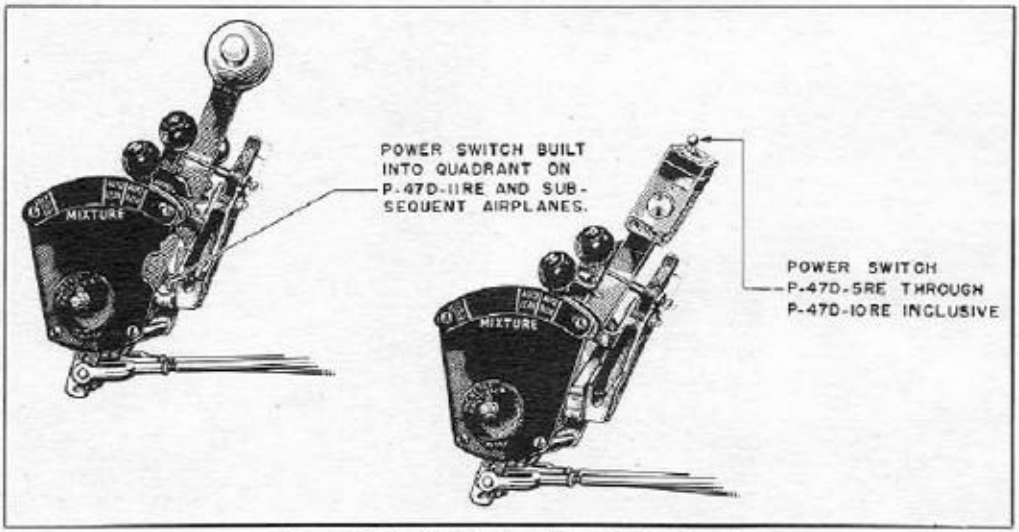
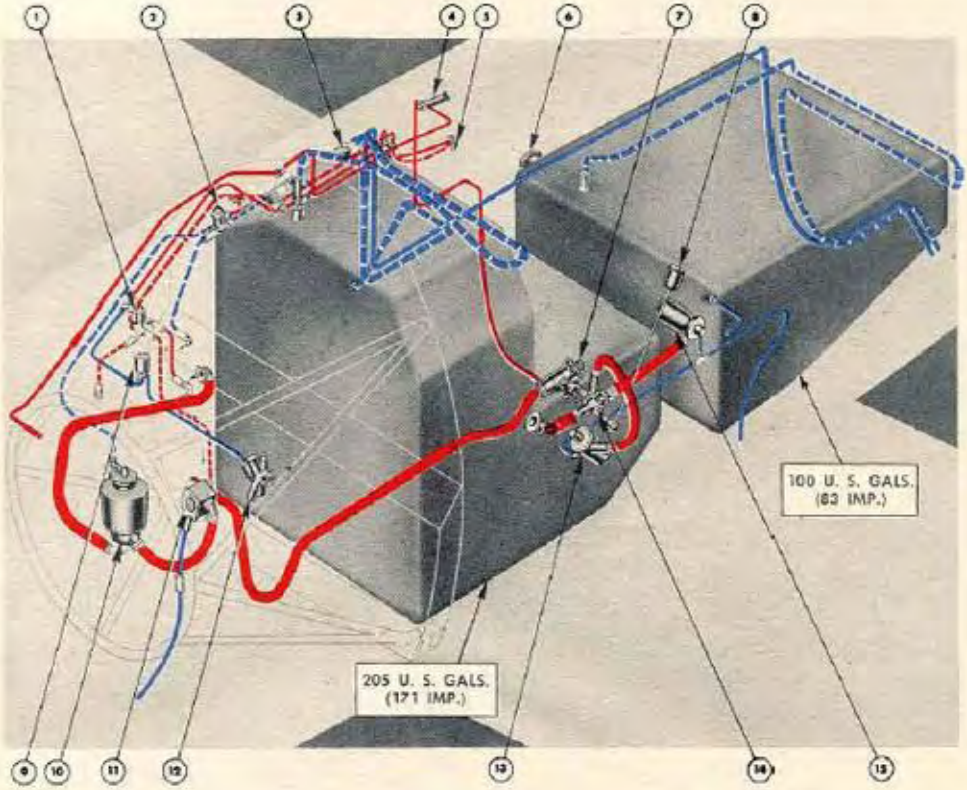


Figure 22—Throttle Quadrant (Sheet 2 of 2 Sheets)

Figure 23—Air Filter Control

(5) AIR FILTER.—A push-pull control (figure 23) is provided on the left side of the rear wall of the cockpit to allow the bypassing of the air filter. Pull to bypass filter and push to attain full use of the filter. The use of this filter is recommended when atmospheric conditions so direct; i.e., dusty ground conditions or sand. The filter should be in the bypass position in clear air for maximum power plant efficiency. Use the bypass if there is a noticeable manifold pressure drop while using filter in icing conditions.



1. Pressure Warning System
2. Vapor Pressure Control Valve
3. Main Tank Filler Neck
4. Engine Primer
5. Pressure Gage
6. Auxiliary Tank Filler Neck
7. Strainer
8. Fuel Selector Valve Control Handle
9. Oil Dilution Solenoid
10. Vapor Eliminator
11. Engine-Driven Pump
12. "Y" Drain Cock
13. Main Booster Pump
14. Selector Valve
15. Auxiliary Booster Pump

Figure 24—Fuel System Diagram, RP-47B

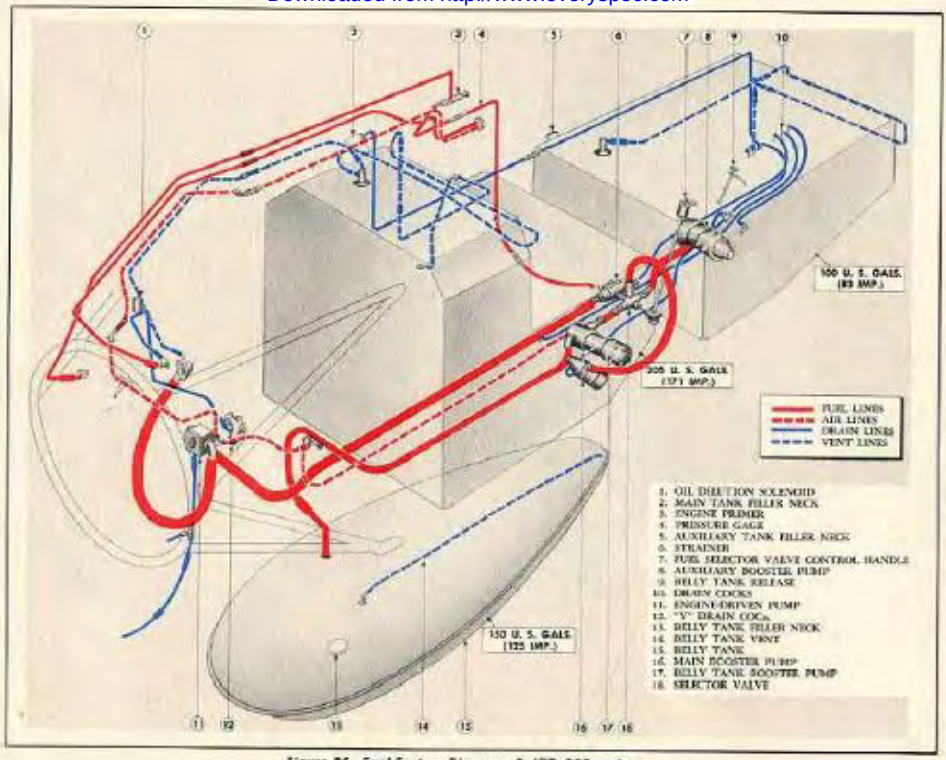


Figure 25—Fuel System Diagram, P-47D-2RE and up

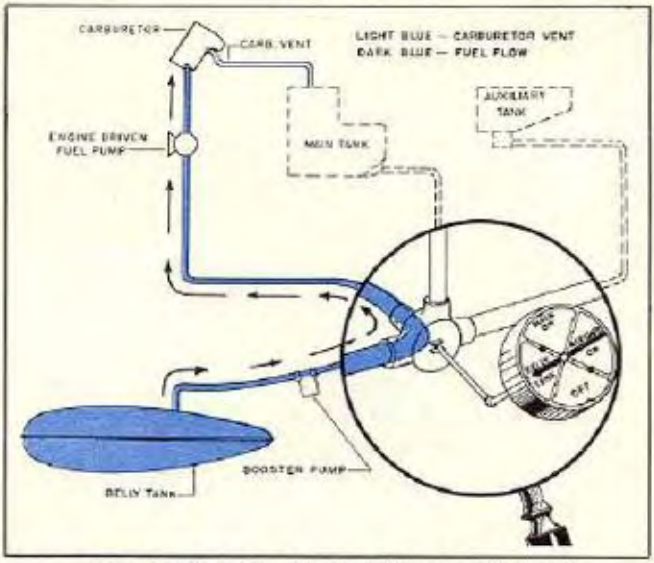


Figure 26—Fuel Flow, Belly Tank (Sheet 1 of 3 Sheets)

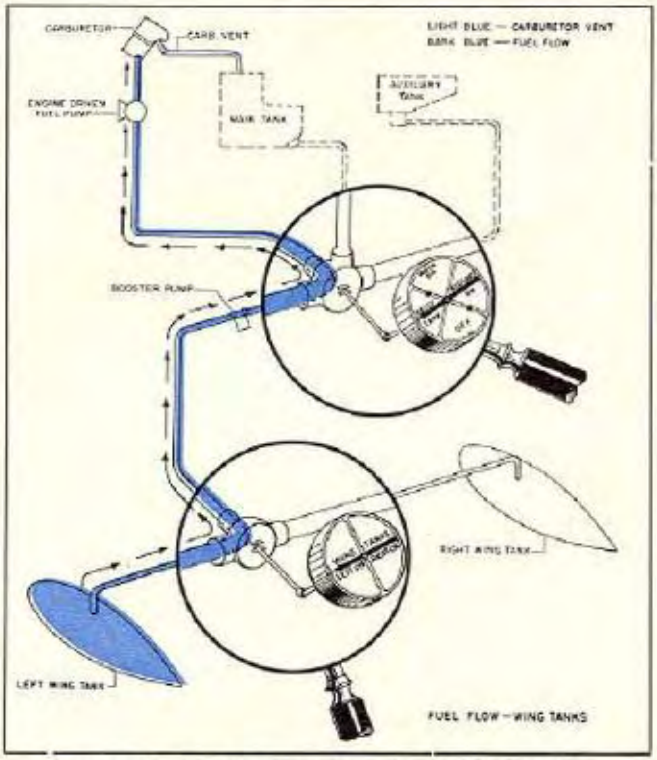


Figure 26—Fuel Flow, Wing Tanks (Sheet 2 of 3 Sheets)

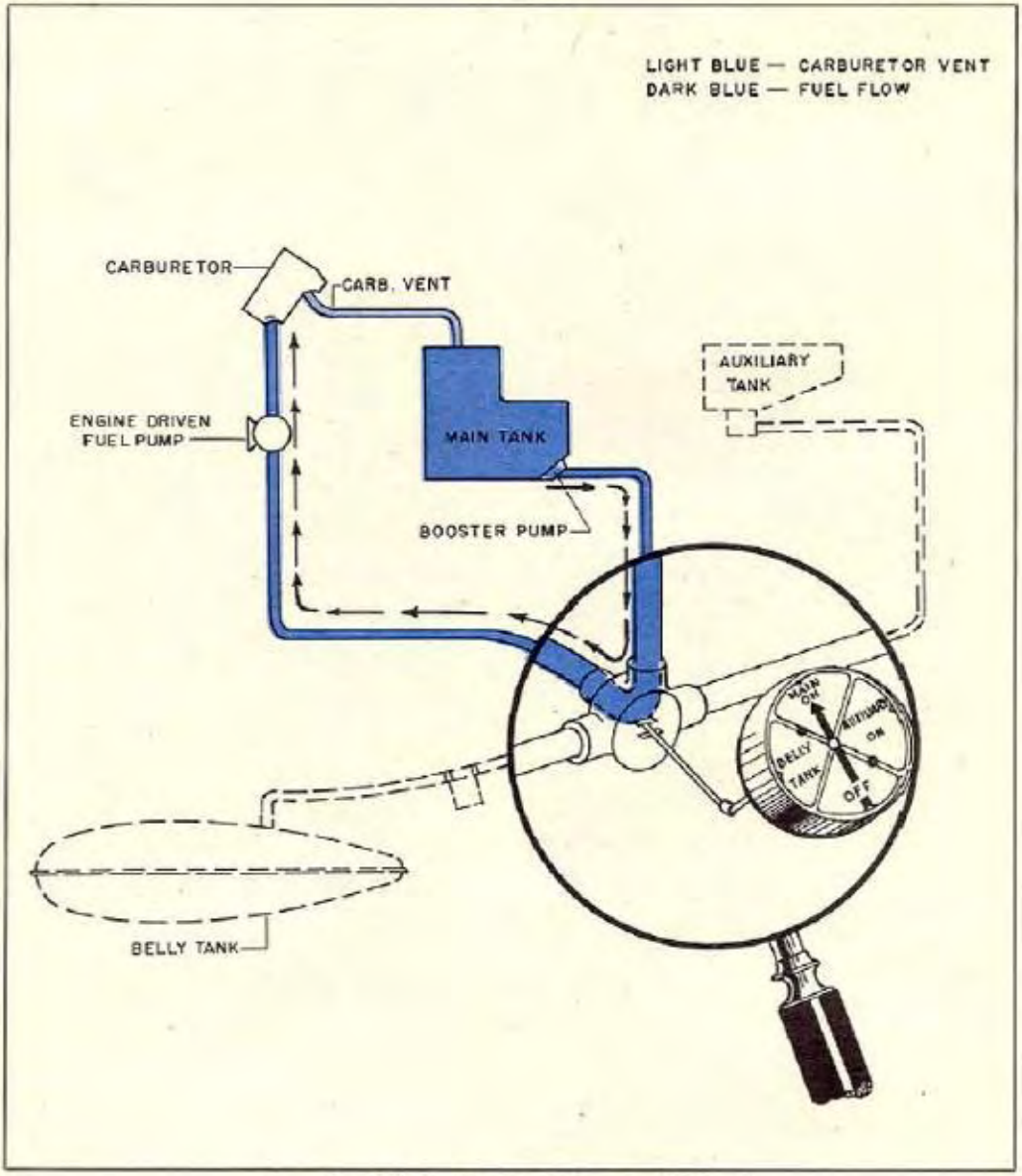
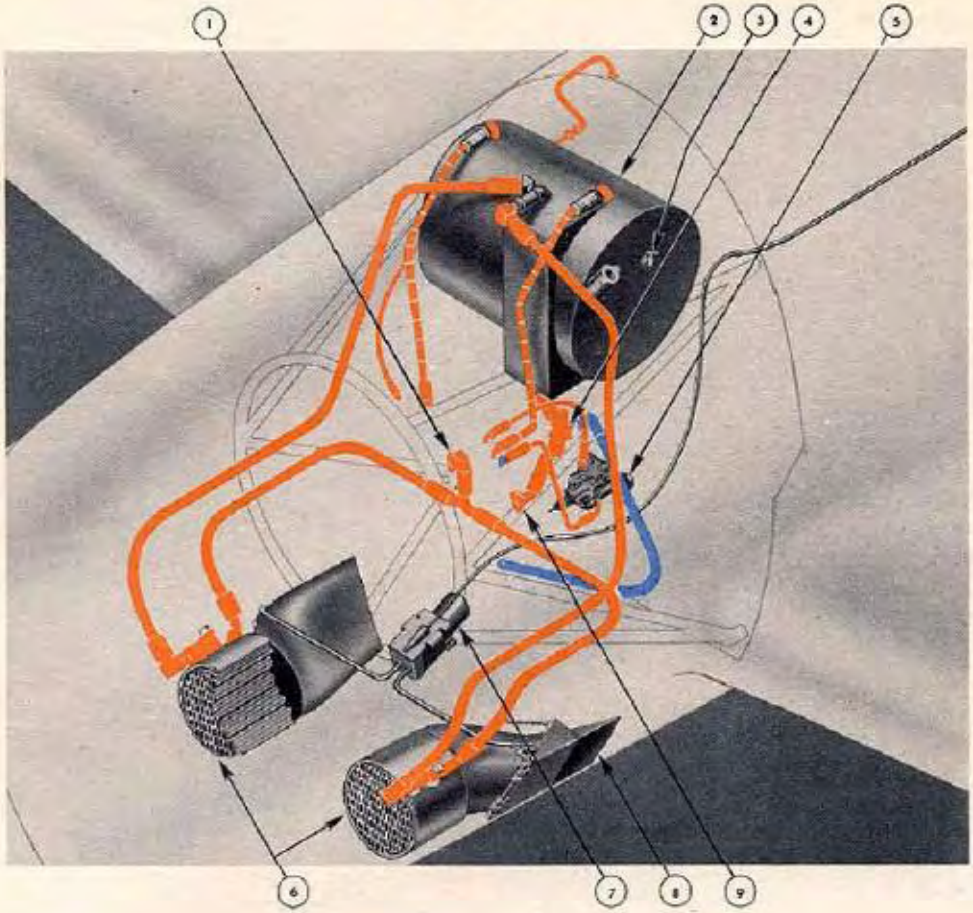
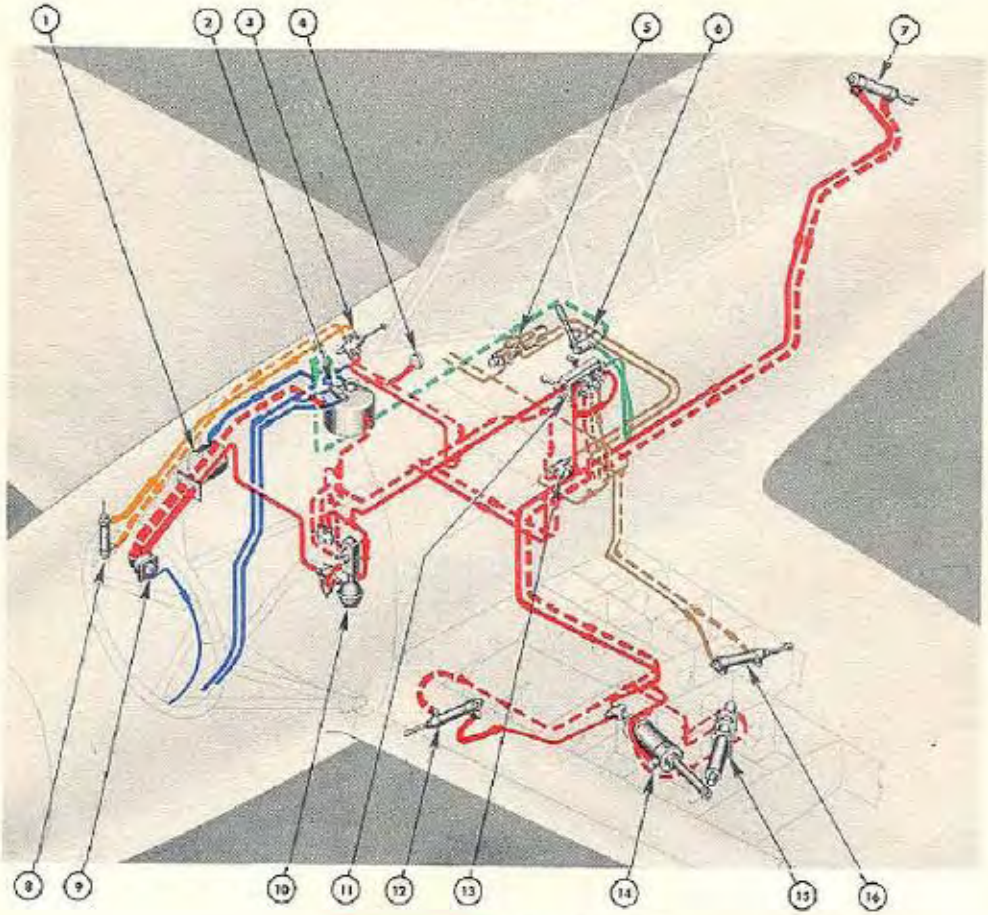


Figure 26—Fuel Flow, Main Tank (Sheet 3 of 3 Sheets)



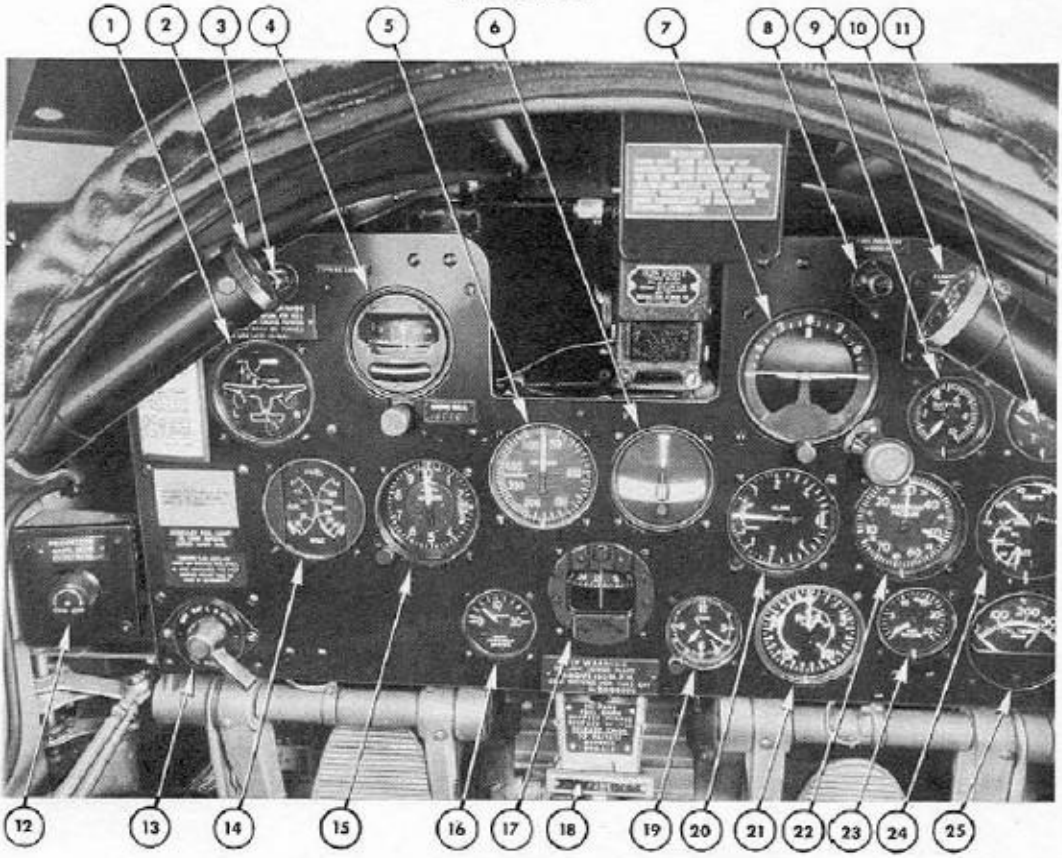
1. Oil from Engine
2. Hopper Type Tank
3. Oil Level Pet Cock
4. Connection for Oil Dilution
5. Supercharger Regulator
6. Oil Coolers
7. Temperature Regulator
8. Air Outlet Duct
9. Oil to Engine

Figure 27—Oil System Diagram



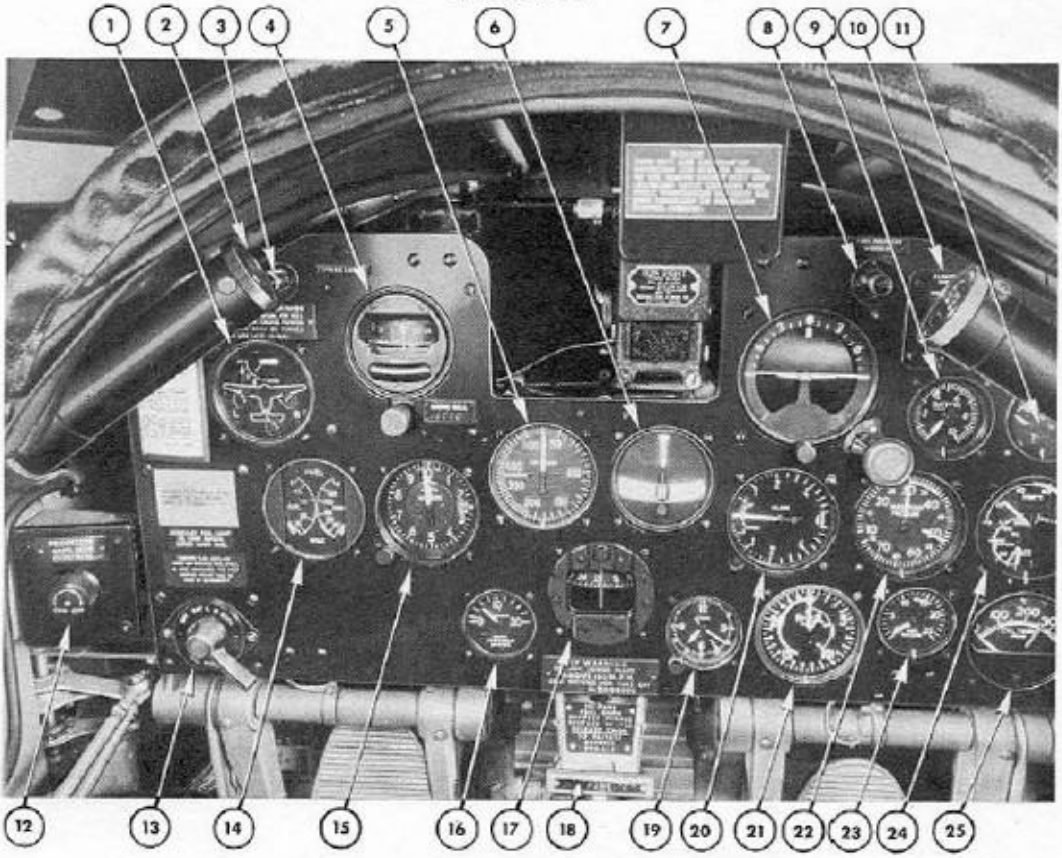
1. Carburetor Air Duct
2. Tank
3. Cowl Flap Valve
4. Pressure Gage
5. Equalizer Cylinder
6. Hand Pump
7. Tail Wheel Cylinder
8. Cowl Flap Cylinder
9. Engine-Driven Pump
10. Hydraulic Units
11. Selector Valve
12. Landing Gear Door Cylinder
13. Relief Valve
14. Landing Gear Cylinder
15. Downlock Cylinder
16. Flap Cylinder

Figure 28—Hydraulic System Diagram



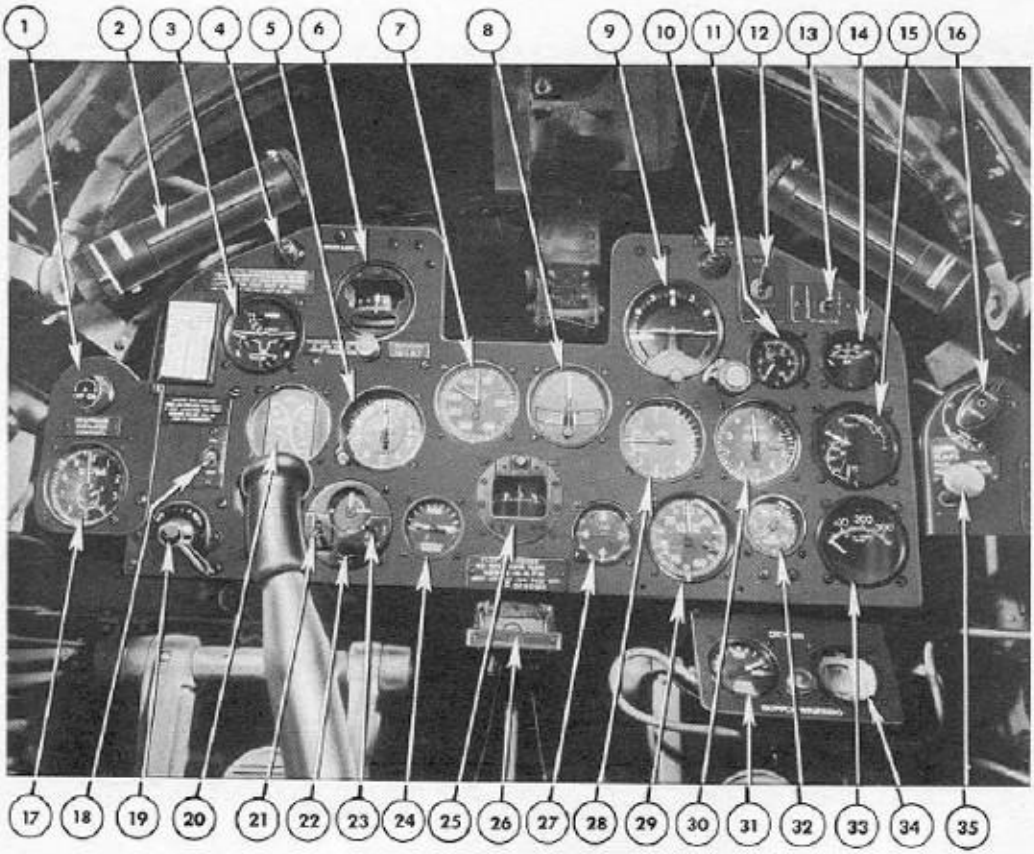
1. Landing Gear, Tail Wheel and Flap Position Indicator
2. Fluorescent Light
3. Fuel Level Warning Lamp
4. Turn Indicator
5. Air-Speed Indicator
6. Bank and Turn Indicator
7. Artificial Horizon
8. Fuel Pressure Warning Light
9. Suction Gage
10. Vacuum Gage Selector Valve
11. Carburetor Air Temperature Gage
12. Propeller Anti-Icer Control
13. Ignition Switch
14. Fuel Quantity Gage
15. Kollsman Altimeter
16. Hydraulic Pressure Gage
17. Compass
18. Parking Brake
19. Clock
20. Rate of Climb Indicator
21. Tachometer
22. Manifold Pressure Gage
23. Fuel Pressure Gage
24. Oil Temperature and Pressure Gage
25. Cylinder Head Temperature Gage

Figure 29—Instrument Panel, RP-47B



1. Landing Gear, Tail Wheel and Flap Position Indicator
2. Fluorescent Light
3. Fuel Level Warning Lamp
4. Turn Indicator
5. Air-Speed Indicator
6. Bank and Turn Indicator
7. Artificial Horizon
8. Fuel Pressure Warning Light
9. Suction Gage
10. Vacuum Gage Selector Valve
11. Carburetor Air Temperature Gage
12. Propeller Anti-Icer Control
13. Ignition Switch
14. Fuel Quantity Gage
15. Kollsman Altimeter
16. Hydraulic Pressure Gage
17. Compass
18. Parking Brake
19. Clock
20. Rate of Climb Indicator
21. Tachometer
22. Manifold Pressure Gage
23. Fuel Pressure Gage
24. Oil Temperature and Pressure Gage
25. Cylinder Head Temperature Gage

Figure 29—Instrument Panel, RP-47B



1. Propeller Anti-Icer Control
2. Fluorescent Light
3. Landing Gear Tail Wheel and Flap Position Indicator
4. Fuel Level
5. Altimeter
6. Turn Indicator
7. Air-Speed Indicator
8. Bank and Turn Indicator
9. Artificial Horizon
10. Fuel Pressure Warning Lamp
11. Suction Gage
12. Vacuum Gage Selector Valve
13. Starter Switch
14. Carburetor Air Temperature Gage
15. Oil Temperature and Pressure Gage
16. Engine Primer
17. Turbo Tachometer
18. Master Battery Switch
19. Ignition Switch
20. Fuel Quantity Gage
21. Contactor Switch
22. Contactor (Pip Squeak)
23. Contactor Clock Switch
24. Hydraulic Pressure Gage
25. Compass
26. Parking Brake Handle
27. Clock
28. Rate of Climb Indicator
29. Manifold Pressure Gage
30. Tachometer
31. Oxygen Cylinder Pressure Gage
32. Fuel Pressure Gage
33. Cylinder Head Temperature Gage
34. Oxygen Flow Indicator
35. Cowl Flap Control

Figure 30—Instrument Panel, RP-47C, P-47D, and P-47G

Figure 31—Instrument Panel, P-47D-1-RE

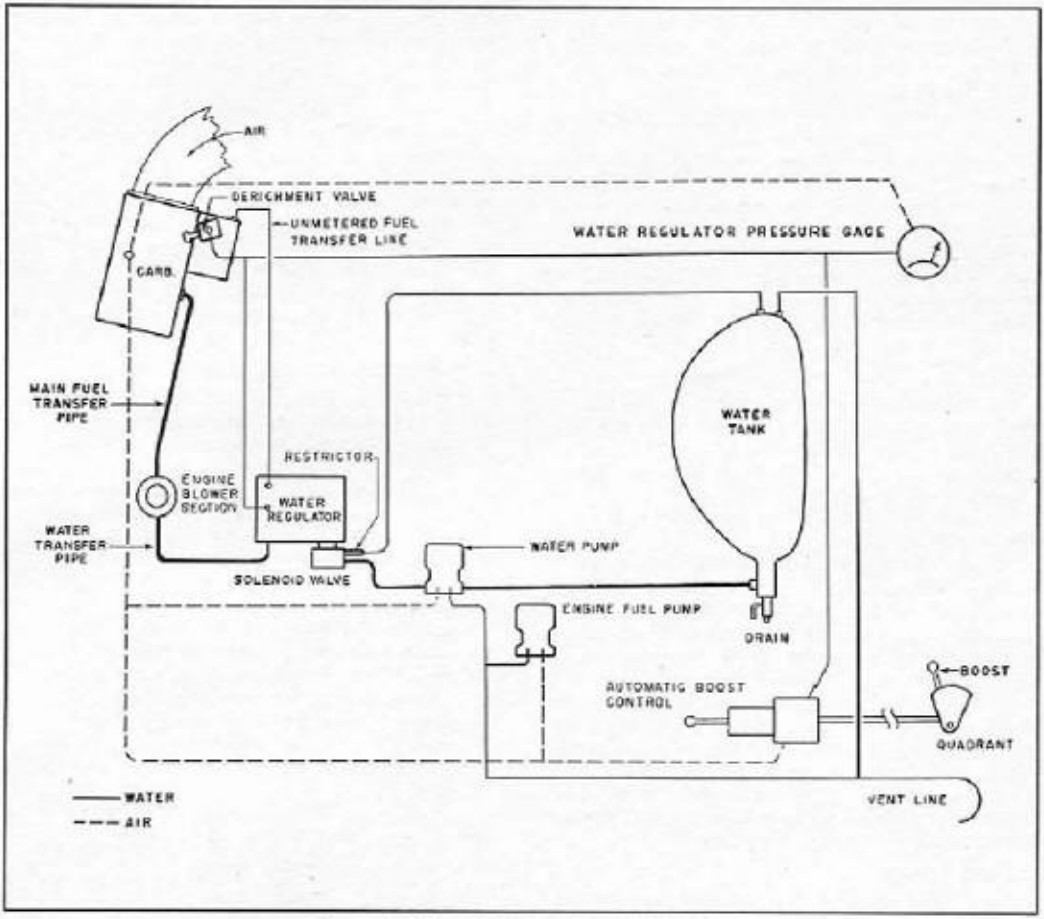


Figure 32—Water Injection System Schematic

5. WATER INJECTION SYSTEM.

a. GENERAL.

(1) The present military ratings represent safe maximum power output with present prescribed military fuels. In combat operation, however, there have been numerous instances of engine being operated at excess power without incurring failure, and this has encouraged the consideration of a higher emergency rating. To meet these demands, water injection has been applied to safeguard the engine from detonation when operated at considerably above the present military power.

(2) The injection of water has three main advantages. The cooling effect due to vaporization is greater with water than with fuel. Second, the susceptibility to detonation is apparently greatly lessened with the presence of water in the cylinder. Third, it produces more efficient performances. This is so because the addition of water does not result in a reduction in power such as is experienced with the addition of fuel over and above that required for best power.

(3) The system provides automatic increase to the war emergency rating through the operation of a "POWER SWITCH" by the pilot. Closing the power switch does three things.

(a) It starts the flow of water at a predetermined rate into the fuel discharge nozzle.

(b) It reduces the fuel flow to give best mixture strength.

(c) It resets the supercharger regulator to provide for the increased manifold pressure corresponding to the war emergency rating. With a gain of approximately 15 per cent in power, the total flow of fuel and water through the nozzle is just about the same as the amount of fuel that would be required for the same amount of power without injection, but with a larger engine.

b. DESCRIPTION.—P-47D-5-RE and subsequent D airplanes have provisions for a water injection system. Units in this assembly are:

(1) A tank of 15 U.S. (12.5 Imperial) gallons capacity.

(a) The tank is serviced to capacity with a solution of water and alcohol.

(2) A transfer pump which is set to deliver "water" to the water regulator at 20 ± 1 pounds per square inch through a solenoid valve and check valve.

(3) A derichment valve assembly which is attached to the carburetor in place of the jet cover plate to reset the carburetor mixture when emergency power is used.

(4) A toggle (power) switch is mounted on the throttle lever. This switch operates the emergency equipment. P-47D-11-RE and subsequent models have the power switch built into the control quadrant. It is operated automatically when the throttle control lever reaches approximately 1/8 inch from the full forward end of quadrant.

c. OPERATION.

(1) When the engine is operating, the transfer pump delivers "water" to the solenoid valve. "Water" is circulated through the lines and back to the tank until the power switch is closed.

(2) When the power switch is closed, the solenoid valve is energized and "water" is delivered to the water regulator where it is metered to the engine. The automatic boost reset (which is interconnected with the supercharger regulator) is actuated by water pressure to increase manifold pressure, even though boost control may be in full open position against the stop as would be the case for military power operation.

(3) Should water pressure fail or when the water supply becomes exhausted, the derichment valve diaphragm will return to normal positions thereby increasing fuel flow and decreasing manifold pressure. This automatically safeguards the engine when water pressure is not available. The check valve in the water regulator prevents reverse flow of fuel in the event that the solenoid valve sticks open.

d. DIRECTIONS FOR USE.

(1) War emergency power represents an increase over the present military power ratings of engines to meet the demands of combat pilots for emergency operation to obtain a quick burst of speed either to close in on the enemy, or to evade him as the case may be. *Inasmuch as it represents a strain on the engine, the pilot must use it with discretion; he must treat it as ammunition which he expends unhesitatingly, but only when the occasion demands.*

(2) Conserve water and do not use emergency power until full rated power as delivered by engine without water has been obtained. Throttle and propeller levers should be adjusted so as to give military power. Use "water" below critical altitude only. When added power is required, close toggle on airplanes up to and including P-47D-10-RE. Subsequent models will inject water automatically when throttle reaches end of quadrant.

CAUTION

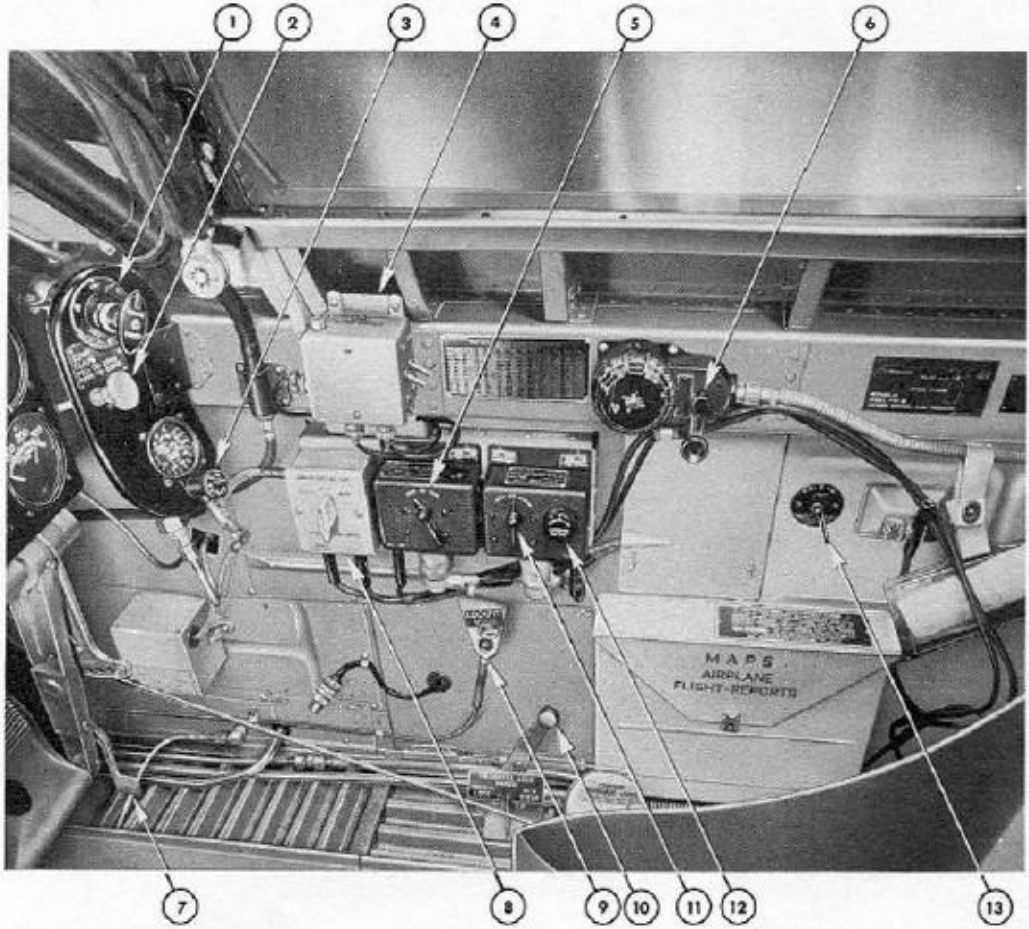
When water is used at low altitude care must be exercised to maintain manifold pressure within safe limits. On those airplanes incorporating the water power switch built into the control quadrant, it will be necessary to disconnect the controls and advance the throttle lever only. Manifold pressure can then be controlled by the boost lever.

NOTE

It should be noted, that with plain water serviced in this system, better cooling will be experienced when the water injection system is used. When operating in areas where ground temperatures are below freezing, the water injection system should be serviced after the engine is warm and prior to take-off, or the following alcohol and water combinations be used.

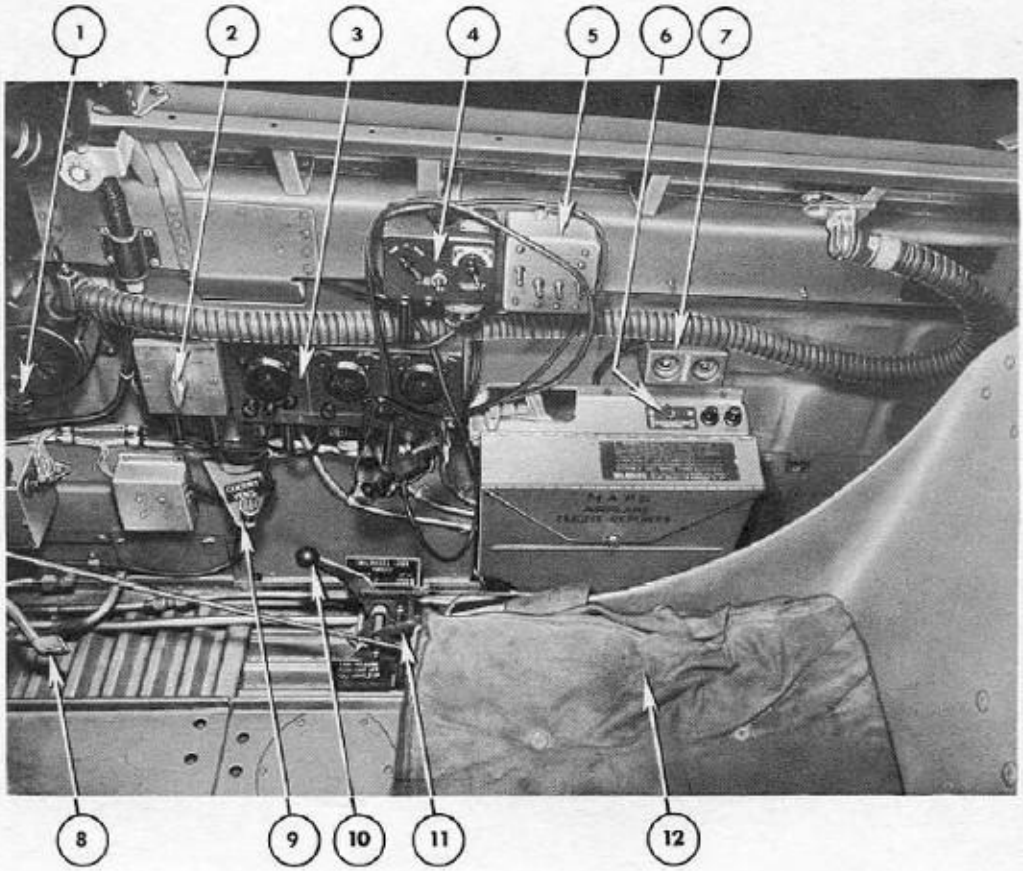
	Methanol	*Synasol*	*Ethyl*	*Isopropyl*
50°F to 20°	15%	18%	19%	20%
20° to 10°	20%	27%	29%	32%
10° to 0°	28%	35%	36%	40%
0° to −10°	33%	43%	43%	60%
−10° to −20°	58%	49%	49%	75%
−20° to −30°	46%	55%	55%	83%

All percentages shown in red have been proven to catch fire when hit by gun fire.



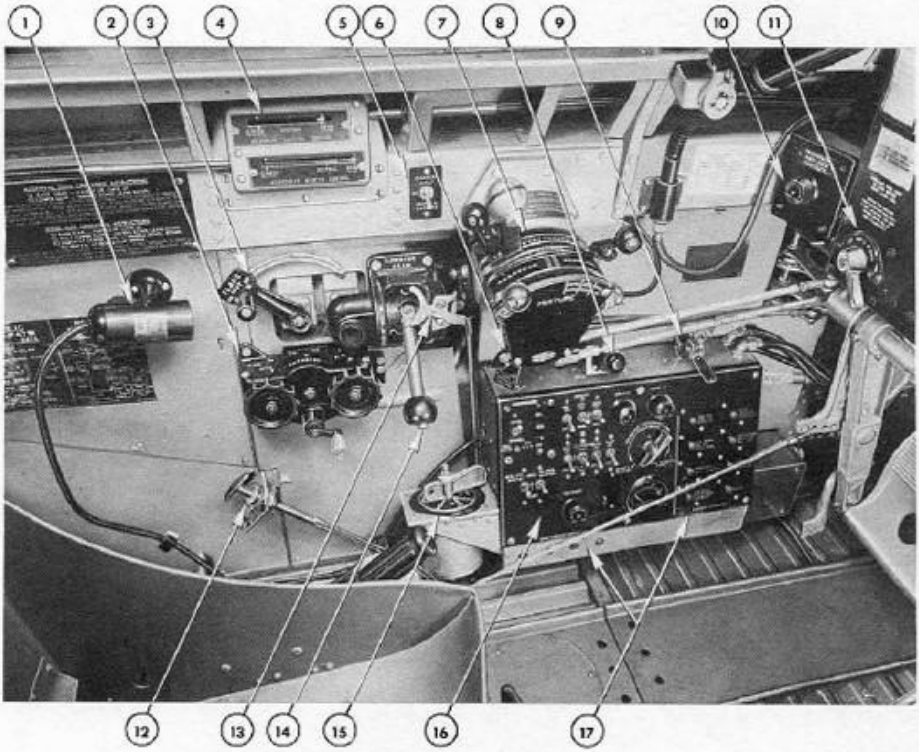
1. Engine Primer
2. Cowl Flap Control
3. Oxygen Regulator
4. Identification Keying Switches
5. Transmitter Emission Control Switch
6. Radio Tuning Dial Control
7. Rudder Pedal Adjustment Lever
8. Radio Switch Box
9. Cockpit Vent Control
10. Tail Wheel Lock
11. Radio Receiver Volume Control Selector Switch
12. Radio Receiver and Transmitter Filament "Off-On" Control Knob
13. "Hi-Lo" Switch

Figure 33—Cockpit—Right Side View, RP-47B



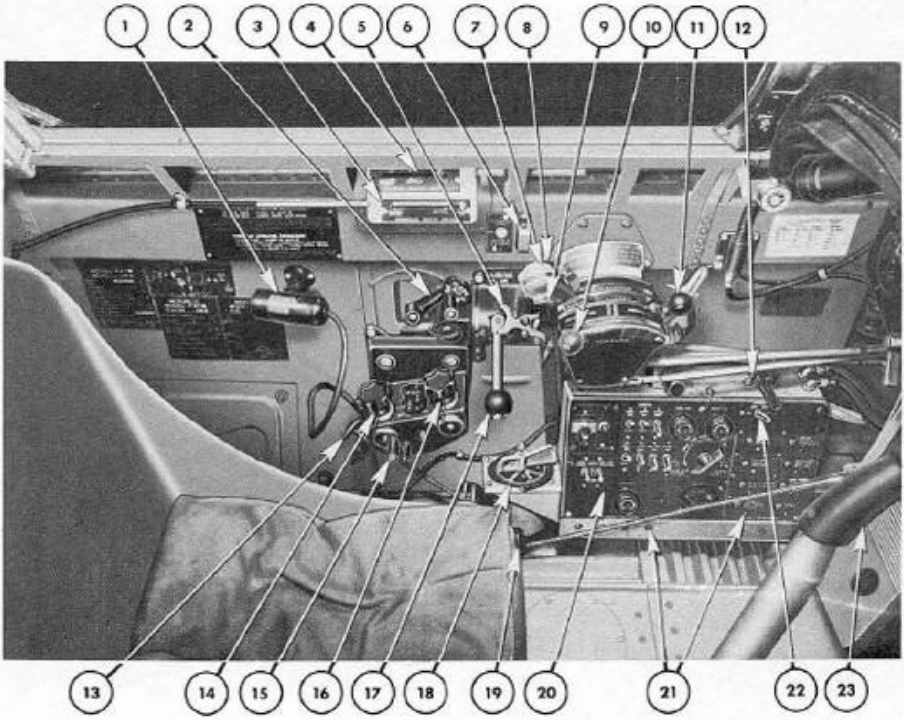
1. Oxygen Regulator
2. Crystal Filter Selector Switch
3. Command Receiver Control Box
4. Command Transmitter Control Box
5. Identification Lights Switches
6. Contactor Heater Switch
7. IFF Radio Destroyer Buttons
8. Rudder Pedal Adjustment Lever
9. Cockpit Vent Control
10. Tail Wheel Lock
11. Belly Tank Release
12. Pilot's Seat

Figure 34—Cockpit—Right Side View, RP-47C, P-47D, and P-47G



1. Spotlight
2. Trim Tab Control Group
3. Flap Control Lever
4. Shutter Position Indicators
5. Gun Safety Switch
6. Propeller Safety Light
7. Throttle Quadrant
8. Panel Light
9. Landing Gear Warning Horn Switch
10. Propeller Anti-Icer Control
11. Ignition Switch
12. Gun Heat Control Lever
13. Safety Latch
14. Landing Gear Control Lever
15. Fuel Selector Valve
16. Main Switch Box
17. Circuit Breakers

Figure 35—Cockpit—Left Side View, RP-47B



1. Cockpit Spotlight
2. Wing Flap Control Handle
3. Intercooler Shutter Indicator
4. Oil Cooler Shutter Indicator
5. Landing Gear Control Safety Latch
6. Gun Safety Switch
7. Throttle
8. Supercharger Control
9. Microphone Push-to-Talk Button
10. Mixture Control
11. Propeller Control
12. Landing Gear Warning Horn Switch
13. Propeller Anti-Icing Control
14. Rudder Trim Tab Control
15. Elevator Trim Tab Control Crank
16. Aileron Trim Tab Control
17. Landing Gear Control Handle
18. Fuel Selector Valve
19. Hydraulic Hand Pump
20. Main Switch Box
21. Circuit Breakers
22. Belly Tank Control Switch
23. Control Stick Grip

Figure 36—Cockpit—Left Side View, RP-47C, P-47D, and P-47G

SECTION II

PILOT'S OPERATING INSTRUCTIONS

1. FLIGHT RESTRICTIONS.

a. MANEUVERS PROHIBITED.

(1) Intentional spins of more than one-half turn.

(2) Outside loops.

(3) Whip stalls.

(4) Inverted flight.

(5) Violent maneuvers, practice landings, and high-speed dives with belly tank.

b. (1) RP-47B, RP-47C, P-47D, and P-47G airplanes (this DOES NOT include the long nose P-47D, P-47D-1, and subsequent models that do not have bob weights installed in elevator control system) will be restricted as follows:

(a) Airplanes will not be flown to exceed 300 mph IAS.

(b) Acrobatics and violent maneuvers will NOT be performed intentionally.

(c) Fuel will NOT be carried in rear tank on instrument flights OR for practice landings.

(2) RP-47C-1 airplanes will be restricted as follows:

(a) Airplanes will NOT be flown to exceed 500 mph IAS.

(b) No fuel will be carried in rear tank when performing acrobatics, practice combat maneuvers, or high speed dives.

c. Due to the possibility that pull-out from dives, resulting from exceptionally high forces exerted on the elevators, may be extremely hazardous, RP-47C airplanes with bob weights installed on the elevators controls, will be restricted to 300 mph IAS. No fuel will be carried in the rear tank when performing acrobatics or practice maneuvers.

d. Due to the compressibility effect, diving at high altitude will produce a tendency for the airplane to nose down. Dives will not be entered with the airplane trimmed for a more nose-down condition than high speed level flight. Keep the airplane trimmed so that a forward load must be applied to the stick to hold the airplane in the dive. If extremely high indicated speeds are reached, the elevator tab will have to be used for recovery. When the elevator tab is used for pull-out, the pilot will be on guard against sudden recovery and will apply forward stick during pull-out to hold-down "g's." Application of power materially aids recovery — reduction of power makes dives steeper.

(1) Safe indicated diving speeds must be limited as altitude is increased, as follows:

Sea Level to 10,000 ft	500 mph
10,000 ft to 15,000 ft	450 mph
15,000 ft to 20,000 ft	400 mph
20,000 ft to 25,000 ft	350 mph
25,000 ft to 30,000 ft	300 mph
30,000 ft to 35,000 ft	250 mph

(2) Tight turns or dives exceeding 225 IAS are prohibited with cowl flaps open. Tail buffeting will result.

(3)

CAPACITY OF TANK	MAXIMUM IAS
Wing Tanks 150 gallons	300 mph
Belly Tank 75 gallons	350 mph

CAUTION

The maximum fatigue break point of wing and belly tank installations during pull-out is approximately 4 "g's." Airplanes with the 75 gallon belly tanks installed should be limited to a 5 "g" pull-out.

2. BEFORE ENTERING PILOT'S COMPARTMENT.

a. Check Form 1.

b. Check Form F, weight, and balance clearance, AN 01-1-40.

3. ON ENTERING THE PILOT'S COMPARTMENT.

a. CHECK FOR ALL FLIGHTS.

(1) RP-47B airplane: Ignition switch "OFF." P-47D and P-47G: ignition switch and master battery switch "OFF."

(2) Landing gear handle "DOWN."

(3) Flaps "UP" (handle must be left in "UP" position).

(4) Flap equalizer "CLOSED" (down).

(5) Generator switch "ON."

(6) RP-47B: Ignition switch to "BAT." RP-47C, P-47D, and P-47G: ignition switch "OFF," and master battery switch "ON."

(7) Intercooler shutters "NEUTRAL."

(8) Oil cooler shutters "NEUTRAL."

(9) Propeller switch "ON." Selector in "AUTOMATIC."

(10) Fuel boost pump to "START" and "ALTITUDE" (fully counterclockwise).

(11) Check fuel pressure.

(12) Gun switch "OFF."

(13) Water switch "OFF."

b. SPECIAL CHECK FOR NIGHT FLYING.

(1) RP-47B: Turn ignition switch to "BAT." RP-47C, P-47D, and P-47G: master battery switch "ON."

(2) Turn cockpit spotlights and fluorescent lights "ON."

(3) Test-operate gun sight light brilliancy.

(4) Test-operate position lights.

(5) Test-operate compartment lights.

(6) Test-operate landing light. Be sure that the light is retracted after test. Do not operate landing light for more than 5 seconds.

4. STARTING ENGINE.

a. Turn propeller several revolutions by hand with ignition "OFF."

b. RP-47B: Ignition switch "BAT."

c. RP-47C, P-47D, and P-47G: Master battery switch "ON."

d. Supercharger lever "OFF" (full rear position).

e. Fuel selector valve "Main."

f. Crack throttle 1 inch to 1-½ inches open.

g. Mixture control "IDLE CUT-OFF."

h. Propeller switch "AUTOMATIC." Circuit breaker "ON."

i. Propeller control MAXIMUM RPM: 2700 rpm.

j. Fuel boost pump control on "START" and "ALTITUDE."

k. Prime two to four strokes if hot, and four to six if cold. As much as one-fourth throttle opening and heavy priming may be necessary in extreme cold.

l. Ignition switch to "BOTH."

m. Energize at least 15 seconds and engage starter.

n. When engine starts, move mixture control to "AUTO-RICH" and throttle to 900 rpm.

CAUTION

Failure to keep mixture control in "IDLE CUT-OFF" position unless engine is running, will result in flooding and fire hazard.

o. Correct boost pump on tank is selected automatically by fuel selector valve.

5. ENGINE WARM-UP.

a. Check oil pressure at once. If not 25 pounds in 30 seconds, shut off engine.

b. Oil pressure will go to about 150 pounds to 200 pounds. DO NOT INCREASE power above 1000 rpm until pressure drops to normal.

c. Run at 800 rpm to 1000 rpm until pressure is normal and oil temperature is 40°C (104°F). In cold weather, close oil shutter and cowl flaps during warm-up. During warm weather, open cowl flaps and leave oil shutter at neutral. Avoid prolonged running on the ground and always keep cowl flaps open during long ground runs to prevent burning of ignition harness.

6. EMERGENCY TAKE-OFF.

a. Use oil dilution to obtain proper oil pressure at moderate power, and TAKE-OFF.

WARNING

Apply throttle slowly but steadily. Too sudden application of throttle seriously affects torque.

7. ENGINE AND ACCESSORIES TEST.

a. When warm, and with propeller control set for maximum rpm, check magneto as follows:

(1) Turn propeller selector to "MANUAL."

(2) Open throttle to 2000 rpm, 30 inches Hg, and test each magneto. Drop in rpm should not exceed 50 on either magneto.

(3) Return propeller switch to "AUTOMATIC," and check full power at 45 inches Hg. Move supercharger control to "FULL ON" and check for 52 inches Hg. Full power check is not required for each flight. Tail must be tied down and wheels chocked to take propeller thrust when running engine above 2000 rpm.

CAUTION

When running at high power, NEVER CLOSE throttle with supercharger control "ON."

b. Check proper functioning of propeller by operating control.

c. Check for generator charge on ammeter.

d. With flap selector handle "UP" (fully forward), open flap equalizer valve (figure 10) on floor at right of seat, for a minimum of 10 seconds, and until rod on equalizer cylinder extends between ⅝ inch and ¾ inch. Return equalizer valve to "CLOSED" position. Do NOT OPEN equalizer valve unless flap handle is "UP." Equalization is necessary to insure that flaps will work together.

8. TAXYING INSTRUCTIONS.

a. Always unlock tail wheel for taxying; it is necessary therefore to keep swinging the airplane from side to side for visibility directly ahead.

CAUTION

Avoid taxying through mud holes and tall grass as the propeller can easily be damaged by small stones, mud clots, or hidden pieces of foreign material. *DO NOT TAXI WITH FLAPS EXTENDED.*

9. TAKE-OFF.

a. PREFLIGHT CHECK.

(1) Trim tabs—set for take-off. If auxiliary tank is full, set elevator tab ¼-inch forward of white mark.

(2) Mixture control—"AUTO-RICH."

(3) Propeller control—"MAXIMUM RPM" (fully forward). Propeller switches—"ON" and "AUTOMATIC."

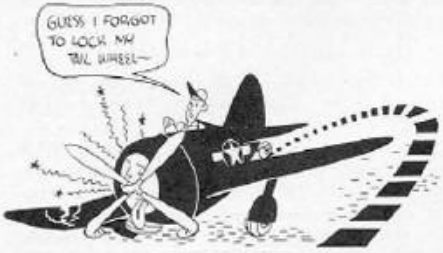
(4) Fuel selector valve—"MAIN TANK."

(5) Flaps—"UP." (Handle must be left in "UP" position.)

(6) Cowl flaps—"OPEN."

b. TAKE-OFF PROCEDURE.

(1) Turn straight down runway, move straight forward slightly, and "LOCK" tail wheel.



WARNING

Always lock tail wheel prior to take-off. A swing may develop if tail wheel is free.

(2) Half flaps will improve take-off.

(3) Take-off may be made with or without turbine supercharger. To obtain shortest run, supercharger should be used as follows:

(a) Push turbine control "FULL ON" or to setting previously determined to give 52 inches Hg.

(b) Hold with brakes while opening throttle to about 30 inches Hg.

(c) Release brakes and push throttle "FULL ON."

(d) Manifold pressure should not exceed 52 inches Hg.

NOTE

When the interconnected controls are used, the pilot should make certain that the take-off stop is in place. Take-off should be accomplished by pushing all controls (using throttle only) against the stop. It will be necessary to reduce the throttle setting slightly up to 10,000 feet to avoid over-boosting. Above 25,000 feet it may be necessary to go past the stop to obtain military power.

(4) As soon as the airplane is off the ground, move safety latch and raise landing gear lever to "UP." Leave lever at "UP" until it is desired to lower the landing gear. Always complete landing gear cycle except in an emergency. If handle is moved to "UP," allow gear to go completely up before changing handle. If lever is moved to "DN," allow gear to go completely down before changing handle.

10. ENGINE FAILURE DURING TAKE-OFF.

a. Nose-down.

b. Landing on field STRAIGHT AHEAD. If too late, retract gear and land OFF field STRAIGHT AHEAD.

c. During warm weather operation when ground temperature is approximately 95°F (35°C) or hotter, it will be necessary to disconnect controls and take off without using the turbosupercharger to avoid excessive carburetor air temperatures and loss of power. In this case, boost may be used as soon as sufficient altitude is reached, and lower carburetor air temperatures are obtained.

CAUTION

DO NOT ATTEMPT TO TURN BACK INTO THE FIELD.

11. CLIMB.

a. Best climbing speed is 140 to 155 IAS. It will be necessary in prolonged climbs or in hot weather to climb at higher speeds in order to properly cool the engine. Speed of climb should be increased until allowable cylinder head temperature is obtained.

b. Cowl flaps "OPEN," check cylinder head temperature frequently. If over 260°C (500°F), increase IAS. Check oil temperature 95°C (203°F) and carburetor air temperature 35°C (95°F).

c. The supercharger control should be set so that with full throttle, and supercharger control "FULL ON," 52 inches Hg at 2700 rpm is obtained for take-off. When operating at high power above 7000 feet, the throttle should be wide open and should be left there. Adjustments of power should then be made by the supercharger control. The supercharger control should always be moved slowly, so that manifold pressure will follow and overboost will be avoided.

NOTE

On airplanes equipped with interconnected engine controls, power may be adjusted by operating the throttle only, provided the supercharger lever is engaged with the throttle.

CAUTION

Never shut off throttle completely with the supercharger "ON." Power at altitudes above 27,000 feet is limited by the rpm of the turbine only. Overspeeding of the turbine must be avoided, except in extreme emergencies.

d. NO CARBURETOR FILTER INSTALLED.—Critical altitude at military power (5 minutes' operation) is about 27,000 feet. When operating above 27,000 feet in military power, manifold pressure must be reduced 2 inches for each 1000 feet above 27,000. The critical altitude in normal power is about 29,000. When operating above that altitude in normal power, manifold pressure should be reduced 1½ inches Hg for each 1000 feet above 29,000 feet. For example, military power at 40,000 feet is 2700 rpm and 26 inches Hg (for 5 minutes). Normal power at 40,000 feet is 2550 rpm and 25.5 inches Hg.

e. If the engine tends to "cut out" when flying at low power settings at high altitudes, the pilot should disconnect the engine controls and use the controls as follows:

(1) To reduce power, leave throttle setting at forward position and reduce boost setting to the desired manifold pressure. Then change engine rpm by moving the propeller control to the desired engine speed, after which the boost lever should be readjusted to the required manifold pressure.

(2) To increase power, adjust the propeller control to the desired engine rpm and then adjust the boost lever to the desired manifold pressure.

(3) After landing, the pilot should report the necessity for using disconnected controls to the crew chief. The crew chief shall be instructed to readjust the controls.

CAUTION

Never exceed the red line at 18,250 rpm on models equipped with turbo tachometers. On R-47D-1-RE and subsequent models, also P-47G-1-CU and up, a warning light glows when 18,250 rpm is exceeded. All operations above 2350 rpm and 31 inches Hg should be in "AUTO-RICH." If carburetor air filter is installed, critical altitude drops to 24,000 feet for military power and to 26,000 feet for normal power. Operations above these altitudes should be restricted as without the air filter above.

12. FLIGHT CHARACTERISTICS.

a. STABILITY.—All models are stable with the rear tank empty. The RP-47C-1-RE and subsequent are stable under all loading conditions. The belly tank decreases directional stability. Violent maneuvering or acrobatics should be avoided until belly tank is empty. No high-speed diving should be done with fuel in the belly tank.

b. FUEL TANK USE.—Always warm up and take off on "MAIN." Then switch over and RUN OUT BELLY TANK. When no belly tank is installed, always run out rear tank first. While running from either the belly or rear tank, the main tank should be switched "ON" for several minutes at intervals to insure that the vented fuel from the carburetor will not cause the main tank to overflow. The amount of vented fuel bypassed to the main tank may be as high as 10 U.S. gallons per hour.

c. CHANGE IN TRIM.

(1) The trim tabs are very sensitive.

(2) Lowering landing gear—no change.

(3) Lowering flaps—becomes slightly nose heavy.

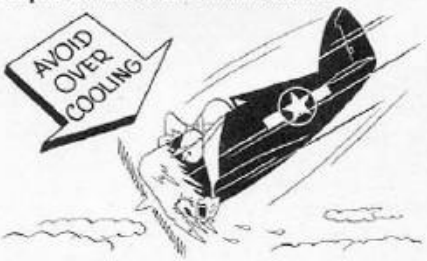
(4) Dive-Airplane tends to yaw right as speed increases.

WARNING

Attention is drawn to the fact that on early type airplanes the aileron and rudder trim tab wheels do not work in the same plane as the controls they operate, and that a danger exists that pilots may turn the controls in the wrong direction. Their extreme effectiveness renders this a source of danger, and care must always be exercised to see that the trim tab wheels are rotated in the correct direction to produce the desired effect.

d. ECONOMICAL CRUISING. — Complete engine operating data are contained on the FLIGHT OPERATING INSTRUCTION CHARTS in appendix II. For economical cruising, set manifold pressure at 28 inches Hg and reduce rpm, depending on the range desired. Low limit for rpm is 1500.

e. ICING CONDITIONS.—Under icing conditions, open carburetor filter bypass, close intercooler shutter, and use higher power with as much turbine supercharger as is consistent. This will result in high carburetor air temperatures and should eliminate the ice.



f. TANK SHIFTING.

(1) When shifting tanks at high altitudes, reduce power and turn on emergency boost while shifting. BE CAREFUL TO STOP ON THE "CLICK."

(2) To shift from auxiliary or main tank to belly tank on airplane from P-47D-5-RE and up, simply turn fuel selector cock to "BELLY TANK ON." On models prior to P-47D-5-RE, first place belly tank switch in "ON" position and then place fuel selector valve in "OFF" position.

(3) Due the fact that the main tank fuel gage is inaccurate at lower readings and that varying amounts

of fuel may remain when the tank is run out on "MAIN," a reserve of 10 to 15 gallons should be carried in the auxiliary tank at all times. This fuel can be used at any time that the pilot runs completely out on "MAIN" and "RESERVE." When both tanks are full at take-off, run down to 10 gallons on rear (auxiliary) tank and shift to "MAIN." If the main tank only is to be used, service 10 gallons into auxiliary prior to take-off.

13. ENGINE FAILURE DURING FLIGHT.

a. Nose-down.

b. Ignition switch "OFF."

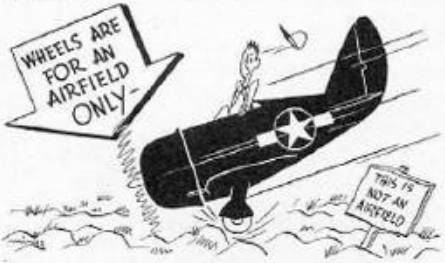
c. If airplane is equipped with a belly tank, pull release lever immediately.

d. Fuel selector valve "OFF."

e. Lower flaps by placing flap selector handle in "DOWN" position. (Sufficient pressure is available in accumulator of the hydraulic system to lower flaps.)

f. Master battery switch "OFF" (RP-47C, P-47D and P-47G only).

g. If a suitable emergency airfield is available, the landing gear may be lowered. IF NOT, KEEP LANDING GEAR "UP" AND LAND AIRPLANE ON ITS BELLY.



14. STALLS.

a. If controls are held in neutral, there is no tendency to spin, although the left wing drops rapidly, and the airplane will dive out and recover.

b. Stalling speeds are as follows:

Flaps and landing gear up-115 mph IAS

Flaps and landing gear down-100 mph IAS.

c. There is a pronounced tendency for the airplane to snap to the left when stalled in a turn. There is ample warning of the impending stall, however, in the form of buffeting and sloppiness of the controls.

15. SPINS.

a. Spin characteristics of a standard P-47 airplane without belly tank and with a gross weight of approximately 12,500 pounds and a center of gravity location of 28 percent or less are normal, except for a vertical oscillation of the nose during the spin. During all types of maneuvers and spin demonstrations, it has been found that the airplane will never spin of its own accord, but must be forced into the spin by use of elevator and rudder. In order to obtain a stable spin, it is necessary that full elevator and full rudder be carried at all times. Recovery is made by applying controls in the following sequence:

(1) Full opposite rudder.

(2) Neutral elevators.

(3) Ailerons full against spin.

b. All control movements should be smooth but rapid. The above procedure should give a spin recovery without one-half turn, but in the event it does not, hold controls in this position and apply at least one-half throttle. DO NOT TRY DIFFERENT CONTROL POSITION UNTIL AT LEAST THREE TURNS HAVE BEEN MADE WITH NO CHANGE IN THE SPINNING ALTITUDE. Approximately 1000 feet of altitude will be lost in the entry into the spin, 1000 feet in the recovery and 1000 feet per turn, wheels and flaps up, canopy closed. Approximately 3000 feet per turn is lost with gear down, flaps up. PRACTICE SPINS IN EXCESS OF ONE-HALF TURN ARE PROHIBITED.

16. ACROBATICS.

All normal acrobatics are permitted. NO OUTSIDE LOOPS or INVERTED FLIGHT shall be performed. Do not slow roll at speeds over 313 mph IAS. Snap rolls are not recommended and should never be performed above 150 mph IAS.

17. DIVING.

a. Aileron forces become high at speeds above 350 mph IAS. At least 12,000 feet should be allowed for recovery from dives at limiting speed which is 500 mph IAS. NEVER dive with cowl flaps "OPEN."

b. Due to the compressibility effect, diving at high altitude will produce a tendency for the airplane to nose down. If extremely high speeds are reached the elevator trim tab should not be used except in small amounts. The pilot should guard against too rapid recovery at low altitude if tab is used.

18. NIGHT FLYING.

a. The landing light should be extended only during the final approach and should be left on for the minimum time necessary. Do not extend it at speeds above 200 mph IAS.

CAUTION

BE SURE TO RETRACT LIGHT AT ONCE AFTER TAKE-OFF.

19. EMERGENCY EXIT.

a. At reasonable speeds, release canopy latch and push canopy to rear. In high speed dive, pull small ring on right forward side of canopy. This will release spoiler flaps on outside of canopy and will assist in

moving canopy to rear after releasing latch. Roll airplane on back if possible, push nose up, and pilot will fall clear of all structures (figure 37).

20. APPROACH, LANDING, AND CROSS-WIND LANDING.

a. APPROACH.

(1) Reduce speed to 140 to 150 mph.

(2) Close cowl flaps.

(3) Mixture control in "AUTO-RICH."

(4) Turbine supercharger "OFF."

(5) Propeller—2550 rpm.

CAUTION

NEVER LOWER LANDING GEAR ABOVE 200 mph.
NEVER LOWER FLAPS ABOVE 195 mph.
NEVER EXCEED 250 mph WITH LANDING GEAR DOWN.

(6) Landing gear and flaps "DOWN" (flap handle must be left in "DOWN" position). Check position of landing gear by observing indicator (on early models) or signal. Check position of flaps by observing the indicator on early models. On those models without indicator, the position of the flaps may be determined by observation from the cockpit. Check hydraulic pressure. If partial flaps are desired return handle to "NEUTRAL" when desired position is reached.

(7) Normal approach speeds:

(a) ENGINE "ON"—115-120 mph.

(b) ENGINE "OFF"—120-130 mph.

(8) Do not make steep turns below 130 mph IAS with flaps and landing gear "DOWN."

b. LANDING.

(1) Airplane has no tendency to swing after landing.

(2) Every effort should be made to land on the first quarter of the field. The airplane is heavy and requires considerable distance in which to stop rolling.

c. CROSS-WIND LANDING. — No special comments. Keep airplane straight with runway.

d. EMERGENCY OPERATION OF LANDING GEAR AND FLAPS.—If engine-driven hydraulic pump fails to lower landing gear within 30 seconds, check hydraulic pressure gage which should read 800 pounds per square inch minimum. If pressure reads zero, yaw airplane in both directions until signal indicates that landing gear is locked and down. DO NOT USE HAND PUMP TO LOWER LANDING GEAR. Any attempt to do so may use up reserve fluid in accumulator which is only sufficient for the emergency operation of the flaps. Return landing gear selector handle to neutral, before lowering flaps. Lower flaps by placing flaps selector handle "DOWN." If flaps do not lower and no pressure is indicated on pressure gage with flap handle "DOWN" and landing gear handle "Neutral," operate hand pump until desired flap angle is obtained.

e. EMERGENCY TAKE-OFF IF LANDING IS NOT COMPLETED.

(1) Open engine to full power, taking care not to exceed 52 inches Hg.

WARNING

Watch the tendency to swing, due to the sudden power application.

(2) Raise landing gear at once.

(3) Open cowl flaps.

(4) Raise flaps when above 500 feet.

(5) DO NOT PULL UP TOO STEEPLY or loss of directional control may result.

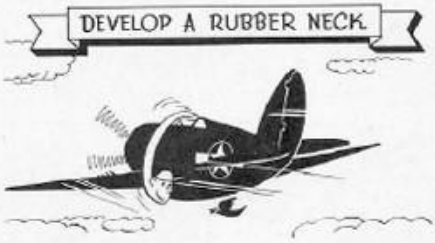
21. STOPPING ENGINE.

a. Apply toe brakes and set parking brake lever.

b. When a cold weather start is anticipated, before stopping the engine, hold the oil dilution switch (figure 18-15) in the "ON" position for a period of 4 minutes at 800 rpm. The dilution of the engine oil while the oil temperature is above 70°C (158°F) is not effective. If oil dilution is to be accomplished and oil temperature is too high, stop the engine until it has been cooled to 40 to 50°C (104-122°F), restart it and proceed with the oil dilution.

NOTE

At lower temperatures, 4 minutes is inadequate. As much as 8 to 11 minutes may be necessary in two or more periods, 3 to 5 minutes each.



c. Open engine to 1000 rpm and place mixture control in "IDLE CUT-OFF," holding the dilution switch "ON" until the engine stops.

d. After propeller stops rotating, turn ignition switch "OFF."

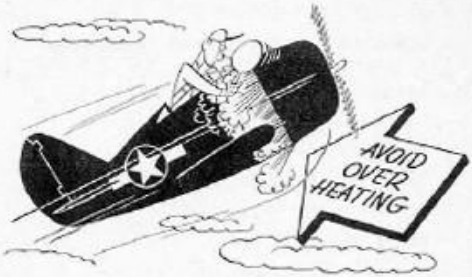
22. BEFORE LEAVING PILOT'S COMPARTMENT.

a. Fuel selector valve (figure 16) "OFF."

b. All cockpit light switches, pitot heater switch, generator, master battery switch, etc., "OFF."

c. If oxygen has been used during the flight, close valve to prevent leakage.

d. If windy, lock flight controls to prevent damage to the control surfaces.



SECTION III
FLIGHT OPERATING DATA

1. SPECIFIC ENGINE FLIGHT CHART.

a. Engine limitations and operating characteristics are summarized for ready reference. Learn them! Note restriction when Amendment No. 4 fuel is used.

b. Definitions of the engine power ratings shown on the chart are as follows:

(1) TAKE-OFF. — Maximum recommended for take-off under the specified time limit.

(2) WAR EMERGENCY.—The rating established by the manufacturer and accepted by the Government specifically for combat use under the specified time limit, not over 5 minutes.

(3) MILITARY. — Maximum recommended for operation limited to five or fifteen minutes duration unless otherwise specified.

(4) NORMAL RATED (Maximum Continuous). —Maximum recommended for unlimited operation with rich mixture in level flight and in climb.

(5) MAXIMUM CRUISE. — Maximum recommended for operation with lean mixture.

2. AIR-SPEED CORRECTION.

Mph—IAS	*Mph—Calibrated*
310	322.5
290	300.5
260	268.5
230	237.5
200	206.5
170	175.0

FORM AOC 813A

AIRPLANE MODELS: P-47 Series

SPECIFIC ENGINE FLIGHT CHART

ENGINE MODELS: R-2800-21

CONDITION	FUEL PRESSURE (LB./SQ. IN.)	OIL PRESSURE (LB./SQ. IN.)	OIL TEMP. °C	OIL TEMP. °F	COOLANT TEMP. °C	COOLANT TEMP. °F
DESIRED	16-17	75-85	50-70	–	AIR	
MAXIMUM	17	90	95	–	COOLED	
MINIMUM	16	60	40	–		
IDLING	7	25				

MAX. PERMISSIBLE DIVING RPM: 3050

CONDITION	ALLOWABLE OIL CONSUMPTION
NORMAL RATED (MAX. CONT.)	.33. U.S.QT./HR. IMP.PT./HR
MAX. CRUISE	.21. U.S.QT./HR. IMP.PT./HR
MIN. SPECIFIC	.33. U.S.QT./HR. IMP.PT./HR

OIL GRADE: (S) 1120 (W) 1100A

SUPERCHARGER TYPE: TURBO

FUEL GRADE: AMEND. 5; 100+ OCTANE

OPERATING CONDITION	RPM	MANIFOLD PRESSURE (BOOST)	HORSE-POWER	CRITICAL ALTITUDE WITH RAM	CRITICAL ALTITUDE NO RAM	BLOWER	USE LOW BLOWER BELOW:	MIXTURE CONTROL POSITION	FUEL FLOW (GAL./HR./ENG.) U.S.	FUEL FLOW (GAL./HR./ENG.) IMP.	MAXIMUM CYL. TEMP. °C	MAXIMUM CYL. TEMP. °F	MAXIMUM DURATION (MINUTES)
TAKE-OFF	2700	52"	2000	SEA LEVEL	SEA LEVEL	–	USE TURBO	A.R.	275	–	260	–	15
WAR EMERGENCY	2700	58"	2300	25,000	25,000	–	–	A.R.	315	–	260	–	5 (WATER INJ.)
MILITARY	2700	52"	2000	27,000	27,000	–	–	A.R.	275	–	260	–	15
NORMAL RATED (MAX. CONT.)	2550	42	1625	29,000	29,000	–	–	A.R.	210	–	232	–	UNLIMITED
MAXIMUM CRUISE	2250	32	1200	25,000	25,000	–	–	A.L.	105	–	232	–	UNLIMITED
MINIMUM SPECIFIC CONSUMPTION	1700	32	800	5,000		–	–	A.L.	60	–	232	–	UNLIMITED
	1850	31	950	15,000		–	–	A.L.	70	–	232	–	
	2150	31	1100	25,000		–	–	A.L.	95	–	232	–	

REMARKS: Under Military Power, reduce M.P. 2" per 1000 feet above 27,000 feet. Under Normal Rated, reduce M.P. 1½" per 1000 feet above 29,000 feet. If no turbine tachometer is installed, observe above remarks to avoid overspeeding turbine. If turbine tachometer is installed, do not exceed 18,250 turbine rpm. If carburetor air temperature exceeds 35° C. with intercooler doors open, do not exceed 2550 rpm and 42" Hg.
+M.P. must not exceed 47" Hg. if fuel is 100 Octane (Amend. No. 4).

SECTION IV
EMERGENCY OPERATING INSTRUCTIONS

1. EMERGENCY TAKE-OFF.

Use oil dilution to obtain proper oil pressure at moderate power, and as soon as the engine will take the throttle, taxi out, and *take off*.

WARNING

Apply throttle slowly but steadily. Sudden application of full throttle greatly affects torque.

2. ENGINE FAILURE DURING TAKE-OFF.

a. Nose-down.

b. Land on field STRAIGHT AHEAD. If too late, retract gear and land OFF FIELD, STRAIGHT AHEAD.

CAUTION

DO NOT ATTEMPT TO TURN BACK INTO THE FIELD.

3. ENGINE FAILURE DURING FLIGHT.

a. Nose-down.

b. Ignition switch "OFF." (To "BAT" on RP-47B only.)

c. If airplane is equipped with a belly tank, pull release lever immediately.

d. Fuel selector valve "OFF."

e. Manually lower the flaps.

f. Master battery switch "OFF" (RP-47C, P-47D and G only).

g. If a suitable emergency airfield is available, the landing gear may be lowered. If not, keep landing gear "UP" and LAND AIRPLANE ON ITS BELLY.

4. EMERGENCY EXIT DURING FLIGHT.

a. Release canopy lock and push canopy back in the usual manner. At high speeds, pull the handle on the right forward edge of the canopy, releasing spoiler flaps which aid in sliding canopy back.

b. To release panels, turn the emergency release handle 180 degrees until it snaps into place. Push out the partition between the windows. Push out windows.

5. EMERGENCY ENTRANCE ON GROUND.

Remove the red cover plate at the lower edge of the canopy on either side and pull out the handle thus exposed. Pull out the partition between the two panes by means of the ring located at its lower end. Pull out the panes.

6. WING FLAP OPERATION.

In event of failure of the engine-driven hydraulic pump, the flaps may be manually lowered by use of the emergency hand pump located at the left of the pilot's seat.

7. LANDING-GEAR OPERATION.

a. FAILURE OF ENGINE-DRIVEN HYDRAULIC PUMP.

(1) TO RETRACT LANDING GEAR.—Move control lever to "UP" position as usual. Operate the hand pump until the position indicator shows that the gear is "UP" and locked.

(2) TO EXTEND LANDING GEAR. — Move control lever to the "DOWN" position as usual. This will release the gear which should drop into position and lock due to its own weight. If it does not fully attain the locked "DOWN" position, operate the hand pump until the "locked" signal is given. If the gear is still not locked down, yaw the airplane from side to side.

WARNING

Always complete landing gear cycle if possible. If handle is moved to "UP," allow gear to go completely up, before changing valve. If handle is moved to "DOWN," allow gear to go completely down before changing control.

b. FAILURE OF ENTIRE HYDRAULIC SYSTEM. —Extend the landing gear by moving the control into the "DOWN" position as usual. This motion releases the gear which drops, due to its own weight, and usually falls to the fully extended and locked "DOWN" position. In case air pressure prevents one wheel from fully attaining the locked position, it can be shaken into place by yawing the airplane from side to side.

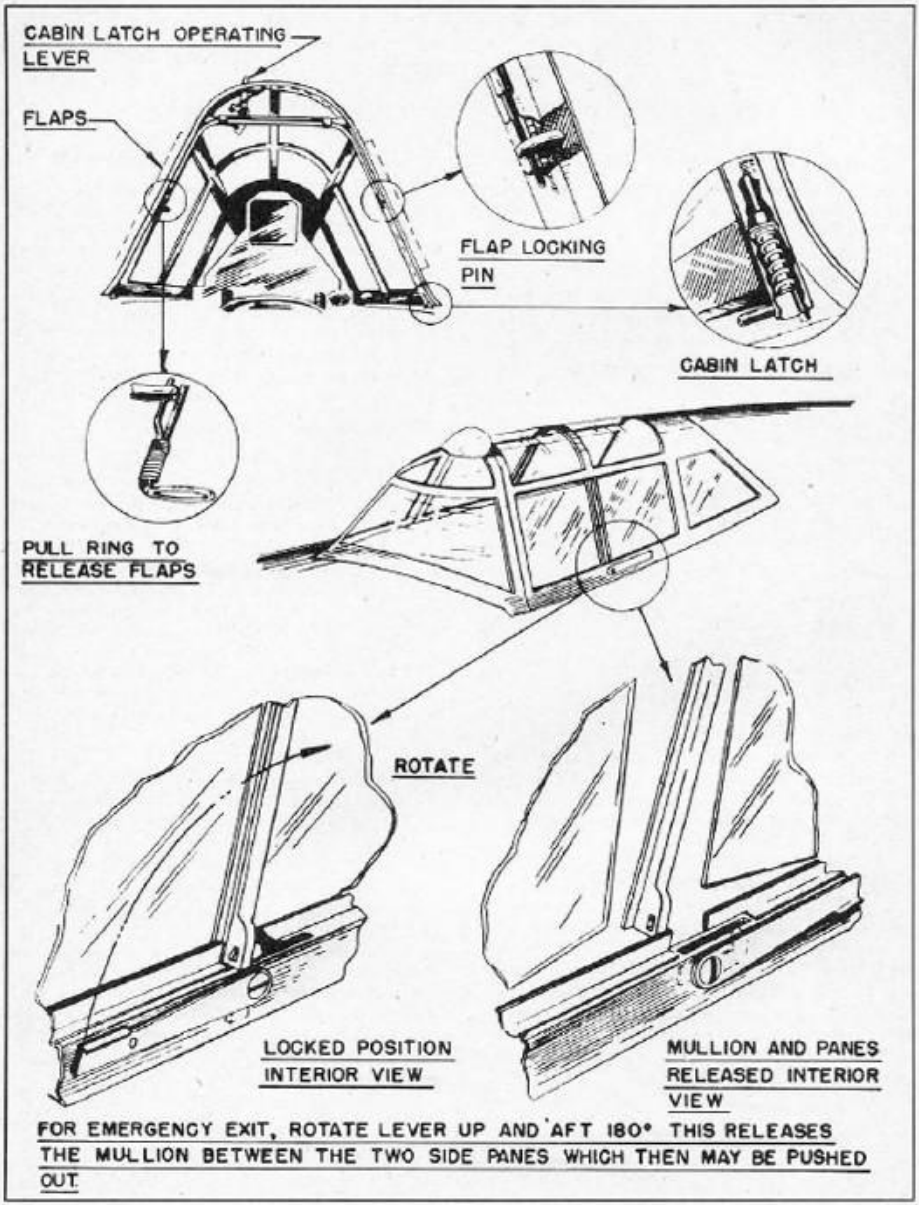


Figure 37—Canopy—Emergency Exits Diagram

SECTION V
OPERATIONAL EQUIPMENT

1. COMMUNICATIONS EQUIPMENT.

a. P-47B AIRPLANE.

(1) GENERAL DESCRIPTION.

(a) INSTALLATION. — The radio installation consists of a type SCR-283 command set equipped with a range filter and a throat microphone. A "push-to-talk" button is provided on the engine throttle, with all other operating controls located on the right side of the cockpit.

(b) RECEIVER.—The receiver is calibrated and adjusted to receive the radio range frequencies between 201 and 398 kilocycles, and the tactical communication range between 2500 and 7700 kilocycles. Provisions for receiving other frequencies can be installed by a radio technician.

(c) TRANSMITTER.

1. The transmitter will operate on any frequency between 2500 and 7700 kilocycles at which the radio technician sets it. It is capable of transmitting voice, modulated CW (MCW), or straight CW signals.

2. The effective range of the transmitter for dependable voice transmission is approximately 25 miles.

(2) OPERATING INSTRUCTIONS.

(a) RECEIVER.

1. Turn receiver control box selector switch (figure 38-5) on "MANUAL." Plug receiver phones in jack No. JK-26 and turn volume control knob (figure 36-6) to the right until a frying noise or a signal is heard in the head set.

CAUTION

For all normal (voice or MCW) reception, the radio receiver crystal filter selector switch should be set at "BOTH." To receive the radio range "MCW" without possibility of voice interference, set the selector switch to "RANGE." To receive voice without possibility of radio range interference, set the selector switch to "VOICE." IT IS IMPOSSIBLE TO RECEIVE VOICE WHEN THIS SELECTOR SWITCH IS SET ON "RANGE."

2. To receive the radio ranges and control tower on 201 to 398 kilocycles, set the "HI-LO" selector switch (figure 38-8) to "LO." Adjust tuning dial knob for desired frequency as calibrated on the inner scale of tuning dial.

NOTE

When tuning receiver for a definite frequency, always turn dial a little to each side of the calibration mark to find the point where the signal is strongest. This procedure is to be followed when the receiver selector switch is set on "MANUAL."

3. To receive tactical frequencies, turn the "HI-LO" selector switch to "HI." Adjust tuning dial knob for desired frequency as calibrated on the outer scale of the tuning dial. The intermediate scale on the tuning dial (0-100 scale) is used only in special instances when special frequency ranges are being used, and require installation of special coils by radio maintenance personnel. In this case, there will be found a metal "FREQUENCY IN KC" calibration chart installed in every cockpit near the tuning dial.

NOTE

The "HI-LO" selector switch is connected to the receiver by a spring cable and must be operated by the "click and feel" method. Care must be taken to insure proper contact in either "HI" or "LO" position, since the position of the pointer does not accurately indicate the setting.

4. TO RECEIVE CODE.

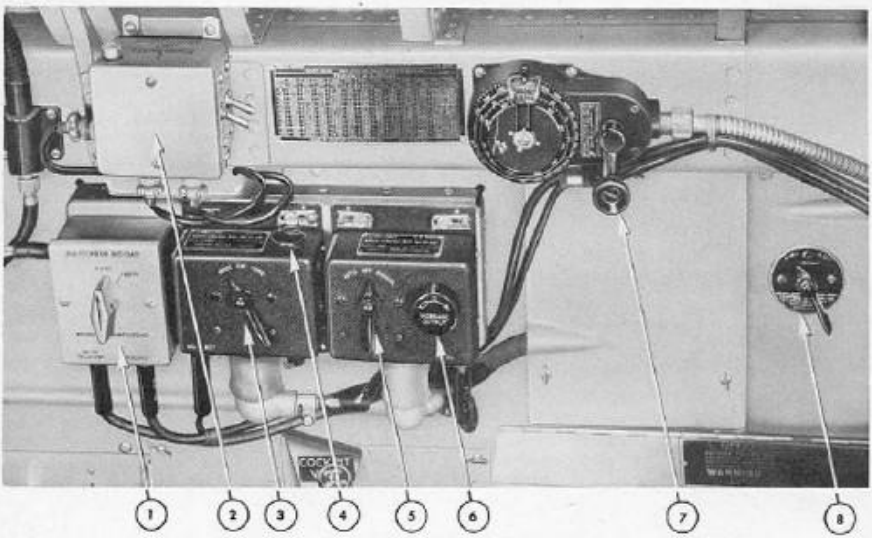
a. Straight continuous wave signals (CW) cannot be heard on this receiver, as it is not equipped with a beat frequency oscillator.

b. Tone (MCW) signals may be heard on this receiver by tuning in the same manner as for voice reception with the radio range filter selector switch set on "BOTH."

c. The receiver (and transmitter filaments) may be turned off by placing the control box selector switch in its "OFF" position.

5. TRANSMITTER.

a. Place throat microphone around neck and adjust the band so that its two circular elements are held snugly against each side of the throat just *above* the "Adam's-apple."



1. Crystal Filter Selector Switch
2. Identification Light Switches
3. Transmitter Emission Control Switch
4. Transmitting Key
5. Radio Receiver Volume Control Selector Switch
6. Receiver Off-On Volume Control
7. Tuning Dial Control Crank
8. Radio Receiver "Hi-Lo" Switch

Figure 38—Radio Controls, RP-47B

b. Before transmitting, adjust radio receiver to the same frequency as the station with which you desire to talk, and listen in to be sure the operator is not talking to someone else. If the station is transmitting, take advantage of the opportunity to more accurately set the airplane receiver on the assigned frequency, and when the other operator is through, proceed with your transmission.

6. VOICE TRANSMISSION.

a. Set transmitter emission selector switch (figure 38-3) to "VOICE."

b. When the selector switch is set on "AUTO" or "MANUAL," press the microphone button located on the engine throttle and start talking. Speak *slowly, distinctly*, and in a *normal* tone of voice. Shouting will seriously distort the voice signal.

c. Release the microphone button when through talking.

7. CODE TRANSMISSION.

a. TONE (MCW).—Set transmitter emission selector switch (figure 38-3) to "TONE" and operate transmitter key (figure 38-4).

b. CW.—Set transmitter emission selector switch to "CW" and operate transmitter key.

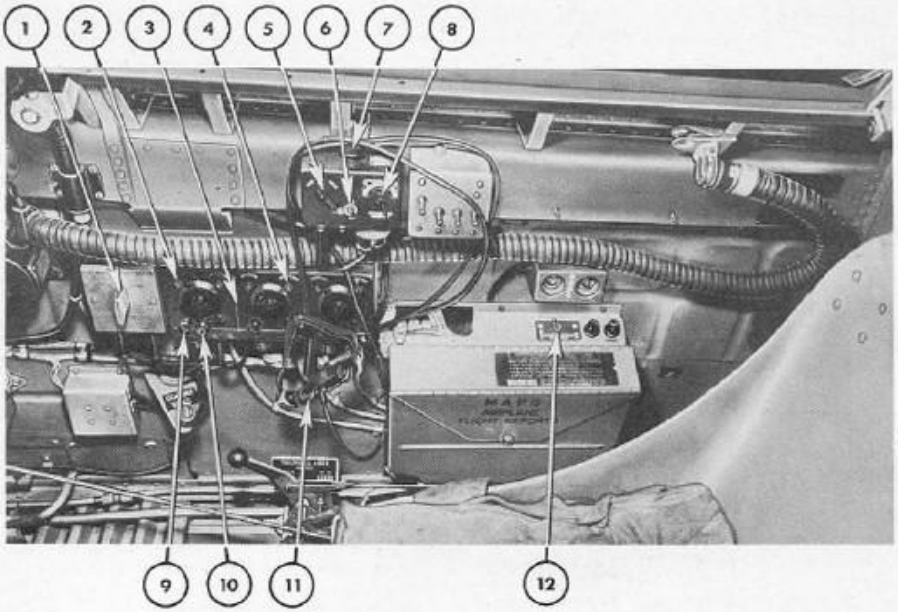
NOTE

Any receiving station "standing by" a particular frequency, expecting voice signals, will hear any "TONE" (MCW) code transmissions. However, this station will not hear "CW" signals unless his receiver is equipped with a beat frequency oscillator, and the oscillator is turned on. Ground stations and bomber airplanes are usually equipped with receivers containing a beat frequency oscillator. Fighter airplanes are not equipped to receive "CW" signals.

(3) OPERATION NOTES FOR PILOT.

(a) UNABLE TO RECEIVE.

1. Ascertain that receiver selector switch is on "MANUAL" or "AUTO."



1. Radio Filter Switch Box
2. "A-B" Telephone Switch
3. Command Receiver Control Box—BC-450-A
4. "CW—OFF—MCW" Switch
5. "Tone—CW—Voice" Selector Switch
6. Transmitter Power Switch
7. "Built-In" Transmitting Key
8. Transmitter Selector Switch
9. Volume Control
10. Tuning Crank
11. Microphone T-30—( )
12. Contactor Heater Switch

Figure 39—Radio Controls, P-47C, P-47D, and P-47G

2. Ascertain that the "HI-LO" switch is in proper position and is making good contact. Refer to NOTE under paragraph 1.*a.*(2)*(a)*3. Test receiver operation on band known to be in use.

3. Systematically check for secure connections in all cables and wires about the radio controls, starting with head set and ending at the receiver control box.

4. Turn range filter switch pointer to all positions to be sure internal contact points are making good connection, or that the pointer is not set somewhere between positions.

5. Turn volume control through its entire range to test for an intermittent short circuit or some isolated position where receiver is inoperative.

(b) UNABLE TO TRANSMIT.

1. Ascertain that receiver (and transmitter filament) selector switch is set on "MANUAL" or "AUTO."

2. Be sure that the transmitter emission selector switch is not set between positions.

3. Carefully inspect microphone for evidence of damage due to rough treatment.

4. Systematically check for secure connections in all cables and wires about the radio controls, starting with the microphone and ending at the transmitter control box.

5. If transmitter does not "come on" for voice transmission when the "push-to-talk" button on the engine throttle is operated, hold the transmitter key down; operate the "push-to-talk" button if failure was on "TONE" or "CW."

NOTE

The key and "push-to-talk" button may be substituted for each other for any three positions of the transmitter emission control.

b. RP-47C, P-47D, and P-47G AIRPLANES.

(1) GENERAL.—Provisions are made for the installation of either the SCR-274N or the SCR-522A radio set in these airplanes. The contractor, RC96 (pip squeak), is used in conjunction with either of the two command sets. The command radio equipment is located in the baggage compartment (figure 49-17) and is accessible through the baggage compartment door. All

radio equipment is controlled remotely by the pilot through control boxes located on the right side of the cockpit.

(2) COMMAND SET SCR-274N.

(a) DESCRIPTION.—The command set SCR-274N is designed for communicating with nearby aircraft for tactical purposes and with ground stations for navigational and traffic control purposes. Three receivers and one transmitter are installed in the rear of the fuselage. All dials and controls are located on remote control units to the right of the pilot.

(b) RECEIVING.

1. The receiver remote control unit is divided into three identical sections, each section controlling the particular receiver to which it is electrically and mechanically connected. Reception of a signal of a specific frequency as indicated on the dial is accomplished by the use of the section of the receiver control box which controls the particular receiver involved.

2. Plug head set phone jack plug in jack. Turn volume control (figure 39-9) to right until a faint frying noise is heard in the head set.

3. Set crystal filter selector switch (figure 39-1) on "BOTH" for all normal (voice or MCW) reception.

4. Turn switch (figure 39-4) on. This switch, in addition to having an "OFF" position, has two selective positions marked "CW" and "MCW," each of which is an "ON" position and indicates the type of signal which is to be received.

NOTE

When tuning receiver for a definite frequency, always turn dial a little to each side of the frequency calibration mark to find the point where the signal is the strongest.

5. The "A-B" switches should be left in the "A" position at all times.

(c) TRANSMITTING.

1. Before transmitting, adjust radio receiver to the same frequency as the station with which you desire to talk and listen in to be sure that the operator is not talking to someone else. If the station is transmitting, take advantage of the opportunity to more accurately set the receiver on the assigned frequency, and when the other operator is finished, proceed with your transmission.

2. Place transmitter master switch (figure 39-6) in "ON" position.

3. Select type of transmission desired with switch marked "TONE-CW-VOICE." (See figure 39-5.)

a. With switch in "VOICE" position, voice will be transmitted when the push-to-talk button (figure 36-9) is pressed.

b. With the switch in the "CW" position, a continuous wave, or unmodulated signal, will be transmitted. The microphone is inoperative.

c. With the switch in the "TONE" position, a modulated tone signal is transmitted. The microphone is inoperative.

NOTE

Greatest effective range can be obtained on "CW." Range is most limited when operating on "VOICE." Transmitting in both the "CW" and "VOICE" positions is done by a key (figure 39-7) located on the top of the transmitter control unit.

4. To reduce battery drain and to increase dynamotor life, the "TONE-CW-VOICE" switch (figure 39-5) should be left on "VOICE" unless continued use on "CW" or "TONE" is expected.

(3) RADIO SET SCR-522-A (UHF).

(a) GENERAL.

1. This equipment is an ultra high frequency (UHF) command set designed for voice communication only. It is used in conjunction with a contactor (pip squeak) for identification and navigational purposes.

2. The radio waves from this equipment travel in straight lines, like beams of light, and do not follow the curvature of the earth. Due to this fact, in order to receive signals from a ground station, it is necessary that the airplane be above a certain altitude, the altitude being determined by the distance of the airplane from the ground station.

a. If the airplane is between 35 and 50 miles away from the ground station, it must be above 1000 feet before reception is possible.

b. If the airplane is between 80 and 100 miles away from the ground station, it must be above 5000 feet before reception is possible.

c. If the airplane is between 120 and 160 miles away from the station, it must be above 10,000 feet before reception is possible.

NOTE

If the range differs from any of the above-mentioned distances, altitude will change proportionately.

3. Excessive operation of this equipment on the ground must be avoided unless a battery cart is used to prevent running down the airplane's battery.

(b) OPERATION.

1. Press the proper channel button on the cockpit control box for the frequency upon which you are to transmit and receive.

NOTE

Transmission and reception take place on the same frequency.

2. The green pilot light (figure 40-4) adjacent to the channel button, pressed, lights up whenever the set is in operation.

3. The white pilot light adjacent to the toggle switch (figure 40-5) should light up, indicating that the set is on "RECEIVE."

4. For throttle microphone button transmission, the toggle switch (figure 40-6) must be in the "REM" position.

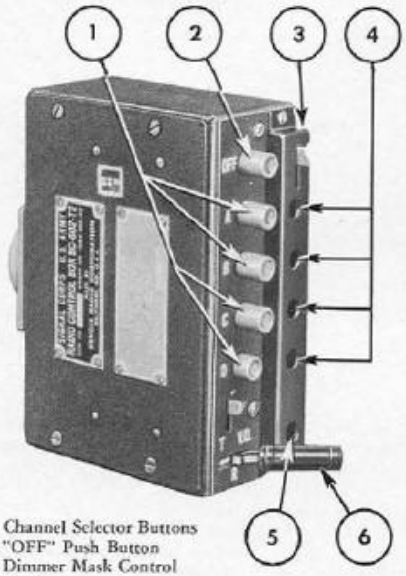
NOTE

"REM" (Remote) was marked "V.O." on early control boxes.

5. Press microphone button, press the throttle microphone "push-to-talk" button, and speak in a loud voice with the microphone against your lips. The white pilot light goes out, indicating that the set is on "transmit."

6. It is also possible to transmit by moving the control box toggle switch (figure 40-6) to the "T" position, instead of pressing the throttle "push-to-talk" button. However, it must be returned to either the "R" or "REM" position immediately after transmission is completed in order to receive.

7. Indicator lamps on the control box are provided with a dimmer mask for night flying. The mask is operated by moving a small lever beside the "OFF" push button (figure 40-3).



1. Channel Selector Buttons
2. "OFF" Push Button
3. Dimmer Mask Control Knob
4. Channel Warning Lamps (Green)
5. Receive Warning Lamp (White)
6. Master Toggle Switch

Figure 40—Control Box—Radio Set SCR-522

(4) CONTACTOR RC-96 (PIP SQUEAK).

(a) The contactor is used with either the SCR-274N or SCR-522A command sets.

(b) When the contactor clock on the instrument panel (figure 30-22) is turned on, the transmitter is in operation. It sends out a 14-second tone signal once every minute on channel "D" when used with the SCR-522 radio set and on channel 2 when used with the SCR-274N set. Transmission of the signal occurs during the period that the hand is moving through the marked quadrant on the face of the clock.

(c) Connect contactor clock to radio set by placing switch (figure 30-21) in the "IN" position.

(d) Start clock by placing clock master switch (figure 30-23) in the "RUN" position.

(e) When the clock takes over, the channel selector switch automatically goes to the proper channel and a continuous tone is heard both in the phones and on the ground for 14 seconds. At the end of the 14-second signal period, the selector switch automatically switches back to the original channel.

WARNING

It is impossible to transmit or receive voice during the 14-second tone signal period.

(5) RADIO SET SCR-535 (IFF).

(a) The control box for this radio set is located on the right side of the cockpit. A master switch is located on the box. Operation of the set is automatic and the pilot has only to place the switch in the "ON" position to place the equipment in operation.

(b) A dual push button switch, painted red, is located on the right side of the cockpit above the map case (figure 34-7). The purpose of the two push buttons is to destroy the IFF equipment should it be necessary to abandon the airplane over unfriendly territory. When both push buttons are pressed simultaneously, a detonator is set off in the receiver which is located in the aft end of the fuselage in the baggage compartment. The explosion of the detonator will destroy the receiver internally. No damage to the airplane will result at the time of destruction of the set.

NOTE

Regeneration adjustment of the IFF set must be made on the ground prior to flight in order to insure correct operation of the equipment.

2. ARMAMENT.

a. GUNSIGHT OPERATION. — The airplane is equipped with an N-3A sight. The brilliance of the sight reticle is adjustable by means of a rheostat (figure 18-12) on the main switch panel on the left side of the cockpit below the throttle. The reticle is visible only when the eyes are in the proper position, within a 2-inch circle directly behind the sight. In some eye positions, only a portion of the outer ring is visible, but this in no way affects the accuracy of the sight.

Figure 41—Gun Heat Control

Figure 42—Gun Safety Switch

b. GUNS.—Eight .50-caliber guns, four in each wing, are provided. Only six guns, with ammunition, are included in the design useful load. Two guns and ammunition are alternate load. No rounds indicators are provided. The maximum load is 425 rounds each. Desired loading with six guns is 300 rounds each and with eight guns, 200 rounds each. These guns are charged manually on the ground before take-off. Determine the loading for each particular flight in order to estimate the firing time. Three hundred rounds of ammunition is approximately 20 seconds of fire.

c. GUN OPERATION.—Since the guns have been previously loaded and charged on the ground, they are ready to fire immediately when the safety switch installed on the left wheel of the cockpit is turned "ON." The squeeze trigger on the stick fires all guns simultaneously. If one or more guns should jam, the others will continue to operate effectively. THE GUN SAFETY SWITCH SHOULD BE IN THE "OFF" POSITION BEFORE LANDING.

d. BORESIGHTING.—The guns may be boresighted in a horizontal plane from a position where each gun is parallel to the other, to a position where all guns converge at 250 yards, and in a vertical plane from intersection with the sightline at 250 yards and 85 percent maximum speed at best performing altitude to intersection at 250 yards at full speed at best performing altitude. Ordinarily the guns are set to converge at 250 yards or 350 yards. Figure 43 shows the ranges for each setting through which effective firing may be accomplished. Determine the boresighting position of your guns before take-off on a firing mission.

3. OXYGEN EQUIPMENT.

a. DEMAND TYPE SYSTEM.

(1) PREFLIGHT CHECK.

(a) GENERAL.—Before using this equipment, be sure you are familiar with the complete oxygen demand system. Consult your Oxygen Officer and refer to the applicable Technical Orders, the Lithograph Instruction Charts, and Trailing Films on oxygen equipment. Thoroughly understand the operation, use, and purpose of each instrument and item. Give each part the care and consideration it requires for its proper functioning.

(b) MASK.

1. The mask must be properly fitted and checked for leakage by the Oxygen Officer. Flights over 30,000 feet must not be made when the mask leak is greater than 5 percent.

2. Check all parts of the mask to see if it is in good shape and ready for instant use. The mask must be clean and free of all foreign matter.

3. Try the mask on in the airplane and check for leaks by holding the thumb over the corrugated hose fitting and inhaling normally.

(c) QUICK DISCONNECT FITTING.—Insert the male fitting (see that the gasket is in place) of the mask into the female end of the tubing from the regulator. Be sure the fit is snug and that a pull of at least 10 pounds is required to separate the two.

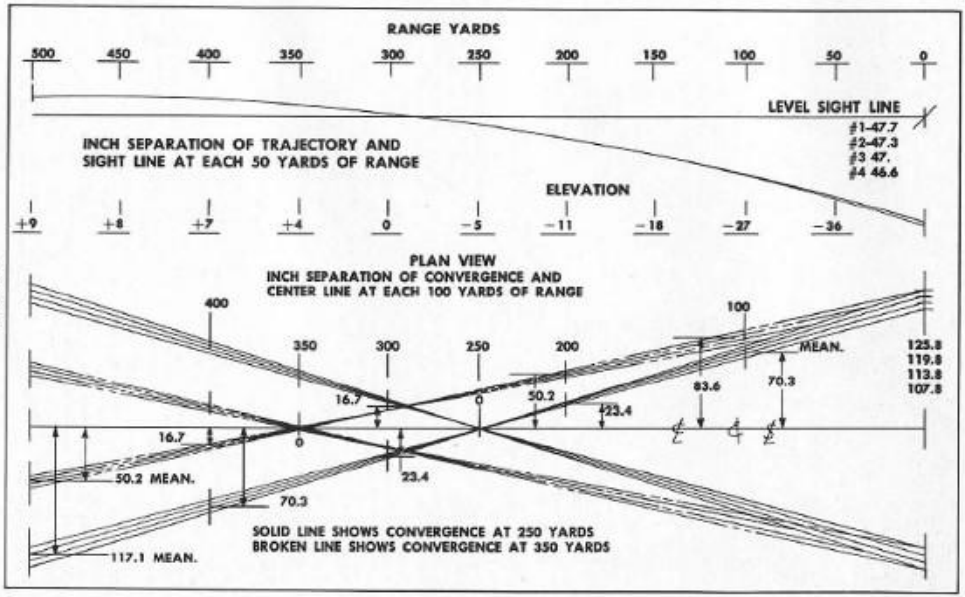


Figure 43—Gun Elevation and Convergence Diagram, RP-47B, RP-47C, and P-47G

Figure 44—Engine Primer, Cowl Flaps and Oxygen Controls

(d) MASK-REGULATOR TUBING.

1. Inspect the mask-regulator tubing for any damages, such as tears, holes, and kinks. Be sure all clamps are firmly in place.

2. Attach the tubing, by means of the spring clip on the female fitting, to the clothing or parachute harness high up on the chest. It may be desirable to sew on a tab of fabric or webbing to the clothing to accommodate the clip. Be sure that the attachment is high enough so that there is free movement of the head without kinking the mask hose. Be sure that the mask hose does not become kinked or twisted in flight.

(e) REGULATOR AND INDICATING INSTRUMENTS.

1. Be sure that the knurled collar at the outlet end of the regulator is tight. Examine the top diagram to see that it is not ruptured or distorted.

2. Turn on the "EMERGENCY" valve and see that you get a large flow. Observe the pressure gage. There should be no perceptible pressure drop. Turn "OF" the "EMERGENCY" valve tightly, and be sure that it does not leak. Leave it in this position.

3. Turn the "AUTO-MIX" to the "OFF" position. Notice that on inhalation the top diaphragm goes down and that you get nearly 100 percent oxygen, which will be indicated on the flow indicator. Turn the "AUTO-MIX" to the "ON" position. Notice that on inhalation you get almost pure air and that there is little or no indication of oxygen flow on the flow indicator. Leave it in this position.

4. Check the pressure of the system. It must not be less than 400 pounds per square inch.

(2) IN FLIGHT.

(a) Manipulate the mask to free it of ice at regular intervals when temperatures are low enough to cause ice formation in the mask.

(b) Be sure that your mask hose does not become kinked or twisted.

(c) Be sure that your mask does not lose its leak-proof characteristics.

(d) If for any reason you feel you are suffering from lack of oxygen, if your mask should suddenly leak, if the demand mechanism fails, or if no oxygen flow is indicated by the flow indicator, immediately turn on the "EMERGENCY" control on the regulator.

(e) Check the oxygen pressure gage frequently.

(f) Check the flow indicator frequently.

(g) In any flight over 30,000 feet, pay particular attention to your oxygen equipment. Be sure all items and instruments are functioning perfectly before attempting flight to these extreme altitudes. Any failure of the equipment may be fatal.

(3) AFTER FLIGHT.

(a) Be sure that all oxygen equipment is in proper condition before leaving the airplane. If any difficulties developed during the flight, take necessary steps to have them corrected.

(b) If your pressure is less than 100 pounds per square inch, observe that the supply warning light is on. Occasionally, at the end of a flight, when the pressure is slightly above 100 pounds per square inch, bleed the oxygen out of the system by opening the "EMERGENCY" on the regulator and see that the supply warning light goes on at about 100 pounds per square inch. Then turn the "EMERGENCY" off.

(c) Wash the mask with mild soap and water, dry thoroughly, and leave in a clean, airy place out of the sunlight.

(d) At all times, be sure that the mask is in good condition and is properly fitted for instant use.

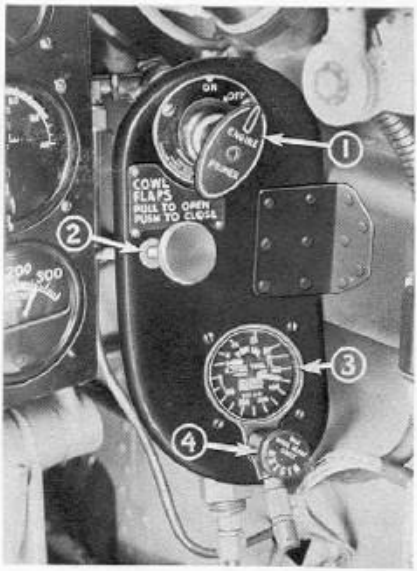
b. CONSTANT FLOW TYPE.

(1) PREFLIGHT CHECK.

(a) GENERAL.—Before using this equipment, be sure you are familiar with the complete oxygen system. Consult your Oxygen Officer and refer to the applicable Technical Orders, the Lithograph Instruction Charts, and Training Films on oxygen equipment. Thoroughly understand the operation, use, and purpose of each instrument and item. Give each part the care and consideration it requires for its proper functioning.

(b) MASK.

1. The mask must be properly fitted. Check all parts of the mask to see if it is in good shape and ready for instant use. Particular attention should be paid to the condition of the bag. The mask must be clean and free of all foreign matter.



1. Engine Primer
2. Cowl Flap Control
3. Oxygen Flow Gage
4. Oxygen Flow Control

Figure 45—Oxygen Flow Regulator, RP-47C, P-47D, and P-47G

2. Be sure that the component parts of the mask are securely held together with wire or tape. Be sure that the plug at the bottom of the bag and the sponge rubber valves are in proper position.

3. If flight is to be made under freezing conditions, have the plastic connector between the facepiece and the bag sticking up inside the facepiece above the lower surface, so that moisture will not readily drain into the connector and bag. Protective shields, drawing No. 43B8375, should be used for the sponge rubber valves.

4. Be sure that the bayonet fitting at the end of the mask hose has its rubber gasket and that proper connection can be made with the outlet fitting on the regulator.

(e) REGULATOR.

1. Check the cylinder or system pressure as shown on the regulator gage. It must be at least 400 pounds per square inch.

2. Turn the needle valve knob on and see that there is no restriction to flow. This adjustment knob should not be too loose. If it is, tighten the gland packing which is on the same shaft.

3. Check the regulator for proper flow with the ground flow check meter, Specification No. 40400.

(2) IN FLIGHT.

(a) Be sure to set the regulator to the proper altitude.

(b) Manipulate the mask to free it of ice at regular intervals when temperature is low enough to cause ice formation in the mask.

(c) Be sure that your mask hose does not become kinked or twisted.

(d) Be sure that your mask retains its proper fit.

(e) Check the oxygen gage on the regulator frequently.

(f) Above 30,000 feet the bag should never be completely collapsed during inhalation. If it is, the adjustment knob on the regulator should be opened farther, no matter what the flow indicator setting is.

(g) When activity is required, the flow should be also increased so that the bag does not completely collapse.

(3) AFTER FLIGHT.

(a) Be sure that the regulator adjustment knob is tightly closed so that there is no leakage.

(b) Be sure all the oxygen equipment is in proper condition before leaving the airplane. If any difficulties developed during the flight, take necessary steps to have them corrected.

(c) Wash the mask with mild soap and water, dry thoroughly, and leave in a clean, airy place out of the sunlight.

(d) At all times, be sure that the mask is in good condition and is properly fitted for instant use.

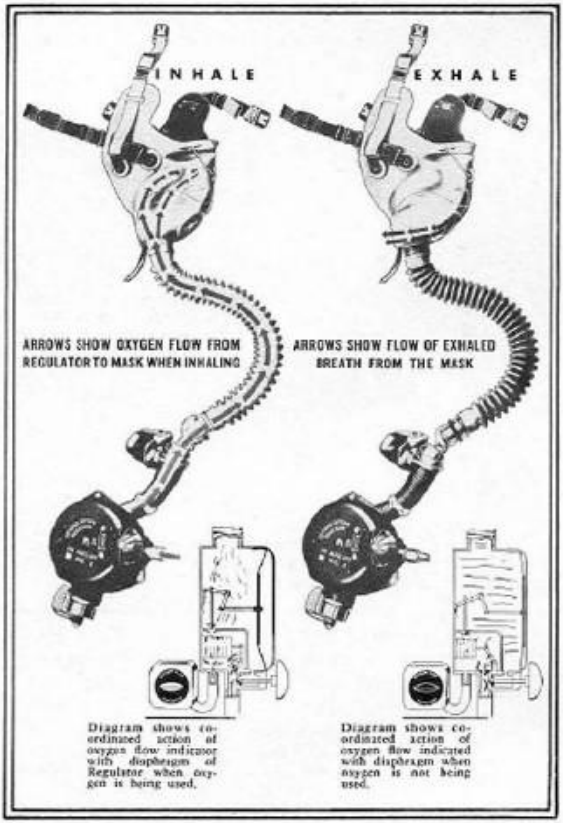
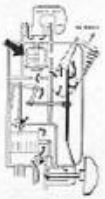
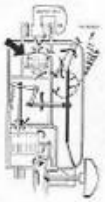


DIAGRAM OF OXYGEN MIXTURE AT 50,000 FEET



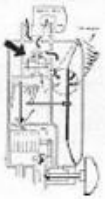
At 50,000 feet and above, the Auto-Mix sylphon because of barometric pressure shuts off all outside air, permitting only pure oxygen to flow through the Regulator. Green arrows indicate the movement of oxygen from the supply line to the mask.

DIAGRAM OF OXYGEN MIXTURE AT 10,000 FEET



At intermediate altitudes the Auto-Mix sylphon controls a variable mixture of oxygen and air. The percentage of oxygen depending on the altitude. All of this is automatically controlled by the action of sylphon. The higher the altitude the greater is the percentage of oxygen flow. The black arrows indicate incoming air and the green arrows indicate the incoming oxygen.

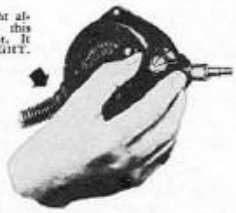
DIAGRAM OF OXYGEN MIXTURE AT SEA LEVEL



At sea level the Auto-Mix sylphon is completely depressed because of the barometric pressure; thus stopping most of the oxygen flow through the Regulator. Black arrows in illustration show the incoming air as it flows through the Auto-Mix into the Regulator and to the mask. Small green arrows indicate trickle of oxygen flow into mixing chamber.

FOR USE IN CASE OF EMERGENCY

Prior to flight always check this knurled collar. It must be TIGHT.



If Regulator fails to function, turn on Emergency Valve. This allows a constant flow of oxygen to the mask direct from the supply line. Flow indicator will not operate under this condition, and oxygen will flow from the supply line at a higher rate. Watch your pressure gage.

EMERGENCY "ON"

When Emergency Valve is opened the green arrows indicate the flow of oxygen from supply line direct through the Emergency Valve and Regulator to the mask.

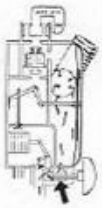


Figure 46—Oxygen Operating Instructions, RP-47C, P-47D, and P-47G

Illustration shows the A-9 Oxygen Mask in position at left side of helmet ready for quick attachment on face. When not in use leave mask attached to helmet as shown.

Here the A-9 Mask is being attached with straps in uncrossed position on helmet. This method recommended for broad or full faces. Mask must not leak. To check this, hold thumb over end of mask hose. If leaks occur around face, adjust straps or nose wire to fit mask more securely and test again.

Illustration shows the A-10 Oxygen Mask being attached with straps in crossed position to the rear of the "Juliet." This cross position of straps is recommended for small, or long and narrow faces, as it makes a firm and leak-proof fitting.

Here the nose strap (distinguishing difference between the A-9 and the A-10 Masks) is being fixed to the front of the "Juliet" in regular suspender-like manner. This helps to hold the mask in position. Check for leaks, following the method suggested for testing the A-9 Oxygen Mask.

To get oxygen, place the end connection of mask hose into the fitting, on end of feeder hose coming from the Demand Regulator.

For normal operation the "Auto-Mix" should always be turned to "ON" position as noted here. This assures a proper mixture of oxygen with the outside air.

If regulator fails to function, turn on emergency valve illustrated above.

EMERGENCY GAS ABSORBING CANISTER

Gas canisters are furnished for all flying personnel to provide for protection against gas attacks while in flight or when landing on gassed terrain. Grasp canister near bottom and pull loose. This will automatically release both seals, making it ready for immediate use.

Before detaching oxygen mask hose from regulator connecting hose, take a deep breath. Then, before attaching the mask hose to the gas canister, exhale sufficiently to clear the mask and hose itself of any possible gas accumulation. Immediately thereafter, attach gas canister to mask hose, by inserting connection end into top of canister. Fasten canister to clothing by means of clip affixed to it.

To use the regulator chemical warfare service training canister, attach a small section of rubber tubing to it, replacing cork stopper to end of tube. This should be done before arcent. In attaching it to the oxygen mask, remove the corks, top and bottom, and thus proceed in the same manner as with the aircraft gas canister.

Figure 47—Oxygen Mask Instructions, RP-47C, P-47D, and P-47G

APPENDIX I

GLOSSARY OF NOMENCLATURE (U. S. A.—BRITISH)

U.S.A.	*British*
Accumulator (hydraulic)	Should not be confused with electrical accumulator or battery
Airfield	Aerodrome
Battery (electrical)	Electrical accumulator
Bombardier, bomber	Bomb aimer
Ceiling	Cloud height
Empennage	Tail unit
Flight indicator	Artificial horizon
Gasoline (gas)	Petrol
Glass, bulletproof	Armour glass
Gross weight	All up weight
Ground (electrical)	Earth
Gyro horizon	Artificial horizon
Gyro pilot	Automatic pilot
(to) Land	(to) Alight
Lean	Weak
Left	Port
(to) Level off	(to) Flatten out
Line, mooring	Mooring guy
Manifold pressure	Boost
Mast, radio	Rod aerial
Overload	Non-standard load
Panel, outboard	Outer plane
Reticle (gunsight)	Graticule
Screen	Filter
Set, command	Pilot controller set
Ship	Aircraft
Speed, indicated air (IAS)	Air-speed-indicator reading
Stabilizer, horizontal	Tail plane
Stabilizer, vertical	Fin
Stack	Manifold (inlet or exhaust)
Tachometer	Engine speed indicator
Tube (radio)	Valve
Turn indicator	Direction indicator
Valve (fuel or oil)	Cock
Weight empty	Tare
Windshield	Windscreen
Wing	Main plane

APPENDIX II

FLIGHT OPERATING CHARTS, TABLES, CURVES AND DIAGRAMS

1. GENERAL.

This section presents diagrams and tables containing a summary of specific characteristics, restrictions, and instructions. Every effort has been made to present complete data in simple, practical, and reliable form. Due to limitations of space, the data appear complex but careful study will reveal a surprising amount of valuable information. Distances shown have been adjusted to account for service conditions and are slightly conservative.

2. FUSELAGE CONTENTS ARRANGEMENT.

a. Items of equipment are shown in their relative positions. The numbers in black disks are fuselage stations expressed in inches aft of the nose.

3. TAKE-OFF, CLIMB, AND LANDING CHART.

a. This chart is a general summary of characteristics with a few pertinent instructions. Note the temperature correction under each table.

b. The following is a sample take-off problem:

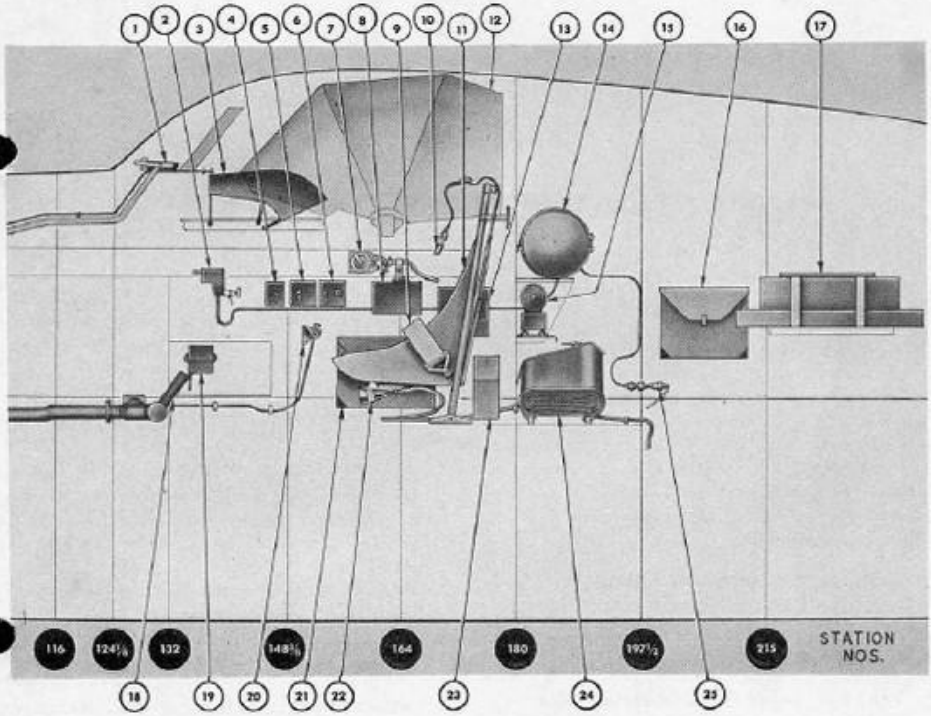
Can a P-47 airplane operate from 3,000 foot clearance surrounded by trees if elevation is 2,500 feet, no wind, the surface is sod and the average temperature is about 30°C? Refer to chart. The take-off distance table under "Sod-Turf Runway," "At 3,000 feet," "To clear 50-foot object" (on account of trees), and opposite 15,000 pounds gross weight and zero wind (top line), reads 4,000 feet; 10 percent is 400 feet, which must be added for each 10°C above 0°C. For 30°C, three times 400 feet is 1,200 feet, which added to the 4,000 feet gives 5,200 feet required for safe operation. A similar calculation for 12,500 pounds gross shows 130% of 3,200, which is over 4,000 feet. Therefore, use of that field is practically out of the question in spite of the fact that a landing without belly tank could be made in about 2,800 feet with 13,500 pounds gross weight.

c. SAMPLE CLIMB PROBLEM. — With combat loading of eight guns and 1600 rounds of ammunition, what is the minimum time required to climb to 20,000 feet if the estimated air temperature is 15°C? Gross weight is about 13,300 pounds. "Combat" climb to 20,000 feet with 12,500 pounds requires 10.6 minutes and with 14,000 pounds, requires 12.1 minutes; therefore, with 13,300 pounds, the time would be about 11.5 minutes.

4. FLIGHT OPERATION INSTRUCTION CHARTS.

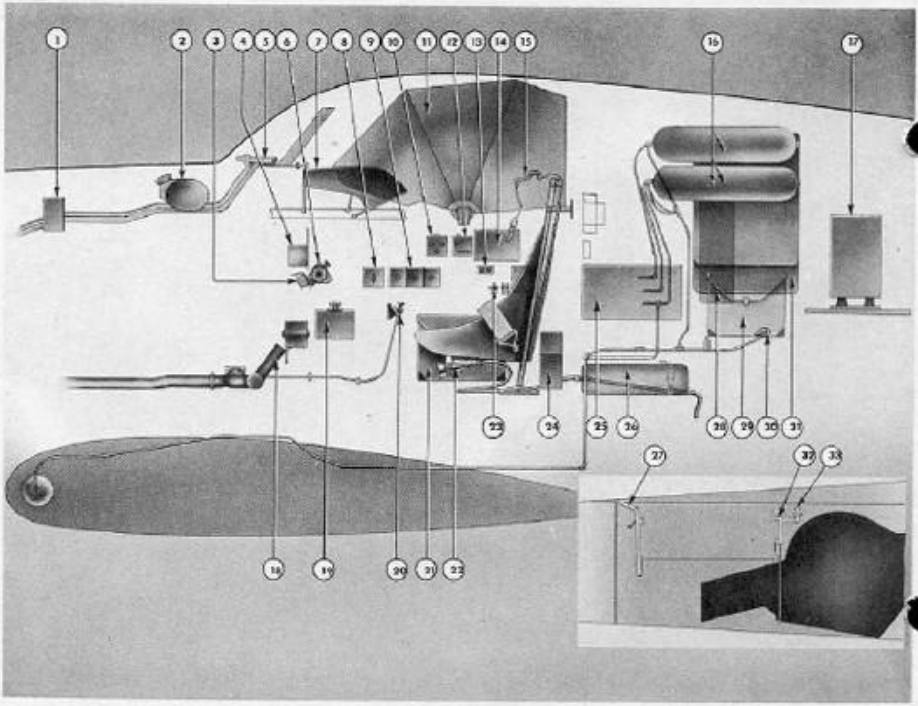
a. Two charts are provided; sheet 1 applies only until belly tank fuel is exhausted and sheet 2 gives operating instructions for all other loading conditions. The difference is primarily due to the weight of the belly tank fuel.

b. On each chart, note the two reference columns which show gallons of fuel in the upper half of the table and altitudes in the lower half. Other columns are in sets with practical ranges (statute and equivalent nautical air-miles) listed in the upper half, and corresponding operation instructions in the lower half. Progressing from left to right, these columns are arranged to show increase in range at sacrifice in speed with maximum cruising speeds on extreme left and maximum range on extreme right.



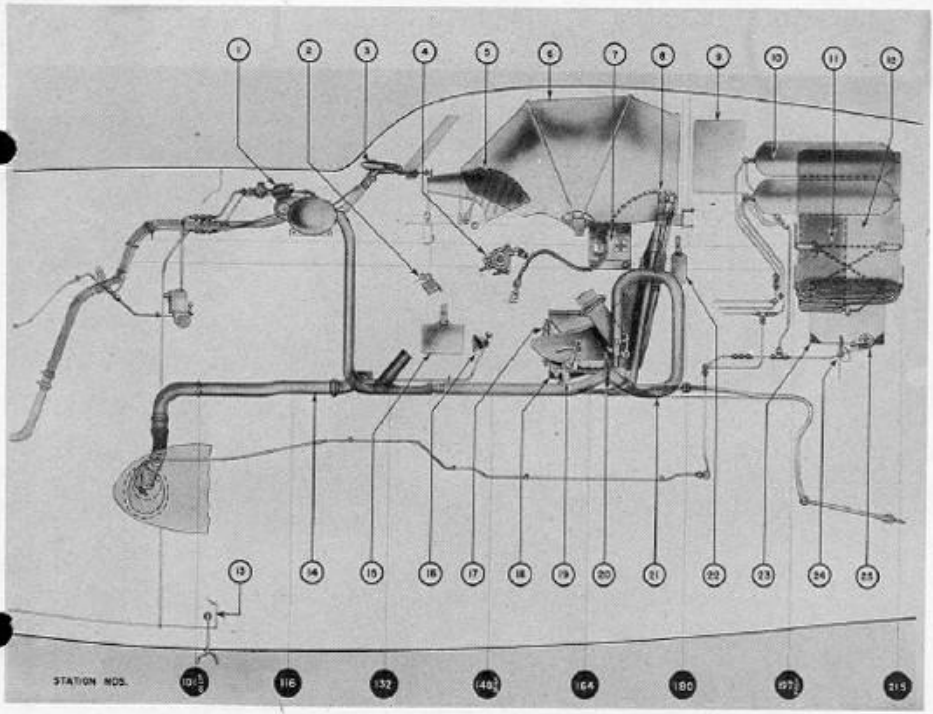
1. Windshield Defroster
2. Oxygen Regulator
3. Anti-Glare Shield
4. Switch Box Radio
5. Control Box—Transmitter
6. Control Box—Receiver
7. Tuning Unit—Receiver
8. Check List Holder
9. Safety Belt
10. Shoulder Harness
11. Pilot Seat
12. Blind Flying Hood
13. First-Aid Kit
14. Oxygen Cylinder
15. Dynamotor
16. Data Case
17. Receiver and Transmitter Radio
18. Cockpit Ventilator
19. Radio Receiver Crystal Filter
20. Control—Cockpit Vent
21. Map Case
22. Pilot's Relief Tube
23. Pyrotechnics
24. Engine Cover and Canopy Cover
25. Filler Valve—Oxygen

Figure 48—Fuselage Contents Arrangement Diagram, RP-47B



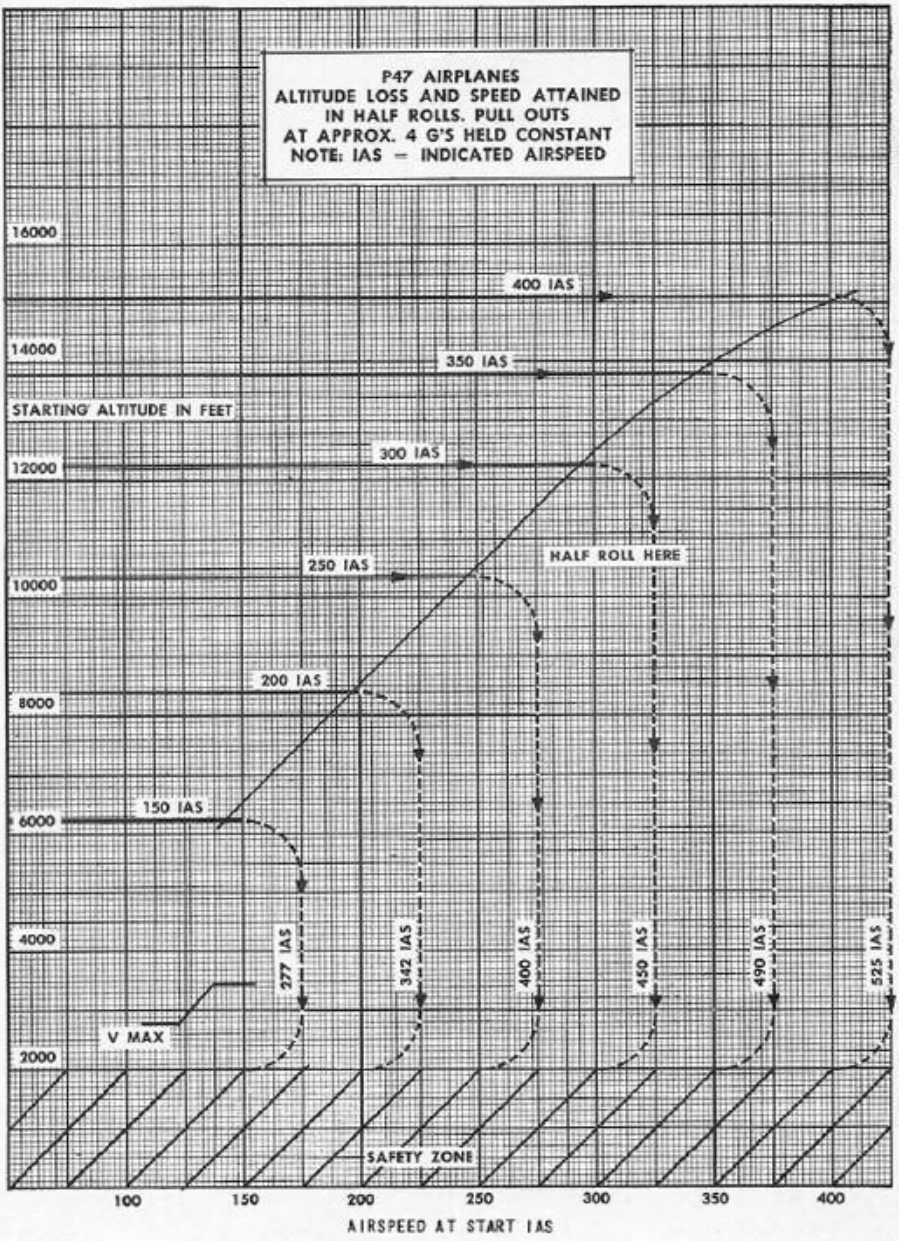
1. Dynamotor
2. Anti-Icing Equipment
3. Oxygen Pressure and Flow Indicator
4. Contactor (Pip Squeak)
5. Windshield Defroster
6. Oxygen Regulator
7. Anti-Glare Shield
8. Crystal Filter Selector Switch Box
9. Receiver Control Unit
10. Transmitter Control Box
11. Blind Flying Hood
12. Identification Lights Switch Box
13. IFF Detonator Switch Box
14. First-Aid Kit
15. Shoulder Harness
16. Oxygen Bottles
17. Radio Command Receiver
18. Cockpit Ventilator
19. Check List Holder
20. Cockpit Vent Control
21. Map Case
22. Relief Tube
23. Contactor Heater Switch Box
24. Pyrotechnics
25. Radio Command Transmitter
26. Tool Kit
27. Ground Charging Tool
28. Mooring Kit
29. Data Case
30. Oxygen System Filler Valve
31. Engine and Canopy Cover
32. Starter Crank Extension
33. Starter Crank

Figure 49—Fuselage Contents Arrangement Diagram, RP-47C, P-47D, and P-47G



1. Anti-icing equipment
2. Oxygen pressure and flow indicator
3. Windshield defroster
4. Oxygen regulator
5. Anti-glare shield
6. Blind flying hood
7. First aid kit
8. Shoulder harness
9. Change list
10. Oxygen bottles
11. Mooring kit
12. Engine and canopy cover (stowage)
13. Engine cover
14. Cockpit ventilator
15. Check list holder
16. Cockpit vent control
17. Flashlight (Penlight)
18. Map case
19. Pilot's relief tube
20. Pilot's seat
21. Cockpit heater
22. Check list holder—winterization
23. Data case
24. Adapter
25. Oxygen system filler valve

Figure 50—Fuselage Contents Arrangement Diagram, P-47D-1-RE



AIRPLANE MODELS

TAKE-OFF, CLIMB & LANDING CHART

ENGINE MODELS

P-47 SERIES

R-2800-21

TAKE-OFF DISTANCE (IN FEET)

GROSS WEIGHT IN LBS.	HEAD WINDS MPH	HEAD WINDS KNOTS	HARD SURFACE RUNWAY — AT SEA LEVEL: GROUND RUN	AT SEA LEVEL: TO CLEAR 50' OBS.	AT 2,000 FT.: GROUND RUN	AT 2,000 FT.: TO CLEAR 50' OBS.	AT 4,000 FT.: GROUND RUN	AT 4,000 FT.: TO CLEAR 50' OBS.	SOD-TURF RUNWAY — AT SEA LEVEL: GROUND RUN	AT SEA LEVEL: TO CLEAR 50' OBS.	AT 2,000 FT.: GROUND RUN	AT 2,000 FT.: TO CLEAR 50' OBS.	AT 4,000 FT.: GROUND RUN	AT 4,000 FT.: TO CLEAR 50' OBS.	SOFT SURFACE RUNWAY — AT SEA LEVEL: GROUND RUN	AT SEA LEVEL: TO CLEAR 50' OBS.	AT 2,000 FT.: GROUND RUN	AT 2,000 FT.: TO CLEAR 50' OBS.	AT 4,000 FT.: GROUND RUN	AT 4,000 FT.: TO CLEAR 50' OBS.
15,000	0	0	3400	5500	3600	5800	3900	6200	3900	5400	3900	6000	4000	6300	3900	5900	3900	6000	4000	6200
	20	17	1800	3600	2000	3800	2200	4000	1900	3700	2100	3900	2300	4100	2000	3900	2100	4000	2300	4200
	40	35	1200	1900	1400	2000	1600	2200	1300	1900	1500	2100	1700	2300	1400	2000	1600	2200	1800	2500
14,000	0	0	2100	3100	2300	3400	2500	3800	2300	3200	2400	3500	2600	3900	2400	3400	2600	3700	2900	4200
	20	17	1300	2200	1700	2600	1900	2900	1500	2300	1800	2700	2000	3000	1900	2500	2000	2900	2300	3300
	40	35	1000	1500	1200	1800	1400	2100	1100	1600	1300	1900	1500	2200	1200	1700	1400	2000	1600	2300
13,500	0	0	1800	2800	2000	3100	2200	3400	1900	2900	2100	3200	2300	3500	2100	3100	2300	3400	2500	3700
	20	17	1300	2000	1500	2300	1600	2500	1400	2100	1600	2400	1700	2600	1600	2300	1700	2500	1900	2800
	40	35	900	1400	1000	1500	1200	1800	1000	1500	1100	1600	1300	1900	1100	1600	1200	1700	1400	2000

NOTE: INCREASE DISTANCE — 10% FOR EACH 10°C ABOVE 0°C | 10% FOR EACH 305' ABOVE 32°F | ENGINE LIMITS FOR TAKE-OFF — 2700 RPM & 52 IN. HG

CLIMB DATA

COMBAT MISSIONS USE — 2700* RPM & 52 IN. HG

FERRY MISSIONS USE — 2350 RPM & 35 IN. HG

GROSS WEIGHT IN LBS.	TYPE OF CLIMB	S.L. TO 5,000 FT. ALT.: BEST I.A.S. MPH	KNOTS	TIME MINS.	10,000 FT. ALT.: BEST I.A.S. MPH	KNOTS	TIME MINS.	FUEL USED U.S.	13,000 FT. ALT.: BEST I.A.S. MPH	KNOTS	TIME FROM S.L. MINS.	FUEL FROM S.L. U.S.	20,000 FT. ALT.: BEST I.A.S. MPH	KNOTS	TIME FROM S.L. MINS.	FUEL FROM S.L. U.S.	BOMB CHARGE
15,000	COMBAT	165	—	3850	3	165	—	3850	6	80	—	155	—	7300	10	75	—	155	—	1300	14	90	—	155	—	900	19	110	—
	FERRY	155	—	730	7	165	—	730	14	75	—	155	—	700	21	90	—	155	—	690	28	110	—	155	—	690	37	135	—
14,000	COMBAT	165	—	3080	3.4	165	—	3080	6.9	57	—	155	—	5600	8.3	70	—	155	—	5200	12.1	85	—	155	—	5050	15.4	98	—
	FERRY	165	—	850	6	165	—	850	12	65	—	155	—	800	18	85	—	155	—	750	24	105	—	155	—	690	32	130	—
13,500	COMBAT	165	—	2200	3.3	165	—	2200	6.4	55	—	155	—	5550	7.7	66	—	155	—	1400	10.6	79	—	155	—	5250	14.5	93	—
	FERRY	165	—	1000	9	165	—	1000	15	60	—	155	—	940	18	75	—	155	—	900	31	90	—	155	—	850	37	105	—

NOTE: INCREASED ELAPSED CLIMBING TIME — 10% FOR EACH 10°C ABOVE 0°C FREE AIR TEMPERATURE | 10% FOR EACH 10°F ABOVE 32°F | FUEL INCLUDES WARM-UP AND TAKE-OFF ALLOWANCE

LANDING DISTANCE (IN FEET)

GROSS WEIGHT IN LBS.	BEST I.A.S. APPROACH MPH	KNOTS	HARD DRY SURFACE — AT SEA LEVEL: TO CLEAR 50' OBS.	AT SEA LEVEL: GROUND ROLL	AT 5,000 FT.: TO CLEAR 50' OBS.	AT 5,000 FT.: GROUND ROLL	AT 10,000 FT.: TO CLEAR 50' OBS.	AT 10,000 FT.: GROUND ROLL	FIRM DRY SOD — AT SEA LEVEL: TO CLEAR 50' OBS.	AT SEA LEVEL: GROUND ROLL	AT 5,000 FT.: TO CLEAR 50' OBS.	AT 5,000 FT.: GROUND ROLL	AT 10,000 FT.: TO CLEAR 50' OBS.	AT 10,000 FT.: GROUND ROLL	WET OR SLIPPERY — AT SEA LEVEL: TO CLEAR 50' OBS.	AT SEA LEVEL: GROUND ROLL	AT 5,000 FT.: TO CLEAR 50' OBS.	AT 5,000 FT.: GROUND ROLL	AT 10,000 FT.: TO CLEAR 50' OBS.	AT 10,000 FT.: GROUND ROLL
13,500	130	—	2400	1550	2600	1700	2850	1850	2500	1750	2650	1900	3000	2050	4550	3600	4900	4000	5350	4350
	115	—	2200	1200	2300	1400	2500	1500	2100	1300	2300	1550	2500	1700	3600	2800	3900	3100	4250	3400

NOTE: FOR GROUND TEMPERATURES ABOVE 25°C INCREASE APPROACH I.A.S. 10% AND ALLOW 20% INCREASE IN GROUND ROLL.

REMARKS: *For combat climb, reduce to 2550 rpm and 42" Hg within 5 minutes from start of take-off.
If 100 octane (Amend. No. 4) fuel is being used, do not exceed 47" Hg for take-off or climb.

I.A.S.: Indicated Air Speed
M.P.H.: Miles Per Hour
S.L.: Sea Level
U.S.: U. S. Gallons
NOTE: All Distances are Statute

(RED FIGURES HAVE NOT BEEN FLIGHT CHECKED)

Figure 51—Take-off, Climb and Landing Chart

MODEL(S)
F-67 Series

ENGINE(S): R-2800-21 (with Turbo)

FLIGHT OPERATION INSTRUCTION CHART

CHART WEIGHT LIMITS: 15,500 TO 11,000 POUNDS

EXTERNAL LOAD ITEMS
1—75-GALLON OR 2—120-GALLON EXTERNAL TANKS

LIMITS	R.P.M.	M.P. (IN. HG. A.)	BLOWER CONTROL POSITION	MIXTURE CONTROL POSITION	TAKE LIMIT	TOTAL G.P.H.
MAX. WAR RATED	2700	66	—	A.R.	5	315
MILITARY POWER	2700	52	—	A.R.	10	295
NORMAL RATED	2550	42	—	A.R.	NO LIMIT	240

INSTRUCTIONS FOR USING CHART: Select figure in FUEL column equal to or less than amount of fuel to be used for cruising. Move horizontally to left or right and select RANGE value equal to or greater than the statute or nautical air miles to be flown. Vertically below and opposite desired cruising altitude (ALT.) read tabulated R. P. M., I. A. S. 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. Manifold pressure (M. P.), gallons per hour (G. P. H.) and true airspeed (T. A. S.) are approximate values for reference. For efficiency maintain indicated airspeed (I. A. S.) hourly. Adjust RPM slightly if necessary to avoid exceeding manifold pressure more than 3 in. Hg.

I		FUEL	II		III		IV		FUEL	V	
RANGE IN AIR MILES		U. S.	RANGE IN AIR MILES		RANGE IN AIR MILES		RANGE IN AIR MILES		U. S.	RANGE IN AIR MILES	
STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL
—	—	600	① ② GAL. ALLOWANCE NOT AVAILABLE IN FLIGHT				③		600	—	—
750	650	550							550	1300	1100
710	620	500							500	1400	1200
640	550	450							450	1250	1000
570	490	400							400	1140	950
500	435	350							350	1000	840
430	370	300							300	860	720
355	310	250							250	710	600
285	245	200							200	570	480
215	185	150							150	430	370
140	120	100							100	280	240
70	60	50							50	140	120

MAXIMUM CONTINUOUS						OPERATING DATA						OPERATING DATA						OPERATING DATA						MAXIMUM RANGE					
R.P.M.	I.A.S. M.P.H.	MIX. POS.	M.P. In. Hg.	G.P.H.	T.A.S.	ALT. Feet	R.P.M.	I.A.S. M.P.H.	MIX. POS.	M.P. In. Hg.	G.P.H.	T.A.S.	R.P.M.	I.A.S. M.P.H.	MIX. POS.	M.P. In. Hg.	G.P.H.	T.A.S.	R.P.M.	I.A.S. M.P.H.	MIX. POS.	M.P. In. Hg.	G.P.H.	T.A.S.	ALT. Feet	R.P.M.	I.A.S. M.P.H.	MIX. POS.	M.P. In. Hg.	G.P.H.	T.A.S.
						35000																			35000					
						30000																			30000					
2500	230	A.R.	38	200	340	25000																			25000					
2550	225	A.R.	37	195	320	20000																			20000					
2550	220	A.R.	36	190	290	15000																			15000					
2550	220	A.R.	35	170	270	10000																			10000	1900	200	A.L.	32	75	260
2500	220	A.R.	33	165	250	5000																			5000	1750	190	A.L.	32	70	250
2300	215	A.R.	30	160	225	S. L.																			S. L.	1600	180	A.L.	30	65	200

NOTES

① ALLOW 22 GAL. FOR WARM-UP, TAKE-OFF & INITIAL CLIMB PLUS ALLOWANCE FOR WIND, RESERVE & COMBAT AS DESIRED.

② IF TANKS ARE DROPPED, SEE SHEET 2, "SELECTION THEREOF."

EXAMPLE

AT 15000 LB. GROSS WT. WITH 1 REGAL OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 300 GAL.)
TO FLY 1650 STAT. MILES AT 10,000 FT. ALT.
MAXIMUM ENDURANCE AND MINIMUM FUEL ASSUMED
WITH MIXTURE SET AUTO-LEAN
(TWO 150-GALLON TANKS CARRIED).

LEGEND

I.A.S.: INDICATED AIRSPEED
M.P.: MANIFOLD PRESSURE
G.P.H.: U. S. GAL. PER HOUR
T.A.S.: TRUE AIRSPEED
A.L.: AUTO-LEAN
M.P. In. Hg.: MANIFOLD PRESSURE
G.P.H.: U. S. GAL. PER HOUR
T.A.S.: TRUE AIRSPEED
A.L.: AUTO-LEAN
A.R.: AUTO-RICH
T.T.: FULL THROTTLE
F.R.: FULL RICH
A.R.: AUTO-RICH
A.L.: AUTO-LEAN
C.L.: CRUISING LEAN

RPM REQUIRED AIR PREDICTABLE, SUBJECT TO REVISION AFTER FLIGHT CHECK

Figure 52—Flight Operation Instruction Chart (Sheet 1 of 2 Sheets)

MODEL(S)

P-47 Series

ENGINE(S): R-2800-21

FLIGHT OPERATION INSTRUCTION CHART

CHART WEIGHT LIMITS: 14500 TO 15000 POUNDS

EXTERNAL LOAD IT...

NONE

LIMITS	R.P.M.	M.P. (IN. HG.)	SUPER'G POSITION	MIXTURE POSITION	TIME LIMIT	FUEL G.P.H.
MAX RAN.	2700	52	—	A.R.	5	275
TAKE-OFF	2700	52	—	A.R.	5	275
NORMAL RATED	2550	42	—	A.R.	—	180

INSTRUCTIONS FOR USING CHART: Select figure in FUEL column equal to or less than amount of fuel to be used for cruising. Move horizontally to left or right and select RANGE value equal to or greater than the statute or nautical air miles to be flown. Vertically below and opposite desired cruising altitude (ALT.) read optimum R. P. M., I. A. S. 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. Manifold pressure (M. P.), gallons per hour (G. P. H.) and true airspeed (T. A. S.) are approximate values for reference. For efficient operation indicated airspeed (I. A. S.) hourly. Adjust RPM slightly if necessary to avoid exceeding manifold pressure more than 3 in. Hg.

I			FUEL U. S. GAL.	II		III		IV		FUEL U. S. GAL.	V	
RANGE IN AIR MILES (R. L.)				RANGE IN AIR MILES		RANGE IN AIR MILES		RANGE IN AIR MILES			RANGE IN AIR MILES	
STATUTE	NAUTICAL			STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL		STATUTE	NAUTICAL
—	—		305	① 60 GAL. ALLOWANCE NOT AVAILABLE IN FLIGHT ②						305		
300	260		340	550	480	620	540	730	630	295	690	600
290	250		330	535	465	600	520	705	610	285	670	580
280	245		320	520	450	580	505	685	595	275	650	565
270	235		310	505	440	565	490	665	575	265	630	545
260	225		300	490	425	545	475	645	560	255	610	530
250	220		290	475	410	530	460	625	540	245	590	510
240	210		280	460	400	515	445	605	525	235	570	495
230	200		270	445	385	495	430	585	505	225	550	475
220	190		260	430	370	480	415	565	490	215	530	460
210	180		250	415	360	460	400	545	470	205	510	445
200	175		240	400	345	445	385	525	455	195	490	425
190	165		230	385	335	430	370	505	440	185	470	410
180	155		220	370	320	415	360	485	420	175	450	390
170	145		210	355	305	395	345	465	405	165	430	375
160	140		200	340	295	380	330	445	385	155	410	355
150	130		190	325	280	365	315	425	370	145	390	340
140	120		180	310	270	345	300	405	350	135	370	320
130	115		170	295	255	330	285	385	335	125	350	305
120	105		160	280	245	315	270	365	320	115	330	285
110	95		150	265	230	295	255	345	300	105	310	270
100	85		140	250	215	280	240	325	280	95	290	250
90	80		130	235	205	265	230	305	265	85	270	235
80	70		120	220	190	245	215	285	250	75	250	215
70	60		110	205	180	230	200	265	230	65	230	200
60	50		100	190	165	215	185	245	215	55	210	180
50	45		90	175	150	195	170	225	195	45	190	165
40	35		80	160	140	180	155	205	180	35	170	145
30	25		70	145	125	160	140	185	160	25	150	130
20	15		60	130	115	145	125	165	145	15	130	115
10	10		50	115	100	130	110	145	125	10	110	95

MAXIMUM CONTINUOUS						ALT. Feet	OPERATING DATA								ALT. Feet	OPERATING DATA								ALT. Feet	MAXIMUM RANGE						
R. P. M.	I. A. S. M.P.H.	MIX. TURE	M. P. In. Hg.	G. P. H.	T. A. S.		R. P. M.	I. A. S. M.P.H.	MIX. TURE	M. P. In. Hg.	G. P. H.	T. A. S.				R. P. M.	I. A. S. M.P.H.	MIX. TURE	M. P. In. Hg.	G. P. H.	T. A. S.				R. P. M.	I. A. S. M.P.H.	MIX. TURE	M. P. In. Hg.	G. P. H.	T. A. S.	
						40000																									
						35000																									
2600	220	A.R.	60	305	370	30000	2350	230	A.R.	55	150	350				2350	190	A.L.	52	200	320	30000									
2500	210	A.R.	57	290	360	25000	2350	225	A.R.	50	145	330				2350	180	A.L.	51	195	310	25000									
2500	205	A.R.	52	280	350	20000	2300	225	A.R.	51	135	320	USE COLUMN IN ABOVE 12,500 FT.			2350	180	A.L.	50	185	300	20000									
2500	200	A.R.	47	270	340	15000	2300	220	A.R.	52	125	300				2300	180	A.L.	52	180	290	15000									
2500	200	A.R.	42	260	330	10000	USE COLUMN 12,500 FT. BELOW 12,500 FT.									2350	180	A.L.	52	165	275	10000	1800	205	A.L.	30	65	240			
2500	195	A.R.	37	250	320	5000										2350	175	A.L.	52	160	260	5000	1700	200	A.L.	30	60	225			
2500	195	A.R.	32	240	310	S. L.										2350	170	A.L.	52	155	245	S. L.	1700	200	A.L.	30	58	220			

NOTES

① ALLOW 45 GAL. FOR WARM-UP, TAKE-OFF & INITIAL CLIMB PLUS ALLOWANCE FOR WIND, RESERVE & COMBAT AS DESIRED.

② DATA IS BASED ON TESTS OF P-47B.

EXAMPLE

AT 12,000 LB GROSS WT. WITH 230 GAL. OF FUEL (AFTER EXPENDING TOTAL ALLOWANCES OF 80 GAL.) TO FLY THE STAT. ASSIGNED AT 25,000 FT. ALT. MAINTAIN 2150 RPM AND 200 MPH IND. AIRSPEED WITH MIXTURE SET AUTOMATIC

LEGEND

I. A. S.: INDICATED AIRSPEED
M.P.: MANIFOLD PRESSURE
G. P. H.: U. S. GAL. PER HOUR
T. A. S.: TRUE AIRSPEED
S. L.: SEA LEVEL

T. T.: FULL THROTTLE
A. R.: AUTO RICH
A. L.: AUTO LEAN
A.S.: AUTO-LEAN
C.L.: CRUISING LEAN

RED FIGURES ARE PRELIMINARY SUBJECT TO REVISION AFTER FLIGHT CHECK

Figure 52—Flight Operation Instruction Chart (Sheet 2 of 2 Sheets)