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AN 01-65BC-1A

*PILOT'S FLIGHT OPERATING  
INSTRUCTIONS*  
FOR  
ARMY MODELS  
P-47D-25, -26, -27, -28, -30 and -35  
AIRPLANES  
BRITISH MODEL  
THUNDERBOLT



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25 JANUARY 1945

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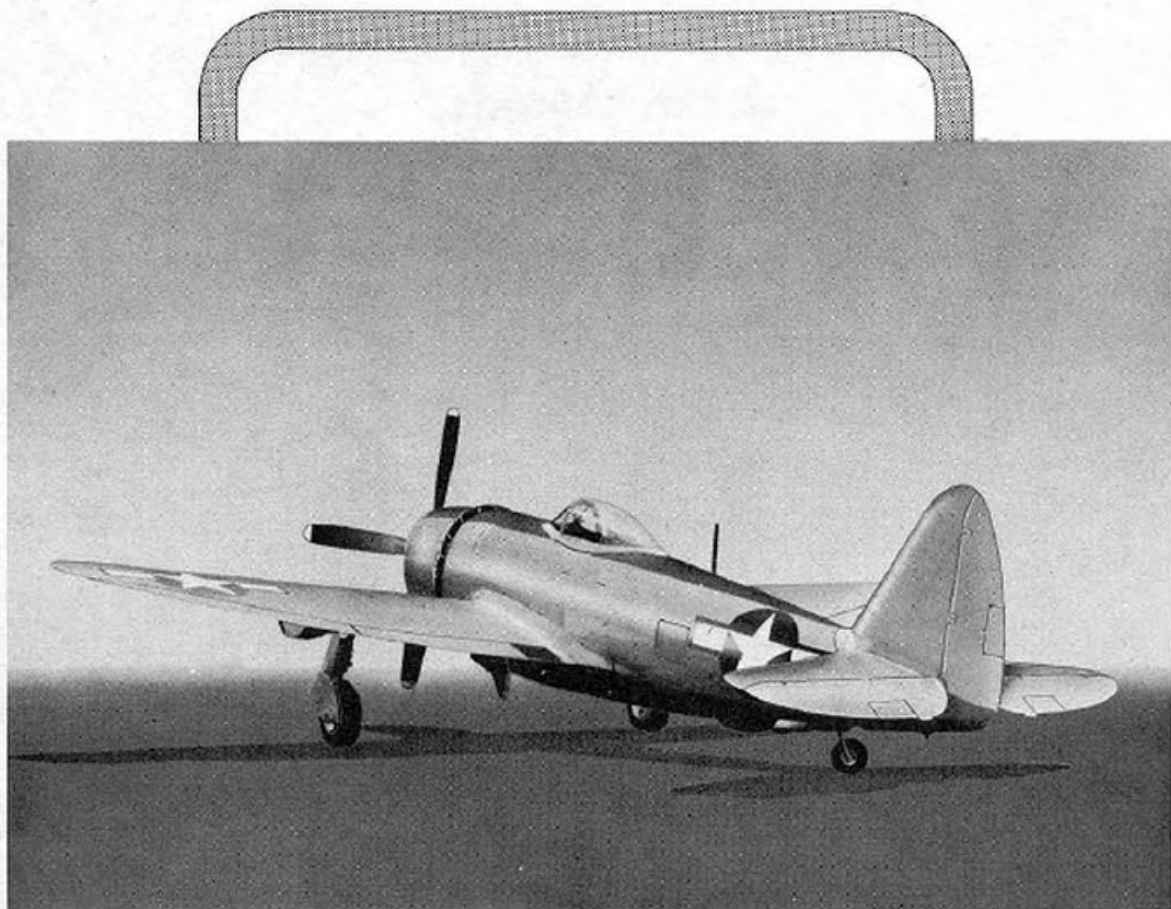
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**Figure 1—Three Quarter  
Rear View P-47D-25**

**P-47**

*Thunderbolt*

**MODELS P-47D-25,  
-26,-27,-28,-30,-35**



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Section I  
Paragraphs 1-3

## SECTION I DESCRIPTION

### 1. AIRPLANE.

*a. GENERAL.*—The P-47D-25 and subsequent P-47 models are low-wing, single-place, all-metal monoplanes, powered with a Pratt & Whitney 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: Length—36 feet, 1 inch; Height—14 feet, 2 inches; Span—40 feet, 9-5/16 inches.

*b. ACCESS TO AIRPLANE.*—A step and handholds are provided in the fuselage on the left side of the airplane. The jettisonable, bubble-type canopy is unlocked by pulling on a small lever (figure 2) on the left side of the fuselage, allowing the canopy to slide back. The canopy is automatically locked in position when the lever is released.

#### *c. FUEL AND OIL.*

(1) Fuel: Specification No. AN-F-28 (Grade 100/130).

#### **Note**

If a fuel of lower octane rating such as Grade 91, Specification No. AN-F-26 is used, Take-Off and Military Power manifold pressure must be reduced 10 percent.

(2) Oil: Specification No. AN-VV-O-446a. Grade: 1120. (Cold weather. Grade: 1100).

#### *d. PILOT PROTECTION.*

(1) ARMOR.—Front and rear armor protection for a direct right-angle hit is provided for the pilot. Enemy fire originating within the areas graphically illustrated in figure 3 will not reach the pilot.

(2) CRASH PROTECTION. — 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 just outboard of the landing gear legs. They are made available for use by pulling open the door marked "TIE-DOWN" and then pulling out the lugs. The tail may be lashed down by inserting a rope through either the lift tube or the tail wheel yoke.

### 2. PROPELLER.

*a.* The propeller may be either a four-bladed Curtiss Electric or a four-bladed Hamilton Standard Hydromatic.

*b.* Controls for the Curtiss Electric Propeller consist of a circuit breaker, a toggle selector switch mounted on a small switch box to the left of the instrument panel, (figure 4) and a lever on the control quadrant to set the propeller governor to desired engine speed. The selector has four positions: "AUTO CONSTANT SPEED," "INCREASE RPM," "DECREASE RPM," and "FIXED PITCH." When in "AUTO CONSTANT SPEED," the propeller governor automatically maintains engine rpm as set at the quadrant. "INCREASE RPM," and "DECREASE RPM" are momentary positions which, when used, vary engine rpm as indicated, and when released, leave the propeller in a fixed pitch condition.

*c.* The Hamilton Standard Hydromatic propeller is controlled by a propeller lever (5, figure 6) on the control quadrant.

### 3. POWER PLANT.

*a.* The R-2800 series engine is a twin-row 18

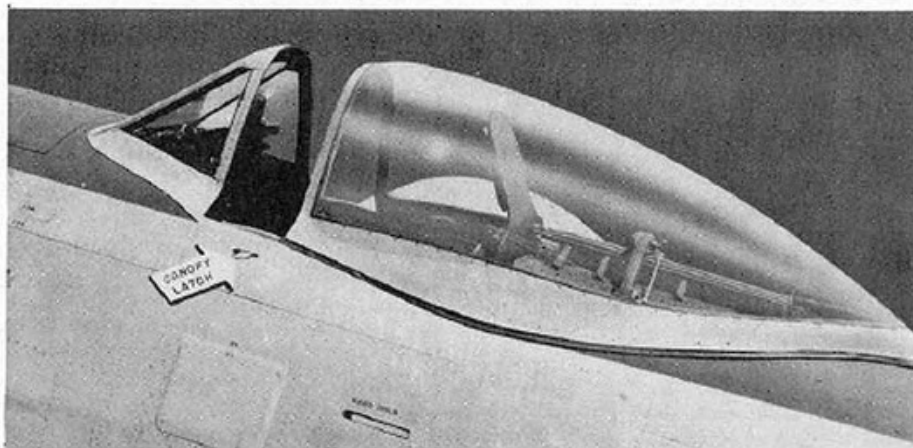


Figure 2—Bubble-Type Canopy

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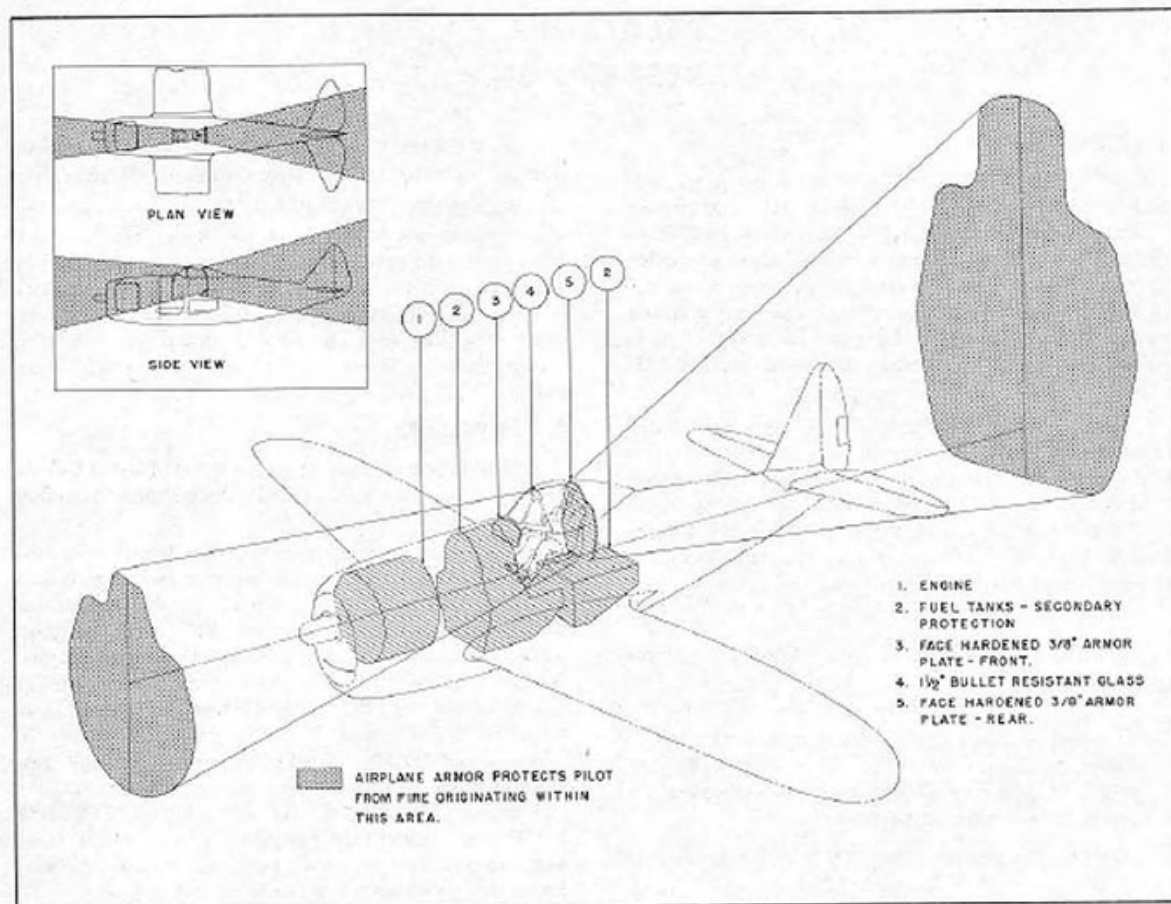


Figure 3—Angles of Personnel Protection

cylinder supercharged air-cooled engine. In the P-47 series both geared and turbine superchargers are used. The turbine-driven supercharger is a separate and remotely installed unit operated by engine exhaust. The engine is equipped with an injection-type carburetor and a water injection system to permit operation at War Emergency Power.

b. Power controls are mounted in the conventional quadrant and consist of throttle, boost, mixture, and propeller levers. Throttle, boost, and propeller levers are equipped with spring-loaded latches to permit interconnected operation. An adjustable take-off stop, which can be bypassed, is provided in the path of the throttle. A momentary switch (1, figure 6) is mounted on the throttle lever to control operation of the water injection system.

#### 4. FUEL SYSTEM.

a. GENERAL.—The main fuel supply consists of 370 US (308 Imperial) gallons of fuel carried in two self-sealing tanks located under and forward of the cockpit. This supply can be supplemented by using external tanks hung from the airplane belly and

each wing. Fuel is supplied to the carburetor by means of an engine-driven pump assisted by an electric-driven, variable-speed booster pump, installed in the sump of each internal tank and controlled by a rheostat on the main switch panel. (See 6, figure 5.) When external tanks are used, a tank pressurizing system is employed to assist the engine-driven pump. Level gages (17, figure 37) in the cockpit indicate the amount of fuel in each internal tank when the airplane is in level flight position. A three-point correction chart (figure 8) is posted on the left wall of the cockpit for calculating amount of fuel aboard when the airplane is on the ground. When only approximately 40 US gallons of fuel remain in the main tank, a fuel-level warning light (6, figure 37) in the instrument panel will glow. Fuel pressure is read on the lower right scale of the engine gage unit. (See 26, figure 37.) Conventional selector valves (figure 7) permit operation from each tank individually and must be switched to the tank desired, as no internal transfer system is used. To facilitate starting and cold-weather operation, an engine primer (1, figure 10) is located in the right forward side of



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Section I  
Paragraph 4

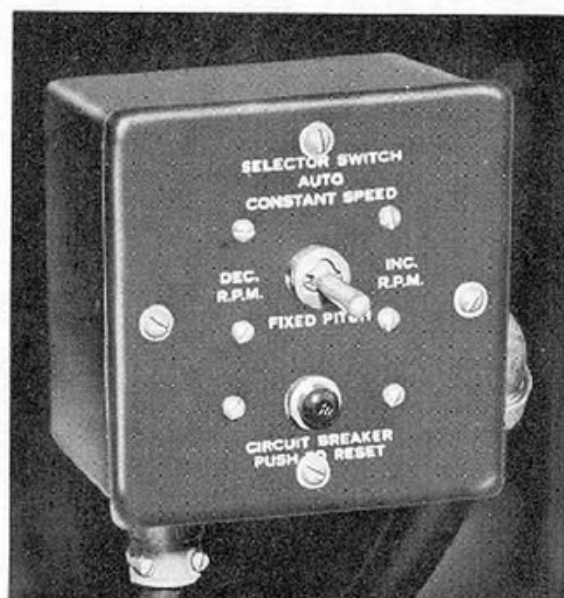


Figure 4—Electric Propeller Switches

the cockpit; and an oil dilution system controlled by switch shown in figure 5, is provided. The carburetor is of the fuel injection type and is equipped with a vapor return line that empties about 10 US (8.3 Imperial) gallons of fuel per hour into the main tank.

#### b. TANKS.

(1) MAIN.—The main tank, located forward of the cockpit has a total capacity of 270 US (225 Imperial) gallons. The main tank is vented by a line to the right wing just outboard of the wheel well, and the drain line runs to a cock outside the fuselage at the trailing edge of the right wing. (See figure 25.)

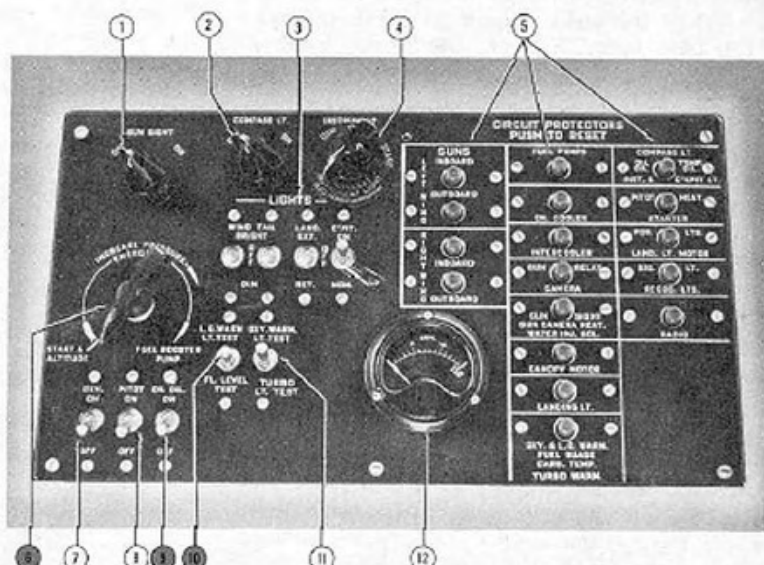
(2) AUXILIARY.—The auxiliary tank has a total capacity of 100 US (83 Imperial) gallons. Vent and drain lines terminate just outside the fuselage skin at the right wing trailing edge.

(3) EXTERNAL TANKS.—Provision is made for hanging the following external tanks in any combination:

- 165 US (137 Imperial)—gallon wing tanks
- 110 US (92 Imperial)—gallon belly tank
- 75 US (62 Imperial)—gallon belly tank

The tanks are hung from standard Army type B-10 or B-7 bomb shackles mounted in the belly and from combat wing tank adapters located just outboard of the landing gear main strut. A tank pressurizing system is employed to assist the engine-driven pump in delivering fuel to the carburetor. On models up to and including P-47D-27, tank release control handles (figure 9) are located on the left side of the cockpit just aft of the main fuel selector cock. Six control handles are provided on this bracket, all appropriately marked. Three are tank releases, and the other three,

Figure 5—  
Main Switch Box



1. Gun Sight Rheostat
2. Compass Light Rheostat
3. Light Switches
4. Instrument Light Rheostat
5. Circuit Breakers
6. Fuel Booster Pump Rheostat
7. Generator Switch
8. Pitot Heater Switch
9. Oil Dilution Switch
10. Fuel Level Warning Light Test Switch
11. Oxygen Supply Warning Light Test Switch
12. Ammeter

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# Section I Paragraph 4

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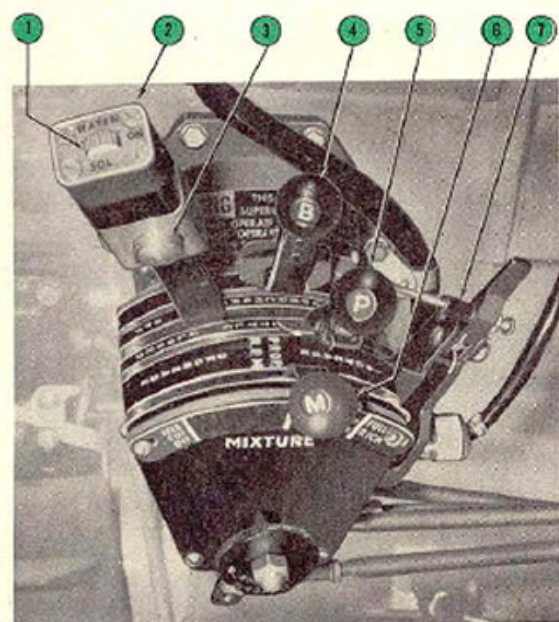


Figure 6—Engine Control Quadrant

1. Water Injection Switch
2. Throttle Lever
3. Push-to-talk Button
4. Supercharger Control
5. Propeller Control
6. Mixture Control
7. Take-Off Stop

"ARM" and "SAFE" controls, for use when bombs are carried in the racks. Models P-47D-28 through P-47D-30 have three "T"-type tank release handles (figure 11) mounted on the parking brake control bracket. In addition to the manual release controls, models P-47D-30 and later, are equipped with electrical tank or bomb releases, which are operated by the button on top of the control stick. A selector panel is mounted below the parking brake control. (See figure 11.) Three switches are provided: "RIGHT WING," "LEFT WING," and "BELLY," permitting release individually or simultaneously when the stick button is depressed.

## c. FUEL PUMPS.

(1) MAIN.—The main fuel pump is a positive displacement, engine-driven, type G-9 pump, mounted on the engine accessory section. The pump is balanced against supercharged air to maintain constant flow and pressure with increase in altitude. In the event of failure of the main pump, an internal bypass valve will open, permitting fuel under booster pump pressure to pass through to the carburetor.

(2) BOOSTER-PUMPS.—An electric-driven, variable-speed booster pump is mounted in the sump of each internal fuel tank. The proper booster pump is turned on automatically by means of a rotary switch mounted on the selector valve control shaft, when the selector valve is turned to "MAIN" or

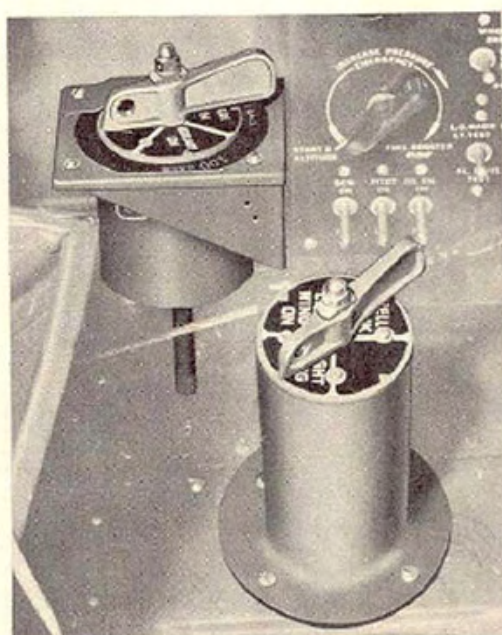


Figure 7—Fuel Selector Valves

"AUXILIARY". When either booster pump is turned on, its speed is controlled by the booster pump emergency rheostat which is located on the main switch panel. (See 6, figure 5.)

(3) EXTERNAL TANK PRESSURIZING. — When external tanks are used, a tank pressurizing system is employed to assist the main fuel pump. Exhaust air from the instrument vacuum system is led to the tanks through a pressure control valve which supplies pressure in accordance with altitude requirements. Since all external tanks are connected to the same source of pressure, those lines not in use must be capped at all times.

## CAUTION

When external tanks are used, none should be dropped until all are empty, as the pressurizing system would be inoperative.



Figure 8—Three-Point Fuel Correction Chart



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#### d. FUEL GAGES.

(1) **PRESSURE GAGE.**—Fuel pressure is indicated by the fuel-pressure section of the engine gage unit (26, figure 37) mounted on the right-hand side of the instrument panel. The gage is balanced against carburetor air to read correctly at altitude. Operating pressures are ruled with colored lacquer on the cover glass.

(2) **QUANTITY GAGE.**—An electrically operated compound gage (17, figure 37) mounted on the instrument panel reads directly, in US gallons, the amount of fuel in each internal tank when the airplane is in flight position. When approximately 40 US (33 Imperial) gallons remain in the main tank, the fuel-level warning light (6, figure 37) will glow. No quantity gages are included for the external tanks, but their contents may be estimated by use of fuel consumption data contained in Flight Operation Instruction Charts.

e. **SELECTOR VALVES.**—Two conventional four-position selector valves (figure 7) are incorporated in the system. The main valve controls "MAIN," "AUXILIARY," "EXTERNAL," and "OFF." It is located on the left-hand side of the cockpit, just aft of the main switch panel. The secondary cock uses three positions only: "BELLY," "RIGHT WING," and "LEFT WING" and is located in the cockpit floor to the right and forward of the main valve. To draw fuel from the external tanks it is necessary to turn the secondary selector valve to the desired external tank and then switch the main valve to "EXTERNAL."

f. **ENGINE PRIMER.**—The engine priming system consists of a hand-operated pump (1, figure 10) mounted on the instrument panel. Fuel is pumped by the tank booster pump to the primer which injects it directly into the engine.

g. **OIL DILUTION.**—To facilitate cold-weather starting, an oil dilution system is provided. It em-

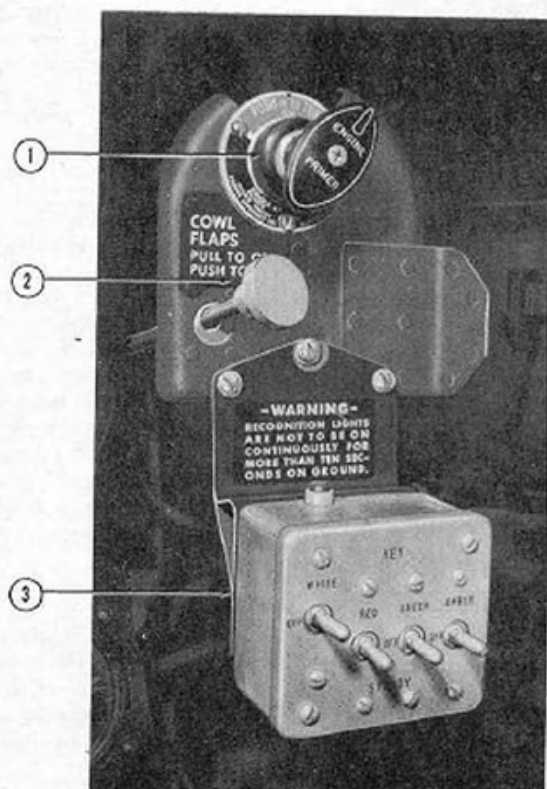


Figure 10—1-Engine Primer, 2-Cowl Flaps Control, and 3-Recognition Light Switches

plays a solenoid valve operated by a switch on the main switch box. (See 9, figure 5.) Opening of the valve permits gasoline to flow directly into the engine oil system diluting the oil.

#### 5. OIL SYSTEM.

The engine oil supply is carried in a pendulum equipped, hopper-type tank (3, figure 28) located in the upper part of the engine section. A filler neck is accessible through a cowl door, marked "OIL," in the upper-left side of the secondary cowling. The total capacity of the tank is 28 US (23 Imperial) gallons, of which 19 US (16 Imperial) gallons is a normal supply and the remainder overload. Oil temperature is regulated by two oil coolers installed one on each side in the lower part of the engine compartment at the fresh-air scoop. The flow of air through the cooler is controlled by adjustable split doors located in the exit ducts operated electrically and controlled from the cockpit by a toggle switch. (See figure 12.) A shutter-position indicator (figure 13) is mounted on the left side of the cockpit above the wing flap control handle. The oil radiators are equipped with thermostatic valves which operate in conjunction with surge valves to permit the oil



Figure 9—External Tank and Bomb Release Controls Through P-47D-27

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### Paragraphs 5-8

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at excessive pressure, resulting from cold oil, to bypass the coolers completely and return directly to the tank. To facilitate cold-weather engine starting, a standard oil dilution system, is incorporated. Operated by a toggle on the main switch box, (9, figure 5) it permits gasoline to flow into the engine oil system.

## 6. HYDRAULIC SYSTEM.

The hydraulic system operates the landing gear, wing flaps, and cowl flaps, with pressure supplied by an engine-driven pump. The fluid is drawn from the 1.9 US (1.6 Imperial) gallon supply tank in the upper section of the engine compartment and pumped into the system through a pressure regulator. (See figure 29.) This unit admits fluid to the system when the system pressure drops to 800 psi and returns fluid to the supply tank when system pressure reaches 1,000 psi. An accumulator containing 6.6 cubic inches of fluid and charged with compressed air is used between "cut-in" and "cut-out" pressures. A hand pump is installed on the left of the pilot's seat for use in the event the engine-driven pump fails.

## 7. SUPERCHARGING SYSTEM.

a. A General Electric type-"C" series turbosupercharger is installed in the lower section of the fuselage aft of the cockpit. Engine exhaust gases are directed to the turbine wheel of the supercharger through exhaust pipes on each side of the fuselage.

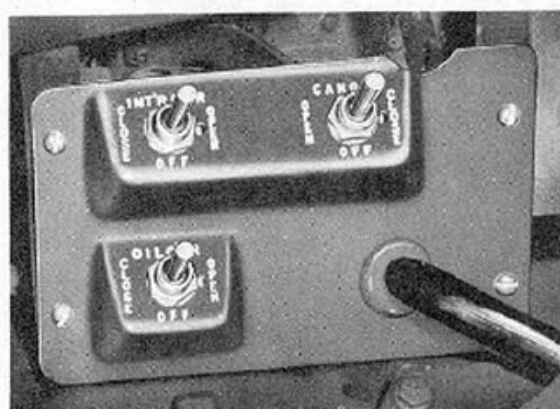


Figure 12—Oil Cooler, Intercooler, and Canopy Switches

(See figure 30.) Fresh air is collected in the scoop beneath the engine and conducted to the compression section of the supercharger. Heat generated during compression is dissipated by passing the supercharged air through an intercooler which is cooled by a portion of fresh air blast. The quantity of fresh air flowing through the intercooler is controlled by exit duct doors which are electrically operated and activated by a toggle switch (figure 12) in the cockpit left wall. An indicator denotes the position of the doors. (See figure 13.) All models include a built-in air filter which may be bypassed by using the control handle located to the left and aft of the pilot's seat. (See figure 14.)

b. The quantity of supercharged air directed to the carburetor is determined by the setting of the booster lever on the engine control quadrant. (See figure 6.) This lever sets an engine-oil operated regulator which is balanced against exhaust pressure. When engine exhaust pressure drops, the supercharger regulator closes a waste gate in each exhaust pipe, which permits more of the engine exhaust gases to be directed against the turbine wheel of the supercharger, thus maintaining boost.

## 8. WATER INJECTION SYSTEM.

The water injection system permits operation at War Emergency Power of 64 in. Hg. manifold pressure and approximately a 30 per cent increase over military horsepower. The system consists of a 30 US (25 Imperial)-gallon supply tank, an engine-driven pump, a water regulator, a derichment valve assembly, and an automatic booster-reset mechanism. The system is controlled by a momentary switch (1, figure 6) on the throttle lever which opens a solenoid valve admitting water to the regulator which meters it to the engine. At the same time, water pressure actuates the booster-reset mechanism which increases manifold pressure. Ambient temperatures in the engine compartment prevent freezing of water supply when the engine is running and in flight; however, if the



Figure 11—Electric Bomb Release Selector Panel  
P-47D-30 and Up



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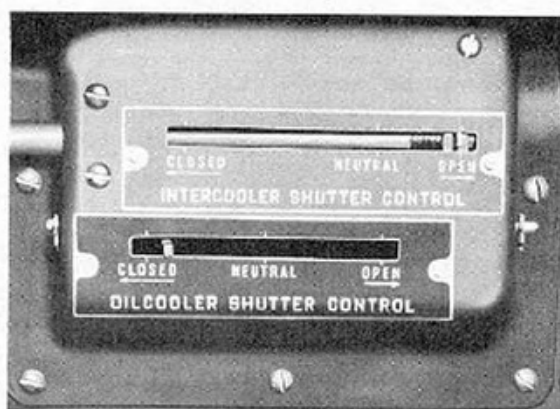


Figure 13—Oil Cooler and Intercooler Shutter-Position Indicators

system is to be serviced before the engine is operating, alcohol must be added to prevent freezing when ground temperature so indicates.

#### 9. ELECTRICAL SYSTEM.

The electrical system is a 24-volt, dc, single wire grounded type, energized primarily from a 100-amp. generator. A storage battery is mounted on the right side of the firewall. An ammeter is located on the main switch box (12, figure 5) to indicate the charging current. A plug in the right forward engine cowl, reached through an access door, permits the attachment of an external source of power for flight line service.

#### 10. SURFACE CONTROLS.

**a. AILERONS AND ELEVATORS.** — All-metal, balanced control surfaces are operated with the conventional stick-type control. On models P-47D-30 and later, a refined aileron of the blunt-nose type is used. The blunt-nose type surface lessens the possibility of aileron buffeting in high speed dives. On all models, adjustable trim tabs are built into the left aileron and the trailing edges of the elevators. They are adjusted by the trim tab control unit (figure 15) in the cockpit. Fixed trim tabs are installed on the right aileron and each elevator. These are adjusted at the factory and provide correction for minor manufacturing tolerances.

**b. RUDDER.** — The all-metal rudder is controlled by conventional pedals. An adjustable trim tab is built in the rudder trailing edge and is set by the trim tab control unit (figure 15) in the cockpit.

**c. FLIGHT CONTROL LOCK.** — The control stick and rudder pedals may be locked by a strap and latch arrangement at the base of the control stick. (See figure 18.) The lock is engaged by fastening the lock strap to its hook in the back of the pilot's seat and placing forward end over red knob of control lock when knob and control stick are in locked position. The pilot's seat must be in its lowest position in order to engage the strap.

**d. WING FLAPS.** — Each wing flap extends from the fuselage to the aileron and may be fully extended or held in any intermediate position by use of the control unit (figure 15) in the cockpit. The flaps are hydraulically operated.

**e. COMPRESSIBILITY RECOVERY FLAPS.** — Models P-47D-30 and later, incorporate electrically operated compressibility recovery flaps located in the under surface of each wing just outboard of the landing gear shock strut. The flap motors are operated by a switch (figure 16) mounted alongside the propeller switch box in the cockpit and are interconnected to insure synchronized action.

#### 11. LANDING GEAR.

**a. MAIN GEAR.** — The main gear units are full-cantilever independent right and left air-oil shock struts mounted in the wing and retracted hydraulically. Hydraulically controlled downlock mechanism retains the gear in its extended position and a mechanical uplock assists hydraulic pressure in holding the gear in its retracted position. The gear is controlled by a unit (figure 15) in the cockpit. A warning light is provided to indicate whenever the gear is in transit. A switch on the throttle also causes the warning light to glow if the gear is not locked down when the throttle is retarded to a point insufficient to main-



Figure 14—  
Air Filter  
Control

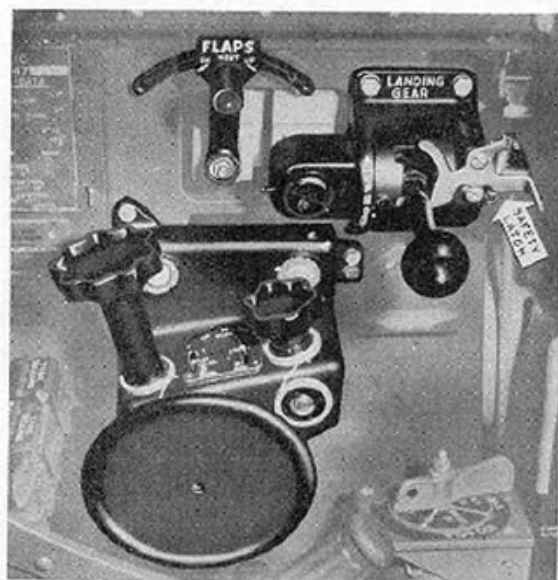


Figure 15—Trim Tab, Landing Gear, and Wing Flap Controls

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Figure 16—  
Compressibility  
Recovery Flap  
Switch

Figure 17—  
Rudder Pedal  
Adjustment  
Lever

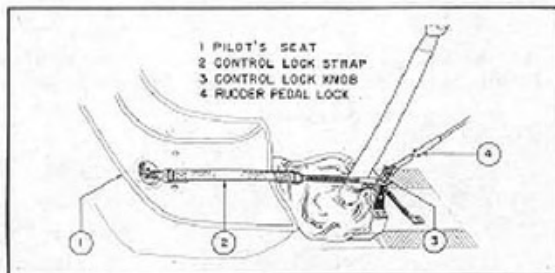
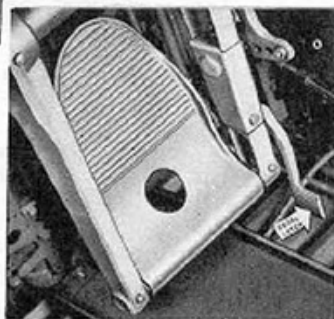


Figure 18—Surface Controls Lock

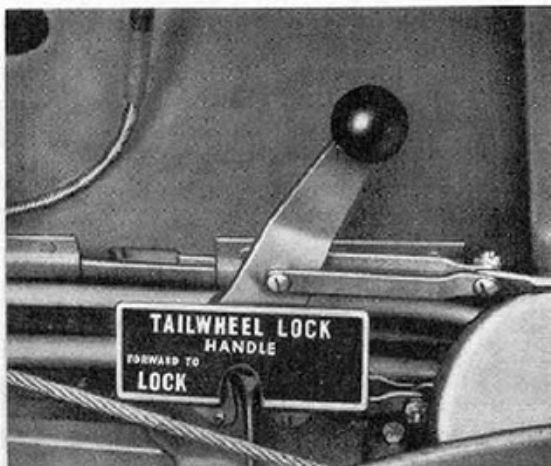


Figure 19—Tail Wheel Lock Control

tain level flight. On models P-47D-35 and later, the warning system consists of a red lamp, a green lamp, and a horn, used in the following manner:

- Green on, Red off.—Landing gear locked down.
- Red on, Green off.—Landing gear in any unlocked position.
- Both lights off.—Landing gear locked up and throttle beyond minimum cruising position.
- Red on, Green off,  
Horn sounding.—Landing gear locked up or in any unlocked position when the throttle is below minimum cruising.

A cutout switch is provided on the main switch box to enable turning the warning horn off when the gear is locked down and the throttle is below minimum cruising position.

**b. TAIL WHEEL.**—The tail wheel is a free swiveling, hydraulically retractable unit. A mechanical up-lock aids hydraulic pressure in retaining the gear in a retracted position, and an extension spring maintains a mechanical advantage built into the unit which holds it extended. The tail wheel may be locked in the fore-and-aft position by the control handle (figure 19) to the right of the cockpit seat.

**c. BRAKES.**—Shoe-type hydraulic brakes are operated by individual master cylinders attached to the rudder pedals. (See figure 34.) The system contains its own fluid and is independent of the main hydraulic system. A parking brake control (figure 24) is located at the center of the instrument panel.

## 12. INSTRUMENTS.

**a.** Most of the instruments are mounted in a shock-resistant panel (figure 37) forward of the pilot. Exceptions are: an ammeter, located in the main switch box (12, figure 5), and oxygen gages (6, figure 45) on a sub-panel to the right of the main panel. Starting with model P-47D-30, the ammeter is located on the main instrument panel.

**b.** The instrument vacuum system (figure 35) consists of an engine-driven vacuum pump, vacuum relief valve, vacuum regulating valve, air filter, oil separator, and a vacuum gage.

**c.** The pitot static, or airspeed head, is located in the left wing panel near the tip and supplies pitot pressure and static air conditions to the airspeed indicator, altimeter, and rate-of-climb indicator.



Figure 20—  
Cockpit Vent Control



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Section I  
Paragraphs 13-18

### 13. COCKPIT HEATING AND DEFROSTING.

Fresh air is gathered near the main duct, passed through a heater muff at the exhaust collector-ring, and then to the defroster unit at the base of the windshield and the cockpit heater between the rudder pedals. Forward of the firewall is a butterfly valve operated by the defroster control (figure 21) in the cockpit which directs heated air to the cockpit or overboard.



Figure 21—  
Defroster Control

### 14. COCKPIT COOLING.

A vent in the leading edge of the right wing admits fresh air to the cockpit through a distributor between the rudder pedals. A control (figure 20) which admits or restricts the fresh air is located on the right cockpit wall.

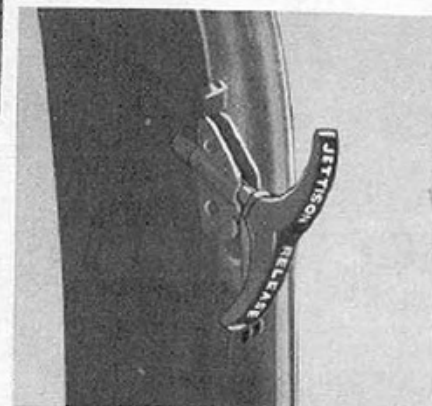


Figure 22—Canopy Jettison Control

### 15. LIGHTS.

a. A sealed-beam landing light is installed in the lower surface of the left wing panel. Normally, it is retracted with its lens flush. Extension is automatic as the switch (3, figure 5) is turned to "EXT."

b. Conventional position lights are installed in each wing tip and rudder trailing edge. Switches are mounted on the main switch box. (See 3, figure 5.)

c. Recognition lights, mounted in the wing, are controlled by switches (3, figure 10) on a sub-panel to the right of the instrument panel.

d. The cockpit is provided with a swivel-mounted spot light (figure 23) on the right wall.



Figure 23—  
Cockpit Light

### 16. COWL FLAPS.

Engine cooling is achieved by adjustable cowl flaps. They are hydraulically operated and controlled by a valve control (2, figure 10) mounted on a sub-panel to the right of the main instrument panel. Any intermediate setting may be obtained by releasing the control when the desired position is attained.

### 17. CANOPY.

The full-vision bubble-type canopy is electrically operated and controlled by a toggle switch (figure 12) mounted on the left side of the cockpit. The canopy will remain locked in any position by releasing the toggle. In emergencies, the canopy is jettisonable by pulling the "T"-type handle (figure 22) located on the right side of the forward bow.

### 18. PILOT'S SEAT.

The pilot's seat is adjustable for height by lifting the lock-release handle located on the right side. The seat accommodates a seat-type parachute, and is equipped with a standard shoulder harness, with the spring release or lock control on the left side.



Figure 24—Parking Brake Control  
Through P-47D-28

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AN 01-65BC-1A

Section I  
Paragraphs 13-18

### 13. COCKPIT HEATING AND DEFROSTING.

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Figure 21—  
Defroster Control

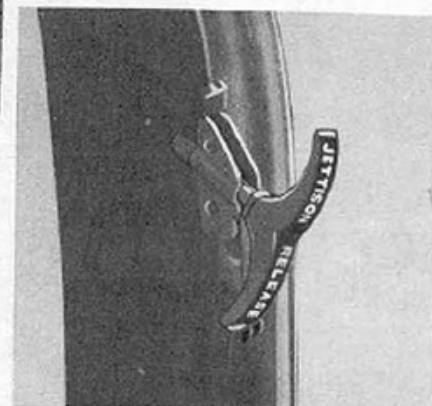


Figure 22—Canopy Jettison Control



Figure 23—  
Cockpit Light



Figure 24—Parking Brake Control  
Through P-47D-28

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### 13. COCKPIT HEATING AND DEFROSTING.

Fresh air is gathered near the main duct, passed through a heater muff at the exhaust collector-ring, and then to the defroster unit at the base of the windshield and the cockpit heater between the rudder pedals. Forward of the firewall is a butterfly valve operated by the defroster control (figure 21) in the cockpit which directs heated air to the cockpit or overboard.



Figure 21—  
Defroster Control

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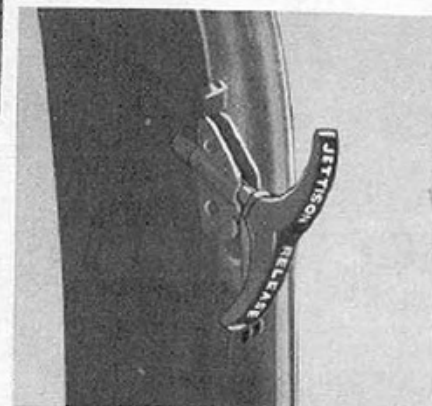


Figure 22—Canopy Jettison Control

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c. Recognition lights, mounted in the wing, are controlled by switches (3, figure 10) on a sub-panel to the right of the instrument panel.

d. The cockpit is provided with a swivel-mounted spot light (figure 23) on the right wall.



Figure 23—  
Cockpit Light

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Engine cooling is achieved by adjustable cowl flaps. They are hydraulically operated and controlled by a valve control (2, figure 10) mounted on a sub-panel to the right of the main instrument panel. Any intermediate setting may be obtained by releasing the control when the desired position is attained.

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The pilot's seat is adjustable for height by lifting the lock-release handle located on the right side. The seat accommodates a seat-type parachute, and is equipped with a standard shoulder harness, with the spring release or lock control on the left side.



Figure 24—Parking Brake Control  
Through P-47D-28

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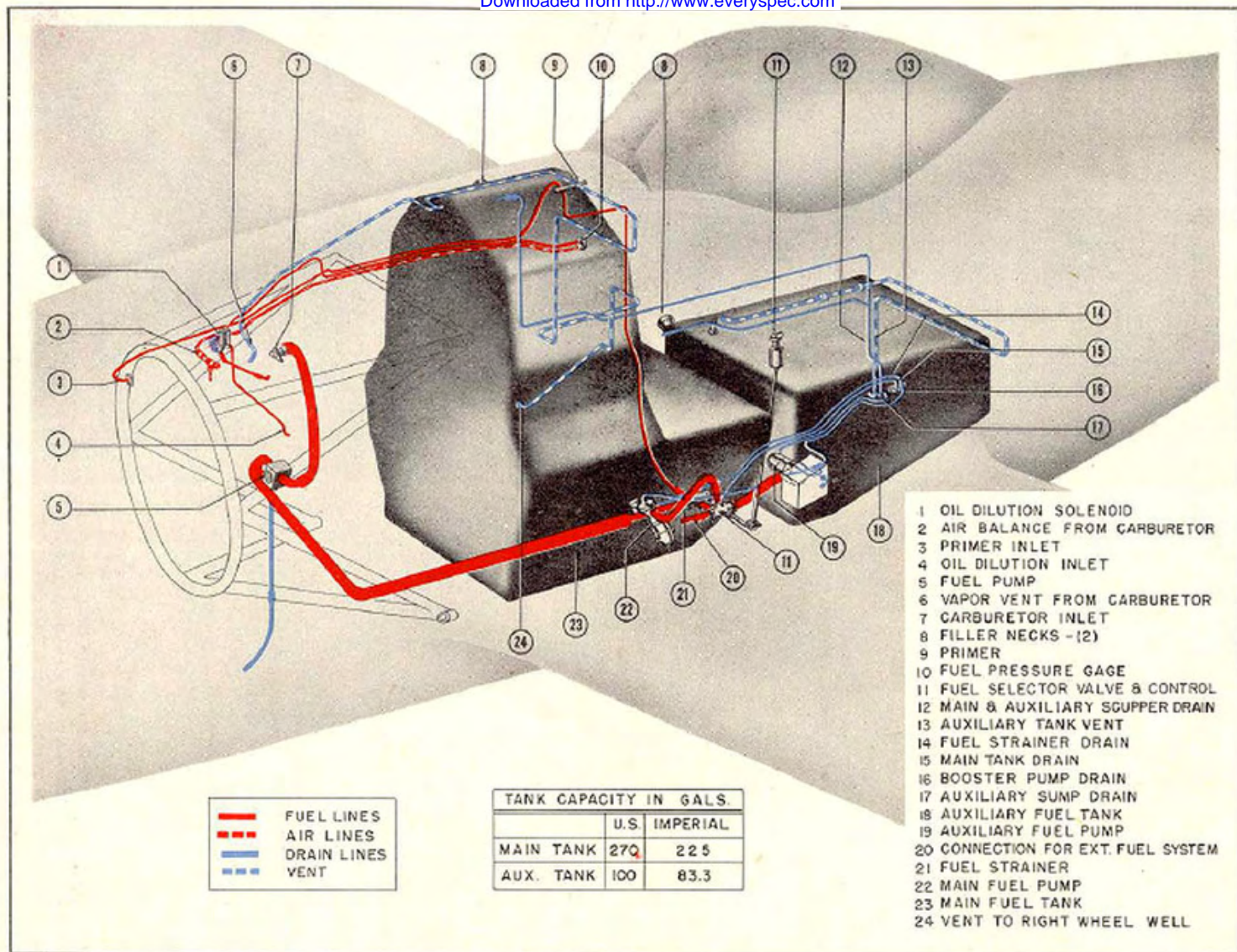


Figure 25—Fuel System



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AN 01-65BC-1A

Section I

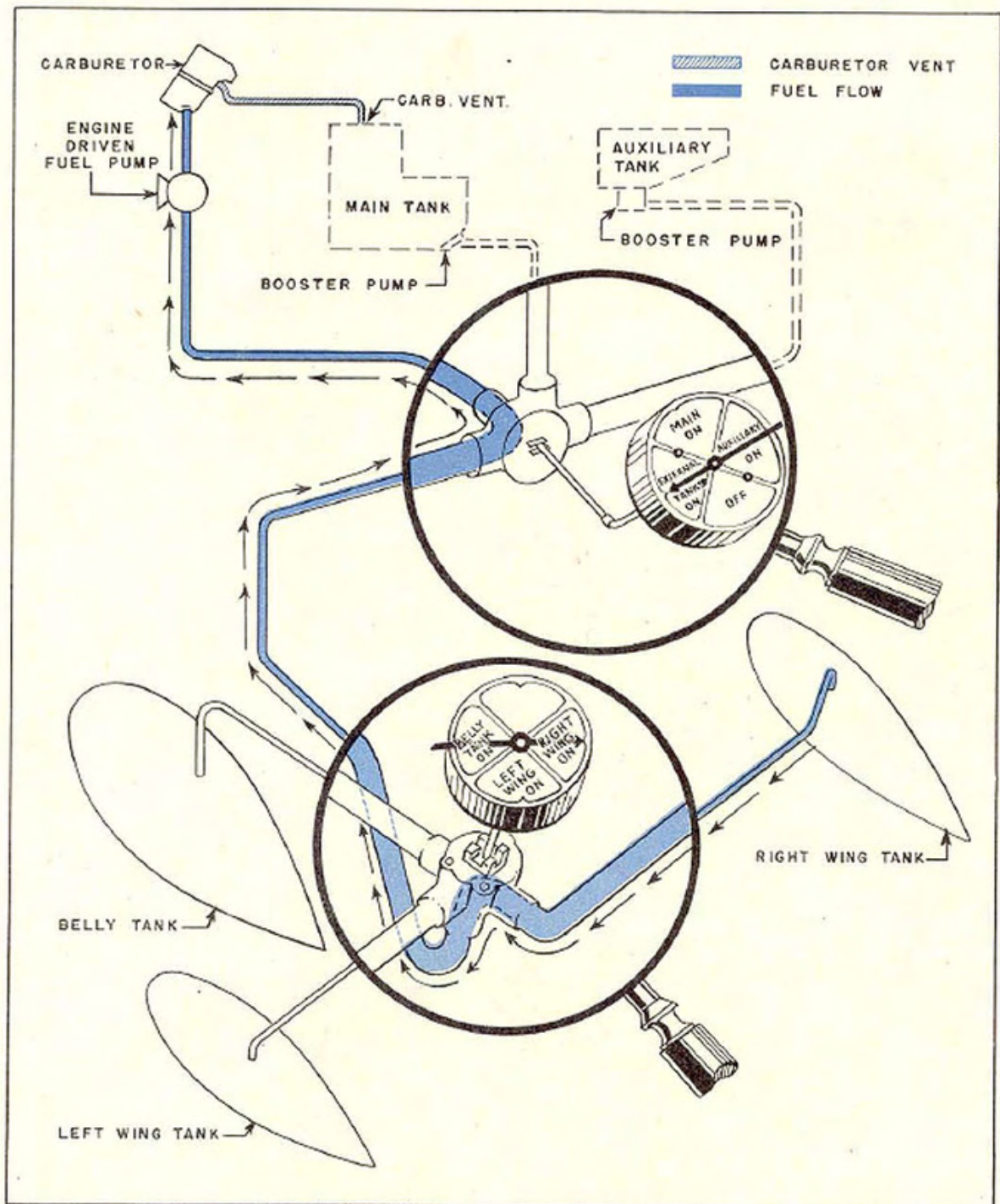


Figure 26—Fuel Flow Diagram

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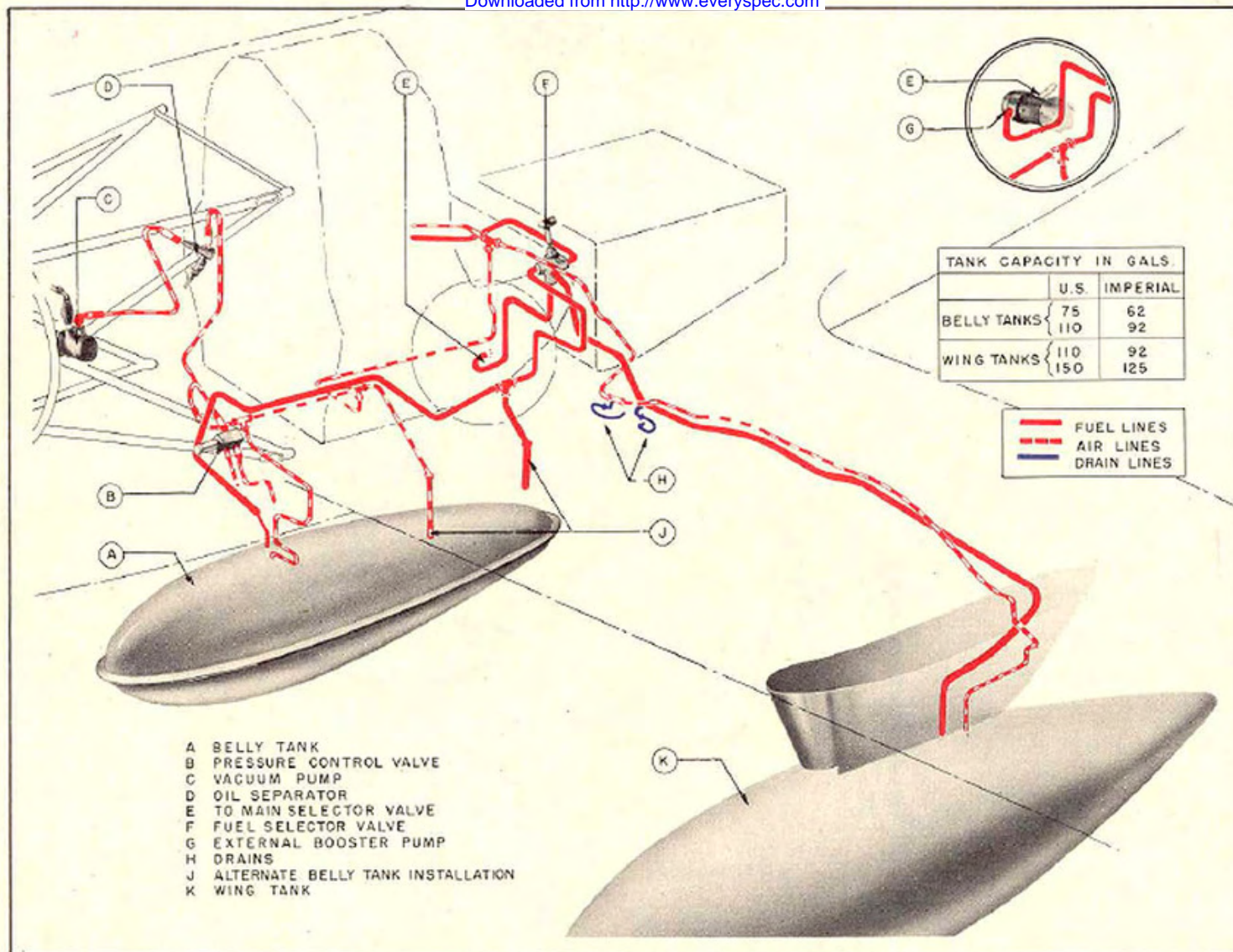


Figure 27—External Fuel System

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AN 01-65BC-1A



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Section I

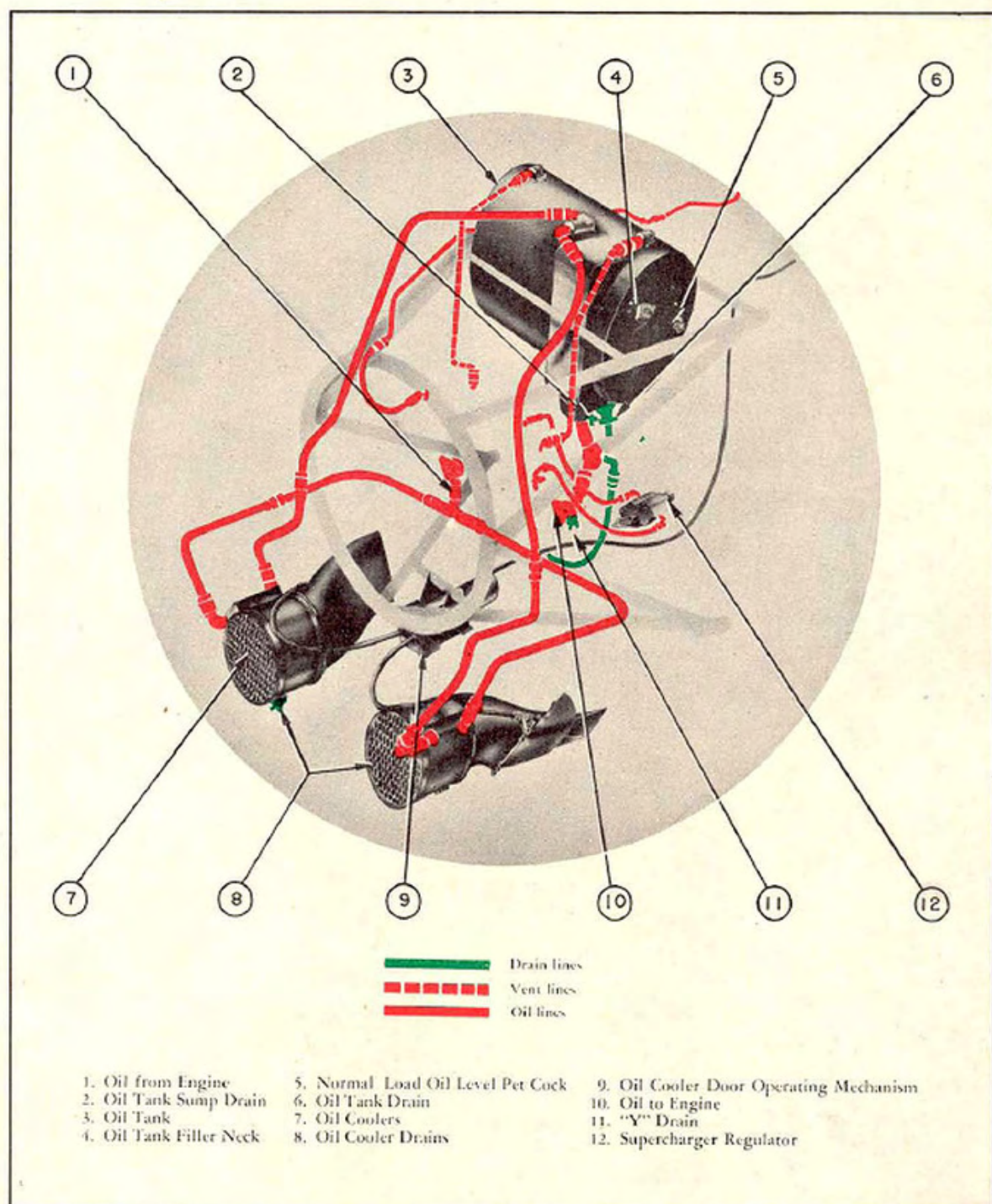


Figure 28—Engine Oil System

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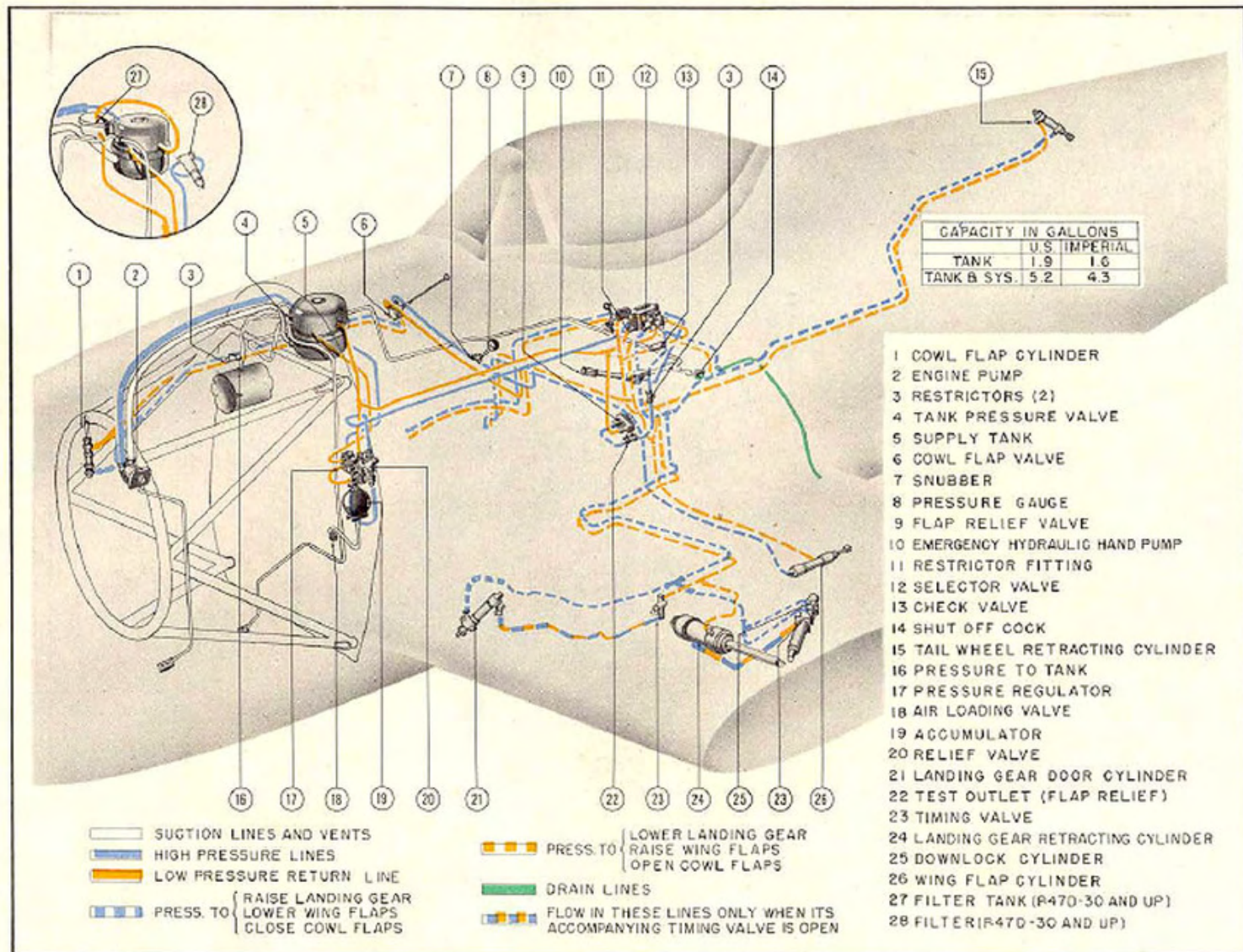


Figure 29—Hydraulic System



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Section I

- 1 WASTE GATE
- 2 MAIN AIR DUCT INTAKE
- 3 COLLECTOR RING
- 4 TO CARBURETOR
- 5 AIR FILTER
- 6 INTERCOOLER COOLING AIR EXIT
- 7 AIR FILTER CONTROL
- 8 EXHAUST PIPES
- 9 SUPERCHARGER
- 10 FLIGHT HOOD
- 11 TURBINE
- 12 INTERCOOLER

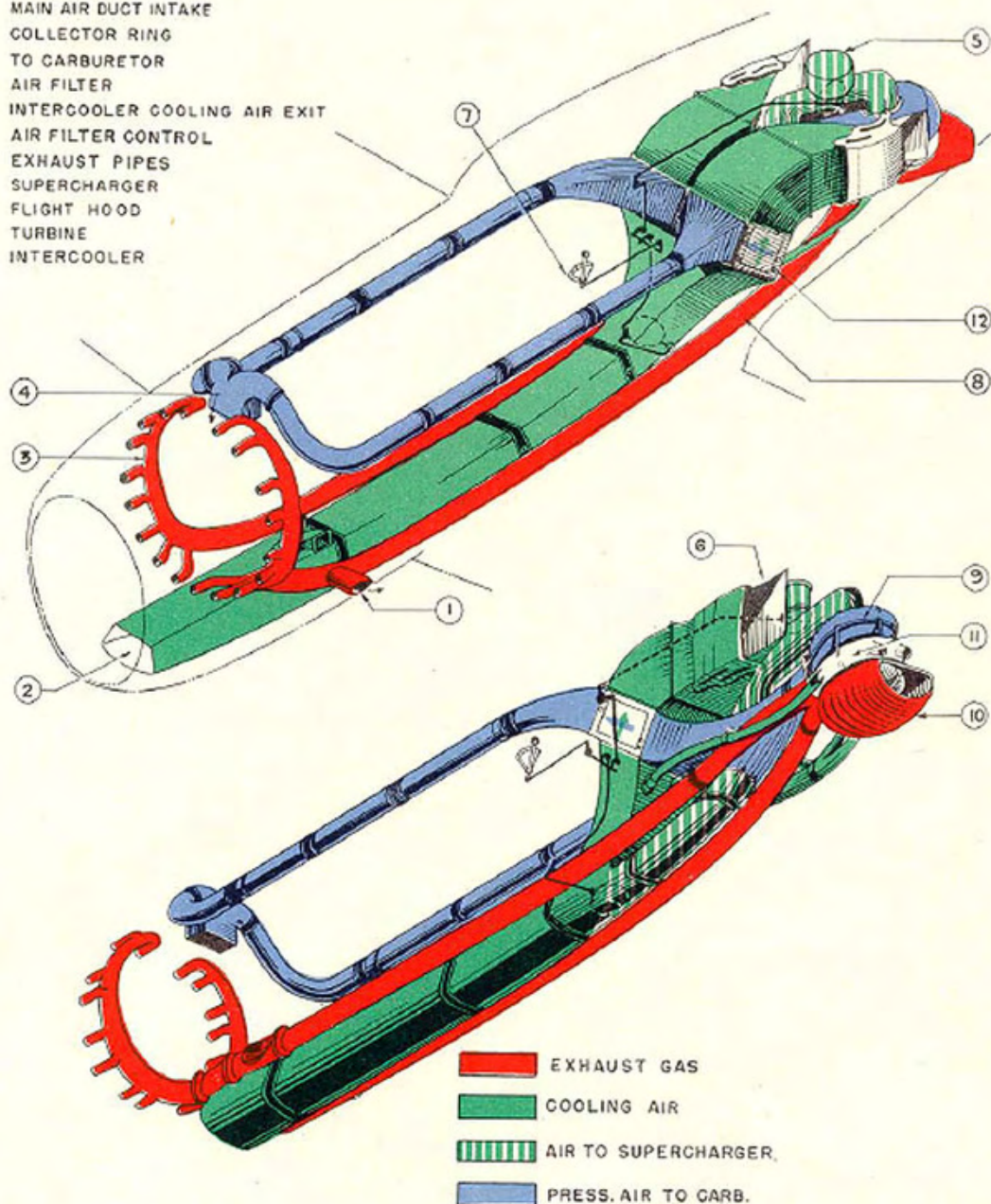


Figure 30—Induction and Exhaust System

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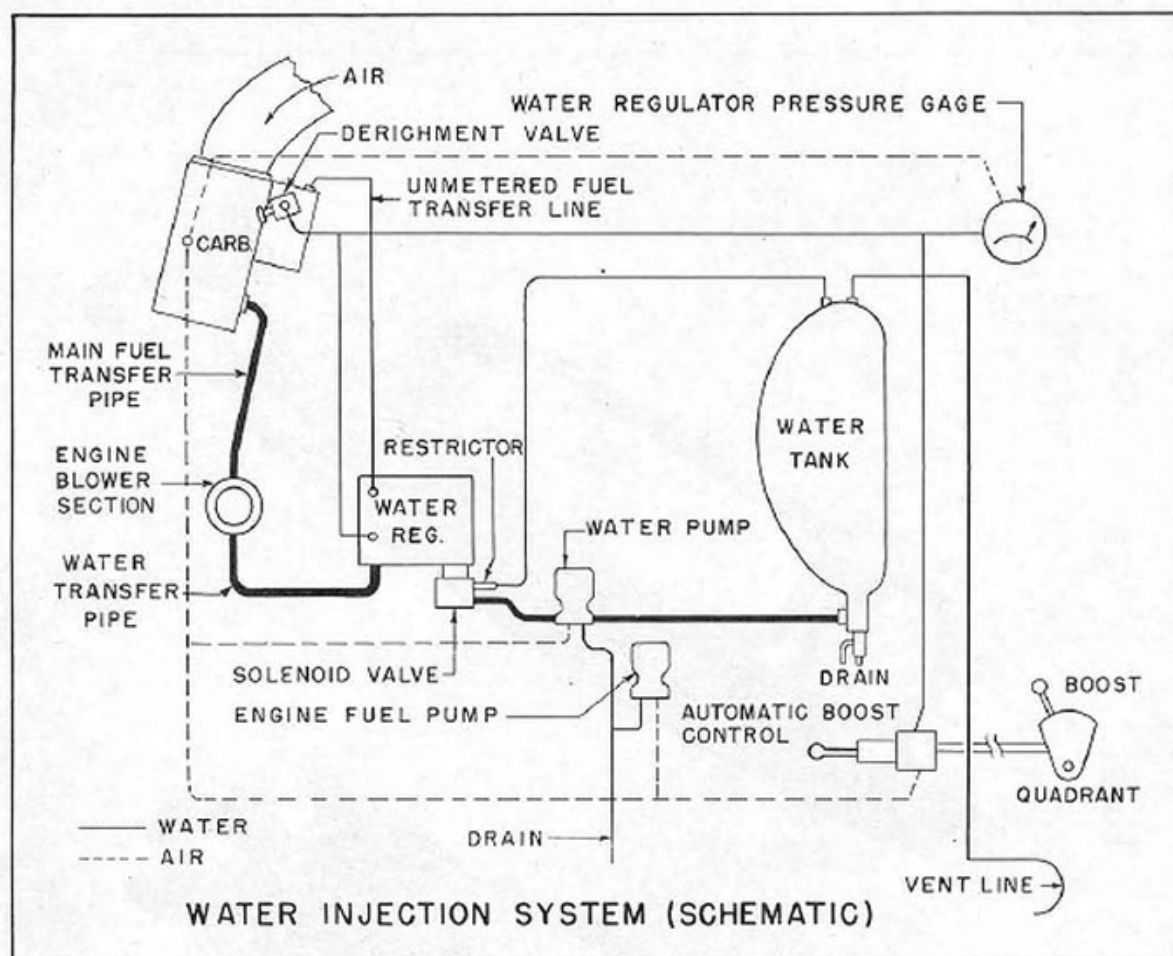
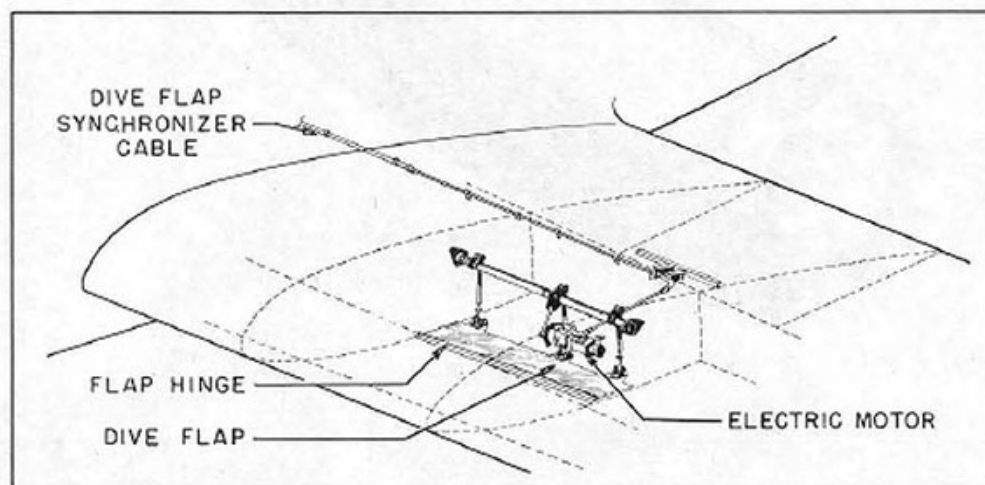


Figure 31—Water Injection System





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Section I

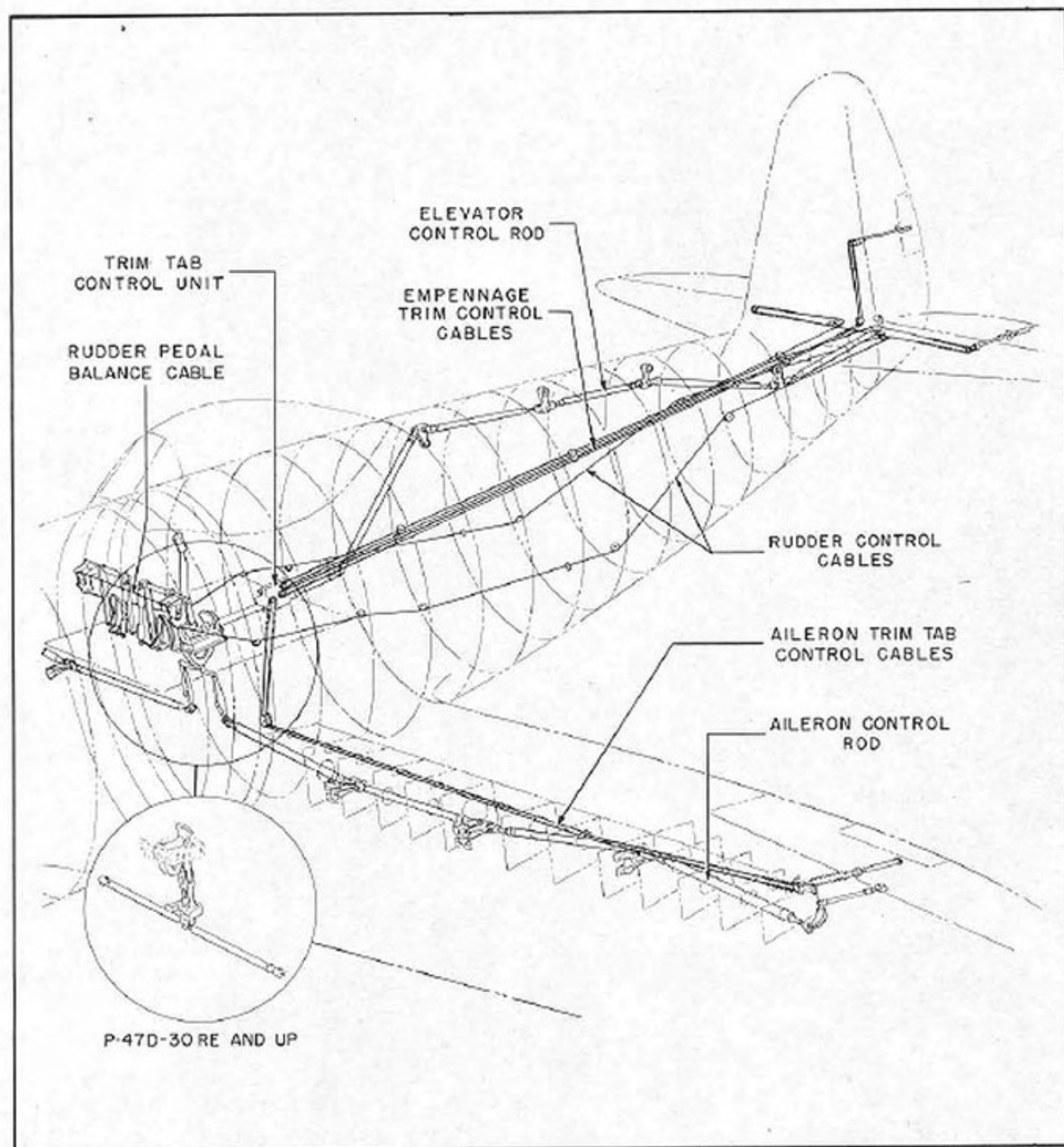
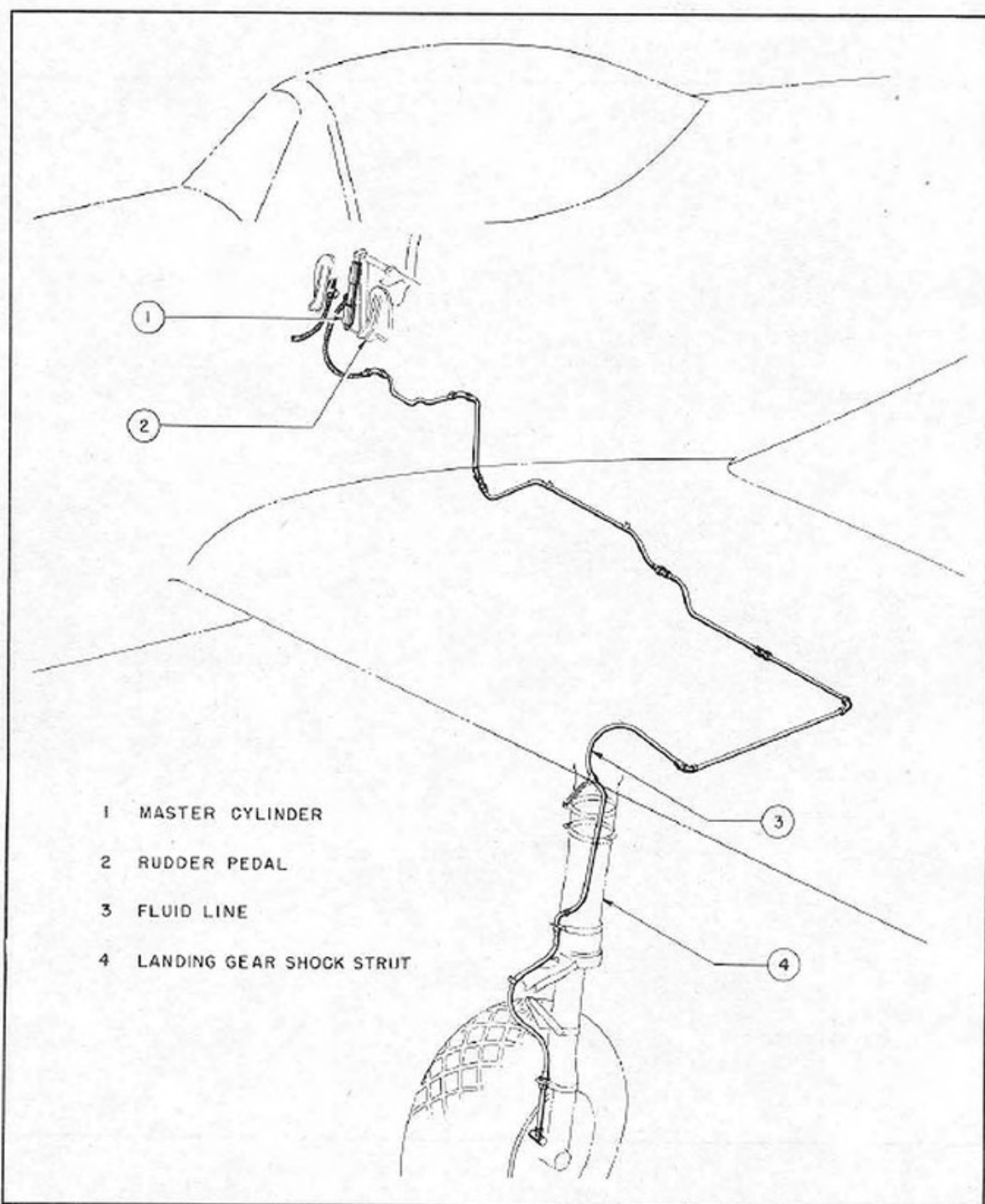


Figure 33—Surface Controls

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## Section I

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**AN 01-65BC-1A****Figure 34—Brake Control System****RESTRICTED**



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AN 01-65BC-1A

Section I

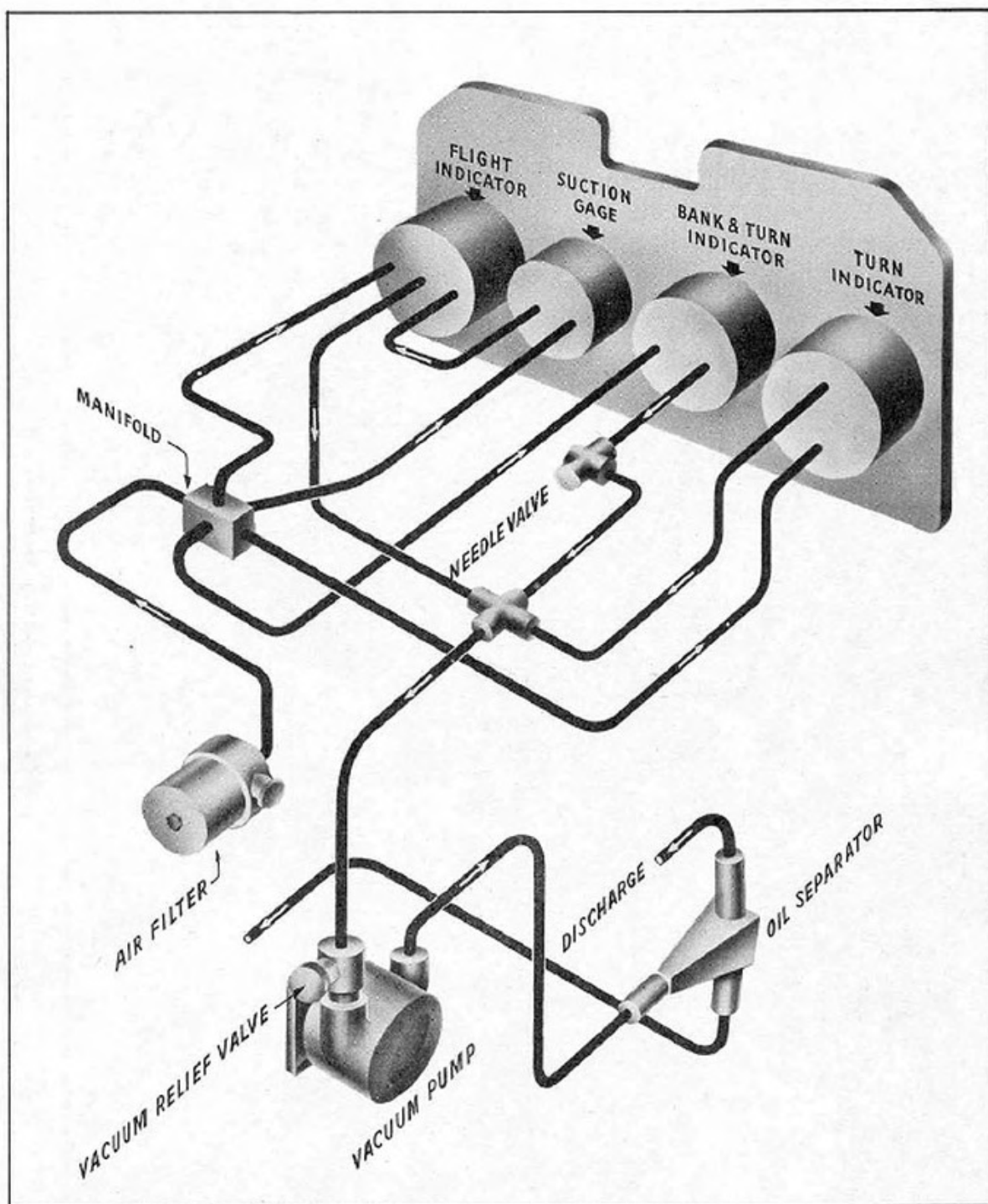


Figure 35—Instrument Vacuum System

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- 1 COCKPIT HEATER INTAKE
- 2 HEATER MUFF
- 3 COCKPIT FRESH AIR VENT
- 4 HEATER CONTROL VALVE
- 5 DEFROSTER UNIT
- 6 HEATER AND DEFROSTER CONTROL
- 7 COCKPIT VENT CONTROL
- 8 COCKPIT HEAT DISTRIBUTOR

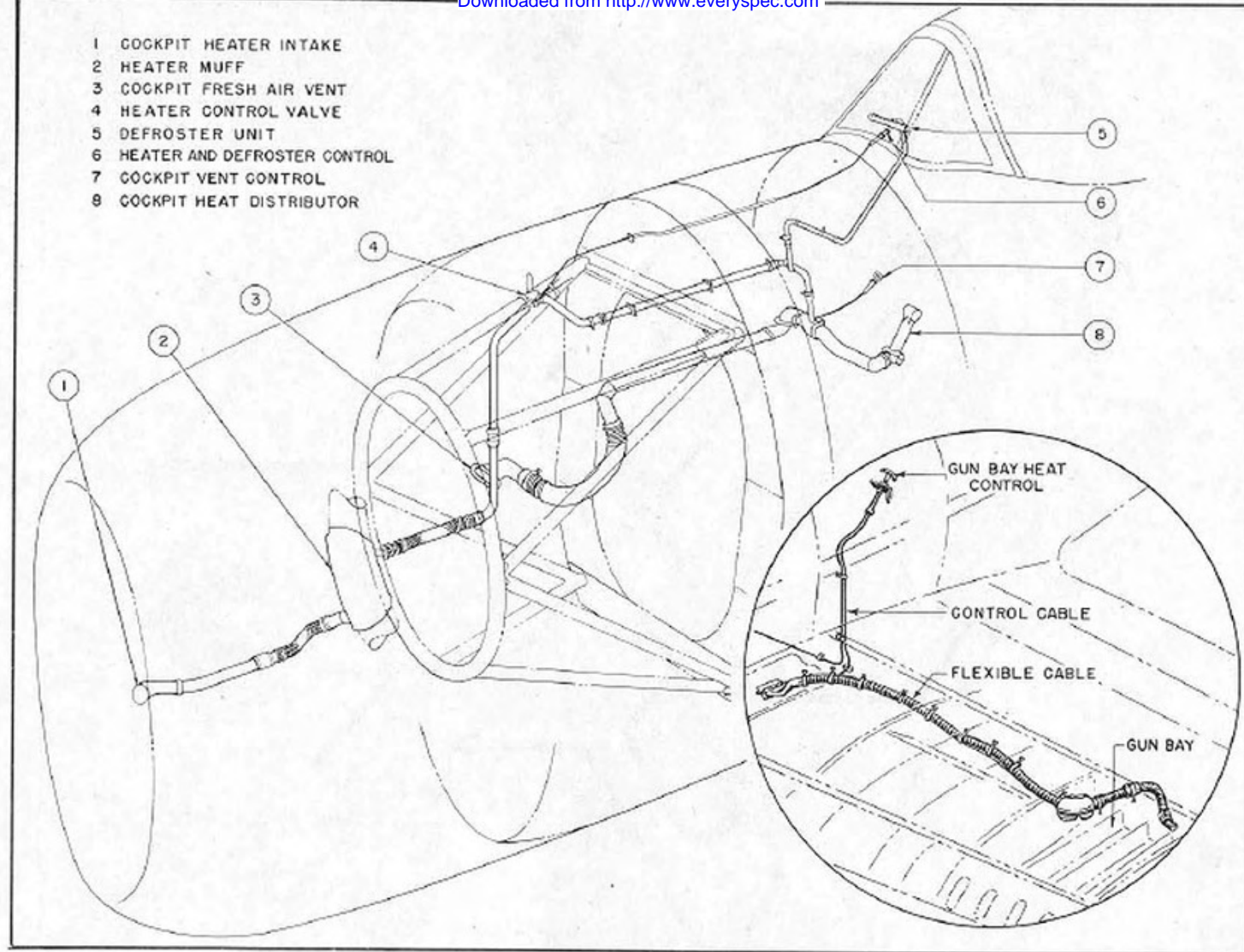


Figure 36—Cockpit Heating, Ventilating and Defrosting System

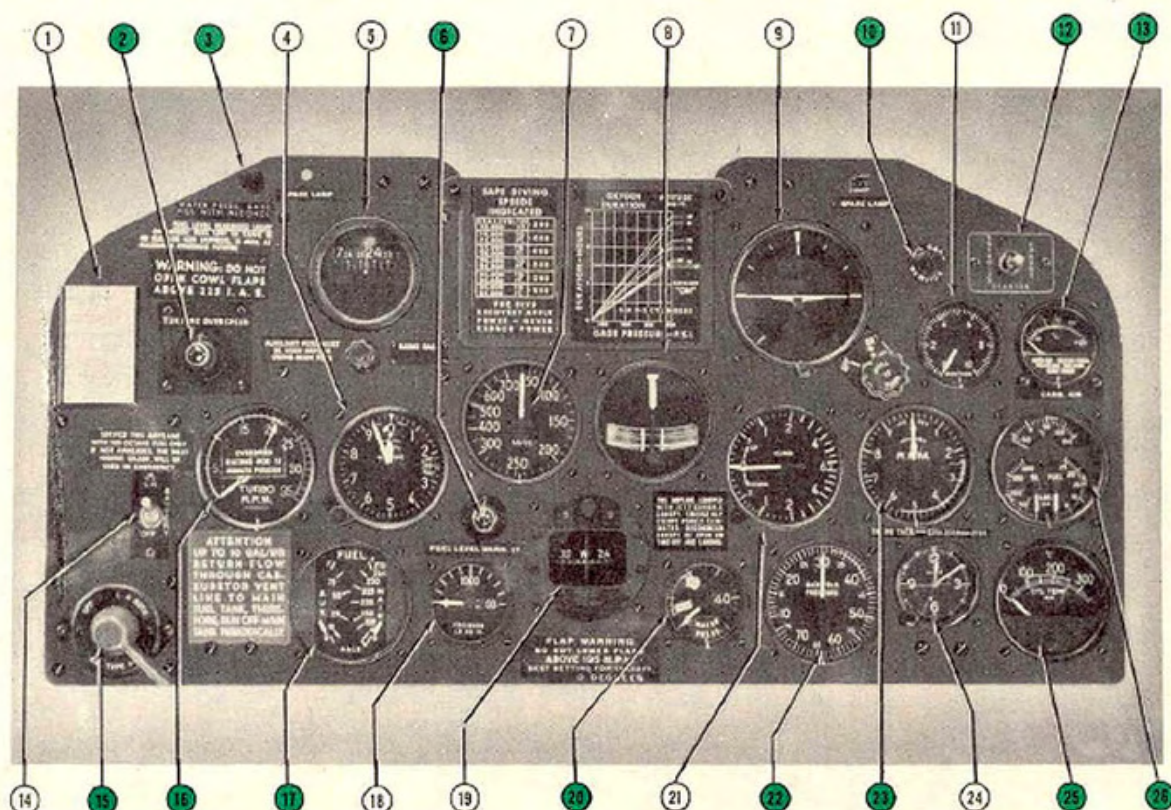
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Section I



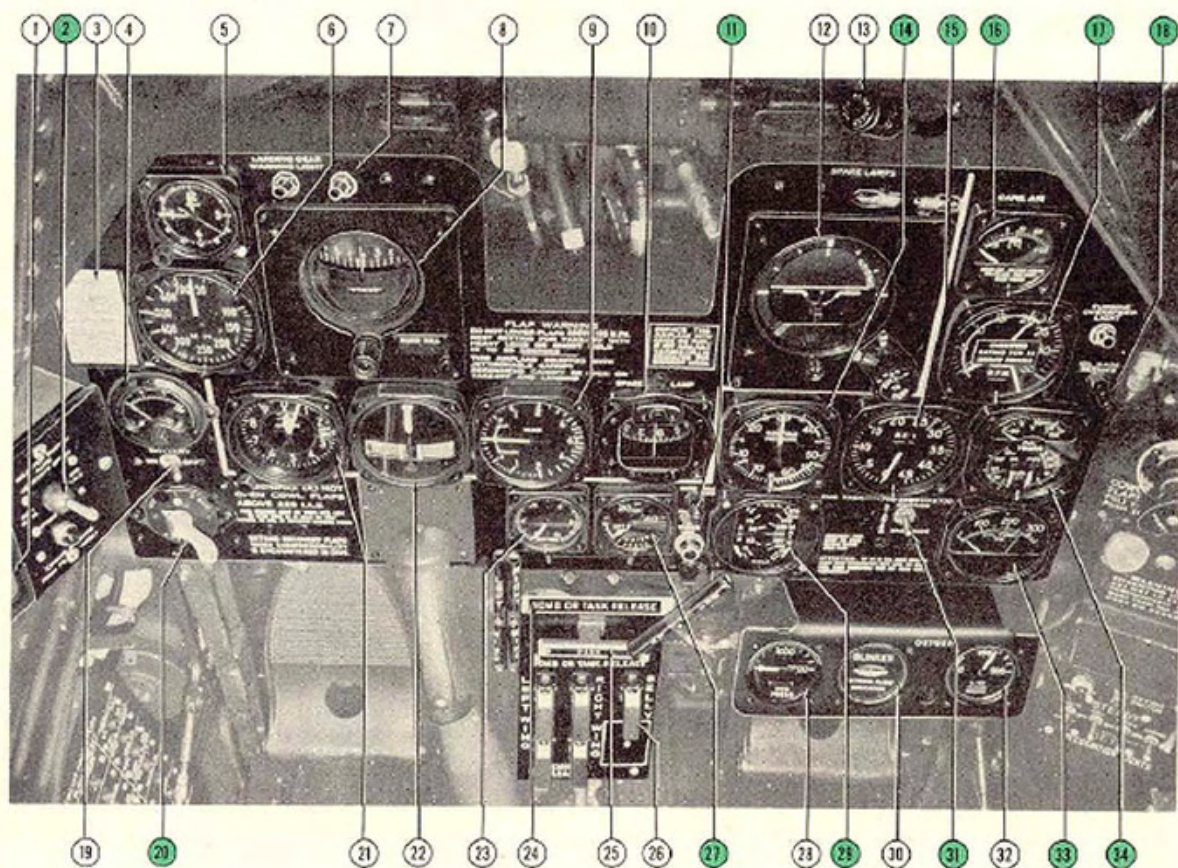
- |                                     |  |
|-------------------------------------|--|
| 1. Altimeter Scale Correction Card  | 14. Master Battery Switch                                  |
| 2. Turbine Overspeed Warning Light  | 15. Ignition Switch  |
| 3. Water Pressure Gage Line Service | 16. Turbine Tachometer                                     |
| 4. Altimeter                        | 17. Fuel Quantity Gage                                     |
| 5. Turn Indicator                   | 18. Hydraulic Pressure Gage                                |
| 6. Fuel Level Warning Light         | 19. Compass  |
| 7. Air Speed Indicator              | 20. Water Pressure Gage                                    |
| 8. Bank and Turn Indicator          | 21. Rate of Climb Indicator                                |
| 9. Artificial Horizon               | 22. Manifold Pressure Gage                                 |
| 10. Oil Gage Line Service           | 23. Engine Tachometer                                      |
| 11. Instrument Vacuum Gage          | 24. Clock  |
| 12. Starter Switch                  | 25. Cylinder Head Temperature Gage                         |
| 13. Carburetor Air Temperature Gage | 26. Engine Gage: Fuel and Oil Pressure and Oil Temperature |

Figure 37—Instrument Panel Through P-47D-28

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## Section I

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AN 01-65BC-1A

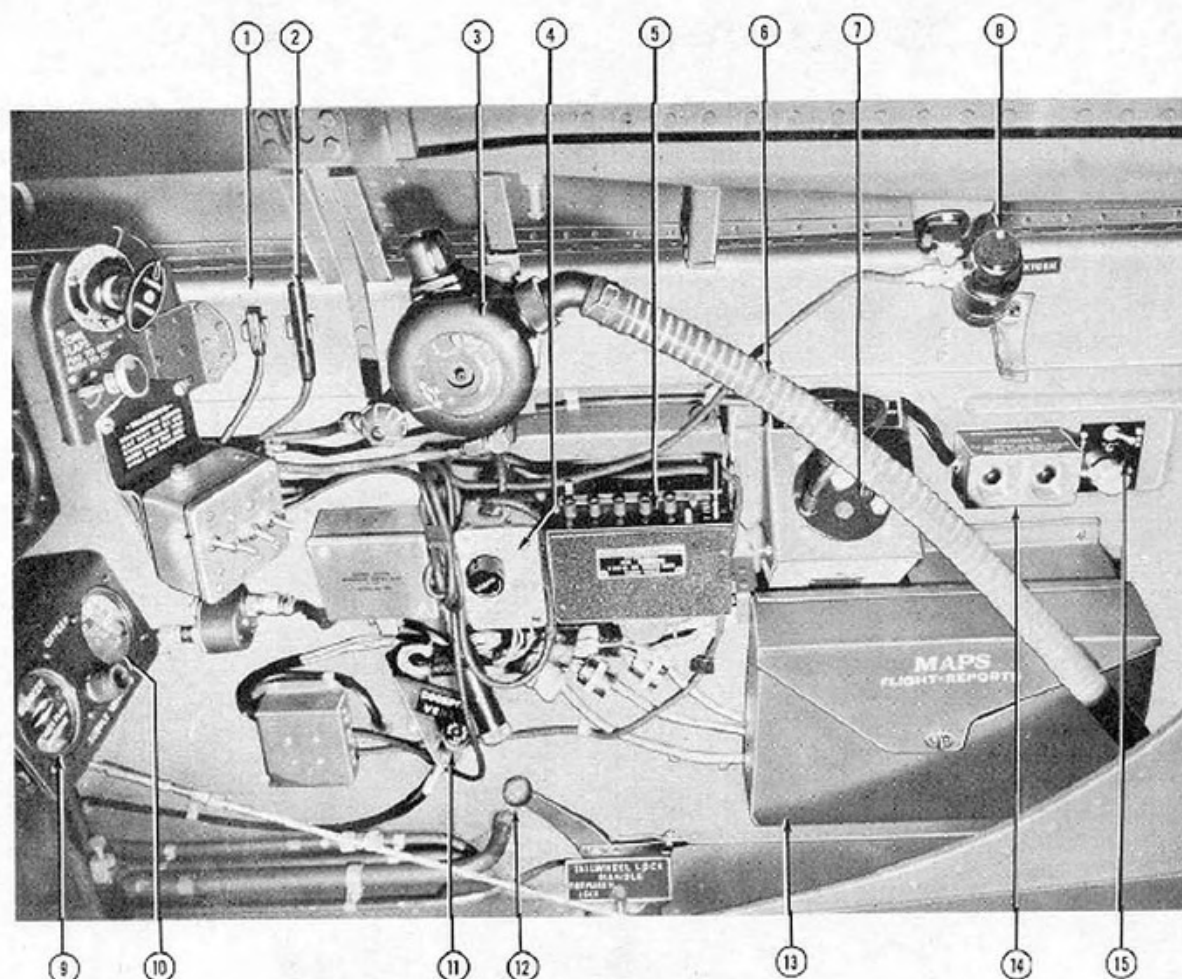
- |   |   |
|---|---|
| 1. Compressibility Recovery Flap Switch | 18. Oil Gage Line Service                         |
| 2. Electric Propeller Switches          | 19. Master Battery Switch                         |
| 3. Altimeter Scale Correction Card      | 20. Ignition Switch                               |
| 4. Ammeter                              | 21. Altimeter                                     |
| 5. Clock                                | 22. Bank and Turn Indicator                       |
| 6. Airspeed Indicator                   | 23. Suction Gage                                  |
| 7. Landing Gear Warning Light           | 24. Bomb and Tank Release Controls                |
| 8. Turn Indicator                       | 25. Parking Brake Control                         |
| 9. Rate of Climb Indicator              | 26. Electric Bomb and Tank Release Selector Panel |
| 10. Compass                             | 27. Water Pressure Gage                           |
| 11. Fuel Level Warning Light            | 28. Hydraulic Pressure Gage                       |
| 12. Artificial Horizon                  | 29. Fuel Quantity Gage                            |
| 13. Defroster Control                   | 30. Oxygen Flow Indicator                         |
| 14. Manifold Pressure Gage              | 31. Starter Switch                                |
| 15. Engine Tachometer                   | 32. Oxygen Pressure Gage                          |
| 16. Carburetor Air Temperature Gage     | 33. Cylinder Head Temperature Gage                |
| 17. Turbosupercharger Tachometer        | 34. Engine Gage Unit                              |

Figure 38—Instrument Panel P-47D-30



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**AN 01-65BC-1A**

**Section I**



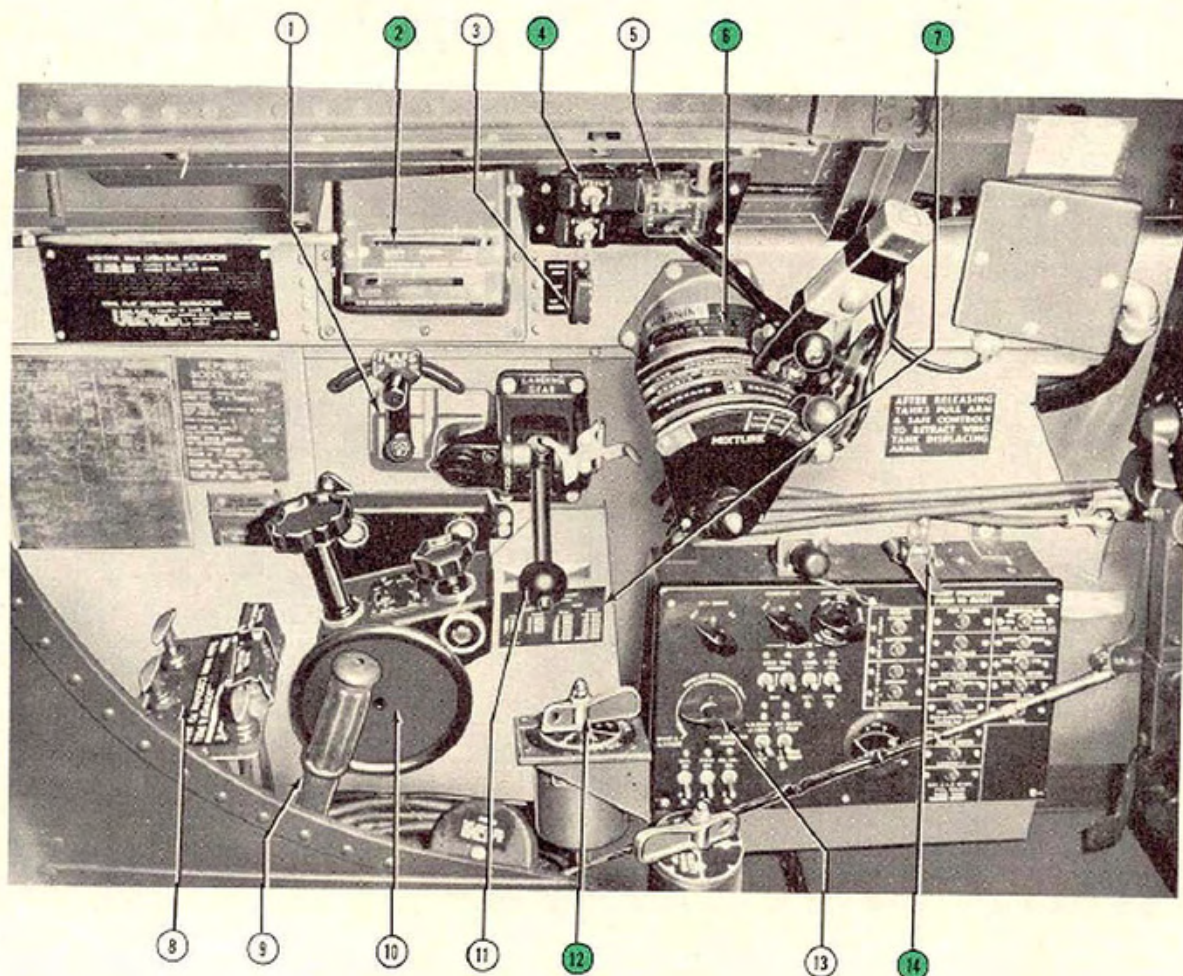
1. Microphone Connector Plug
2. Headphone Connector Plug
3. Oxygen Demand Regulator
4. Radio Receiver Volume Control
5. Control Box Assembly
6. Oxygen Feeder Hose
7. Beam Receiver
8. Cockpit Light
9. Oxygen Flow Indicator
10. Oxygen Pressure Gage
11. Cockpit Vent Control
12. Tail Wheel Lock Control
13. Map Case
14. Secret Radio Detonator
15. Secret Radio Switch

**Figure 39—Cockpit, Right Side**

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## Section I

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1. Landing Flap Control
2. Intercooler and Oilcooler Shutter Position Indicators
3. Gun and Camera Switch
4. Intercooler and Oilcooler Shutter Switches
5. Canopy Switch
6. Engine Control Quadrant
7. Three Point Fuel Correction Chart
8. External Tank and Bomb Release
9. Hydraulic Hand Pump
10. Trim Tab Control Unit
11. Landing Gear Control
12. Main Fuel Selector Valve
13. Fuel Booster Pump Rheostat
14. Landing Gear Warning Switch

Figure 40—Cockpit, Left Side

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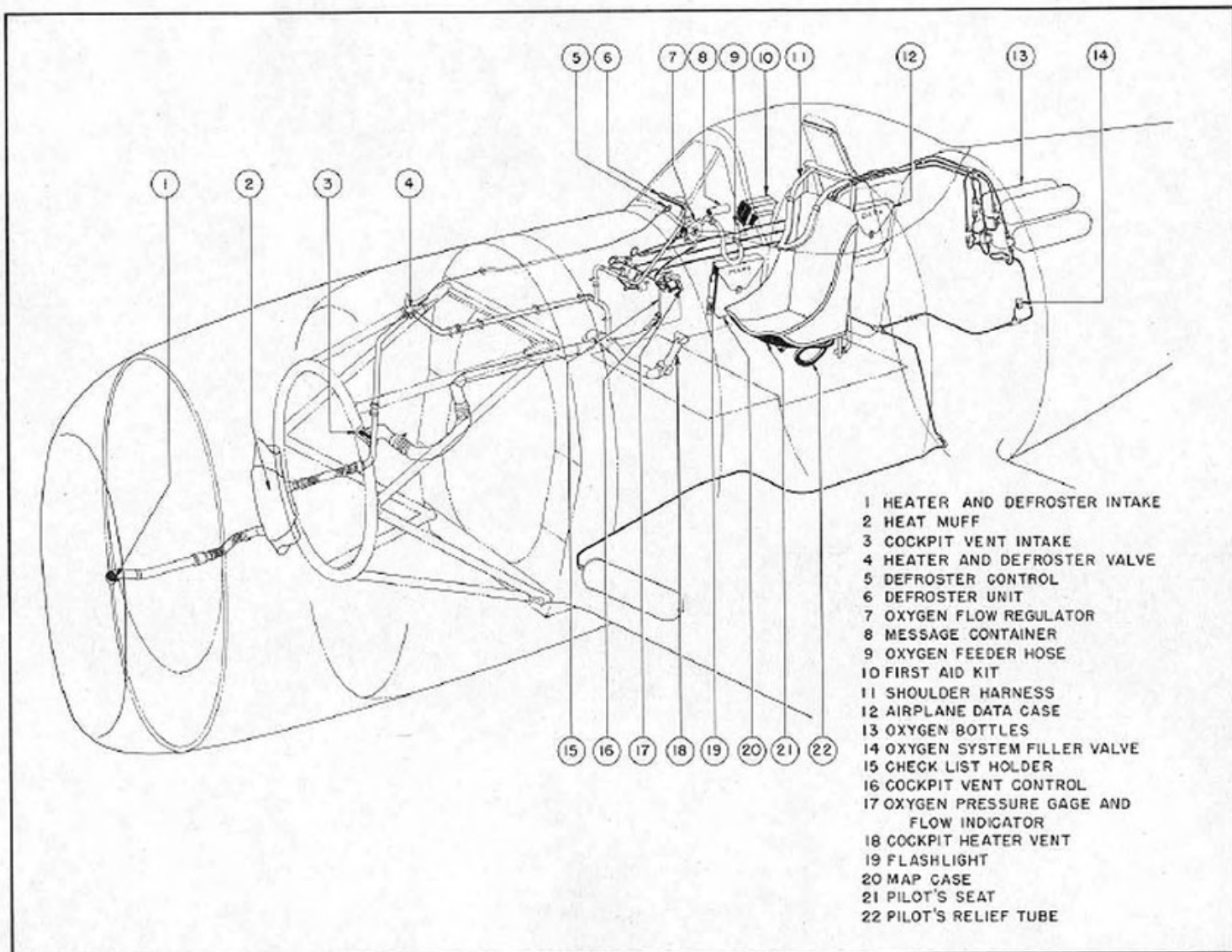


Figure 41—Fuselage Contents Arrangement

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Section I

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Section II  
Paragraphs 1-3

## SECTION II

### PILOTS OPERATING INSTRUCTIONS

#### 1. FLIGHT RESTRICTIONS.

##### a. MANEUVERS PROHIBITED.

- (1) Intentional spins of more than one-half turn.
- (2) Outside loops.
- (3) Whip stalls.
- (4) Prolonged inverted flight.
- (5) Snap rolls.
- (6) Slow rolls above 313 mph.
- (7) Violent maneuvers, practice landings, and high speed dives with external tanks.
- (8) Tight turns or dives exceeding 225 mph are prohibited with cowl flaps open. Tail buffeting may result.

##### b. AIRSPEED LIMITATIONS.

- (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) Make no turns below 130 mph.
  - (3) Do not lower landing gear at speeds in excess of 200 mph.
  - (4) Do not extend wing flaps at speeds in excess of 190 mph.
  - (5) Do not extend landing light at speeds in excess of 200 mph.
  - (6) When external tanks are installed, airspeed is restricted as follows:
- |  |         |
|--|---------|
| 75 US ( 62 Imperial)-gallon belly tank—  | 350 mph |
| 110 US ( 92 Imperial)-gallon belly tank— | 325 mph |
| 165 US (137 Imperial)-gallon wing tank—  | 300 mph |

#### CAUTION

Don't exceed a 4G pull out with wing tanks or bombs installed.

#### 2. BEFORE ENTERING PILOT'S COMPARTMENT.

- a. Check Form 1.
- b. Check Form F, Weight and Balance Data AN 01-1B-40.
- c. Entrance to the airplane is made by pulling outward on the canopy-release latch (figure 2) located in the left side of the fuselage below the canopy rail, allowing the canopy to slide rearward. A step is provided above the wing fillet.

#### 3. ON ENTERING THE PILOT'S COMPARTMENT.

##### a. FOR ALL FLIGHTS.

- (1) Unlock surface controls.
- (2) Adjust cockpit seat to correct height, by releasing the lock handle on right side of seat.
- (3) Adjust length of rudder pedals so as to obtain complete control at extreme positions. Rudder pedal adjustment lever (figure 17) is located on outboard side of each pedal.
- (4) Check landing gear control handle in the "DOWN"-position.
- (5) Move flap handle (figure 15) to "UP"-position.
- (6) Test-operate the emergency hydraulic hand pump. Note increase in system pressure on gage.
- (7) Examine safety belt and shoulder harness for security of attachment and operation of safety locks.
- (8) Check operation of flight controls and trim tabs through complete range.
- (9) Unlock brakes by pressing the tops of rudder pedals with the toes, and check for firm and positive action. Reset parking brake.
- (10) Check the instruments for clean cover glasses. Set the altimeter (4, figure 37) to correct barometric pressure. Wind and set the clock.
- (11) Check that gun switch (figure 47) is "OFF."
- (12) Check that airplane ignition switch (15, figure 37) is "OFF."
- (13) Turn master battery switch (14, figure 37) "ON," and check that all circuit breakers (5, figure 5) are on.

#### Note

Do not use airplane's battery if outside battery cart is plugged in.

- (14) Test all warning lights. (See figure 5.)
- (15) Check quantity of fuel aboard by fuel level gage on instrument panel. (See 17, figure 37.) Refer to three-point correction chart. (See figure 8.)
- (16) Note reading of oxygen system pressure gage (6, figure 45) indicating quantity of oxygen available.
- (17) Test-operate intercooler and oil-cooler doors through complete range. Set at "NEUTRAL." (See figure 13.)
- (18) If battery switch has been "ON," turn to "OFF" when check is completed.
- (19) Check propeller governor full forward "INCREASE RPM." In addition, on airplanes with Curtiss Electric Propeller, check selector switch in "AUTOMATIC," and circuit breaker "ON."
- (20) Place fuel booster pump rheostat, on main

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## Section II

### Paragraphs 3-5

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switch box (figure 5), to "START and ALTITUDE" (Fully counterclockwise.)

(21) Test-operate gun sight light brilliancy. (See figure 5.)

#### b. SPECIAL CHECK FOR NIGHT FLIGHTS.

(1) Turn master battery switch "ON" if battery cart is not plugged in.

(2) Turn cockpit swivel light "ON." (See figure 5.)

(3) Test-operate navigation lights. (See 3, figure 10.)

(4) Test-operate landing light. (See 3, figure 5.) Be sure the light is retracted after test. Do not operate landing light for more than 5 seconds.

## 4. FUEL SYSTEM MANAGEMENT.

a. To draw fuel from "MAIN" or "AUXILIARY" tanks, turn main fuel selector valve to either position. To draw fuel from external tanks, first select desired position of external-system fuel selector valve and then turn main valve (figure 7) to "EXTERNAL."

### Note

Always set fuel selector valves by "click-and-feel" method to insure firm seating of valve.

b. Leave fuel-pump rheostat (6, figure 5) in normal position of "START and ALTITUDE" unless fuel-pressure gage indicates failure of engine pump.

c. If the engine-driven fuel pump fails during high-altitude flights, turn fuel boost to full clockwise "EMERGENCY"-position. If this does not give sufficient fuel pressure, retard 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.

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

e. Due to the fact that the main fuel gage is not calibrated in small quantities, a safe known reserve of 10 to 15 US gallons should be carried in the auxiliary tank at all times.

f. When shifting internal tanks at high altitudes reduce power and turn boost to "EMERGENCY" while shifting. *Be careful to stop on the "click."*

g. To draw fuel from external tanks, first select desired position of external system selector valve and then switch main selector to "EXTERNAL." No quantity gages are included for external tanks, but their contents may be estimated by use of data contained in Flight Operation Instruction Charts in Appendix I.

## CAUTION

External tank pressurizing lines are interconnected; therefore, dropping one tank leaves entire pressurizing system inoperative.

#### b. Use tanks in the following order:

(1) Take off on "MAIN."

(2) Use "EXTERNAL" supply next.

(3) Run "AUXILIARY" down to safe known reserve of 10 US gallons.

(4) Land on "MAIN."

### Note

Run engine on "MAIN" tank periodically to prevent its over-flowing. Vapor line from carburetor returns approximately 10 US (8.3 Imperial) gallons per hour to main tank.

i. A fuel-level warning light on the instrument panel (6, figure 37) will glow when approximately 40 US (33 Imperial) gallons remain in the main tank.

## 5. STARTING ENGINE.

a. With ignition and battery switches "OFF," pull the propeller through several turns by hand.

b. Whenever possible, an external source of power should be plugged into the receptacle in the right-secondary engine cowl.

c. Set fuel selector valve (figure 7) to "MAIN."

d. "Crack" throttle (figure 6) open approximately one inch.

e. Supercharger control (figure 6) full aft.

f. Check mixture control handle (6, figure 6) in "IDLE CUT-OFF".

g. On electric propeller installations, propeller switch (figure 4) in "AUTOMATIC" and circuit breaker "ON."

h. Propeller governor control (5, figure 6) "INCREASE RPM" (full forward for both Curtiss Electric and Hydromatic Propellers.)

i. Fuel booster pump rheostat (6, figure 5) set to "START and ALTITUDE."

j. Air-filter control (figure 14) set "ON" if dust conditions so indicate.

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. After priming, make certain that primer (1, figure 10) is locked in "OFF"-position.

l. Master battery switch (14, figure 37) "ON" if battery cart is not installed.

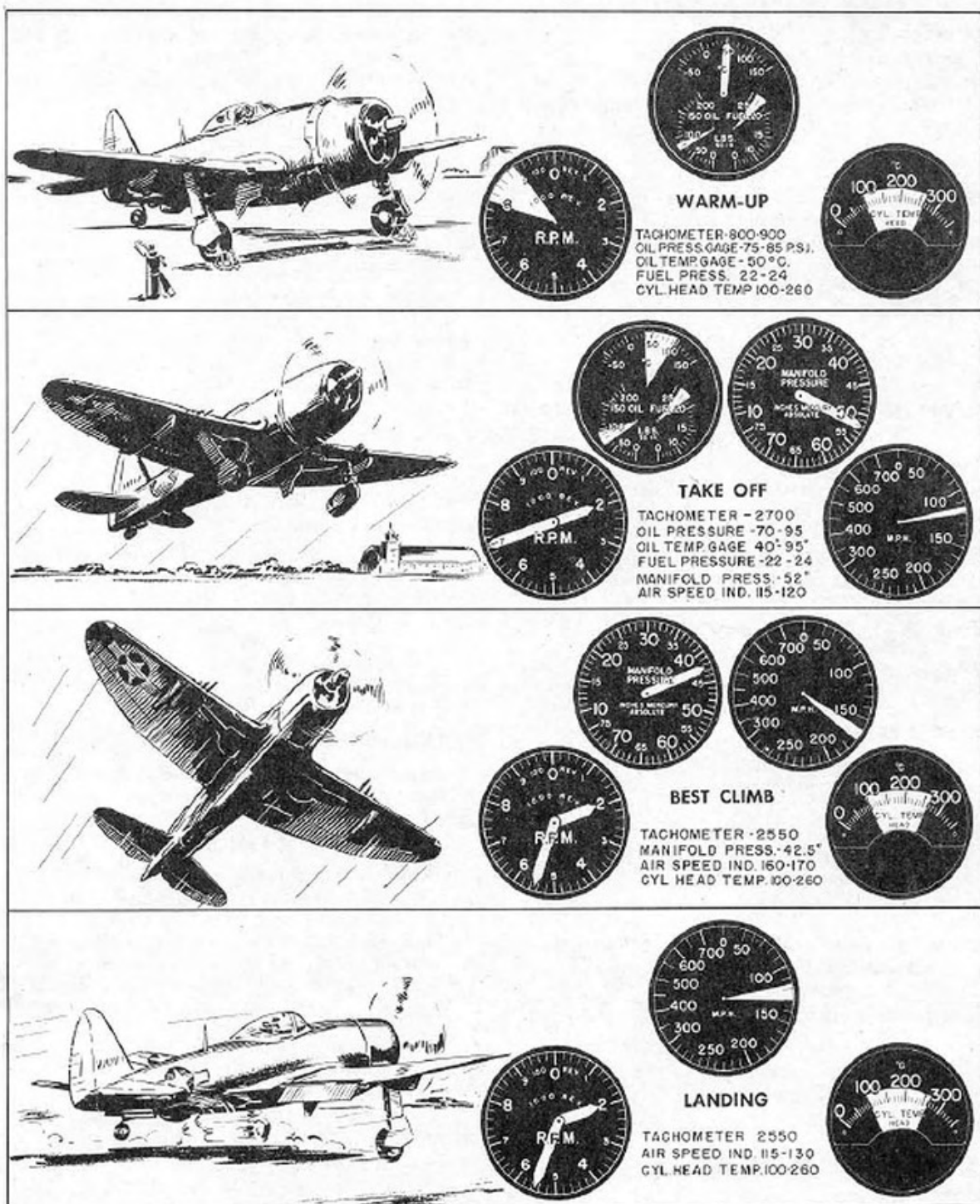
m. See that all personnel is clear of propeller, and turn ignition switch (15, figure 37) to "BOTH."

n. Flick starter switch (12, figure 37) to "ENGAGE" and immediately return to "OFF." (This is to seat starter brushes on commutator.)

o. "ENERGIZE" for not more than 20 seconds and

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**Section II**



**Table of Recommended Engine Operating Instructions**

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## Section II

### Paragraphs 5-10

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switch to "ENGAGE" for a maximum period of 30 seconds.

p. If engine fails to start, let starter cool for at least 1 minute before repeating procedure.

q. When engine starts, move mixture control (figure 6) to "AUTO-RICH" and throttle to 900 rpm.

### CAUTION

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

- r. In the event of fire in the engine section:
- (1) Place mixture control in "IDLE CUT-OFF."
  - (2) Turn fuel selector valve to "OFF."
  - (3) Open throttle wide.

## 6. ENGINE WARM-UP AND ACCESSORY CHECK.

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

b. Oil pressure should rise to about 150 to 200 psi. Do not exceed 1000 rpm until oil pressure drops to normal.

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

## 7. SCRAMBLE TAKE-OFF.

Use oil dilution to obtain proper oil pressure at moderate power, and take-off.

### CAUTION

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

## 8. ENGINE AND ACCESSORIES OPERATION GROUND TEST.

a. When warm, and with propeller control set for "INCREASE RPM," check magnetos as follows:

(1) For airplane with Curtiss Electric Propeller:

(a) Turn propeller selector to "AUTOMATIC."

(b) Open throttle to 2000 rpm, 30 inches Hg. and test each magneto. Drop in rpm should not exceed 100 on either magneto.

(2) For airplanes with Hamilton Standard Propellers:

(a) Open throttle to 2000 rpm, 30 inches Hg. and test each magneto. Drop in rpm should not exceed 100 on either magneto.

(3) Check for full power at 45 inches Hg. Move

supercharger control 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 governor control several times. Check manual operation of Curtiss Electric Propeller by operating selector switch.

c. Check for generator charge on ammeter.

d. Check oil pressure and temperature. (Refer to Specific Engine Flight Chart, Section III.)

e. Check fuel pressure. (Refer to Specific Engine Flight Chart, Section III.)

f. Check water pressure: 30 to 32 psi at 2000 rpm on the ground.

g. Check gage (18, figure 37) for correct hydraulic pressure.

h. Operate engine from each fuel tank including externals, if installed.

i. Check Flight Indicator: The Gyro Horizon (Flight Indicator) will be uncaged at all times except during maneuvers in the air which exceed the operating limits.

### Note

If the horizon bar is not level after the engine is started, momentarily cage the Gyro at least 5 minutes before take-off.

## 9. TAXIING INSTRUCTIONS.

Always unlock tail wheel for taxiing. It is necessary to keep swinging the airplane from side to side for visibility directly ahead.

### CAUTION

Avoid taxiing 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.*

## 10. TAKE-OFF.

a. FINAL 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—"INCREASE RPM" (full forward.) Propeller switches (when electric propeller is installed) "ON" and "AUTOMATIC."

(4) Fuel selector valve—"MAIN TANK."

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

(6) Cowl Flaps—"OPEN."

(7) Canopy open.

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**Paragraphs 10-13**

(8) Run engine up to 1400 rpm. Check for operation of the generator. Check for radio operation. Usually contacting the tower is sufficient.

**b. TAKE-OFF PROCEDURE.**

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

(2) Half-flaps will assist take-off from abnormally short fields. When flaps are used, raise gear quickly and build up as much speed as possible before starting to climb. Flaps should be left down until an altitude of at least 500 feet is reached and then "milked" up carefully to prevent altitude loss.

**CAUTION**

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

(3) Push interconnected boost and throttle forward to approximately 30 inches Hg., while holding the airplane with the brakes. Release brakes and with firm and even pressure open throttle to take-off stop.

**CAUTION**

During warm-weather operation when ground temperature is approximately 35°C (95°F), or hotter, it will be necessary to disconnect controls, and take off without using the turbo-supercharger, 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.

(4) As soon as the airplane is off the ground, move safety latch (figure 15) 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 "DOWN," allow gear to go completely down before changing handle.

**11. ENGINE FAILURE DURING TAKE-OFF.**

a. Nose down to maintain speed.

b. Turn fuel-boost rheostat fully clockwise to "EMERGENCY" in attempt to regain power.

c. If engine does not regain power, prepare to land on field *straight ahead*. If too late, retract gear and land off field *straight ahead*.

**WARNING**

*Do not attempt to turn back into field.*

d. Lower flaps.

e. Turn fuel selector valve "OFF," and mixture to "IDLE CUT-OFF."

f. Switch ignition and battery switches "OFF."

g. Jettison canopy by pulling release handle on forward bow.

b. Get out and away from airplane as quickly as possible after landing.

**12. CLIMB.**

a. Best climbing speed is 150 to 165 mph. It will be necessary in prolonged climbs, or in hot weather, to climb at higher speed in order to properly cool the engine. Speed of climb should be increased until allowable cylinder-head temperature is obtained.

b. Keep cowl flaps "OPEN"; check cylinder-head temperature frequently. If over 260°C, increase air-speed. Check oil temperature 95°C, and carburetor-air temperature 35°C.

**CAUTION**

Watch carburetor air closely. Temperature builds up rapidly when air filter is in use.

c. Place air-filter control in "OFF"-position as soon as dust-free altitude is reached.

**13. GENERAL FLYING CHARACTERISTICS.**

a. Operate engine within limitations outlined in Specific Engine Flight Chart in section III.

b. To reduce power, first retard interconnected boost and throttle levers; set rpm with propeller control, and then adjust power lever for desired manifold pressure.

c. To increase power, push throttle forward; a latch on the control lever insures that the propeller lever will move forward also.

d. Above critical altitude it will be necessary to disconnect controls and adjust boost and throttle independently to avoid overspeeding of the turbosupercharger.

**CAUTION**

Never exceed the red limit line marked on the turbo tachometer.

e. Most stable high-altitude operation is obtained when power adjustment is made by boost control alone. However, caution must be observed to prevent two conditions as follows:

(1) **TURBO COLLAPSE.**—When power is reduced by retarding the throttle or engine speed, leaving the boost well forward, a consequent reduction in exhaust back pressure occurs. When this condition approaches the point where there is insufficient back pressure to maintain the required boost, a further reduction in power and back pressure results, finally

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## Section II

### Paragraphs 13-18

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causing complete collapse. Recovery from collapse is achieved by nosing down and advancing throttle and engine rpm to increase exhaust pressure which again sets the supercharging system in action. Recovery from complete collapse at high altitudes may take as long as 30 seconds.

(2) PULSATION.—At another range of the throttle with the boost lever well forward, when power is reduced by throttle or propeller control, it is possible to "dam" the turbo. In this condition, there is sufficient back pressure to operate this supercharger, but the engine is not absorbing its output, which results in "damming" the pressurized air and causes pulsating pressures in the ducts. Since the fuel pump is balanced against carburetor air, turbo pulsation causes fluctuation in fuel pressure and, if allowed to continue, will cause sufficient fuel-air ratio disruption to result in engine surging. Pulsation is detected by fluctuating fuel pressure and may be corrected by either retarding the boost lever or advancing throttle or engine speed.

f. All models are stable under acceptable loading conditions. The external tanks decrease directional stability. Maneuvering or acrobatics is prohibited until external tanks are empty or dropped. No high-speed diving should be done with fuel in the belly tank.

g. The trim tabs are very sensitive and should be handled cautiously.

(1) Lowering landing gear—no change.

(2) Dive—Airplane tends to yaw to right as speed increases.

b. For economical cruising, set manifold pressure at 32 inches Hg. and reduce rpm depending on range desired. Refer to Flight Operation Charts in Appendix I for complete engine operating instructions.

#### 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:

(1) Flaps and landing gear "UP" — 115 mph.

(2) Flaps and landing gear "DOWN" — 100 mph.

c. There is a pronounced tendency for the airplane to snap to the left when stalled in a turn. However, there is ample warning of the impending stall, in the form of buffeting 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 demonstra-

tions, it has been found that the airplane will not spin of its own accord, but must be forced into a 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 recommended procedure should give a spin recovery within 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 attitude. Approximately 1,000 feet of altitude will be lost in the entry into the spin; 1,000 feet in the recovery, and 1,000 feet per turn, wheels and flaps up, canopy closed. Approximately 3,000 feet per turn is lost with gear down, flaps up. *Practice spins in excess of one-half turn are prohibited.*

#### 16. AEROBATICS.

All normal acrobatics are permitted. No outside loops or inverted flight shall be performed. Do not slow roll at speeds over 313 mph.

#### 17. DIVING.

a. Due to the compressibility effect, diving at high altitude will produce a tendency for the airplane to "dig-in" or nose down. Therefore, do not enter dives 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 keep the airplane in the dive.

b. If extremely high speeds are reached, and the elevator trim tab is used in a small degree to aid recovery, guard against too-rapid pull-out at low altitude. Apply forward stick load to hold down "g's."

c. Apply power to recover from dive. Reducing power makes dives steeper.

d. Safe indicated diving speeds are listed on the instrument panel. Refer to section II paragraph 1. b. (1).

e. Models P-47D-30 and later, incorporate recovery flaps for use when limiting diving speeds have been inadvertently exceeded. Follow normal procedure for recovery, and extend flaps.

f. Never dive with cowl flaps open.

#### 18. NIGHT FLYING.

a. Refer to section I, paragraph 15, for location of light switches.

b. The landing light should not be extended until the final approach and should be left on only for



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the time necessary. Do not extend it at speeds above 200 mph.

**CAUTION**

Never lower landing gear at speeds in excess of 200 mph.

**19. APPROACH AND LANDING.**

*a.* **APPROACH.**

- (1) Check for sufficient fuel for landing.
- (2) Reduce speed to 140 to 150 mph.

**WARNING**

Make no turns below 130 mph.

- (3) Mixture control: "AUTO RICH."
- (4) Electric propeller: "AUTOMATIC."
- (5) Engine rpm: 2550.
- (6) Engine controls: Interconnected.
- (7) Cowl flaps: "CLOSED."
- (8) Move landing gear handle "DOWN" when airplane slows to 200 mph. The landing gear warning light will go out when gear is locked. Except in emergency, always allow landing gear to complete its cycle before changing position of control.

**CAUTION**

Be sure to retract landing light at once after the take-off.

(9) Landing flaps "DOWN" under 190 mph. Check their position by observation from cockpit. If partial flaps are desired, return handle to "NEUT." when desired angle is achieved.

(10) Normal approach speeds:

- (a) Engine on — 115 to 120 mph.
- (b) Engine off — 120 to 130 mph.

*b.* **LANDING.**

(1) With tail wheel "LOCKED," the P-47 series airplanes have no tendency to swing after landing.

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

*c.* **CROSS-WIND LANDING.**—Follow normal procedure. Keep airplane traveling in straight line with runway.

*d.* **TAKE-OFF IF LANDING IS NOT COMPLETED.**

- (1) Advance controls to full power.

**WARNING**

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

- (2) Raise landing gear at once.
- (3) Open cowl flaps.
- (4) Raise landing flaps when above 500 feet.
- (5) Do not pull up too steeply, or loss of directional control may result.

**20. STOPPING ENGINE.**

*a.* Apply toe brakes and set parking brake lever.  
*b.* When a cold-weather start is anticipated, dilute the oil as follows:

- (1) Operate engine at 1000 to 1200.
- (2) Maintain oil temperature below 50°C, and oil pressure above 15 psi.
- (3) Hold oil dilution switch (9, figure 5) "ON" as required by ground temperatures:  
 4° to 12°C. (40° to 10°F.) — 3 minutes.  
 -12° to 29°C. (10° to 20°F.) — 8 minutes.

**Note**

The dilution period to provide the required dilution for temperatures lower than -29°C (-20°F) is excessive for these aircraft. Therefore, heat supplied in addition to the maximum permissible dilution is necessary.

(4) Operate boost control at least 14 complete cycles during last 2 minutes of dilution period.

(5) When Hydromatic propeller is installed, place propeller lever full rear and increase to 1800 rpm at least 4 times during dilution period.

*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."

**21. BEFORE LEAVING THE PILOT'S COMPARTMENT.**

- a.* Fuel selector valve (figure 7) "OFF."
- b.* All cockpit light switches, pitot heater switch, master battery switch, etc. "OFF."
- c.* If windy, lock flight controls to prevent damage to the control surfaces.

**22. TIEING DOWN.**

*a.* Lugs for mooring the airplane are provided in the lower side of each wing, just outboard of the landing-gear leg and concealed by an access door marked "TIE-DOWN." Lashing down the tail may be done by inserting a rope through either the lift tube or the tail-wheel yoke.

*b.* If no stationary mooring points are provided, the portable mooring kit supplied with the airplane may be used.



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Section III  
Paragraphs 1-2

## SECTION III OPERATING DATA

### 1. POWER PLANT CHART.

*a.* Engine limitations and operating characteristics are summarized for ready reference. Learn them. Note restriction when Grade 91 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 5- or 15-minutes duration unless otherwise specified.

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

### 2. AIRSPEED CORRECTION TABLE.

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



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## POWER PLANT CHART

## AIRCRAFT MODEL(S)

P-47D-25 through P-47D-35

## PROPELLER(S)

Hamilton Standard or  
Curtiss Electric

## ENGINE MODEL(S)

R-2800-"B" Series

GAUGE READING	FUEL PRESS.	OIL PRESS.	OIL TEMP.	COOLANT TEMP.	Cyl. Htd Temp.	OIL <sup>(1)</sup> CONS.	MAXIMUM MINIMUM	PERMISSIBLE RECOMMENDED	DIVING CRUISE TURBO	RPM: 3060 RPM: 2070 RPM: 22,000
DESIRED	25	80 psi	80-75°C	Air	252°C	15				
MAXIMUM	26	100 psi	100°C	Cooled	260°C	32				
MINIMUM IDLING	24	30 25								

WAR EMERGENCY (COMBAT EMERGENCY)			MILITARY POWER (NON-COMBAT EMERGENCY)			OPERATING CONDITION			NORMAL RATED (MAXIMUM CONTINUOUS)			MAXIMUM CRUISE (NORMAL OPERATION)		
5 MINUTES			15 MINUTES			TIME LIMIT			UNLIMITED			UNLIMITED		
260°C			260°C			MAX. CYL. HD. TEMP.			252°C			252°C		
A.R. 2700			A.R. 2700			MIXTURE R. P. M.			A.R. 2500			A.L. 2325		
MANIF. PRESS.	SUPER- CHARGER	FUEL <sup>(2)</sup> Gal./Min.	MANIF. PRESS.	SUPER- CHARGER	FUEL <sup>(2)</sup> Gal./Min.	STD. TEMP. °C	PRESSURE ALTITUDE	STD. TEMP. °F	MANIF. PRESS.	SUPER- CHARGER	FUEL GPH <sup>(3)</sup>	MANIF. PRESS.	SUPER- CHARGER	FUEL GPH <sup>(3)</sup>
						-55.0 -55.0 -55.0	40,000 FT. 38,000 FT. 36,000 FT.	-67.0 -67.0 -67.0	42		220 220 220	35 35 35		174 171 169
			52		4.52	-52.4 -48.4 -44.4	34,000 FT. 32,000 FT. 30,000 FT.	-62.3 -55.1 -48.0	42		220 220 220	35 35 35		166 165 160
64 64	SEE SPECIAL NOTES	4.16 4.16	52 52	SEE SPECIAL NOTES	4.52 4.57 4.65	-40.3 -36.5 -32.5	28,000 FT. 26,000 FT. 24,000 FT.	-40.3 -38.7 -26.5	42	SEE SPECIAL NOTES	220 220 220	35 35 35	SEE SPECIAL NOTES	157 154 151
64 64 64		4.16 4.16 4.16	52 52 52		4.65 4.65 4.67	-28.5 -24.5 -20.7	22,000 FT. 20,000 FT. 18,000 FT.	-19.4 -12.3 -5.2	42		220 220 220	35 35 35		149 147 145
64 64 64		4.16 4.16 4.16	52 52 52		4.67 4.67 4.67	-16.7 -12.7 -8.8	16,000 FT. 14,000 FT. 12,000 FT.	2.0 9.1 16.2	42		220 220 220	35 35 35		141 144 143
64 64 64		4.16 4.16 4.16	52 52 52		4.67 4.67 4.67	-4.8 -0.8 3.1	10,000 FT. 8,000 FT. 6,000 FT.	23.4 30.5 37.5	42		220 220 220	35 35 35		143 145 145
64 64 64		4.16 4.16 4.16	52 52 52		4.67 4.67 4.67	7.1 11.0 15.0	4,000 FT. 2,000 FT. SEA LEVEL	44.7 51.8 59.0	42		220 220 220	35 35 35		143 145 145

## GENERAL NOTES

<sup>(1)</sup> OIL CONSUMPTION: MAXIMUM U.S. QUART PER HOUR PER ENGINE.<sup>(2)</sup> GAL/MIN: APPROXIMATE U.S. GALLON PER MINUTE PER ENGINE.<sup>(3)</sup> GPH: APPROXIMATE U.S. GALLON PER HOUR PER ENGINE.<sup>(4)</sup> F.T.L. MEANS FULL THROTTLE OPERATION.<sup>(5)</sup> VALUES ARE FOR LEVEL FLIGHT WITH WIND.

FOR COMPLETE CRUISING DATA SEE APPENDIX I

NOTE: TO DETERMINE CONSUMPTION IN BRITISH

IMPERIAL UNITS, MULTIPLY BY 10 THEN DIVIDE

BY 12. RED FIGURES ARE PRELIMINARY SUBJECT

TO REVISION AFTER FLIGHT CHECK.

## TAKE-OFF CONDITIONS:

RPM-2700 Manif. Press. 52" Hg. COWL FLAPS OPEN  
INTERCOOLER DOORS OPEN

## CONDITIONS TO AVOID:

## SPECIAL NOTES

Turbosupercharger rpm is limited to 20,000 rpm. Operation of the turbosupercharger at 22,000 rpm is limited to 15 minutes.

Highest altitude at any operating condition is limited by turbo rpm or pulsation; pulsation may occur at high altitudes at low rpm's and high manifold pressure.

Figure 42—Power Plant Chart



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Section IV  
Paragraphs 1-6

## SECTION IV EMERGENCY OPERATING INSTRUCTIONS

### 1. EMERGENCY TAKE-OFF.

a. 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.

b. When Hydromatic propeller is installed, operate propeller control at least 3 times to change engine speed 400 rpm to insure a supply of diluted oil in the propeller dome.

### 2. ENGINE FAILURE DURING TAKE-OFF.

- a. Nose down.
- b. Landing gear up.
- c. Jettison all bombs unarmed or external fuel tanks (if installed).
- d. Land on field straight ahead. If too late, retract gear and land off field, straight ahead.

## WARNING

*Do not attempt to turn back into the field.*

### 3. ENGINE FAILURE DURING FLIGHT.

- a. Nose: Down.
- b. Ignition switch "OFF."
- c. If airplane is equipped with external tanks, pull release levers immediately.
- d. Fuel selector valve "OFF."
- e. Flaps "DOWN."
- f. Master battery switch "OFF."
- 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.

Pull canopy jettison handle (figure 22) located on forward bow. (See figure 43.)

### 5. WING FLAP OPERATION.

In the event of failure of the engine-driven hydraulic pump, the flaps may be manually lowered by use of the emergency hand pump (9, figure 40) located at the left of the pilot's seat.

### 6. LANDING-GEAR OPERATION.

a. Failure of engine-driven hydraulic pump:

(1) To retract landing gear: Move control lever to usual "UP"-position. Operate the hand pump until the warning lamp light shows that the gear is "UP" and locked.

(2) To extend landing gear: Move control lever to the usual "DOWN"-position. 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.

## CAUTION

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. 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 full attaining the locked position, it can be shaken into place by yawing the airplane from side to side.

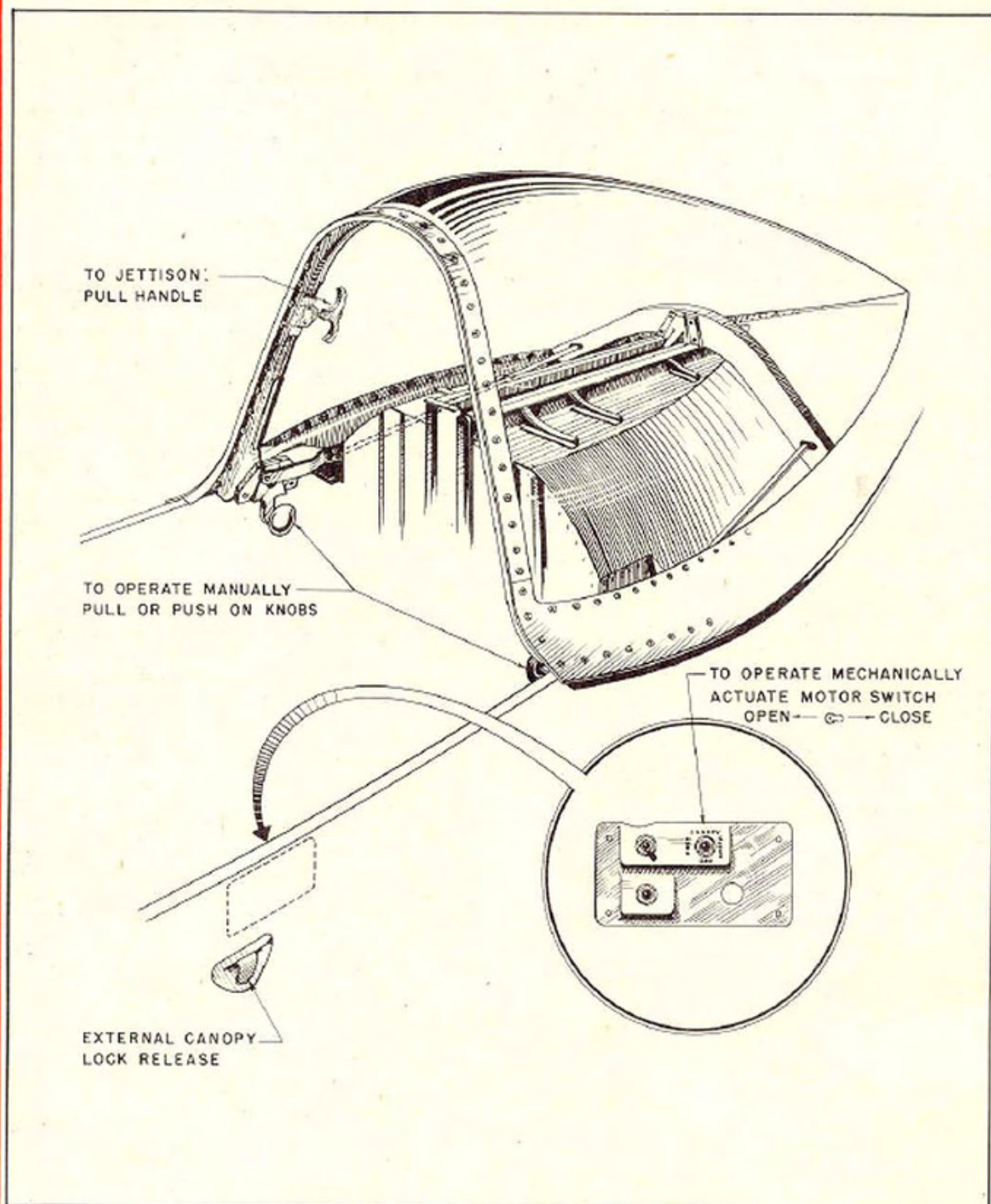


Figure 43—Bubble-Type Canopy Operation



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Section V  
Paragraph 1.

## SECTION V OPERATIONAL EQUIPMENT

### 1. OXYGEN SYSTEM.

*a. GENERAL.*—Breathing oxygen is supplied from six type D-2 low-pressure cylinders located in the fuselage aft of the cockpit and in the left-wing leading edge. (See figure 45.) An oxygen demand regulator is located to the pilot's right on the cockpit wall. A pressure gage and flow indicator are mounted on a sub-panel to the right of the instrument panel. (See figure 39.) The cylinders may be charged through the oxygen filler valve located on the fuselage left side aft of the cockpit.

#### *b. OPERATION.*

(1) *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, 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.

#### (2) MASK.

(a) 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.

(b) Check all parts of the mask to see if it is in good condition and ready for instant use. The mask must be clean and free from all foreign matter.

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

(3) *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.

#### (4) MASK-REGULATOR TUBING.

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

(b) 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 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.

### (5) REGULATOR AND INDICATING INSTRUMENTS.

(a) Be sure that the knurled collar at the outlet end of the regulator is tight. Examine the top diaphragm to see that it is not ruptured or distorted.

(b) Turn "ON" the "EMERGENCY" valve and insure that you get a large flow. Observe the pressure gage; there should be no perceptible pressure drop. Turn the "EMERGENCY" valve tightly, and be sure that it does not leak. Leave it in this position.

(c) 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 indicators. Leave it in this position.

(d) Check the pressure of the system. It must not be less than 400 psi.

#### (6) 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.

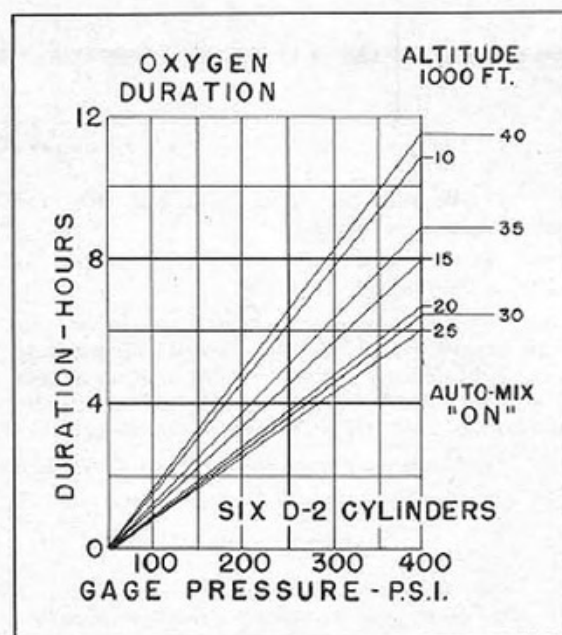


Figure 44—Oxygen Duration Chart

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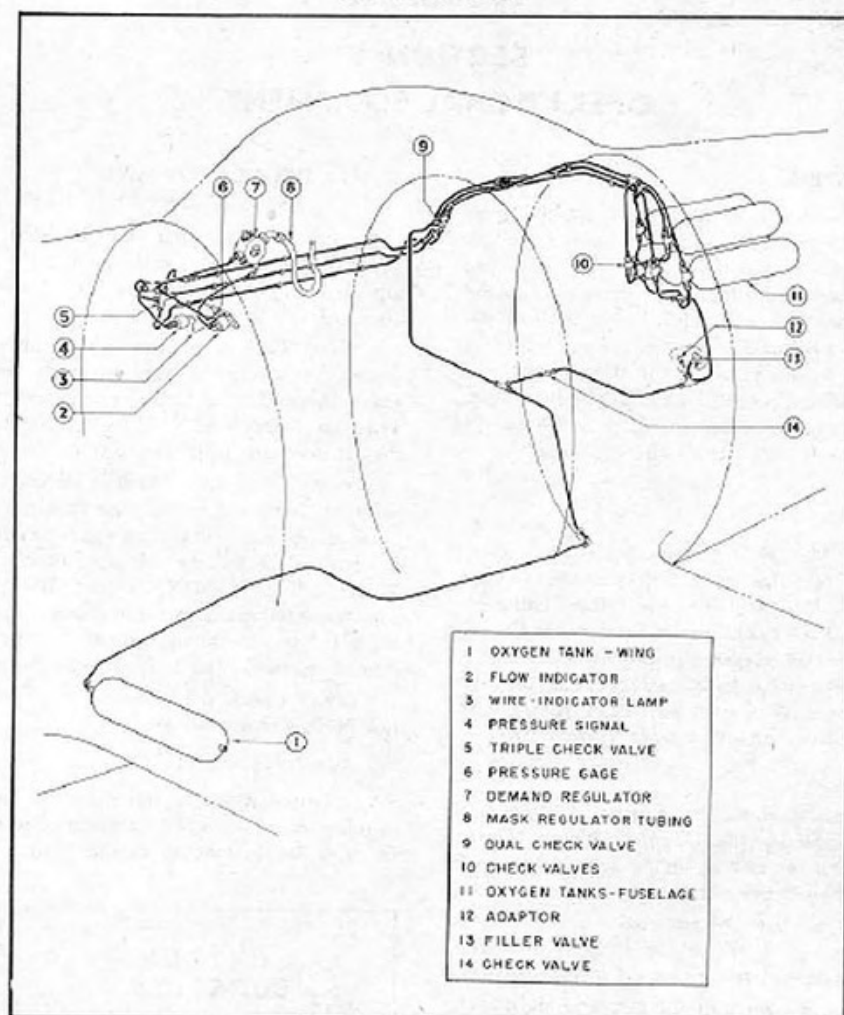


Figure 45—Oxygen System

(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.

## WARNING

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 ex-

treme altitudes. Any failure of the equipment may be fatal.

## (7) 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 psi, observe that the supply warning light is on. Occasionally at the end of a flight, when the pressure is slightly above 100 psi, 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 psi. 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.



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**Section V**  
**Paragraphs 1-2**

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

c. **FILLING CYLINDERS.**—The cylinders may be charged through the filler valve located on the fuselage left side aft of the cockpit beneath an access door. The normal full pressure of the system is 400 psi.

### **WARNING**

Extreme care must be observed to prevent oxygen from contacting any oil, grease, or material containing oil, as spontaneous combustion and explosion are certain to occur.

## **2. COMMUNICATION EQUIPMENT.**

a. **GENERAL.**—Provisions are made for the installation of either the SCR-274N or the SCR-522A radio set in these airplanes. The command radio equipment is located in the baggage compartment and is accessible through the baggage compartment door. All radios are controlled remotely by the pilot through control boxes located on the right side of the cockpit.

### **b. COMMAND SET SCR-274N.**

(1) **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.

#### **(2) RECEIVING.**

(a) 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.

(b) Plug headset phone jack plug in jack. Turn volume control to right until a faint "frying" noise is heard in the headset.

(c) Set crystal filter selector switch on "BOTH" for all normal (voice or "MCW") reception.

(d) Turn "MCW" and "CW" switch 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.

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

## **(3) TRANSMITTING.**

(a) Before transmitting, adjust the 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.

(b) Place transmitter master switch in "ON" position.

(c) Select type of transmission desired with switch marked "TONE-CW-VOICE."

1. With switch in "VOICE" position, voice will be transmitted when the "push-to-talk" button is pressed.

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

3. 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 located on the top of the transmitter control unit.

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

### **c. RADIO SET SCR-522A (VHF).**

#### **(1) GENERAL.**

(a) This equipment is a very-high-frequency (VHF) command set designed for voice communication only.

(b) 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.

1. If the airplane is between 35 and 50 miles away from the ground station, it must be above 1,000 feet before reception is possible.

2. If the airplane is between 80 and 100 miles away from the ground station, it must be above 5,000 feet before reception is possible.

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



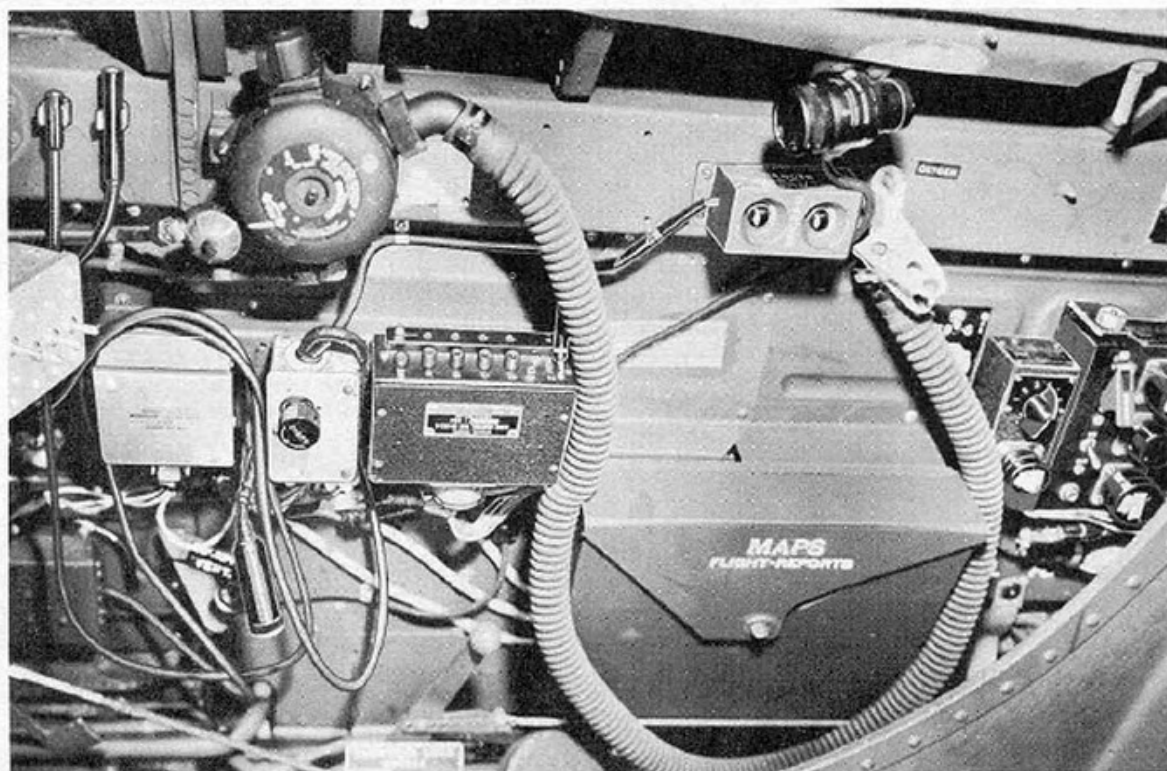


Figure 46—Radio Installation

**Note**

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

**CAUTION**

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.

**(2) OPERATION.**

(a) Press the proper channel button on the cockpit control box for the frequency upon which you are to transmit and receive. (See figure 46.)

**Note**

Transmission and reception take place on the same frequency.

(b) The green pilot light, adjacent to the channel button pressed, lights up whenever the set is in operation.

(c) The white pilot light adjacent to the toggle switch should light up, indicating that the set is on "RECEIVE."

(d) For throttle-microphone button transmission, the toggle switch must be in the "REM"-position.

(e) Press microphone button; press the throttle microphone "push-to-talk" button; and speak in a normal voice with the microphone against your lips. The white pilot light goes out, indicating that the set is on "TRANSMIT."

(f) It is also possible to transmit by moving the control-box toggle switch to the "T"-position, instead of pressing the throttle "push-to-talk" button. However, it must be returned to either the "R"- or



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"REM"-position immediately after transmission is completed, in order to receive.

(g) 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.

**d. RADIO SET SCR-535 (IFF.)**

(1) 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.

(2) A dual push-button switch, painted red, is located on the right side of the cockpit above the map case. 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 the 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.

**3. ARMAMENT.**

**a. GUNSIGHT OPERATION.**—This airplane is equipped with a Mark VIII sight. The brilliance of the sight reticle is adjustable by means of a rheostat (figure 5) 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.

**b. GUNS.**—Eight .50 calibre 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 round indicators are provided. The maximum load is 425 rounds each. Desired loading with six guns is 267 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 switches, installed on the left wall of the cockpit and on the main switch box, are turned "ON." (See figure 47.)

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 switches 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. Determine the boresighting position of your guns before take-off on a firing mission.

**4. GUN CAMERA.**

A camera is installed in the leading edge of the wing which operates in conjunction with the guns. It is controlled by a switch (figure 47) in the cockpit. The camera may be operated alone or with the guns depending on the position of the switch.

**5. CHEMICAL TANKS.**

Electrical provisions are made for operating chemical tanks which may be hung from the bomb shackles in each wing. A selector switch (figure 11) permits operation of either right or left tank or both together.



**Figure 47—Gun Safety Switch**

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Appendix I

## APPENDIX I FLIGHT OPERATING CHARTS

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

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

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

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

Can a P-47 airplane operate from 3,500-foot clearance surrounded by trees if elevation is 2,500 feet; no wind, the surface is sod, and the average temperature is about 75°F? (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 16,000-pounds gross weight and zero wind (top line), reads 5,370 feet; 10 percent is 537 feet, which must be added for the temperature correction, gives 5,907 feet required for safe operation. A similar calculation for 14,200 pounds

gross shows 110 percent of 3880 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 3,190 feet with 11,300 pounds gross weight.

*c.* SAMPLE CLIMB PROBLEM. — With combat loading of eight guns and 2,136 rounds of ammunition, what is the minimum time required to climb to 20,000 feet. Gross weight is about 14,200 pounds. Climb to 20,000 feet with 14,200 pounds requires 9.5 minutes.

### 3. FLIGHT OPERATION INSTRUCTION CHARTS.

*a.* Sheet 1 of 2 sheets gives data that apply only until belly tank fuel is exhausted. Sheet 2 of 2 sheets gives operating instructions for all other loading conditions. The difference is primarily due to the weight of the external tank.

*b.* On these charts, note the two reference columns which show gallons of fuel in the upper half of the table, and altitude 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, 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.

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AIRCRAFT MODEL(S)

ENGINE MODEL(S)

P-47D-25 through P-47D-35

R-2800-"B" Series

## TAKE-OFF, CLIMB &amp; LANDING CHART

## TAKE-OFF DISTANCE FEET

GROSS WEIGHT LB.	HEAD WIND		HARD SURFACE RUNWAY						SOD-TURF RUNWAY						SOFT SURFACE RUNWAY					
			AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET	
	M.P.H.	KTS.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.
18000	0	0	5900	6600	5350	7250	6000	8000	5150	6800	5650	7500	6200	8250	5700	7550	6270	8120	6800	8870
	20	17	5760	6950	4100	5500	4500	6000	3880	5000	4250	5500	4650	6100	4320	5500	4720	6000	5200	6730
	40	35	2980	4000	3250	4550	3580	5000	2680	4100	3360	4500	3700	5120	3560	4500	3750	4880	4100	5500
16000	0	0	3480	4800	3700	5350	4000	5750	3490	4900	3800	5370	4170	6000	3870	5370	4250	5870	4630	6570
	20	17	2530	3550	2780	3875	3040	4250	2600	3620	2860	4000	3110	4370	2900	4000	3180	4570	5490	4750
	40	35	2005	2900	2200	3250	2400	3500	2070	3000	2280	3250	2490	3620	2310	3250	2520	3500	2760	3880
14200	0	0	2150	3500	2350	3775	2570	4120	2220	3550	2420	3880	2660	4120	2170	3750	2700	4120	2950	4500
	20	17	1615	2500	1770	2750	1940	3000	1670	2560	1820	2870	2000	3120	1820	2750	2040	3000	2220	3380
	40	35	1290	2000	1400	2250	1540	2500	1320	2120	1450	2250	1580	2500	1470	2250	1610	2500	1760	2750

NOTE: INCREASE CHART DISTANCES AS FOLLOWS: 35°F + 13%; 10°F + 20%; 125°F + 30%; 150°F + 40%  
 DATA AS OF 10-23-44 BASED ON: R.A.C. Flight Test Data

OPTIMUM TAKE-OFF WITH: 2700 RPM, 52 IN. Hg, &amp; 20 DEG. FLAP IS 80% OF CHART VALUES

## CLIMB DATA

GROSS WEIGHT LB.	AT SEA LEVEL				AT 5000 FEET				AT 10,000 FEET				AT 15,000 FEET				AT 20,000 FEET				AT 25,000 FEET			
	BEST I.A.S.		RATE OF CLIMB		BEST I.A.S.		RATE OF CLIMB		BEST I.A.S.		RATE OF CLIMB		BEST I.A.S.		RATE OF CLIMB		BEST I.A.S.		RATE OF CLIMB		BEST I.A.S.		RATE OF CLIMB	
	MPH	KTS	F.P.M.	FUEL USED	MPH	KTS	F.P.M.	FUEL USED	MPH	KTS	F.P.M.	FUEL USED	MPH	KTS	F.P.M.	FUEL USED	MPH	KTS	F.P.M.	FUEL USED	MPH	KTS	F.P.M.	FUEL USED
18000	165	—	1830	30	165	—	1720	2.85	49	165	—	1590	5.87	68	160	—	1480	9.12	88	155	—	1475	12.51	110
16000	165	—	2100	30	165	—	1960	2.47	47	165	—	1820	5.43	65	160	—	1700	7.97	81	155	—	1675	10.95	100
14200	165	—	2410	30	165	—	2250	2.15	45	165	—	2090	4.46	59	160	—	1950	6.95	74	155	—	1925	9.52	91

POWER PLANT SETTINGS (DETAILS ON FIG. 42 SECTION 111):

DATE AS OF 10-23-44

BASED ON: R.A.C. Flight Test Data

FUEL USED (U.S. GAL.) INCLUDES WARM-UP &amp; TAKE-OFF ALLOWANCE

## LANDING DISTANCE FEET

GROSS WEIGHT LB.	BEST IAS APPROACH				HARD DRY SURFACE						FIRM DRY SOD						WET OR SLIPPERY					
	POWER OFF		POWER ON		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET	
	MPH	KTS	MPH	KTS	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.
14,200	150		120		2120	3250	2370	3560	2620	3800	2450	3500	2750	3960	2950	4120	4750	5880	5250	6450	5750	6940
11,300	125		115		1625	2520	1870	2940	2120	3180	1810	2810	2220	3190	2570	3410	3750	4750	4120	5180	4500	5550

DATE AS OF 10-23-44

BASED ON: R.A.C. Flight Test Data and Certification Data

OPTIMUM LANDING IS 80% OF CHART VALUES

## REMARKS:

NOTE: TO DETERMINE FUEL CONSUMPTION  
 IN BRITISH IMPERIAL GALLONS,  
 MULTIPLY BY 10, THEN DIVIDE BY 12

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

## LEGEND

I.A.S. = INDICATED AIRSPEED  
 M.P.H. = MILES PER HOUR  
 KTS. = KNOTS  
 F.P.M. = FEET PER MINUTE



ENGINE(S): R-2800-B

CHART WEIGHT LIMITS: 14200 TO 12000 POUNDS

NUMBER OF ENGINES OPERATING: 1

LIMITS

WAR ENRG.

MILITARY POWER

RPM

2700

2700

M.P. IN. HG.

64

52

BLOWER POSITION

MIXTURE POSITION

A.R.

A.R.

TIME LEAD

5 Min.

15 Min.

CYL. TEMP.

260

260

TOTAL G.P.H.

255

280

FOR DETAILS SEE POWER PLANT CHART (FIG. 42 SECT. 11)

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 RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M.P.G.) (NO WIND), GALLONS PER HP. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND). TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.) MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

COLUMN I

RANGE IN AIRMILES

STATUTE

NAUTICAL

FUEL

U.S.

GAL.

COLUMN II

RANGE IN AIRMILES

STATUTE

NAUTICAL

COLUMN III

RANGE IN AIRMILES

STATUTE

NAUTICAL

COLUMN IV

RANGE IN AIRMILES

STATUTE

NAUTICAL

FUEL

U.S.

GAL.

COLUMN V

RANGE IN AIRMILES

STATUTE

NAUTICAL

380

325

270

215

165

110

80

55

30

330

280

235

185

140

95

70

45

25

370

350

300

250

200

150

100

75

50

25

480

485

400

315

235

160

120

80

40

SUBTRACT

480

415

345

275

210

140

105

70

35

FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING

750

645

555

430

320

215

160

105

55

655

560

465

370

280

185

140

95

45

890

765

635

510

380

255

190

125

65

770

660

550

440

330

220

165

110

55

370

350

300

250

200

150

100

75

50

25

650

515

385

255

195

125

85

65

45

780

670

560

445

335

220

170

110

55

MAXIMUM CONTINUOUS

R.P.M.

M.P. INCHES

MIX-TURE

APPROX.

TOT. GPH

T.A.S. MPH

KTS.

ALT. FEET

2550

42

AR

222

376

327

40000

35000

30000

2150

42

AR

222

361

314

25000

20000

15000

2150

42

AR

222

345

300

20000

15000

10000

2150

42

AR

222

329

286

15000

10000

5000

2150

42

AR

222

313

272

10000

5000

S.L.

2150

42

AR

222

298

259

5000

S.L.

S.L.

2150

42

AR

222

281

244

S.L.

S.L.

S.L.

2400

37.9

AR

212

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308

2290

35.0

AL

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AIRCRAFT MODEL(S) P-47D-25 through P-47D-35		FLIGHT OPERATION INSTRUCTION CHART										EXTERNAL LOAD ITEMS 2 — 165 U.S. Gallon Wing Tanks																
ENGINE(S): R-2800 "B" Series		CHART WEIGHT LIMITS: 16,200 TO 12,000 POUNDS										NUMBER OF ENGINES OPERATING: 1																
LIMITS	RPM	M.P. IN. HG.	SLINGER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.	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 RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.					NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M.P.GAL.) (NO WIND), GALLONS PER HOUR (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND). TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.) MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.															
WAR EMERG.	2700	64		AR	5 Min.	260° C	255																					
MILITARY POWER	2700	52		AR	15 Min.	260° C	280																					
COLUMN I		FUEL		COLUMN II			COLUMN III			COLUMN IV		FUEL		COLUMN V														
RANGE IN AIRMILES		U.S.		RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES		U.S.		RANGE IN AIRMILES														
STATUTE	NAUTICAL	GAL.		STATUTE	NAUTICAL			STATUTE	NAUTICAL	STATUTE	NAUTICAL	GAL.		STATUTE	NAUTICAL													
		700		SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING									700															
675	585	650	990	860	1160	1000	1360	1180	650	1460	1270	650	1460	1270														
620	540	600	910	780	1065	925	1255	1050	600	1350	1175	600	1350	1175														
575	495	550	855	725	970	845	1150	1000	550	1235	1075	550	1235	1075														
520	450	500	760	660	890	775	1040	905	500	1120	975	500	1120	975														
465	405	450	685	595	800	695	940	820	450	1000	870	450	1000	870														
415	365	400	610	530	710	620	835	725	400	895	780	400	895	780														
350	270	300	455	395	535	465	625	545	300	670	585	300	670	585														
210	180	200	305	265	355	310	420	365	200	450	390	200	450	390														
105	90	100	150	150	175	150	210	180	100	225	195	100	225	195														
80	70	75	115	100	150	115	155	135	75	170	150	75	170	150														
25	20	25	40	35	45	40	50	45	25	55	50	25	55	50														
MAXIMUM CONTINUOUS		PRESS		(1.60 STAT. (1.39 NAUT.) MI./GAL.)			(1.87 STAT. (1.62 NAUT.) MI./GAL.)			(2.20 STAT. (1.91 NAUT.) MI./GAL.)		PRESS		MAXIMUM AIR RANGE														
R.P.M.	H.P. INCHES	MIX-TURE	APPROX.																									
TOT.	T.A.S.			R.P.M.	H.P. INCHES	MIX-TURE	TOT.	T.A.S.		R.P.M.	H.P. INCHES	MIX-TURE	TOT.	T.A.S.														
GPH.	MPH.	KTS.		GPH.	MPH.	KTS.	GPH.	MPH.	KTS.	GPH.	MPH.	KTS.	GPH.	MPH.	KTS.													
2550	42	AR	222	351	305	15000	2525	36.0	AR	171	275	257	2000	33.0	AL	125	234	205	2080	31.2	AL	98	216	188	25000	2000	30.0	AL
2550	42	AR	222	355	291	20000	2530	36.5	AR	182	291	255	2210	35.2	AL	155	252	219	2100	31.5	AL	101	221	192	20000	2050	30.3	AL
2550	42	AR	222	319	277	15000	2560	36.0	AR	171	274	258	2250	35.8	AL	150	280	245	2120	31.9	AL	105	232	201	15000	2080	31.1	AL
2550	42	AR	222	303	265	10000	2560	36.0	AR	162	259	225	2250	36.0	AL	142	266	231	2140	32.0	AL	102	224	195	10000	2100	31.2	AL
2550	42	AR	222	288	250	5000	2530	36.0	AR	158	252	219	2260	34.1	AL	128	259	207	2150	32.2	AL	102	225	196	5000	2150	32.0	AL
2550	42	AR	222	271	255	S. L.	2525	36.0	AR	152	244	212	2270	34.3	AL	125	255	202	2200	33.0	AL	101	225	194	S. L.	2150	32.1	AL
SPECIAL NOTES																EXAMPLE				LEGEND								
(3) MAKE ALLOWANCE FOR WASH-UP, TAKE-OFF & CLIMB (SEE FIG. 48) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.																AT 16,000 LB. GROSS WEIGHT WITH 500 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 200 GAL.) TO FLY 1000 STAT. AIRMILES AT 20,000 FT. ALTITUDE MAINTAIN 2100 RPM AND 31.5 IN. MANIFOLD PRESSURE WITH MIXTURE SET: AL.				ALT. : PRESSURE ALTITUDE M.P. : MANIFOLD PRESSURE GPH. : U.S. GAL. PER HOUR TAS : TRUE AIRSPEED KTS. : KNOTS S.L. : SEA LEVEL				P.H.W. : FULL HIGH A.W. : AUTO-RICH A.L. : AUTO-LEAN C.L. : CRUISING LEAN M.L. : MANUAL LEAN F.T. : FULL THROTTLE				
(2) If external tanks are dropped use sheet 2 (Built in tankage—370 US gal.)																Appendix I of this publication shall not be carried in aircraft on combat missions or when there is a reasonable chance of its falling into the hands of the enemy.												
DATA AS OF 11-1-44																BASED ON: Flight Test Data and Calibrated Data.				RED FIGURES ARE PRELIMINARY DATA, SUBJECT TO REVISION AFTER FLIGHT CHECK								