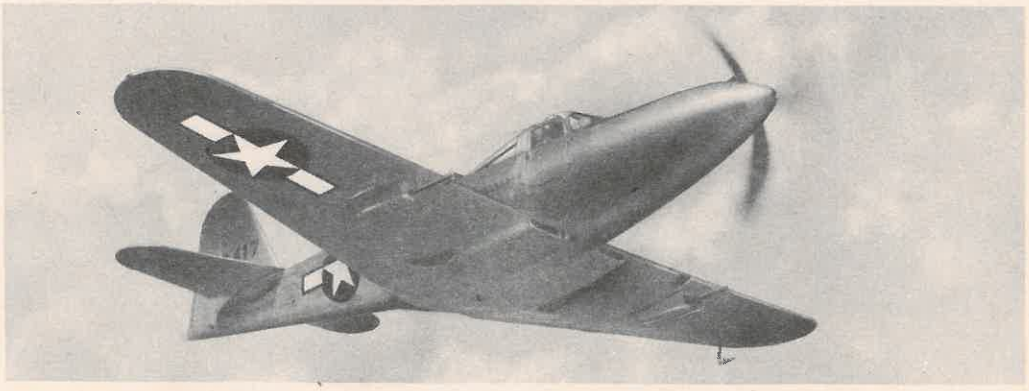
PILOT'S FLIGHT OPERATING INSTRUCTIONS

FOR

ARMY MODELS

P-63A-1, P-63A-5, P-63A-6, P-63A-7 P-63A-8, P-63A-9 and P-63A-10

AIRPLANES



This publication replaces T. O. No. 01-110FP-1 dated 30 August 1944.

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

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.

Published under joint authority of the Commanding General, Army Air Forces, the Chief of the Bureau of Aeronautics, and the Air Council of the United Kingdom.

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

ROSS-GOULD CO., ST. LOUIS, MO.-2/45-9300

10 FEBRUARY 1945

THIS PUBLICATION MAY BE USED BY PERSONNEL RENDERING SERVICE TO THE UNITED STATES OR ITS ALLIES

Instructions Applicable to AAF Personnel.

Paragraph 5.*d.* of Army Regulation 380-5 relative to the handling of restricted printed matter is quoted below:

"*d.* Dissemination of restricted matter.—The information contained in restricted documents and the essential characteristics of restricted material may be given to *any person known to be in the service of the United States and to persons of undoubted loyalty and discretion who are cooperating in Government work,* but will not be communicated to the public or to the press except by authorized military public relations agencies."

Instructions Applicable to Navy Personnel.

Navy Regulations, Article 75½, contain the following paragraphs relating to the handling of restricted matter:

"*(b) Restricted* matter may be disclosed to persons of discretion in the Government service when it appears to be in the public interest.

"*(c) Restricted* matter may be disclosed, under special circumstances, to persons not in the Government service when it appears to be in the public interest."

The Bureau of Aeronautics Circular Letter No. 12-43 further states:

"Therefore, it is requested that all naval activities check their own local regulations and procedures to make sure that handbooks, service instructions and other *restricted* technical publications are actually being made available to both civilian and enlisted personnel who have use for them."

General.

These instructions permit the issue of restricted publications to civilian contract and other accredited schools engaged in training personnel for Government work, to civilian concerns contracting for overhaul and repair of aircraft or aircraft accessories, and to similar commercial organizations.

LIST OF REVISED PAGES ISSUED

NOTE: A heavy black vertical line, to the left of the text on revised pages, indicates the extent of the revision. This line is omitted where more than 50 percent of the page is revised.

ADDITIONAL COPIES OF THIS PUBLICATION MAY BE OBTAINED AS FOLLOWS:

AAF ACTIVITIES.—Submit requisitions through the Air Inspector, Technical, whenever practicable, in accordance with T. O. No. 00-25-3 to the Commanding General, Fairfield Air Service Command, Patterson Field, Ohio. Attn: Publications Distribution Branch, as outlined in AAF Regulation 5-9. For details of Technical Order distribution, see T. O. No. 00-25-3.

NAVY ACTIVITIES.—Submit requests to the Chief, Bureau of Aeronautics, Navy Department, Washington, D. C. Also, see NavAer 00-500 for details on distribution of technical publications.

BRITISH ACTIVITIES.—Submit requirements on Form 294A, in duplicate, to the Air Publications and Forms Store, New College, Leadhall Lane, Harrogate, Yorkshire, England.

TABLE OF CONTENTS

Section		Page
I	*Description*	1
1.	Airplane	1
2.	Controls	2
3.	Power Plant	5
4.	Pilot's Seat	5
5.	Heating and Ventilation	5
6.	Propeller	6
7.	Miscellaneous Equipment	6
II	*Normal Operating Instructions*	23
1.	Before Entering the Pilot's Compartment	23
2.	On Entering the Pilot's Compartment	24
3.	Fuel and Oil System Management	25
4.	Starting the Engine	28
5.	Warm-Up and Ground Test	29
6.	Scramble Take-Off	31
7.	Taxiing Instructions	31
8.	Take-Off	31
9.	Engine Failure During Take-Off	32
10.	Climb	32
11.	General Flying Characteristics	32
12.	Stalls	33
13.	Spins	33
14.	Permissible Acrobatics	33
15.	Diving	34
16.	Night Flying	34
17.	Approach and Landing	34
18.	Stopping the Engine	35
19.	Before Leaving the Pilot's Compartment	35
20.	Mooring	36
III	*Operating Data*	37
1.	Airspeed Limitations	37
2.	Power Plant Chart	37
3.	War Emergency Ratings	37
4.	Airspeed Correction Table	37
	Power Plant Chart	38

Section		Page
IV	*Emergency Operating Instructions*	39
1.	In Case of Fire In The Air	39
2.	Engine Failure During Take-Off	39
3.	Engine Failure During Flight	39
4.	Spin Recovery	39
5.	Emergency Exit	41
6.	Emergency Operation of the Landing Gear	41
7.	Clearing Case Jam (Cannon)	41
8.	Oxygen Regulator Emergency Knob	41
9.	Pyrotechnic Pistol (P-63A-10)	41
V	*Operational Equipment*	43
1.	Oxygen Equipment	43
2.	Communication Equipment	46
3.	Armament	48
VI	*Extreme Weather Operation*	51
1.	Cold Weather Operation	51
2.	Desert Operation	55
3.	Tropic Operation	56
Appendix I—Operating Charts and Diagrams		57
1.	Armor Protection Diagram	57
2.	Flight Planning	57
	Take-Off, Climb, and Landing Charts	
	P-63A-1 through P-63A-7 Airplanes	59
	P-63A-8 through P-63A-10 Airplanes	60
	Flight Operation Instruction Charts	
	P-63A-1 through P-63A-7 Airplanes	
	Clean Airplane	61
	With 75-gallon belly tank	62
	With 175-gallon belly tank	63
	P-63A-8 through P-63A-10 Airplanes	
	Clean Airplane	64
	With 75-gallon belly tank	65
	With two 75-gallon wing auxiliary tanks	66

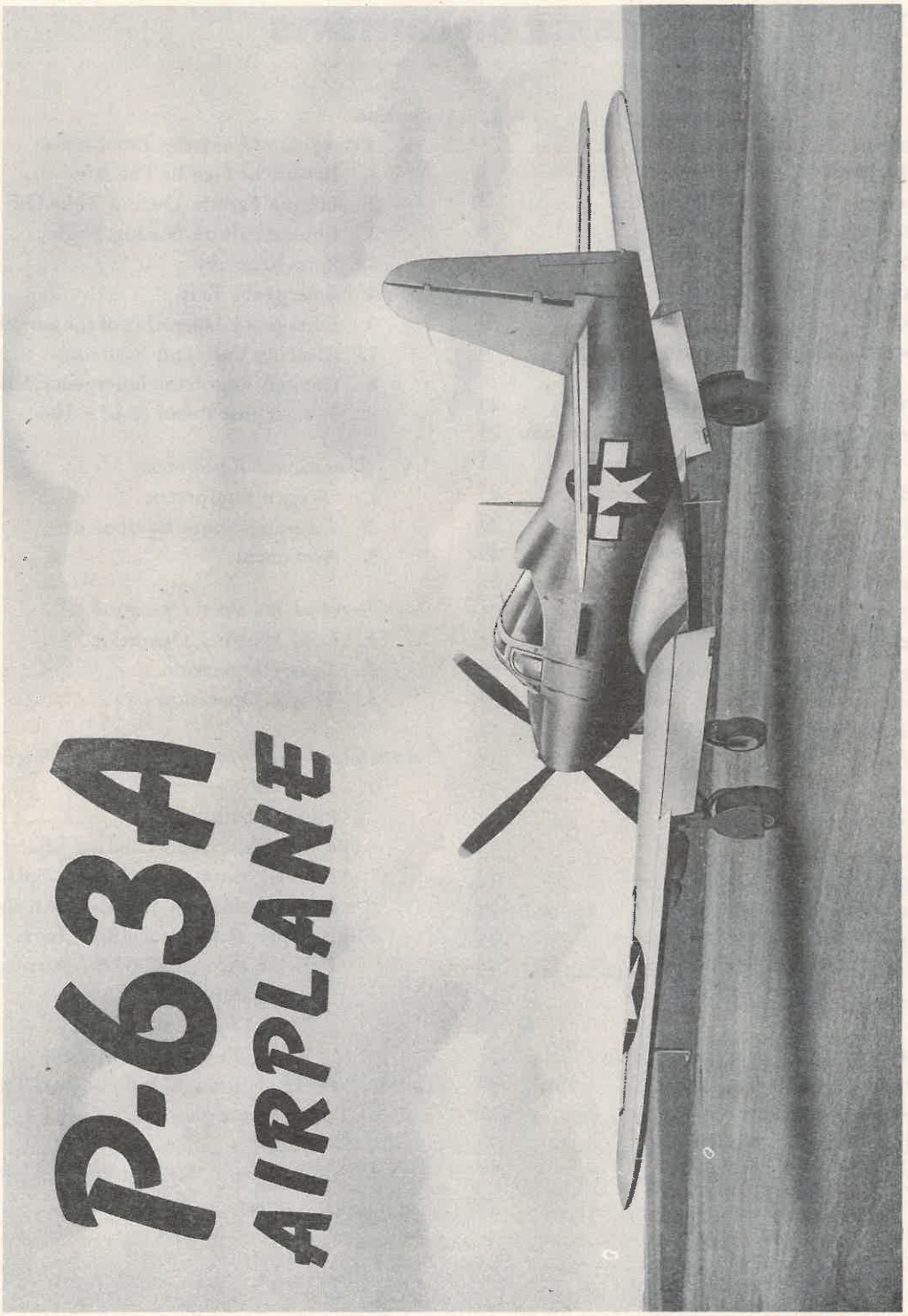


Figure 1—P-63A Airplane, Three-Quarter Rear View

SECTION I
DESCRIPTION

1. AIRPLANE.

a. GENERAL.—The P-63A series airplanes described in this Handbook (P-63A-1, P-63A-5, P-63A-6, P-63A-7, P-63A-8, P-63A-9, and P-63A-10) are armed with one 37mm cannon firing through the hollow propeller hub, two .50 caliber machine guns in the forward fuselage, and two .50 caliber wing machine guns. These all-metal, land monoplanes are powered with a type V-1710-93 engine located behind the pilot. Power is transmitted from the engine to the reduction gear box in the nose of the airplane by means of an extension drive shaft. The propeller is an Aeroproducts, hydraulically controlled, four blade, constant speed type.

Because of the tricycle landing gear, the airplane is at all times in flying position on the ground. The wheels are fully retractable, and, like the wing flaps, are electrically operated. Main landing wheels are equipped with Goodyear hydraulic multi-plate type brakes.

The general gross weights of these airplanes vary from approximately 8000 to 8500 pounds, depending upon the model airplane and the loading. Specific weight data are available in the weight and balance handbook.

Over-all dimensions of the airplanes are as follows:

Length	32 feet 8-3/8 inches
Height	12 feet 6-7/8 inches
Span	38 feet 4 inches

b. FUEL, OIL, AND COOLANT.

(1) FUEL.

(a) SPECIFICATION.—No. AN-F-28 (Grade 100/130).

(b) CAPACITY.

1. INTERNAL LOAD.

a. P-63A-1 THROUGH P-63A-7.—136 US (113.3 Imperial) gallons.

b. P-63A-8 THROUGH P-63A-9.—135 US (112.5 Imperial) gallons.

c. P-63A-10.—126 US (109.9 Imperial) gallons.

2. AUXILIARY FUEL LOADS PROVISIONS.

a. 65 US (54.1 Imperial) gallon belly tank.

b. 75 US (62.4 Imperial) gallon belly tank.

c. 175 US (145.8 Imperial) gallon belly tank.

d. Two 75 US (62.4 Imperial) gallon auxiliary wing tanks, (P-63A-6 and subsequent).

(2) OIL.

(a) SPECIFICATION.

1. TEMPERATURES ABOVE 5°C (41°F).—Specification No. AN-VV-O-446 (Grade 1120).

2. TEMPERATURES BELOW 5°C (41°F).—Specification No. AN-0-5 (Grade 1100).

(b) CAPACITY (Usable Oil).

1. WITH 136 US (113.3 IMPERIAL) GALLONS OF FUEL.—9.6 US (8 Imperial) gallons.

2. WITH 200 US (167 IMPERIAL) GALLONS OF FUEL.—11.5 US (9.6 Imperial) gallons.

3. WITH 211 US (175.8 IMPERIAL) OR MORE GALLONS OF FUEL.—13.7 US (11.4 Imperial) gallons.

(3) COOLANT.

(a) SPECIFICATION.—No. AN-E-2 (ethylene glycol) inhibited with NaMBT.

(b) CAPACITY.—13.5 US (11.2 Imperial) gallons.

2. CONTROLS.

a. AILERON AND ELEVATOR CONTROLS.—A conventional control stick (11, figure 12) is provided for operation of the ailerons and elevators.

(1) AILERON TRIM TAB.—A trim tab, adjustable on the ground by bending, is located on the inboard trailing edge of the left-hand aileron. This tab is adjusted on the initial flight of the airplane, and should require re-setting only as determined by flight tests.

Note

The fixed trim tabs (right-hand elevator and left-hand aileron) are adjusted so that the left-hand elevator trim tab setting is zero when the airplane is in level flight and traveling 212 mph IAS. Maximum deflection for the fixed trim tab is 20 degrees, plus or minus.

(2) ELEVATOR TRIM TABS.—The control wheel for the trim tab on the left-hand elevator is located on the trim tab control box at the left-hand side of the pilot's seat. (See 10, figure 15.) Travel of the left-hand elevator trim tab is 35 degrees, and position of the tab may be measured by counting the number of segments the setting is from zero; each segment represents about two degrees deflection of the trim tab. For example, if the dial is set at four segments from zero, the deflection will be about eight degrees.

b. RUDDER.—Conventional foot pedals are provided. (See 2, figure 14.) Each pedal is equipped with a toe-brake for control of either or both main wheels, as desired. The pedals are adjustable to suit leg length.

(1) RUDDER TRIM TAB.—The rudder trim tab control knob is located on the trim tab control box at the left-hand side of the pilot's seat. (See 9, figure 15.)

c. CONTROL LOCK.—A control locking unit, for locking the control stick and rudder pedals when the airplane is parked, is located just forward of the fuel selector valve control on the cabin floor at the left of the pilot's seat. (See figure 2.) A door on the right-hand side of the unit affords access to the lever. Operation of the lock is as follows:

(1) TO LOCK CONTROLS.—Be sure the throttle is closed. Open the access door, push down on the knob at the top of the lever, and push the lever forward. Then work the control stick into the neutral position until a click is felt, indicating the lock is in position. Repeat this procedure with the rudder pedals. The controls are then locked. The controls cannot be locked when the throttle is open.

Note

If parking brakes are to be used, set the brakes before locking the rudder pedals.

(2) TO RELEASE CONTROL LOCK.—The control lock may be released by pulling the control lever aft, or, the lock automatically unlocks when the throttle is opened one-quarter or more.

d. FLAP CONTROLS.—The toggle switch for raising or lowering the wing flaps is located on the forward end of the trim tab control box at the pilot's left. (See 12, figure 15.) The switch is marked "UP," "OFF," and "DOWN," and should be in the "OFF" position when not operating. Flaps should be lowered when airplane is parked. This prevents mechanics from damaging flaps by stepping on them. Flap position is indicated by a red and white marking

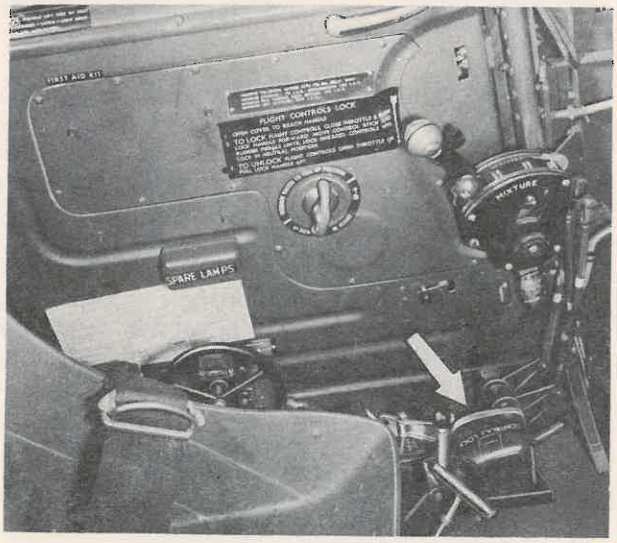


Figure 2—Controls Lock

on the forward, outboard edge of the left-hand flap. (See figure 3.) This marking is visible from the cabin, and flap positions are indicated as follows:

(1) FLAP UP.—No color shows.

(2) FLAP IN INTERMEDIATE POSITION.—White marking shows.

(3) FLAP FULL DOWN.—Both red and white markings show.

e. LANDING GEAR CONTROLS.—A toggle switch for electrical operation of the landing gear is located on the left-hand instrument panel near the landing gear instruction plate. (See 2, figure 11.) The switch is marked "UP," "OFF," and "DOWN." Turn the switch to "OFF" when extension or retraction of wheels has been completed. A hand crank for raising or lowering the landing gear manually in an emergency is located at the right-hand side of the pilot's seat. (See 8, figure 15.) Turning the crank forward lowers the wheels; turning the crank aft raises the wheels. A small ratchet lever on the hub of the crank controls the direction of turn. (See 7, figure 15.) For detailed instructions for manual operation of the landing gear, see section IV, paragraph 6.

(1) WARNING LIGHTS.—Two landing gear warning lights are located on the left-hand instrument panel, top section. (See 4 and 5, figure 11.) These lights are always on when the wheels are in transit (any position between fully retracted and fully down). Lights are off when wheels are either fully extended or retracted. Lights are on when the wheels are retracted and the throttle is cut to 1/3 or less.

Note

Before landing, check that the landing gear is in the fully down position by operating the landing gear manual hand crank, setting the ratchet to the "DOWN" position, and determining that there is no further travel.

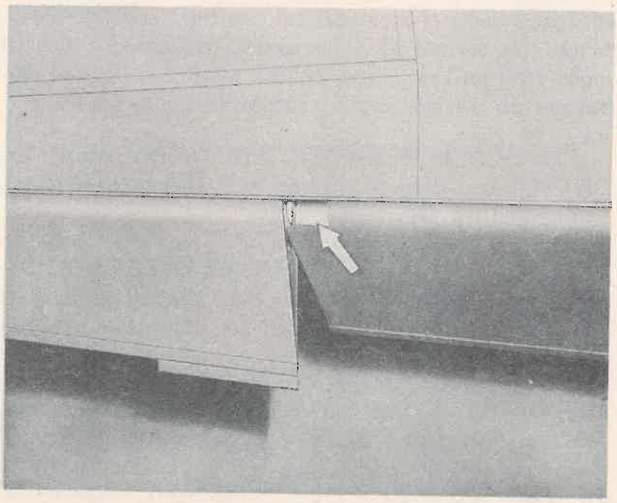


Figure 3—Flap Position Indicator

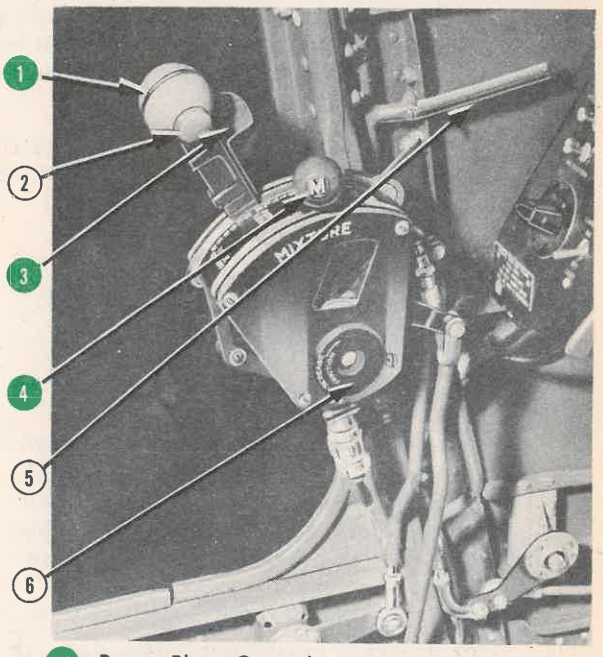
(2) PARKING BRAKE.—The parking brake handle is located just below the lower left-hand corner of the center instrument panel. (See 12, figure 12.) To set parking brakes, depress brake pedals and pull out on parking brake handle, hold for about one second, release brake pedals, then release parking brake handle. To release parking brakes, depress brake pedals and then release. Do not set parking brakes while they are hot.

CAUTION

Only a light pull on the handle is necessary to set the parking brake. Avoid pulling the handle too hard, as this may bend the cable housing.

f. ENGINE CONTROLS.

(1) GENERAL DESCRIPTION.—The airplane is equipped with a synchronized throttle control quadrant (figure 4); this quadrant differs from the conventional type in that the propeller control lever has been omitted, and the propeller control has been synchronized with the throttle control lever. This setting has been so arranged, that when the throttle is opened, the propeller is automatically set to lower pitch, in compensation. The mixture control lever is exactly the same as that on conventional quadrants.



Power Plant Controls

1. Throttle-Propeller Control Lever
2. Microphone Button
3. Take-Off Stop Release
4. Mixture Control Lever
5. Emergency Door Release
6. Friction Lock Knob

Figure 4—Engine Control Quadrant

(2) THROTTLE LEVER.—The throttle control lever (1, figure 4) is located on the engine control quadrant forward and to the left of the pilot's seat. The control lever may be locked in place by a friction lock (6, figure 4) on the inboard side of the quadrant. Turn the lock knob clockwise to lock the throttle control in place. A take-off stop is located on the quadrant to indicate proper throttle setting for take-off. Any setting of the throttle beyond this take-off stop is considered war emergency.

(a) WAR EMERGENCY THROTTLE STOP.—The war emergency throttle stop consists principally of a light wire stop or seal across the throttle lever slot at the take-off stop, or the 52 inches *Hg* manifold pressure point (approximately). To use war emergency setting, release the take-off stop by raising the metal clip at the base of the control knob (3, figure 4) and push the lever forward. In doing this, the light wire will be broken. Full forward position of the lever will increase manifold pressure to 61 inches *Hg*. On the P-63A-8 and subsequent airplanes, water injection automatically cuts in when the manifold pressure reaches 54 inches *Hg*, and allows a war emergency setting of 75 inches *Hg*. Do not maintain dry war emergency setting (61 inches *Hg* for airplanes P-63A-1 through P-63A-7) for more than 5 minutes, and then only in absolute necessity. Wet war emergency rating (P-63A-8 and subsequent, airplanes equipped with water injection) may be maintained for 10 minutes in emergency. The broken wire will indicate to mechanics that war emergency power has been used.

(3) MIXTURE CONTROL.—The mixture control lever (4, figure 4) also is located on the engine control quadrant. There are four mixture settings:

(a) "IDLE CUT-OFF"
(b) "AUTO. LEAN"
(c) "AUTO. RICH"
(d) "EMERGENCY FULL RICH"

Note

Since this airplane incorporates the Stromberg injection type carburetor, the "FULL RICH" mixture setting has been blocked off by a piece of lock wire; the breaking of this lock wire indicates that the carburetor is unsatisfactory.

g. FUEL SYSTEM CONTROLS. *(See figure 16.)*—The fuel selector valve control handle is located on the cabin floor at the pilot's left. A notch may be detected when the control handle is set properly for the desired fuel tank. When the engine is not running, a decided click can be felt when the indicating plate engages. Desired fuel cock settings will always be determined by this click or feel and not solely by dependence on the position of the control handle pointer in the cabin. Selector valve control positions on P-63A-1 and P-63A-5 airplanes are: "OFF," "LEFT," "LEFT & RIGHT," "RIGHT," and "AUX." (belly tank). Selector valve controls on P-63A-6 and subsequent airplanes of this series also include positions for fuel from left and right wing auxiliary tanks.

h. OIL SYSTEM CONTROLS. *(See figure 17.)*—The operation of the oil system is automatic; however, the engine oil temperature may be controlled through setting of the oil radiator shutter control switch, located on the center instrument panel. (See 56, figure 11.) This switch has three positions: "CLOSED," "AUTOMATIC," and "OPEN," but when centered in a neutral position it is off. It is recommended that the control be left in "AUTOMATIC" position for take-off, landing, and combat flying. For cruising flight, manual selection is recommended.

i. COOLANT SYSTEM CONTROLS. *(See figure 19.)*—The operation of the coolant system is automatic; however, the coolant temperature may be controlled through setting of the coolant radiator shutter control switch, located on the center instrument panel. (See 54, figure 11.) This switch is marked for three positions: "CLOSED," "AUTOMATIC," and "OPEN," but when centered in a neutral position, it is off. It is recommended that the control be left in "AUTOMATIC" position for take-off, landing, and combat flying. For cruising flight, manual selection is recommended.

j. CARBURETOR AIR FILTER AND HEATER CONTROLS.—The carburetor air controls consist of a carburetor filter switch located in the right center section of the left-hand instrument panel (10, figure 11) and a push-pull control handle on the bulkhead at the right rear of the pilot's seat. (See 1, figure 13.) The filter switch controls the carburetor air filter, and has positions for "FILTER" and "RAM." When the heat control handle is in a vertical position, it is locked in place, but turned to a horizontal position, it can be pushed or pulled to the desired setting. Desired carburetor air settings can be accomplished as follows:

(1) COLD, RAMMED AIR.—Filter switch on "RAM," heat control pushed in. This setting is recommended for all normal use.

(2) COLD, FILTERED (UNRAMMED) AIR.—Filter switch on "FILTER," heat control pushed in. This setting is recommended for operation in dusty atmosphere.

(3) HEATED, FILTERED (UNRAMMED) AIR.—Filter switch on "FILTER," heat control pulled out to the desired setting. This setting is recommended for icing atmosphere (50°C maximum). Heated air cannot be obtained unless the filter switch is in "FILTER" position.

CAUTION

Carburetor Ice.—The automatic boost control will allow no indication of ice. If ice forms in the intake system, it will tend to reduce the manifold pressure, and the automatic control, performing its function, will open the carburetor throttle wider to maintain the desired manifold pressure. The action of the boost control is sufficiently smooth and automatic so that the pilot probably will have no warning until the boost control has opened the throttle to the limit of its capacity. Then the manifold pressure will begin to drop, since the boost control has already reached the limit of its capacity to adjust the throttle to a greater opening. It is, therefore, necessary to be constantly on the alert to atmospheric conditions conducive to icing. If atmospheric conditions are such that icing is apt to occur, carburetor heat should be applied. If ice forms in the carburetor and the boost control automatically compensates for it by opening the carburetor throttle until nearly full throttle is obtained, and if the pilot is not alert to the icing condition, extremely heavy accumulation of ice may be formed which may be very difficult to remove by the application of carburetor heat.

Note

Carburetor icing usually occurs with the carburetor air temperature below 10°C in high humidity air, although icing has been known to occur at temperatures as high as 35°C. It may be evidenced by engine roughness. Apply carburetor heat as required to prevent icing.

(4) CARBURETOR AIR TEMPERATURE GAGE.—Range markings are provided on the carburetor air temperature gage; these markings (figure 28) are distributed as follows:

Range	*Color*	*Reason*
−10 to +15°C	YELLOW	Caution—Possible icing.
15 to 40°C	GREEN	Desired range during icing conditions.
50°C	RED	Danger of detonation.

3. POWER PLANT.

The 12-cylinder type V-1710-93 engine is of the Vee-type design, and incorporates an auxiliary stage supercharger. The supercharger is automatically regulated. The P-63A-8 and subsequent airplanes are equipped with a water injection system (figure 22), the operation of which is automatic. In operation, this system automatically injects a mixture of water and alcohol into the fuel induction system, cooling the mixture and thereby raising the detonation limit. Capacity of the water injection system is 25 US (20.8 Imperial) gallons, which is sufficient for 15 minutes of operation at manifold pressure of 75 inches *Hg*. Performance ratings of the V-1710-93 engine with water injection are considered wet war emergency, and figures are therefore not included in the flight operating charts, in appendix I.

4. PILOT'S SEAT.

The pilot's seat (15, figure 15) is equipped with a conventional type safety belt (7, figure 13) and shoulder harness (6, figure 13) with locking and unlocking adjustments, and a life preserver cushion. (See 13, figure 15.) The shoulder harness is adjustable to individual size by operating the buckles at the shoulders of the harness. The shoulder harness lock lever is located at the left-hand side of the seat. (See 4, figure 15.) Lock the harness to the rear before all takeoffs and landings.

To lock the harness: Move the control handle forward—engage pawl—lean back.

To release the harness: Move the control handle aft and latch.

5. HEATING AND VENTILATION.

(See figure 21.)

a. The cabin is heated by air taken from the right-hand coolant radiator air exit duct. The air enters the cabin through a duct at the right rear of the pilot's seat. Temperature of the air is regulated by a push-pull control at the right-hand side of the seat, forward of the heater duct, which operates a damper. (See 8, figure 13.) The cold air is taken from the intake duct to the right-hand coolant radiator. For heated air, pull up on the control knob; for cool air, push the knob down. Flow of the air is controlled by shutters in the mouth of the heater duct. (See 2, figure 13.) These shutters can be pushed to the desired position and locked in place by operating a friction knob on top of the heater duct above the shutter. (See 3, figure 13.)

b. Some of the P-63A-10 airplanes are equipped with a cabin windshield defroster. This defroster serves to conduct heated air forward from the left-

hand coolant radiator air-exit duct under the cabin floor, and to the base of the windshield armor glass; here the duct divides, half of the air being conducted to the outside of the cabin windshield, and half to the inside by means of a two-headed nozzle. Flow of air is regulated by a control handle in the cabin, mounted to the forward end of the trim tab control box. (See figure 5.) The handle connects to a flexible cable which operates a control valve in the duct system under the left-hand cabin deck, slightly aft of the fume-tight bulkhead.

6. PROPELLER.

a. GENERAL.

(1) P-63A-1, P-63A-5, P-63A-6, P-63A-7.—A type A642S-D1 four-blade, hydraulically operated, constant speed propeller is installed. It is 11 feet 7 inches in diameter, and has a pitch range of from 24 degrees low to 59 degrees high.

(2) P-63A-8, P-63A-9, P-63A-10.—A type A642S-D3 four-blade, hydraulically operated, constant speed propeller is installed. It is 11 feet in diameter, and has a pitch range of from 24-1/2 degrees low to 59-1/2 degrees high.

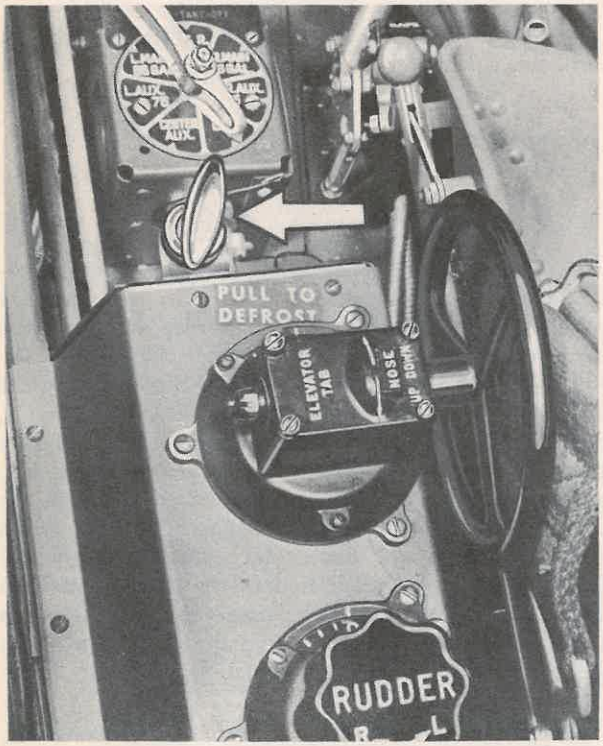


Figure 5—Cabin Windshield Defroster Control Handle

b. CONTROL.—The airplane is equipped with a synchronized propeller-throttle control. Since the propeller rpm is automatically controlled by the position of the throttle lever (1, figure 4), the propeller control lever is omitted. The following table of manifold pressures and limiting rpm may be helpful to pilots not familiar with the synchronized quadrant.

Inches Hg.	*Desired RPM*	*Limiting RPM*
20	1700	1600-1700
25	1750	1700-1750
30	2050	1950-2050
35	2400	2300-2400
40	2750	2650-2750
45	3000	2900-3000
50	3000	2950-3000
55	3000	2950-3000

c. PURGING THE PROPELLER.—Purging of the propeller (if it does not seem to govern properly) may be accomplished by moving the throttle forward to about 2100 rpm and then pulling back. Repeat this operation several times to purge air from the propeller hydraulic system.

d. MAGNETO CHECK.—Prior to normal take-off, the magnetos should be checked individually at 2000 to 2300 rpm and 26 inches *Hg* by switching from both to one magneto; feel and listen for engine roughness. Return to both until operation is smooth; then switch to the other.

Note

Rpm will not drop during magneto check.

7. MISCELLANEOUS EQUIPMENT.

a. FIRST AID KIT.

(1) P-63A-1 THROUGH P-63A-6.—The first aid kit is located on the left-hand cabin door. (See 15, figure 10.)

(2) P-63A-7 THROUGH P-63A-9.—The first aid kit is located on the armor plate behind the pilot's head. (See 14, figure 10.)

(3) P-63A-10.—The first aid kit is located in the aft fuselage on the right-hand side, just aft of the radio compartment, and is accessible through the right-hand radio door. (See 23, figure 10.)

b. RELIEF TUBE.—A relief tube is located underneath the left-hand forward edge of the pilot's seat.

c. MAP CASE.—A map case is attached to the right-hand cabin door. (See 12, figure 10.)

d. DATA CASE.—A data case is located on the right-hand radio access door. (See 46, figure 10.)

e. FLIGHT REPORT.—A flight report form is located in the map case. (See 12, figure 10.)

f. MOORING KIT.—A mooring kit is located on the aft cabin deck. (See 18, figure 10.)

g. AIRPLANE AND ENGINE TOOL KITS.

(1) P-63A-1 THROUGH P-63A-6.—The airplane and engine tool kits are strapped to a bulkhead in the fuselage, directly below the pilot's seat (figure 6), and are accessible by removing a door in the fairing on the bottom of the center panel.

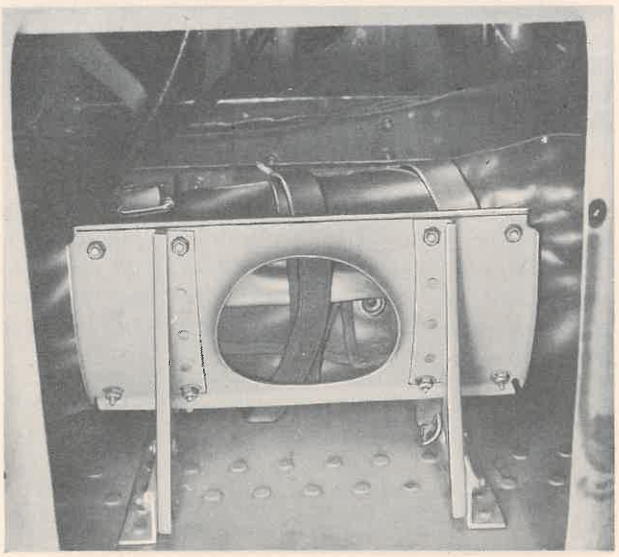


Figure 6—Airplane and Engine Tool Kits, P-63A-1 Through P-63A-6

(2) P-63A-7 AND SUBSEQUENT.—The airplane tool kits are not included on these airplanes. The hoist rings, wing jack pads and jack sockets are stowed in the starting crank compartment in the right-hand wing fillet. (See figure 26.) No engine tool kits are installed on the P-63A-9 and subsequent airplanes.

h. SIGNAL LIGHT.

(1) P-63A-1 THROUGH P-63A-9.—The signal light is clipped to the right-hand cabin door, just below the glass. (See figure 7.)

(2) P-63A-10.—The signal light is clipped to the forward side of the turn-over beam, left-hand side of the pilot's seat.

i. RECOGNITION LIGHTS (P-63A-10).—Three recognition lights are installed in the under surface of the right-hand wing tip. The lights are operated by switches on the control box, located to the right of the pilot's seat on the cabin floor. (See 5, figure 13.)

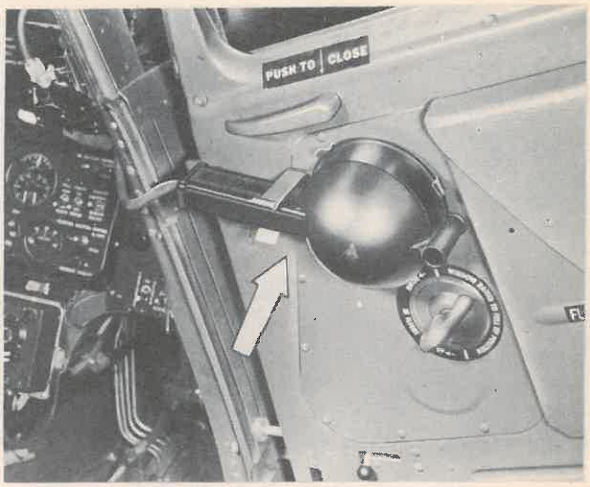


Figure 7—Signal Light, P-63A-1 Through P-63A-9

j. HAND AXE.—A hand axe is clipped to the inside of the left-hand radio access door. (See figure 8.)

k. FLASHLIGHT (P-63A-1 THROUGH P-63A-7).—A pen type flashlight is clipped to the left-hand side of the cabin, under the windshield panel.

Note

The P-63A-8 and subsequent airplanes are not equipped with a flashlight.

l. DROP MESSAGE BAG.—A drop message bag is stowed in the cabin of the P-63A-5 and subsequent airplanes. (See figure 9.) The bag is held to the lower section of the right-hand cabin door, just below the map case, by two spring clips, and may be removed for use by pulling upward.

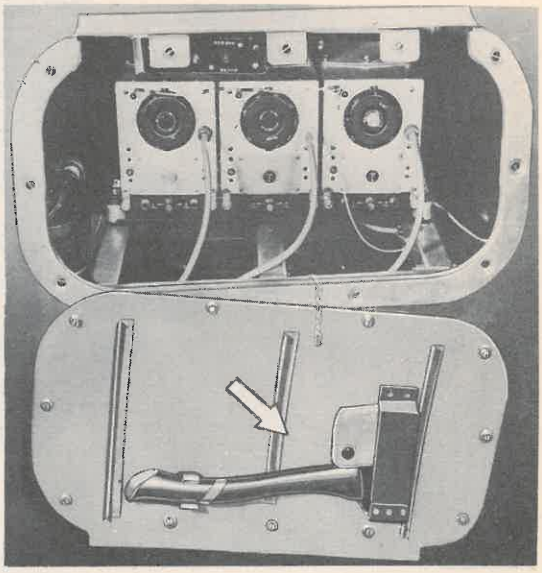


Figure 8—Hand Axe

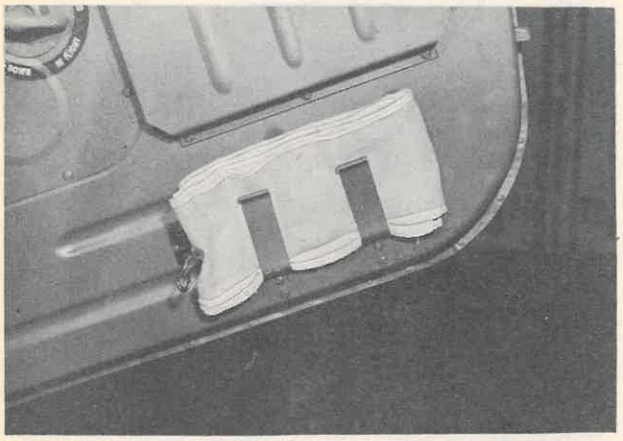


Figure 9—Drop Message Bag

m. PYROTECHNIC PISTOL (P-63A-10).—A pyrotechnic pistol for discharging flares is installed on the left-hand side of the drive shaft cover, slightly aft of the portable range receiver, convenient to the pilot's left hand. Cartridges for the pistol are strapped to the cabin floor, just to the right of the drive shaft, approximately opposite the pistol. (See 18, figure 12.) In order to prevent injury to personnel and damage to equipment, the following precautions will be observed when using pyrotechnic pistols:

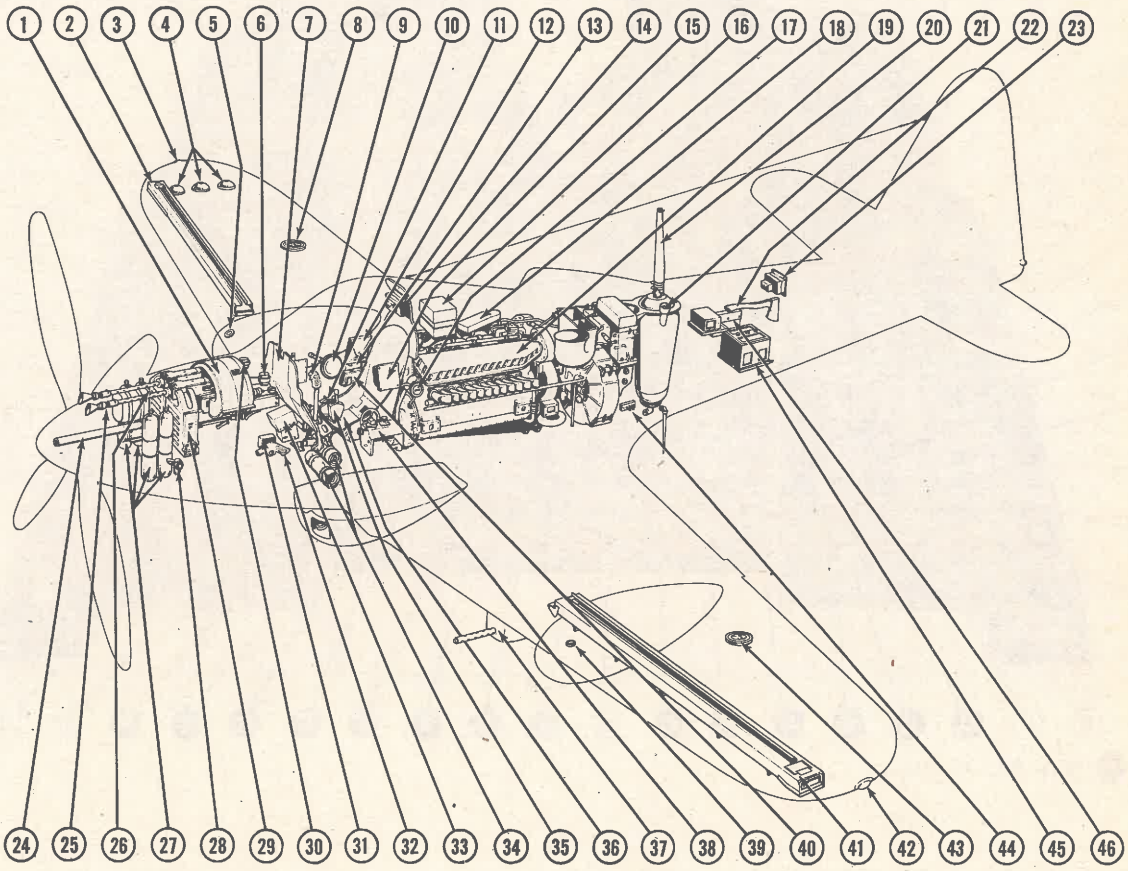
(1) Signal flares will be fired only from airplanes while in flight with the exception of the type M-11 signal flare which may be fired as an emergency signal from the ground or from a life raft.

(2) When flares are fired from an airplane, the pistol should be pointed in a direction so as to result in the least chance of the signals' or flares' striking any part of the airplane. When the M-11 signal flare is fired as a distress signal from the ground or life raft, the pistol should be pointed as nearly vertical as possible.

(3) When firing signal flares from an airplane in flight, in the event a flare fails to fire on the first attempt, at least two additional attempts should be made if necessary. If the third or final attempt to fire the pistol proves to be unsuccessful, continue to keep the pistol pointed overboard and clear of all parts of the aircraft for at least 30 seconds, after which the flare will be discarded.

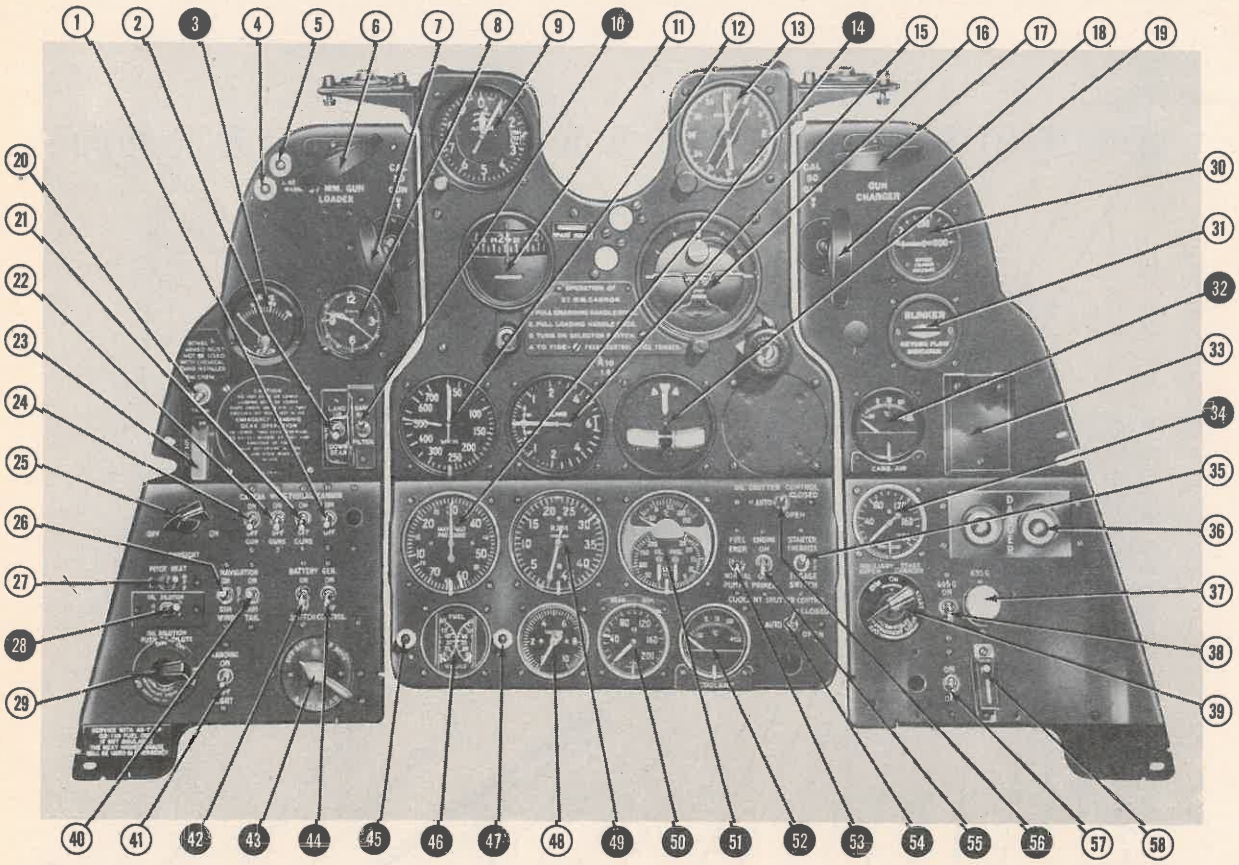
(4) Discarding of misfired flares should be accomplished if possible without actual handling of the flare itself. (The force of the air blast precludes holding of pistols on the outside of most airplanes.) Care should be exercised to prevent discarded flares from striking any part of the airplane.

(5) When flying over populated areas, or when for any other reason it is undesirable or impractical to discard signal flares that have misfired, after the above precautions have been taken, the pistol may be placed in the holder until a suitable area or time can be found for discarding the flare.



1. Cannon Magazine
2. Wing Gun Ammunition Magazine (2)
3. Navigation Light (2)
4. Recognition Lights (3) (P-63A-10)
5. Aux. Wing Tank Filler (2) (P-63A-6 and Subsequent)
6. Hydraulic System Filler (2)
7. Instrument Panels
8. Wing Tank Filler (2)
9. Control Stick Handle
10. Signal Light (P-63A-1 through P-63A-9)
11. Recognition Lights Control Switch (P-63A-10)
12. Map and Flight Report Case
13. Drop Message Bag (P-63A-10, some airplanes)
14. First Aid Kit (P-63A-7 through P-63A-9)
15. First Aid Kit (P-63A-1 through P-63A-6)
16. SCR 695 Radio
17. Coolant System Filler
18. Mooring Kit
19. Engine
20. Radio Antenna Mast
21. Main Oil Tank Filler
22. Hand Axe
23. First Aid Kit, (P-63A-10)
24. 37mm Cannon
25. .50 Caliber Fuselage Guns
26. Gear Box Oil Tank Filler
27. Oxygen Bottles
28. Oxygen Filler
29. Fuselage Guns Ammunition Magazine
30. Hydraulic System Filler (2)
31. Pyrotechnic Pistol Cartridges (P-63A-10)
32. Pyrotechnic Pistol (P-63A-10)
33. Range Receiver
34. Airplane and Engine Tool Kits (P-63A-1 through P-63A-6)
35. Engine Control Quadrant
36. Pilot's Seat
37. .50 Caliber Wing Guns (2)
38. Trim Tab Control Box
39. Aux. Wing Tank Filler (2) (P-63A-6 and Subsequent)
40. Drop Message Bag (P-63A-5 through P-63A-10, some airplanes)
41. Wing Gun Ammunition Magazine (2)
42. Navigation Light (2)
43. Wing Tank Filler (2)
44. External Power Plug Receptacle
45. SCR 522-A Radio
46. Data Case

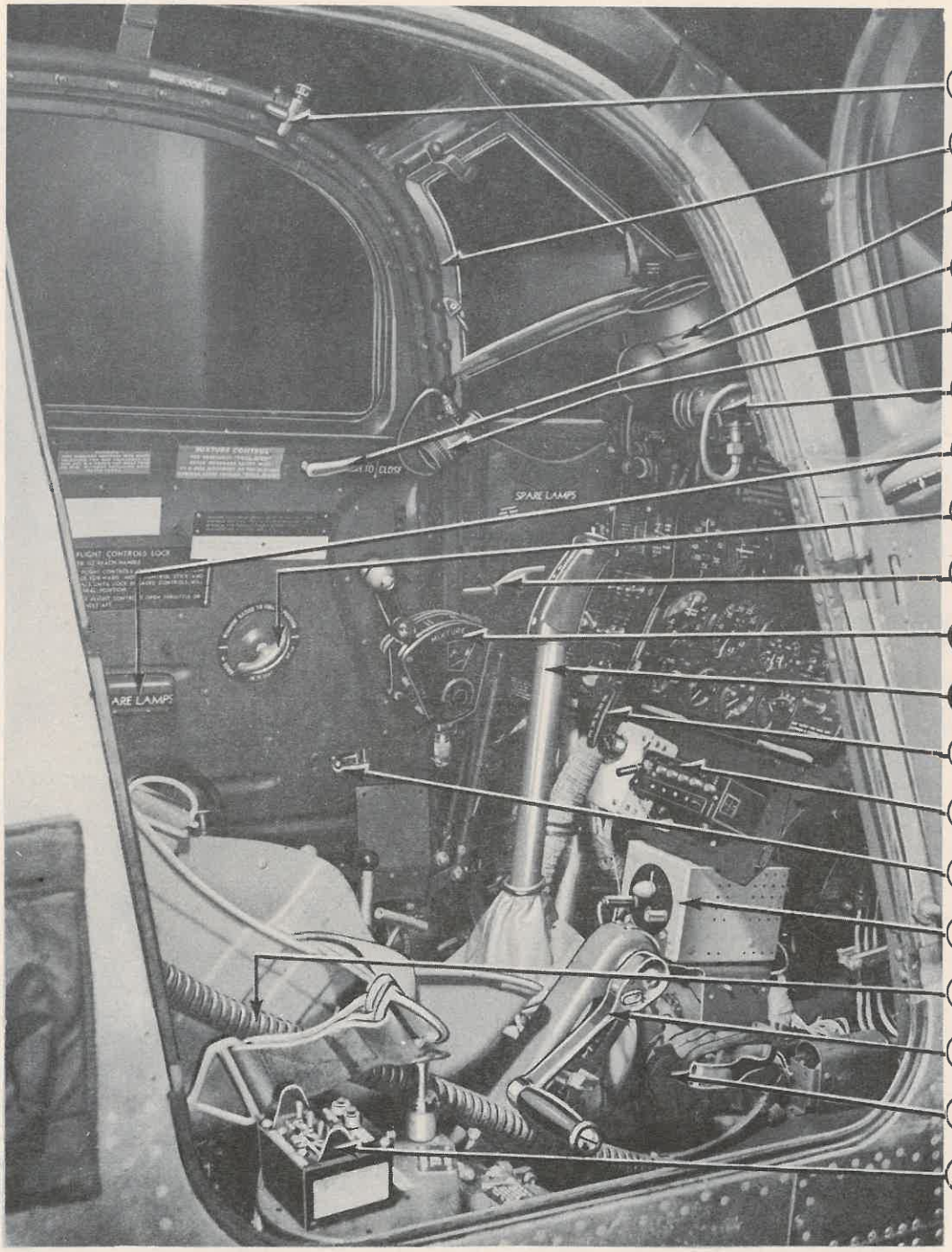
Figure 10—Fuselage Contents Diagram



✕ Power Plant Controls

1. Cannon Switch
2. Landing Gear Switch
3. Ammeter
4. Landing Gear Warning Lights (2)
5. Landing Gear Warning Lights (2)
6. Cannon Loading Handle
7. .50 Caliber Fuselage Gun Charging Handles (2)
8. Clock
9. Altimeter
10. Carburetor Air Filter Switch
11. Turn Indicator
12. Airspeed Indicator
13. Compass
14. Manifold Pressure Gage
15. Rate of Climb Indicator
16. Gyro Horizon
17. Cannon Charging Handle
18. .50 Caliber Fuselage Gun Charging Handles
19. Turn and Bank Indicator
20. Wing Bombs and Chemical Tanks Arming Switch
21. Fuselage Guns Switch
22. Wing Guns Switch
23. Wing Bombs or Tanks Salvo Switch
24. G. S. A. P. Camera Switch
25. Gunsight Rheostat
26. Navigation Light Switch—Wing
27. Pitot Heater Switch
28. Oil Dilution Switch
29. Fluorescent Light Rheostat
30. Oxygen Cylinder Pressure Gage
31. Oxygen Flow Indicator
32. Carburetor Air Temperature Gage
33. Compass Card Holder
34. Auxiliary Stage Supercharger Oil Pressure Gage
35. Starter Switch
36. SCR 695 Radio Detonator Push Buttons
37. SCR 695 Radio SW-180 Switch
38. SCR 695 Radio Off-On Switch
39. Fluorescent Light Rheostat
40. Navigation Light—Tail
41. Landing Light Switch
42. Battery Switch
43. Ignition Switch
44. Generator Control Switch
45. Fuel Low Level Warning Light (2)
46. Fuel Gage
47. Fuel Low Level Warning Light (2)
48. Suction Gage
49. Tachometer
50. Gear Box Oil Pressure Gage
51. Engine Gage Unit
52. Coolant Temperature Gage
53. Fuel Booster Pump Switch
54. Coolant Shutter Switch
55. Engine Primer Switch
56. Oil Shutter Switch
57. SCR 695 Radio I.F.F. Switch
58. SCR 695 Radio Emergency Switch

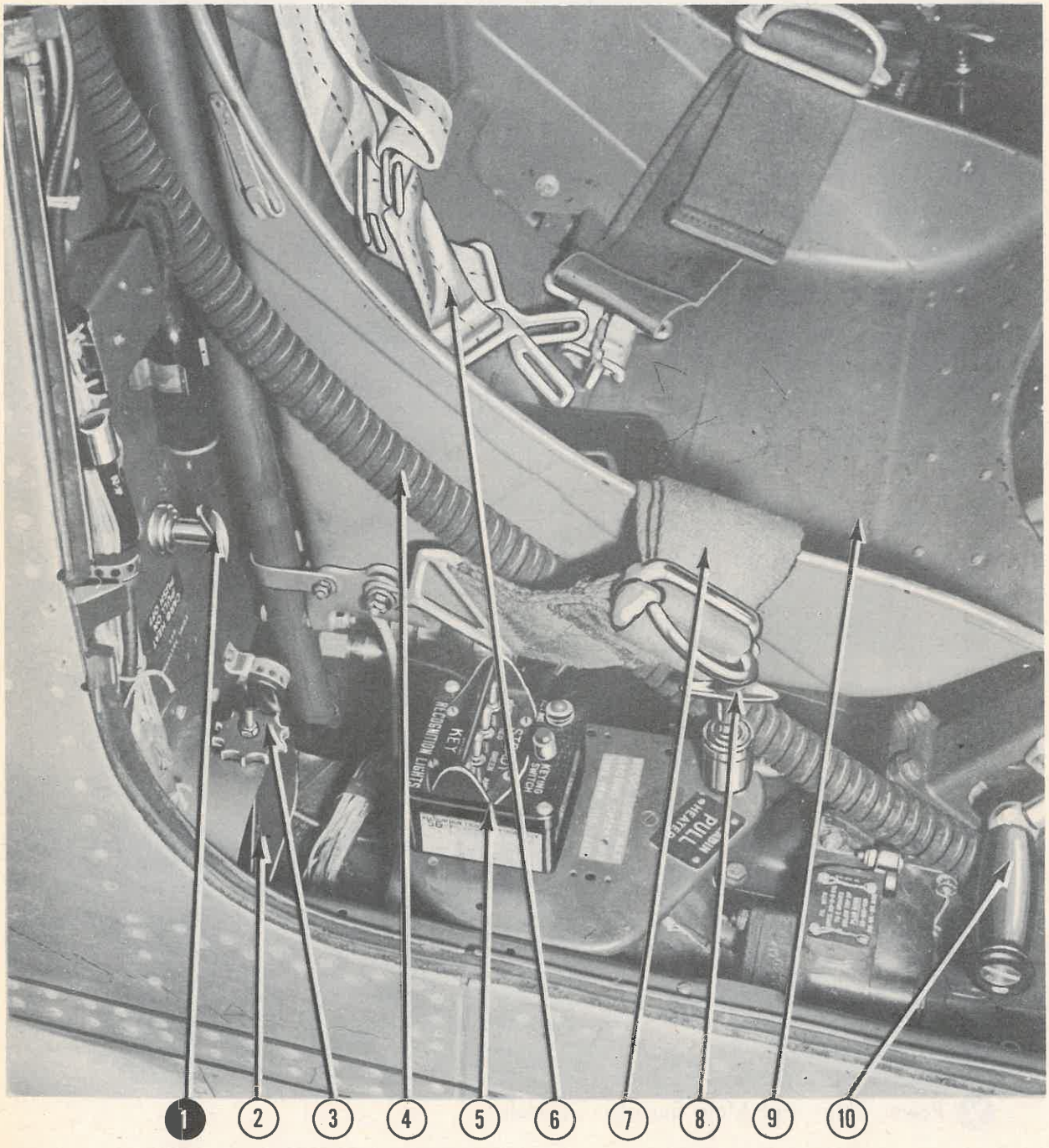
Figure 11—Instrument Panels



Power Plant and Main Surface Controls

1. Auxiliary Door Latch
2. Clear Vision Windshield Panel
3. Gunsight
4. Inside Door Opening Handle
5. Fluorescent Light (2)
6. Fluorescent Light (2)
7. Spare Lamps
8. Window Retracting Knob
9. Emergency Door Release Lever
10. Engine Control Quadrant
11. Control Stick
12. Parking Brake Handle
13. SCR 522-A Radio Control Panel
14. Door Hold-Open Lever
15. Range Receiver
16. Oxygen Mask Tube Connector
17. Landing Gear Hand Crank
18. Pyrotechnic Pistol Flare Case
19. Recognition Lights Control Box

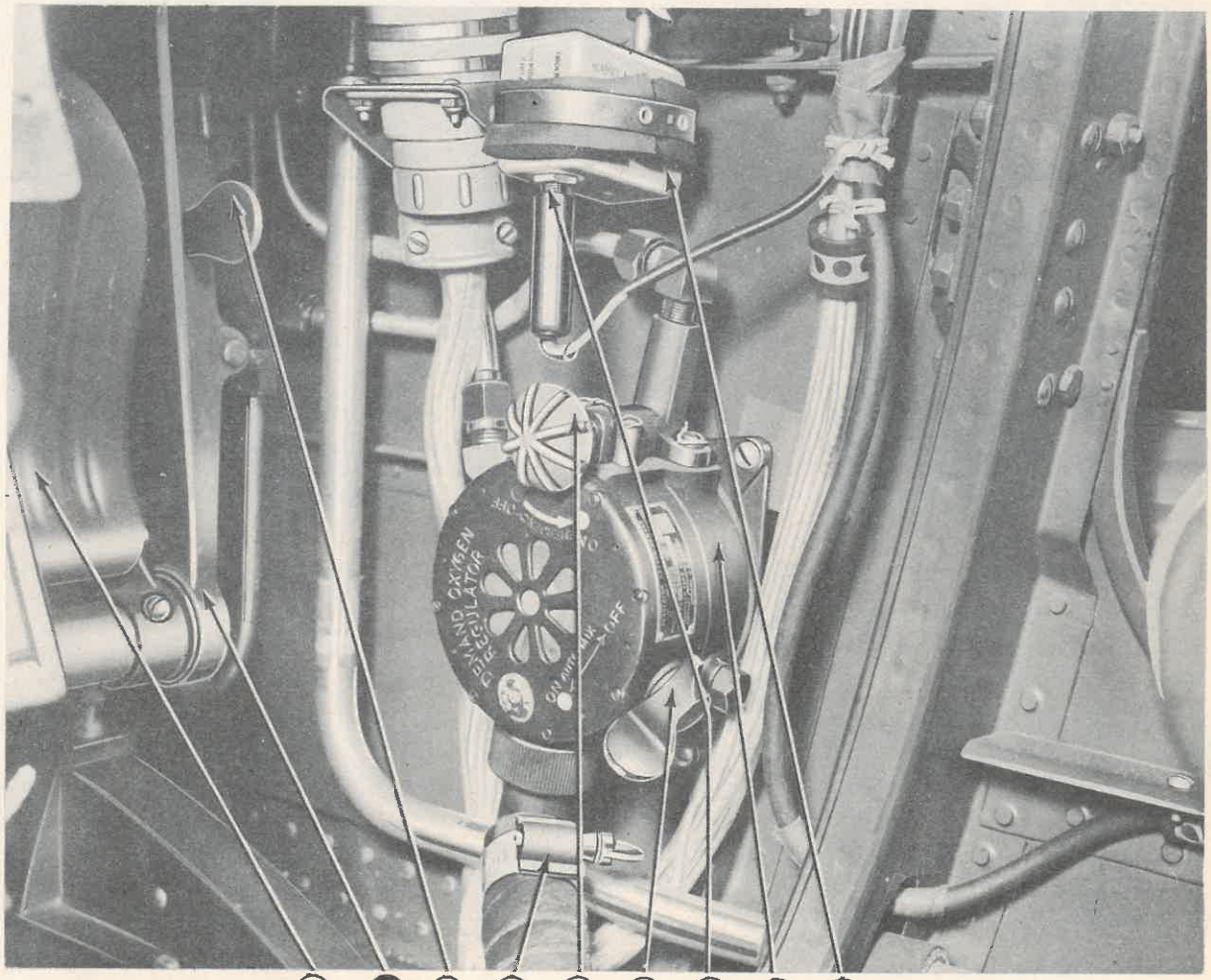
Figure 12—Cabin, General Left-Hand View



Power Plant Controls

1. Carburetor Heat Control Handle
2. Cabin Heat Regulator
3. Cabin Heat Regulator Friction Knob
4. Oxygen Mask Connector Tube
5. Recognition Lights Control Box
6. Pilot's Shoulder Harness
7. Pilot's Safety Belt
8. Cabin Heat Control
9. Pilot's Seat
10. Landing Gear Hand Crank Handle

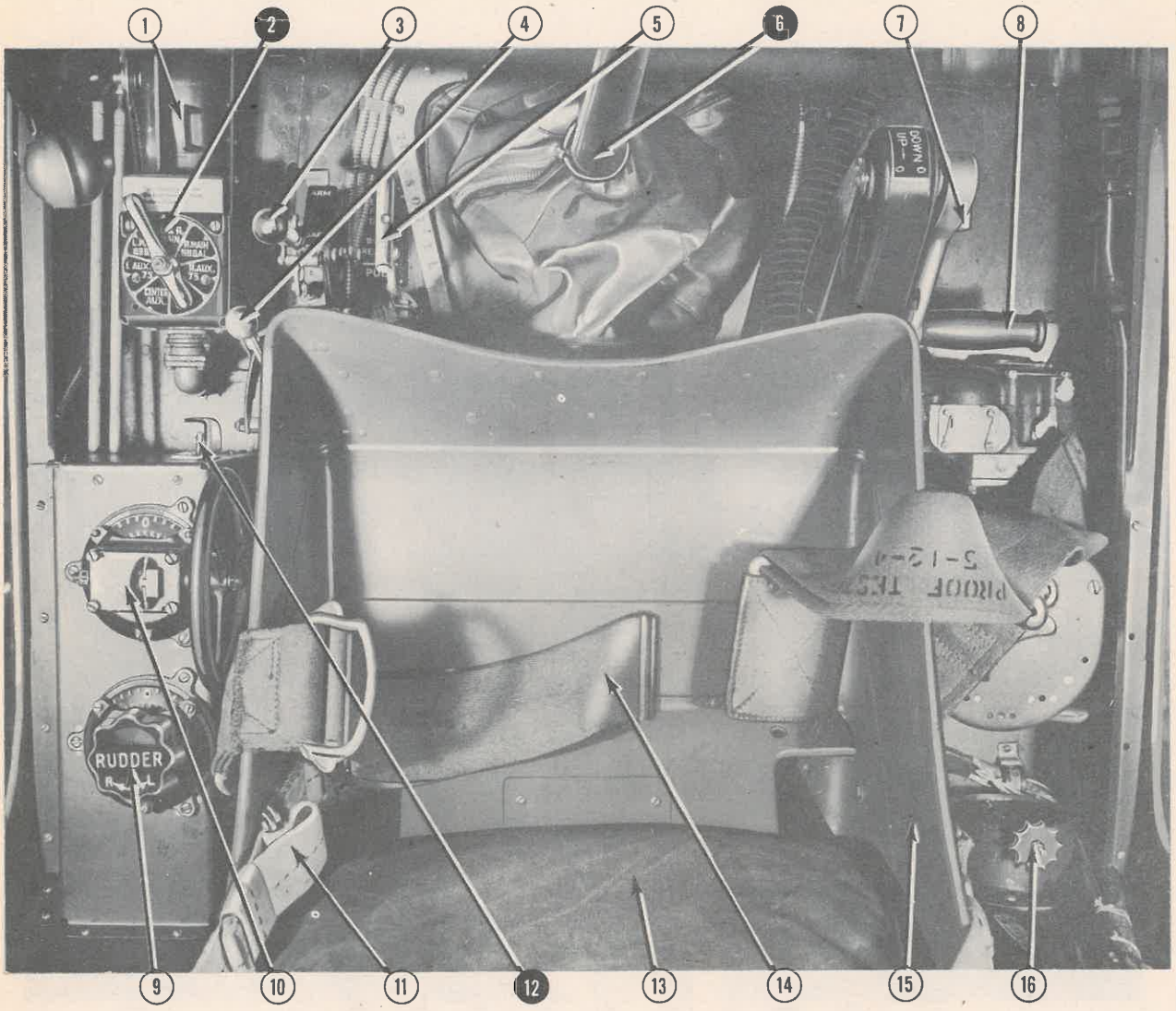
Figure 13—Cabin, Lower Right-Hand Aft View



⊗ Main Surface Controls

1. Brake Pedal
2. Rudder Pedal
3. Rudder Pedal Adjustment Arm
4. Oxygen Mask Connector Tube
5. A-12 Demand Regulator Emergency Knob
6. A-12 Demand Regulator Automatic—Mix Lever
7. Radio Jack Plug
8. A-12 Oxygen Demand Regulator
9. Radio Jack Box

Figure 14—Cabin, Lower Right-Hand Forward View



⊗ Fuel System and Main Surface Controls

1. Controls Lock
2. Fuel Selector Valve Control
3. Bomb Arm and Safe Lever
4. Shoulder Harness Lock Lever
5. Belly Tank or Center Panel Bomb Release Handle
6. Control Stick
7. Manual Landing Gear Hand Crank Ratchet Lever
8. Manual Landing Gear Hand Crank
9. Rudder Trim Tab Control
10. Elevator Trim Tab Control
11. Shoulder Harness
12. Flap Control Switch
13. Seat Cushion
14. Safety Belt
15. Pilot's Seat
16. Cabin Heat Regulator

Figure 15—Cabin Floor View

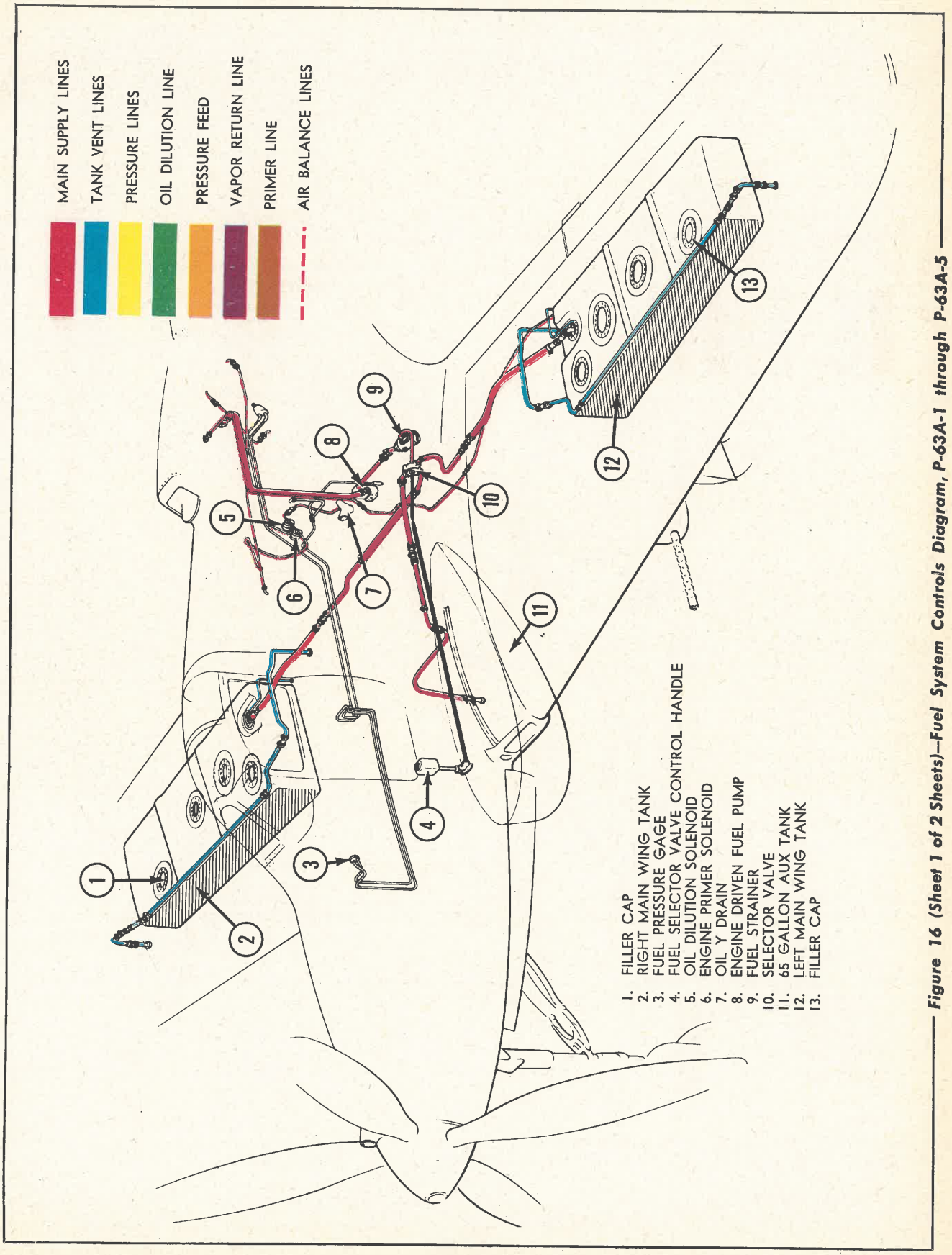


Figure 16 (Sheet 1 of 2 Sheets)—Fuel System Controls Diagram, P-63A-1 through P-63A-5

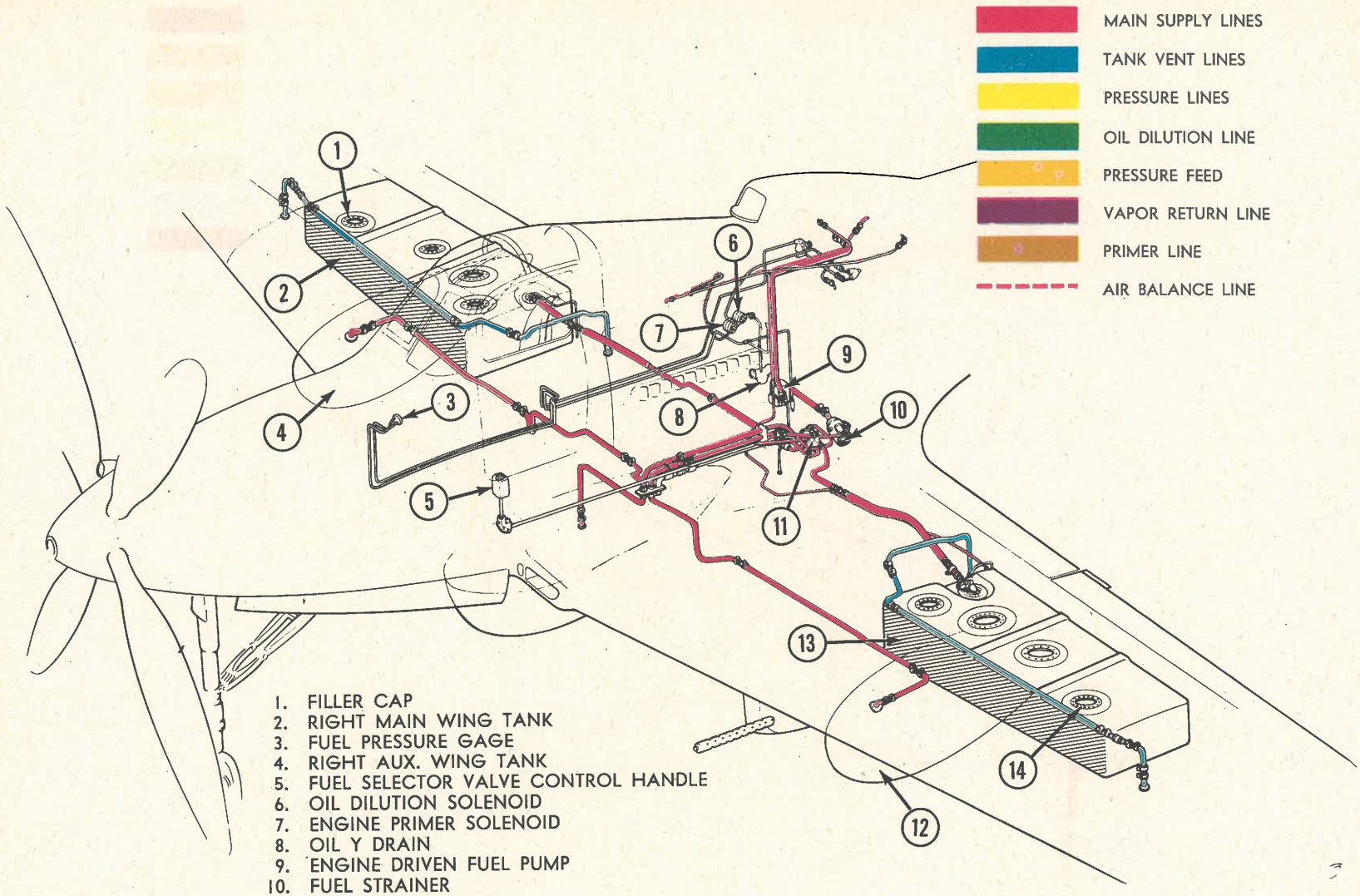
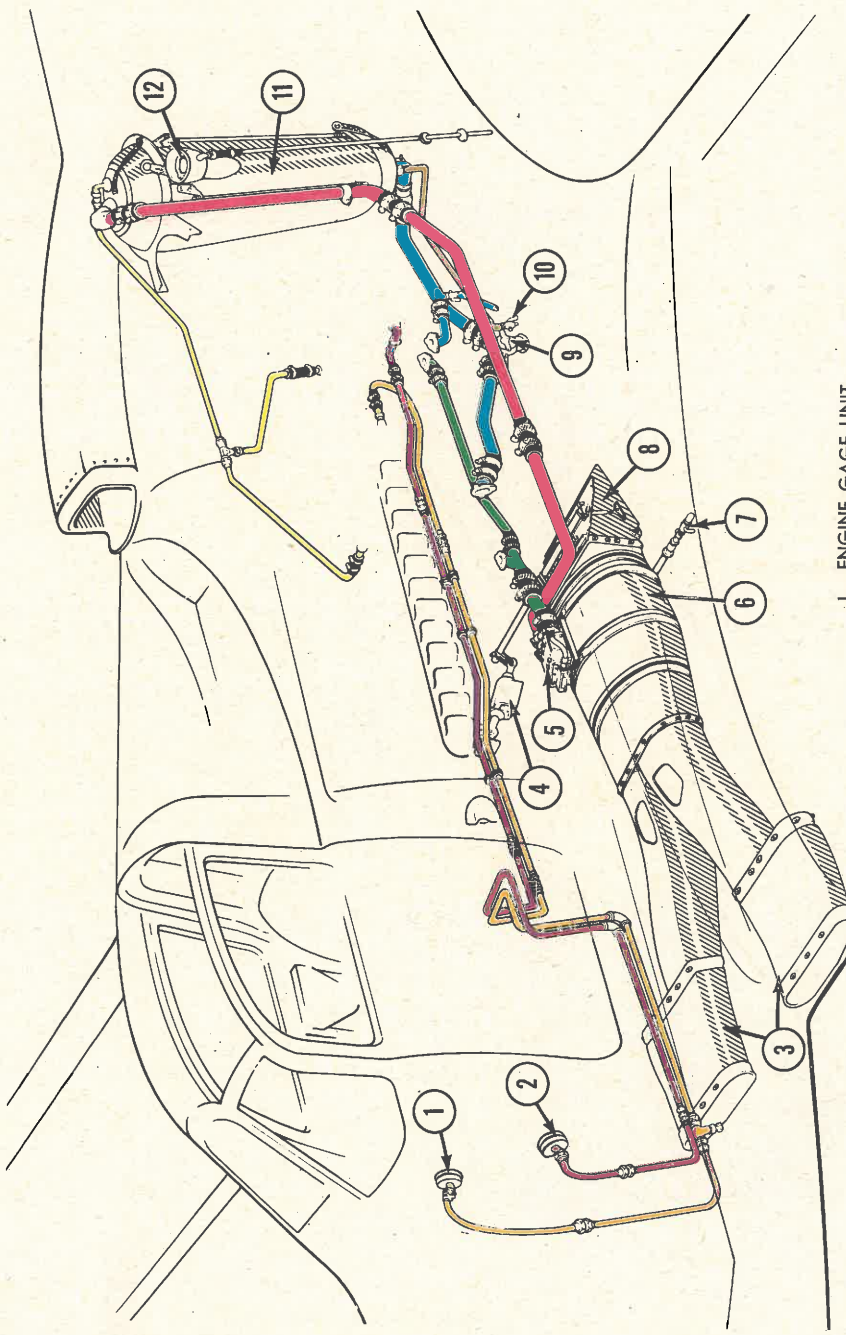


Figure 16 (Sheet 2 of 2 Sheets)—Fuel System Controls Diagram, P-63A-6 and Subsequent



1. ENGINE GAGE UNIT
2. AUX STAGE SUPERCHARGER OIL PRESSURE GAGE
3. OIL COOLER AIR INTAKE DUCTS
4. OIL COOLER AIR EXIT DUCT SHUTTER ACTUATOR
5. SURGE VALVE
6. OIL COOLER RADIATOR
7. OIL RADIATOR DRAIN COCK
8. OIL COOLER AIR EXIT DUCT SHUTTER
9. OIL Y DRAIN
10. MOISTURE DRAIN COCK
11. MAIN ENGINE OIL TANK
12. OIL TANK FILLER NECK

OIL RETURN

MAIN LINE TANK TO ENGINE

SCAVENGER PUMP TO COOLER

VENT LINE

ENGINE OIL PRESSURE LINE

OIL TANK SUMP LINE TO MOISTURE DRAIN COCK

AUX STAGE SUPERCHARGER OIL PRESSURE LINE

Figure 17—Oil System Diagram

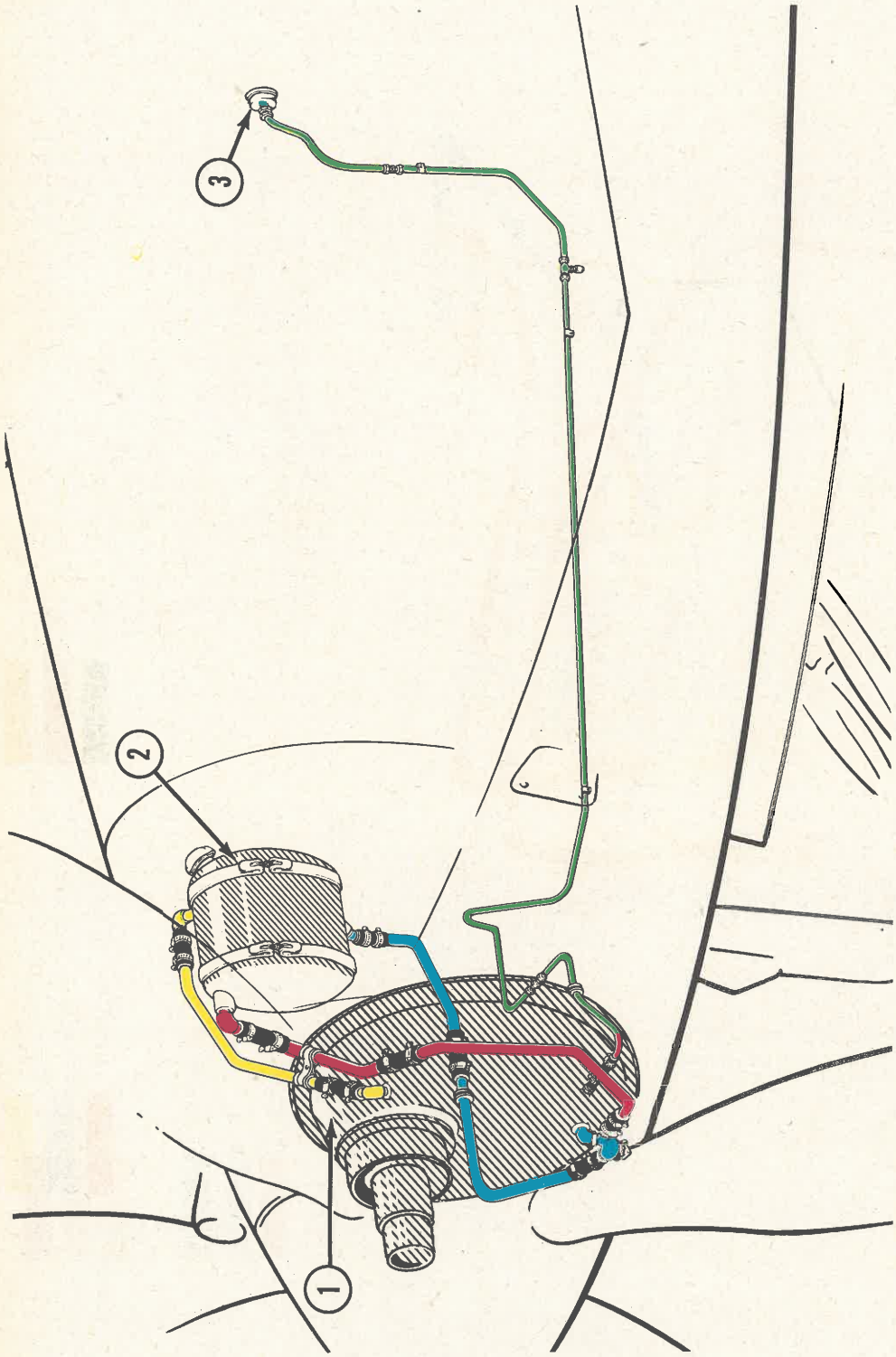


Figure 18—Reduction Gear Box Oil System Diagram

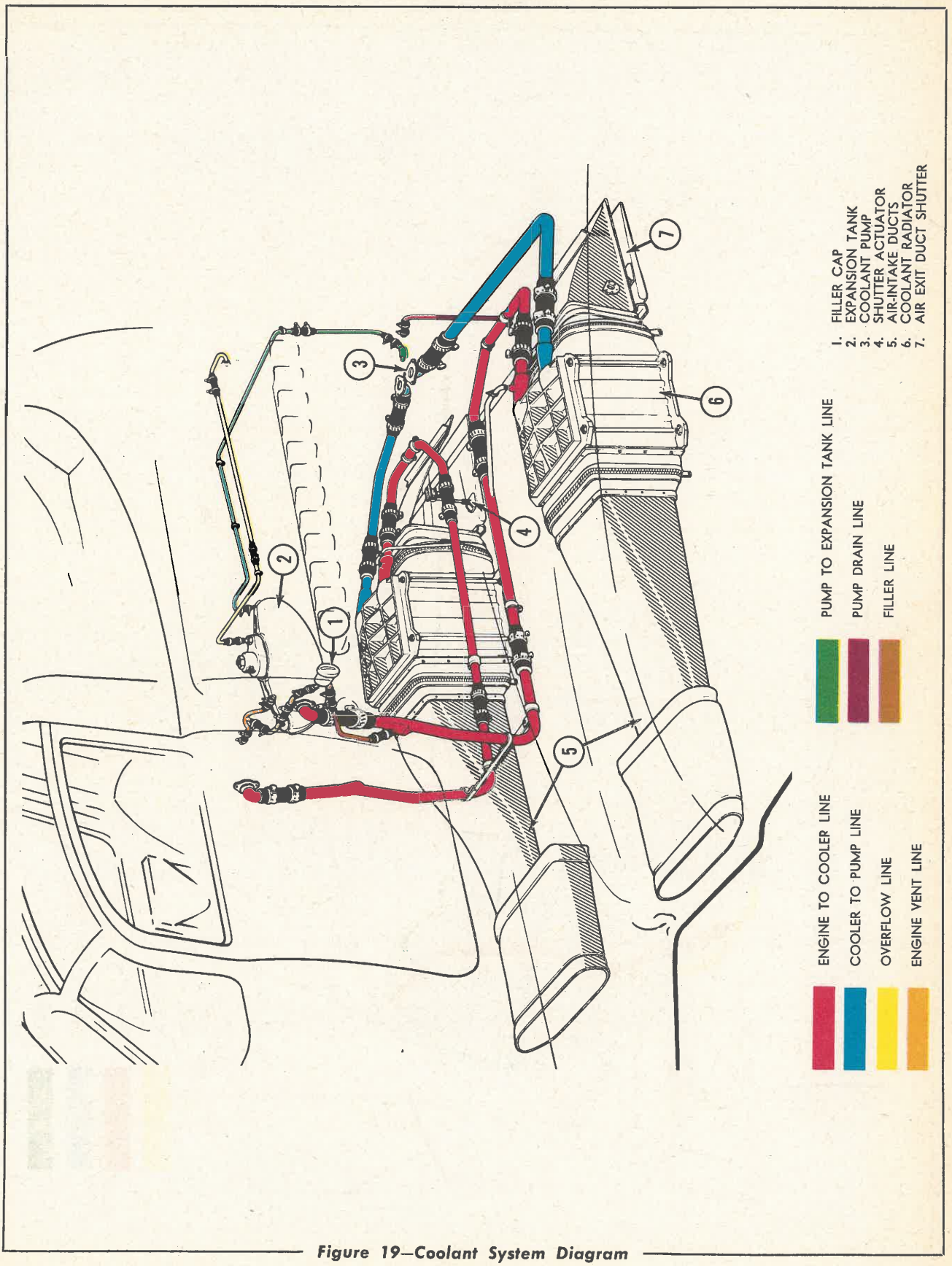


Figure 19—Coolant System Diagram

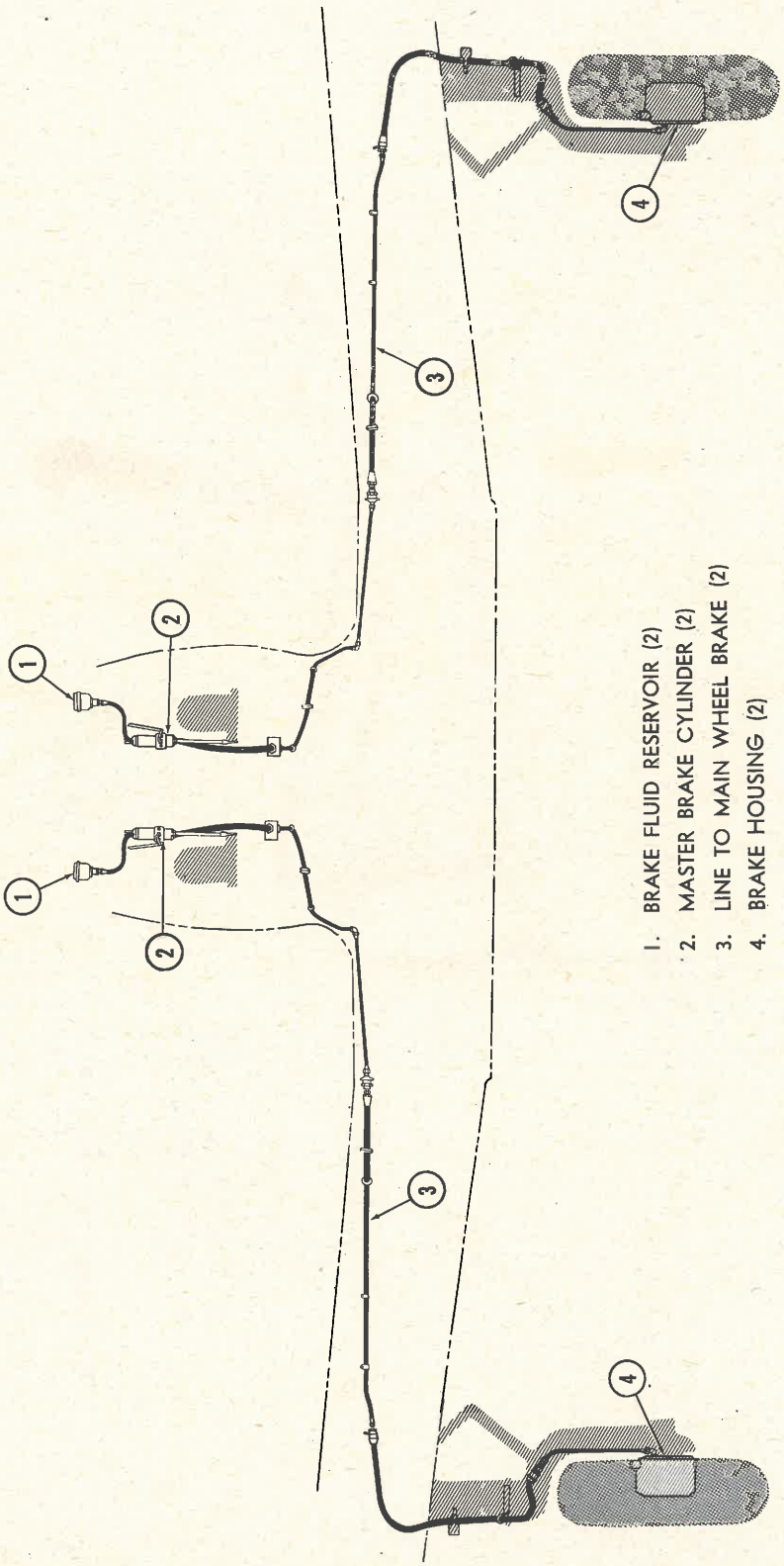
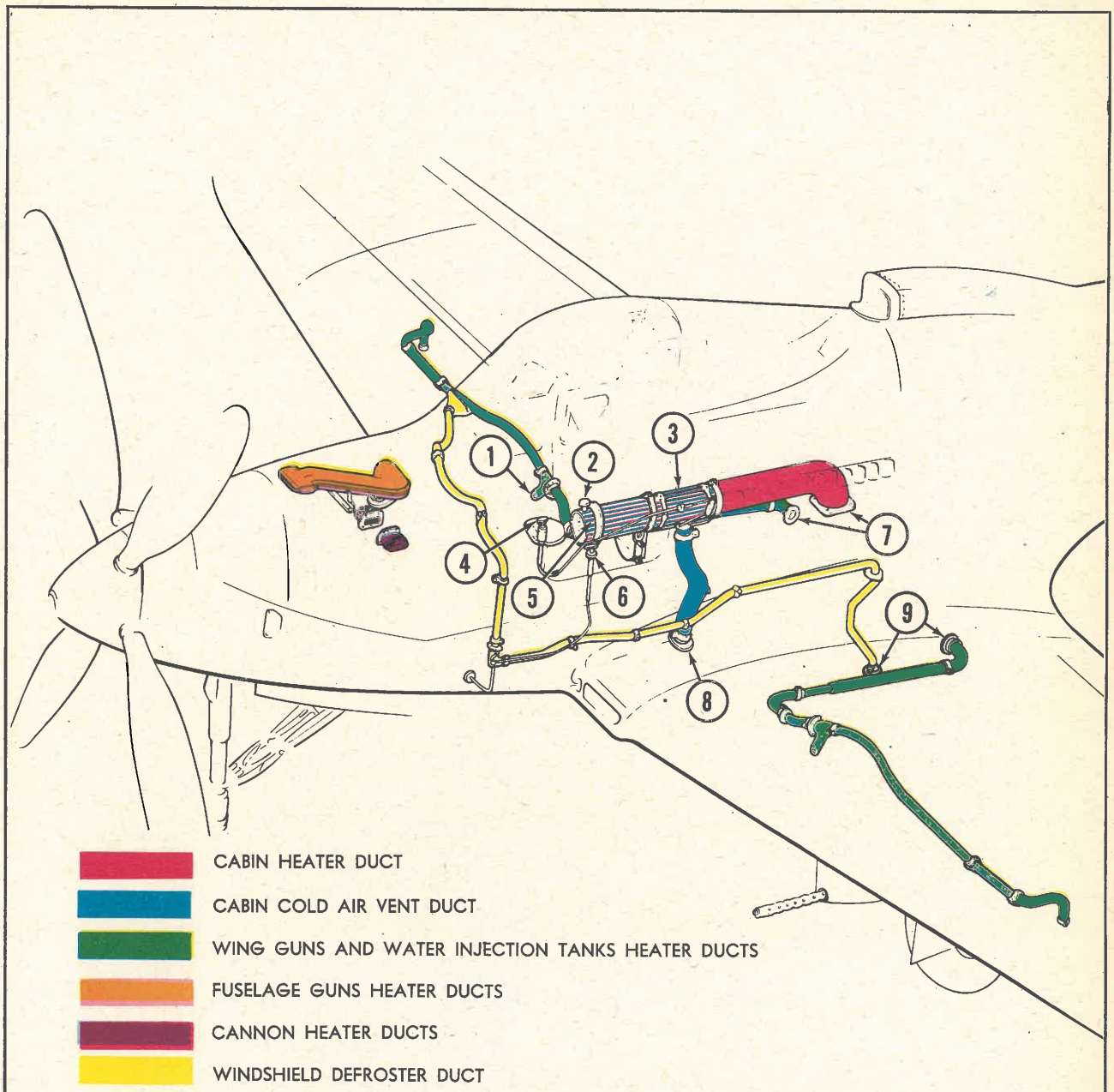


Figure 20—Hydraulic System Diagram



1. TO WATER-ALCOHOL TANKS
2. CABIN HEAT REGULATOR FRICTION KNOB
3. VALVE METERING ASSEMBLY
4. CABIN HEAT CONTROL KNOB
5. CABIN HEAT REGULATOR
6. CABIN WINDSHIELD DEFROSTER CONTROL
7. FROM RIGHT-HAND COOLANT RADIATOR AIR-EXIT DUCT
8. FROM RIGHT-HAND COOLANT RADIATOR AIR INTAKE DUCT
9. FROM LEFT-HAND COOLANT RADIATOR AIR-EXIT DUCT

Figure 21—Heating and Ventilating System Diagram

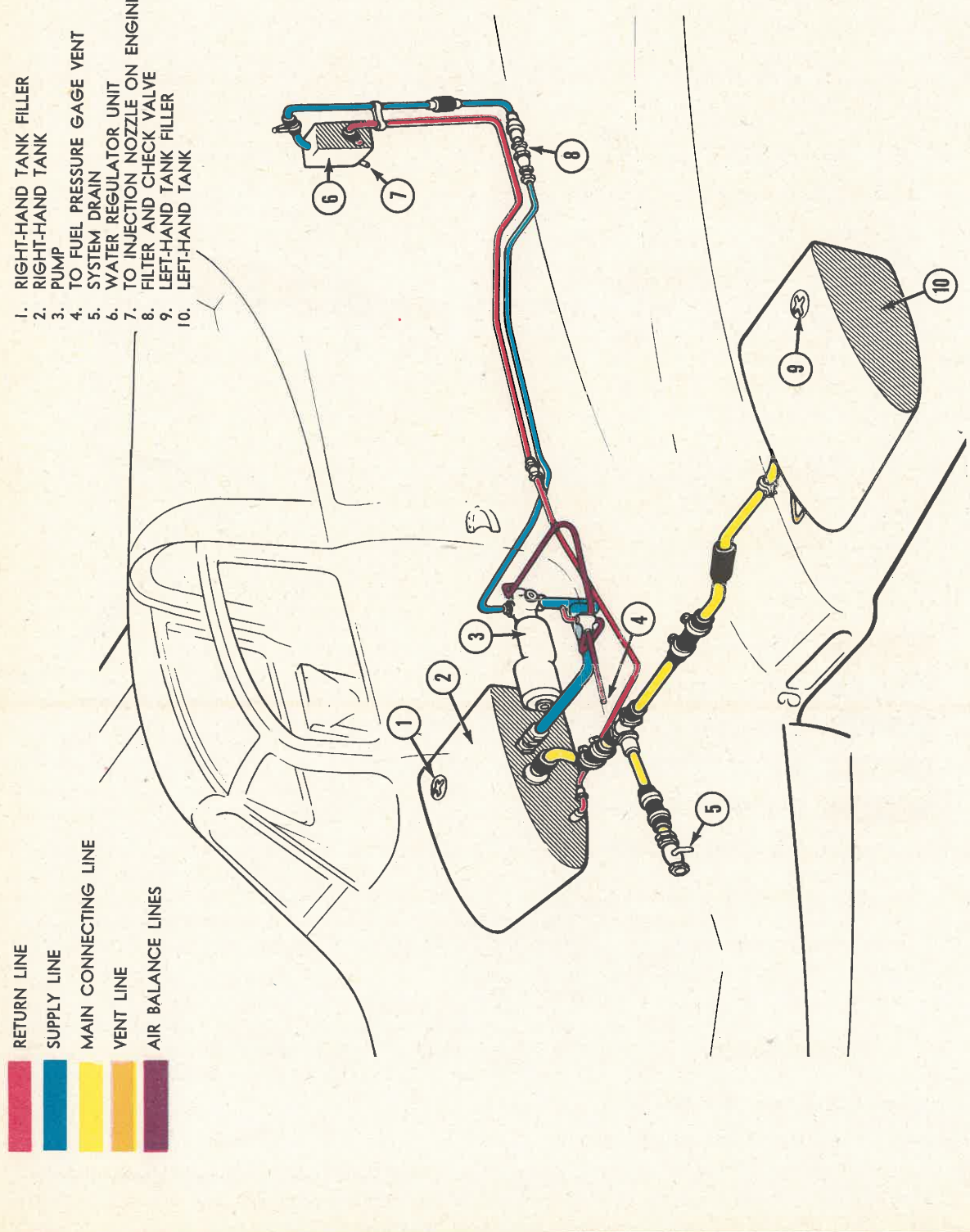
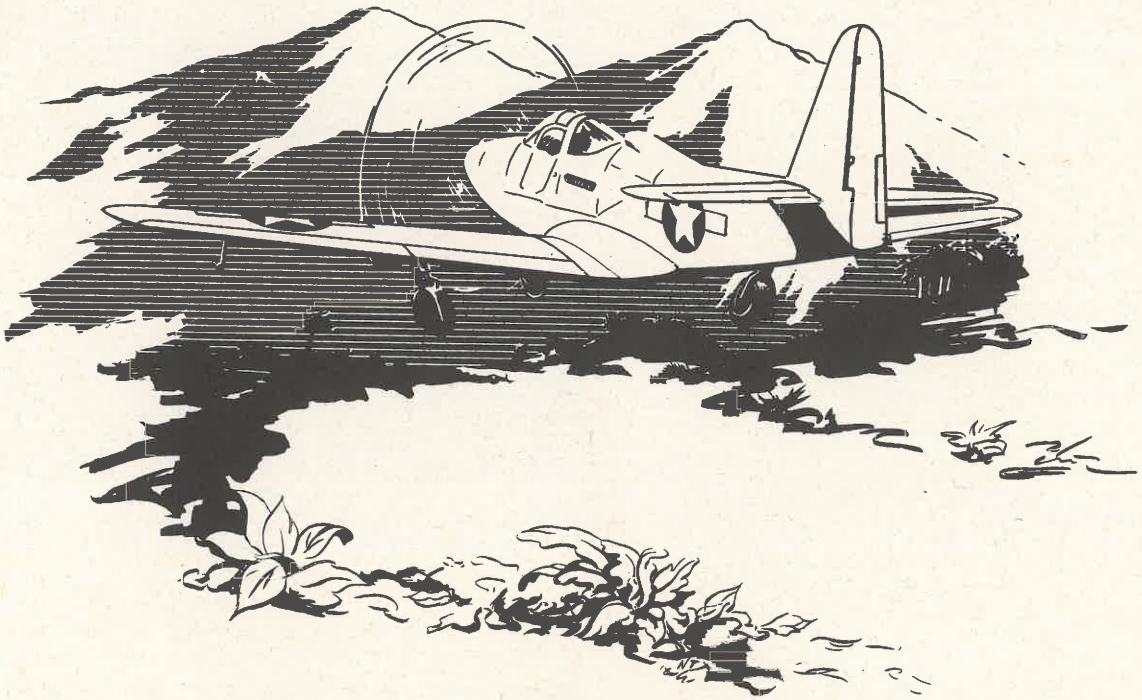


Figure 22—Water Injection System Diagram



SECTION II
NORMAL OPERATING INSTRUCTIONS

1. BEFORE ENTERING THE PILOT'S COMPARTMENT.

a. FLIGHT LIMITATIONS AND RESTRICTIONS.

(1) MANEUVERS PROHIBITED.

(a) Outside loops and inverted spins.

(b) Never try any acrobatics with a tail-heavy airplane.

(c) Spins.

WARNING

Do not intentionally spin this airplane.

(2) MANEUVERS NOT RECOMMENDED.

(a) Snap rolls.

(3) AIRSPEED LIMITATIONS.

(a) WHEN EXTENDING AND RETRACTING LANDING GEAR.—Do not extend or retract the landing gear when flying at more than 180 mph IAS. Turn landing gear switch off when not in use.

(b) WHEN LOWERING THE FLAPS.—Do not lower the flaps when flying more than 180 mph IAS. Turn flap switch off when not in use.

(c) WITH EXTERNAL WING TANKS INSTALLED.—The airplane should not exceed a maximum speed of 250 mph IAS with the external wing tanks installed; the indicated airspeed should not be below 210 mph IAS when dropping the wing tanks.

Note

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

b. FLIGHT OPERATION DATA.

(1) WEIGHT AND BALANCE DATA.—The pilot should make a thorough study of the weight and balance data applicable to the airplane.

(a) Check Form 1.

(b) Check Form F—Weight and Balance Clearance.

WARNING

The main thing to be avoided in loading is shifting the center of gravity to an aft position which has a detrimental effect on longitudinal stability, spin characteristics, and recovery.

(2) FLIGHT OPERATION CHARTS.—Flight operation instruction charts for P-63A models will be found in appendix I of this Handbook. Instructions for their use are given in appendix I. The pilot should familiarize himself with the following:

(a) Power Plant Chart (section III).

(b) Take-off, Climb and Landing Chart (appendix I).

(c) Flight Operation Instruction Charts (appendix I).

c. INSPECTION.—Make a careful visual inspection of the airplane. Accumulations of dust, ice, snow or frost on the wings and tail surfaces should be removed before take-off. Such accumulations will affect the flying characteristics of the airplane, and therefore are dangerous.

d. OBTAIN FLIGHT CLEARANCE.

(1) In the event of war operations, secure the radio frequency assignment for the flight.

(2) If radio model SCR 274-N is installed in the airplane, be sure the correct transmitter is installed and tuned for the proper frequency.

(3) If radio model SCR 522-A is installed in the airplane, be sure the correct crystals are installed for the assigned frequency.

e. ENTRANCE TO THE CABIN.—Entrance to the cabin is gained by opening the automobile-type door on the right-hand side of the airplane (entrance through the left-hand doorway is not as convenient as the right due to the location of the throttle quadrant and the trim tab control box). A handhold is provided in the fuselage at a point above the trailing edge of the right wing. To open the door from the outside, press on the flush handle where it is marked "PUSH," then pull outward and upward on the protruding handle, releasing the catch. In order to safety the doors for flight, an auxiliary latch (figure 23) is provided at the top of each door and should be used. An emergency door release lever (9, figure 12), which will unlock all door fastenings for quick exit, is located forward of each door.

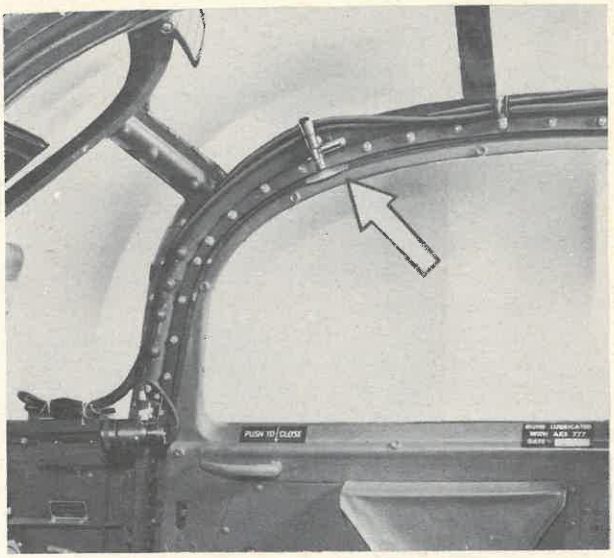


Figure 23—Auxiliary Door Latch

2. ON ENTERING THE PILOT'S COMPARTMENT.

a. CHECK FOR ALL FLIGHTS.

(1) Ignition switch (43, figure 11) "OFF."

(2) Fuselage guns switch (21, figure 11) "OFF."

(3) Wing guns switch (22, figure 11) "OFF."

(4) Cannon switch (1, figure 11) "OFF."

(5) Generator control switch (44, figure 11) "ON."

(6) Landing gear switch (2, figure 11) "OFF," or "DOWN."

(7) Unlock controls by opening throttle or by pulling the lock control lever aft.

(8) Adjust rudder pedals to suit leg length by pushing outboard on the spring loaded pedal adjustment arm on the outer side of each rudder pedal (figure 24), adjusting pedals to proper setting, and then releasing the lever to lock them in place.

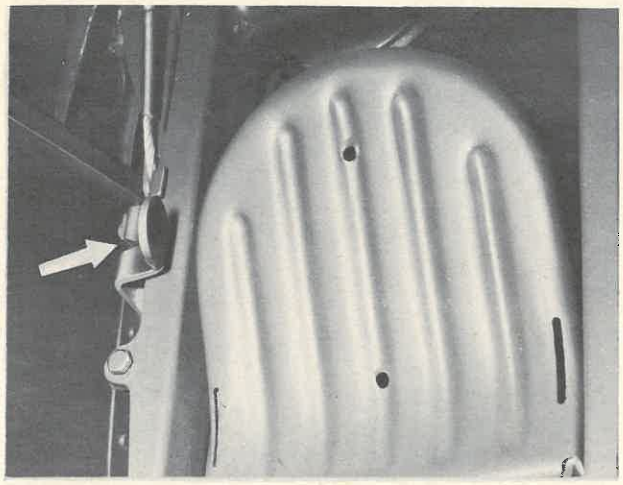


Figure 24—Rudder Pedal Adjustment Arm

BE SURE BOTH PEDALS ARE ADJUSTED EQUALLY. Check for full right and left movement of rudder.

(9) Check for free movement of control surfaces.

(10) Check for full oxygen supply. (See 30, figure 11.)

(11) Turn battery switch (42, figure 11) "ON."

CAUTION

Landing gear switch "OFF" or "DOWN" before turning battery switch "ON" for any checks. Fuel valve "OFF" if battery switch is to be "ON" for any length of time before starting engine.

(12) Test gunsight illumination. (See 25, figure 11.)

(13) Check altimeter setting. (See 9, figure 11).

(14) Check fuel gage (46, figure 11), that desired quantity of fuel is in the tanks.

(15) Consult pilot's check-off list.

b. SPECIAL CHECK FOR NIGHT FLYING.

(1) Turn battery switch (42, figure 11) "ON." (Observe WARNING preceding.)

(2) Turn fluorescent lights (5 and 6, figure 12) "ON" for test. For operation of fluorescent lights, see section II, paragraph 16., *a.*

(3) Test navigation lights. (See 26 and 40, figure 11.)

(4) Test landing light by operating switch on left-hand instrument panel. (See 41, figure 11.)

CAUTION

The landing light should never be allowed to remain "ON" for more than a few seconds when the airplane is not in flight.

(5) Test signal light. (See figure 7.)

(6) Test recognition lights (P-63A-10). (See 5, figure 13).

CAUTION

Do not leave the recognition lights on for more than 10 seconds when the airplane is not in flight. Allowing them to burn for a period longer than this will cause the plastic lenses to crack.

3. FUEL AND OIL SYSTEM MANAGEMENT.

a. FUEL SYSTEM. *(See figure 25.)*

(1) FUEL SYSTEM OPERATIONAL EQUIPMENT.

(a) INTERNAL TANKS.—A built-in fuel cell is located in each wing outer panel. Each tank has a capacity of 68 US (56.6 Imperial) gallons, on the P-63A-1 through P-63A-7. The P-63A-8 and P-63A-9 airplanes have a capacity of 67.5 US (56.2 Imperial) gallons for each tank, and the P-63A-10 airplanes have a capacity of 66 US (54.9 Imperial) gallons for each tank. Selection of fuel from all sources in the airplane is made by operation of the fuel selector valve control handle, located to the left of the pilot on the cabin floor. (See 2, figure 15.)

(b) BOOSTER PUMPS.—An electric booster pump is located in each wing tank, and operates when the selector valve is turned to those tanks. The speed of operation of these pumps is controlled by a toggle switch on the lower left-hand section of the center instrument panel. (See 53, figure 11.) The switch has positions for "NORMAL" and "EMERG" (emergency).

(c) FUEL LOW LEVEL WARNING LIGHTS. —A fuel low level warning light is located at the side of the fuel level gage for each wing tank (45 and 47, figure 11), and will light when its respective tank level is down to 12 gallons or less. Intensity of the light is controlled by turning the knurled rim around its outer edge.

(d) AUXILIARY FUEL TANKS. — Various auxiliary tanks may be installed on the airplane, for use in combination or individually as desired. The center section auxiliary tanks include a 65 US (54.1 Imperial) gallon, self-sealing combat tank, incorporating a built-in electric booster pump; a 75 US (62.4 Imperial) gallon tank; and a 175 US (145.8 Imperial) gallon tank. Provisions are also included in the P-63A-6

and subsequent models for the installation of two 75 US (62.4 Imperial) gallon auxiliary fuel tanks, one under each wing.

(2) DURING GROUND CHECK.

(a) Check flow from each auxiliary tank when running the engine at moderately high powers prior to take-off.

(3) TAKE-OFF.—For take-off, the fuel selector valve control (2, figure 15) should be set to "L & R MAIN" (both) tanks. Switch booster pumps switch 53, figure 11) to "EMERG" delivery.

(4) DURING FLIGHT.

(a) CRUISING FLIGHT.

1. AUXILIARY TANKS.—After take-off, in normal flight, turn the selector valve control handle (2, figure 15) to either wing auxiliary tank position (if wing auxiliary tanks are installed), alternating between "L AUX" and "R AUX" tanks at 15-minute intervals, drawing from first one tank and then from the other, in order to keep the fuel load distributed evenly in the two wing tanks. After exhausting the wing tanks, switch to "CENTER AUX" tank (if center auxiliary tank is installed). If desired, the wing tanks may be dropped upon exhausting their contents, to allow for greater speed and range of the airplane. The airplane should not exceed a maximum speed of 250 mph IAS with the external wing tanks installed; the indicated airspeed should not be below 210 mph IAS when dropping the wing tanks. The center panel auxiliary tank also may be dropped if desirable; however, when flying with the 65 US (54.1 Imperial) gallon combat tank, the speed is increased by only 5 mph after dropping it, so this will be rarely necessary.

Note

When flying on fuel from the auxiliary tanks, turn the fuel selector valve for 1 minute out of every 20 minutes to "L. MAIN" wing tank to provide room for vapor return to that tank. Vapor return flows at the rate of 2 US (1.7 Imperial) gallons per hour.

On airplanes equipped with the pressurized external fuel system (P-63A-9 and subsequent) note that there is sufficient fuel pressure when cruising at high altitudes. If the pressure is insufficient, check for a leak in the pressurization after landing.

Note

No fuel gage is provided for the auxiliary tanks when installed.

CAUTION

Never turn selector valve to auxiliary tanks positions when auxiliary tanks are not installed.

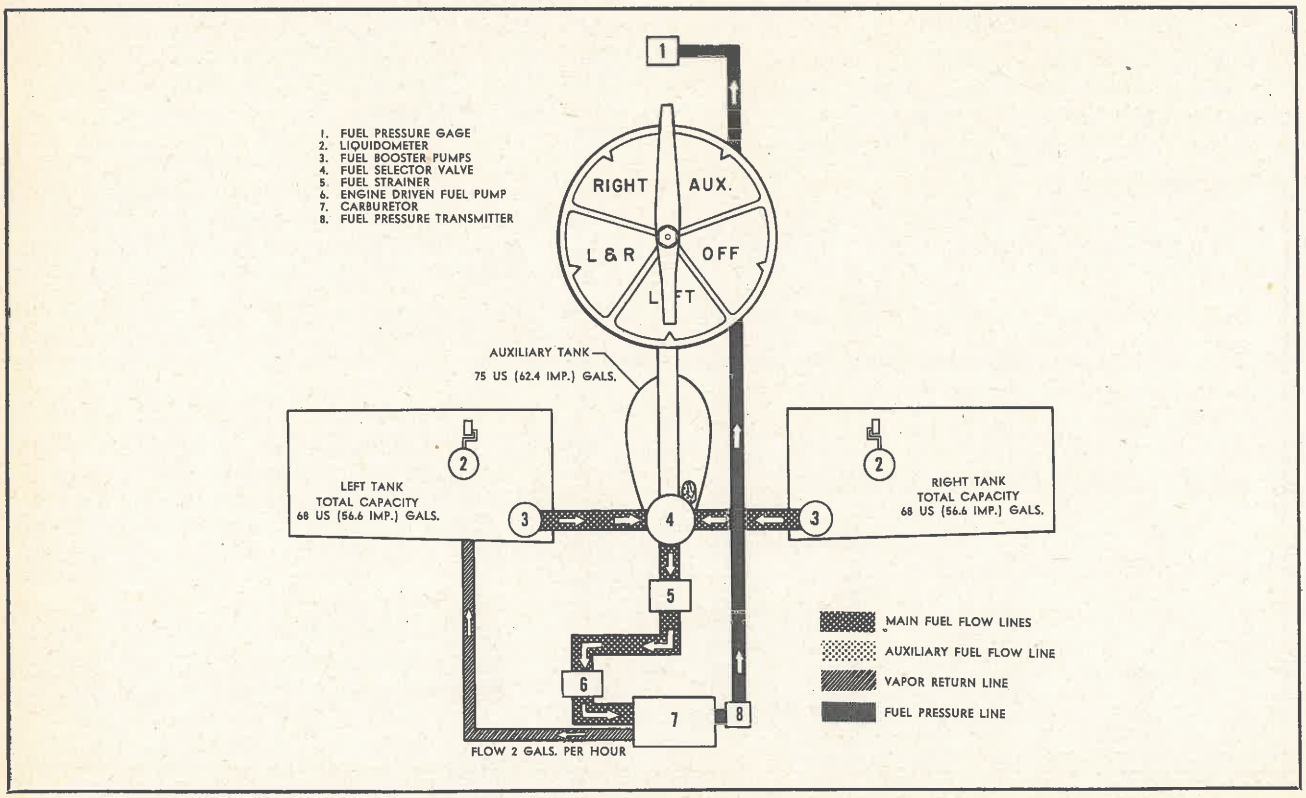


Figure 25 (Sheet 1 of 2 Sheets)—Fuel System Schematic Diagram, P-63A-1 Through P-63A-5

2. INTERNAL TANKS.—If the auxiliary tanks are not installed, or after the auxiliary tanks are empty, operate on "L & R MAIN" (both), switching to individual tanks as necessary to keep the remaining fuel evenly distributed and the airplane trimmed. The fuel low level warning light on each side of the fuel gage (45 and 47, figure 11) will be set to glow when its respective tank is reduced to 12 gallons of fuel.

3. DRY TANKS.—No tank should be permitted to run entirely dry at any time. The change from one fuel tank to another should be made at the first indication of loss of fuel pressure fluctuation in indicated gage pressure.

4. BOOSTER PUMPS.—The booster pumps switch (53, figure 11) should be on "NORMAL" when in cruising flight. At all other times, it should be set on "EMERG."

(b) EMERGENCY AND COMBAT FLIGHT.—When anticipating combat, regardless of fuel load, immediately switch to "L & R MAIN" (both) position in order to assure a continuous flow of fuel as long as there is any fuel in either tank. Always switch booster pumps (53, figure 11) to "EMERG" delivery when anticipating combat, or using high powers.

(c) LANDING.—For landing, the fuel selector valve control (2, figure 15) should be set to "L & R MAIN" (both) tanks. Booster pump switch (53, figure 11) should be on "EMERG." Never land when taking fuel from any of the auxiliary tanks.

Note

Always drop all auxiliary tanks before an emergency landing.

b. OIL SYSTEM *(See figure 17.)*

(1) Operation of the oil system is automatic. Temperature of the engine oil can be regulated through operation of the oil cooler shutter. The oil cooler control shutter switch is located on the lower right-hand section of the center instrument panel (56, figure 11); it has positions for "AUTOMATIC," "CLOSED," "OPEN," and when placed in the center position, it is off. It is recommended that the switch be left in "AUTOMATIC" during take-off and combat flying, only. At all other times manual selection should be used, opening and closing the shutter as the need is indicated by the oil temperature gage.

(2) When oil dilution is required for scramble take-off, or shut-down in cold weather, the dilution is accomplished through operation of the oil dilution control switch, located in the left-hand instrument panel. (See 28, figure 11.) For operation of the oil dilution system in cold weather shut-downs, see section II, paragraph 18. For use of oil dilution in a scramble take-off, see section II, paragraph 6.

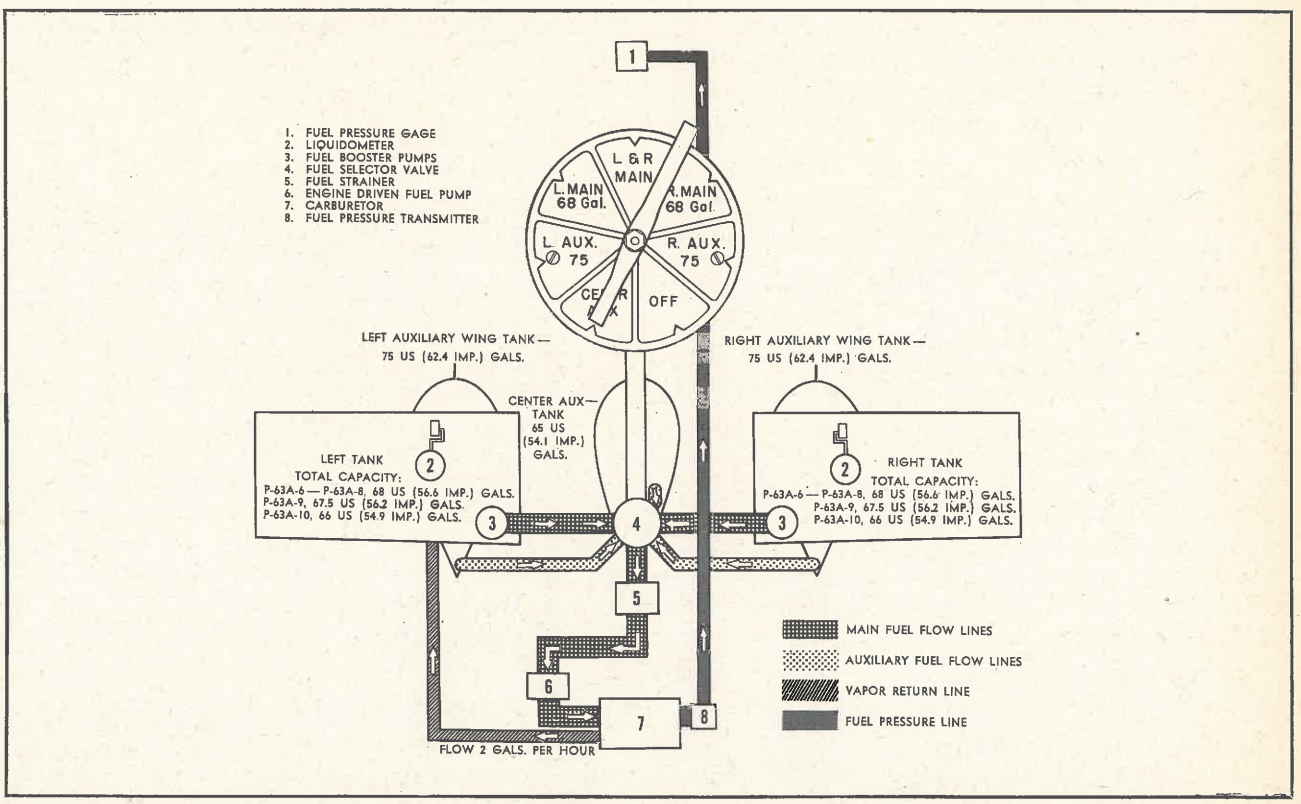


Figure 25 (Sheet 2 of 2 Sheets)—Fuel System Schematic Diagram, P-63A-6 and Subsequent

4. STARTING THE ENGINE.

a. With the ignition switch (43, figure 11) "OFF," turn the propeller over two or three times by hand if the engine is cold.

b. Turn battery switch (42, figure 11) "ON." The fuel gage (46, figure 11) and the coolant temperature gage (52, figure 11) will operate when turning on this switch. (The coolant temperature gage will not register if the coolant temperature is below 50°C.)

c. Turn ignition switch (43, figure 11) on to "BOTH."

d. Check fuel supply in right and left tanks.

e. Turn fuel selector valve control handle (2, figure 15) to "L & R MAIN" (both) tanks. Take-off, landing, low altitude, and combat flying should be done with the fuel selector valve in this position, since this will eliminate the possibility of a pilot taking off on an empty tank if one of the two tanks happen to be empty. Boost pumps go on when the fuel selector valve is turned on.

f. Set the mixture control lever (4, figure 4) in the "IDLE CUT-OFF" range.

g. Set the throttle (1, figure 4) at about the 1000 rpm position (open about 1/4).

h. Set auxiliary fuel pump switch (53, figure 11) on "EMERG."

i. Hold the electric engine primer switch (55, figure 11) up to the "ON" position two or three seconds when the engine is cold, or about one second when the engine is warm. Do this just before engaging the starter.

Note

One second of electric primer operation is approximately equal to one stroke of the hand primer. Avoid excessive priming, as it washes the oil off the cylinder walls, causing scoring of the barrels and seizing of the pistons.

j. Energize the starter by pushing the starter switch (35, figure 11) up to "ENERGIZE." Hold the switch in this position until the inertia fly wheel has reached maximum rpm. Then engage the starter by pushing the switch down to "ENGAGE." Hold until the engine fires regularly; then return the switch to "OFF." (For manual starter operation, see section II, paragraph 4., *l.*)

k. When the engine starts, push the mixture control lever (4, figure 4) forward to "AUTO RICH."

CAUTION

Always start the engine on cold rammed air; otherwise a back fire will cause damage to the duct butterflies.

WARNING

In case of fire coming from the exhaust stacks when starting the engine, it is recommended that the start attempt be continued unless the situation becomes too critical. This will help to eliminate the flooded condition, and the fire will be stopped when the engine starts. Do not continue priming of the engine if a fire is started. In case the situation becomes too critical, involving danger to the airplane and pilot, turn the ignition switch "OFF," the battery switch "OFF," and the fuel selector valve control handle to the "OFF" position; the fire should then be stopped by using a fire extinguisher, and the trouble investigated.

Note

If the engine should stop, return the mixture control handle to the "IDLE CUT-OFF" position immediately to avoid flooding the engine. If the engine is not overloaded, another start can be made, using the same procedure. In case of overloading, the next start should be attempted without priming. If still unsuccessful, turn the ignition switch "OFF" and pull the engine through by hand with the throttle in "FULL OPEN" position to clear the engine of excess fuel. If the starter should stick, it can be loosened by rocking the propeller, but be sure the ignition switch is "OFF."

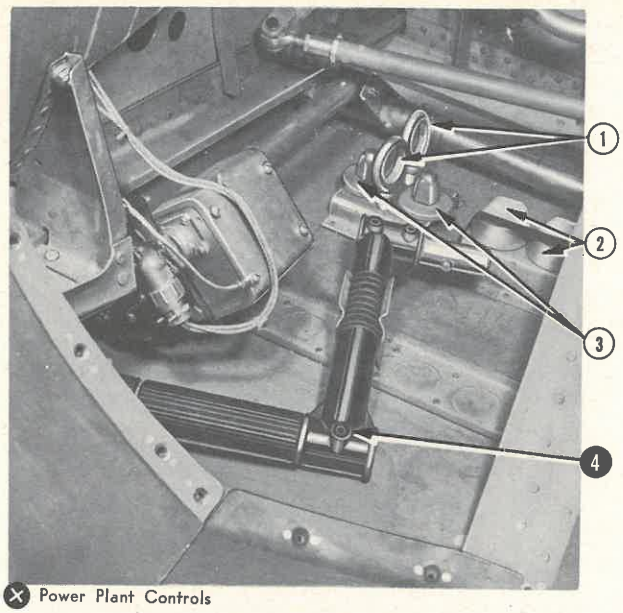
CAUTION

Engine oil pressure of 55 pounds per square inch (minimum of 15 pounds per square inch idling) must be established within 15 to 30 seconds after starting. Auxiliary stage oil pressure should be 45 pounds per square inch minimum. If these pressures are not reached, stop the engine by setting the mixture control in "IDLE CUT-OFF" and locate the trouble.

l. MANUAL STARTER OPERATION.—In manual operation of the starter, the inertia fly wheel is set in motion by turning the hand crank and then engaged by pulling a loop near the crank attachment. The crank is turned counterclockwise, and should be removed before the loop is pulled to engage the starter.

(1) LOCATION OF CRANK AND CONTROLS.

(a) CRANK STOWAGE. *(See 4, figure 26.)*—The starter crank is stowed in a compartment near the trailing edge of the right-hand wing fillet. The crank is held in place by a clip, and may be reached through an access door in the wing fillet.



Power Plant Controls

1. Eyebolts*
2. Jack Sockets*
3. Wing Jack Pads*
4. Starter Crank

*Tool Stowage, P-63A-7

Figure 26—Manual Starting Crank and Tool Stowage

(b) CRANK ATTACHMENT. *(See 2, figure 27.)*—The crank is inserted in a socket on a gear box in the right-hand side of the fuselage, just below the triangular engine cowling. This compartment is accessible through a door in the fuselage skin.

(c) STARTER ENGAGEMENT CABLE. *(See 3, figure 27.)*—In manual operation, the starter is engaged by pulling a cable loop or ring at the end of the cable and just forward of the crank connection.

(d) STARTER BRUSH CONTROL. *(See 1, figure 27.)*—The starter system includes a mechanism for lifting the starter brushes to prevent brush friction and damage while the starter is being manually operated. This mechanism is controlled by a handle at the top of the crank compartment.

(2) PROCEDURE.—To start the engine by means of the manual starting system, follow the same procedure outlined in section II, paragraphs 4., *a.* to 4., *k.* inclusive, but use the crank to energize the inertia fly wheel and the manual engagement cable to engage the starter when the fly wheel has been cranked up to its maximum rpm. Observe the following precautions:

(a) Lift the starter brushes by operating the control handle. (See 1, figure 27.)

(b) Remove the starter crank before pulling the loop to engage the starter.

(c) After the engine has been started, set the brushes in their normal position by means of the control handle.

5. WARM-UP AND GROUND TEST.

a. ENGINE WARM-UP.

(1) Warm up the engine between 1000 and 1400 rpm.

(2) Test oil and coolant radiator shutter switches. (See 54 and 56, figure 11.) For warm-up, it is recommended that these switches be placed in "AUTOMATIC" position until temperatures rise sufficiently for take-off.

(3) Test-operate the flaps by placing the flap control switch (12, figure 15) in the "DOWN" position until the indicator markings on the left-hand flap show that it is fully down. Then place the switch in the "UP" position until the markings are no longer visible, indicating that the flap is fully up. Return the switch to "OFF."

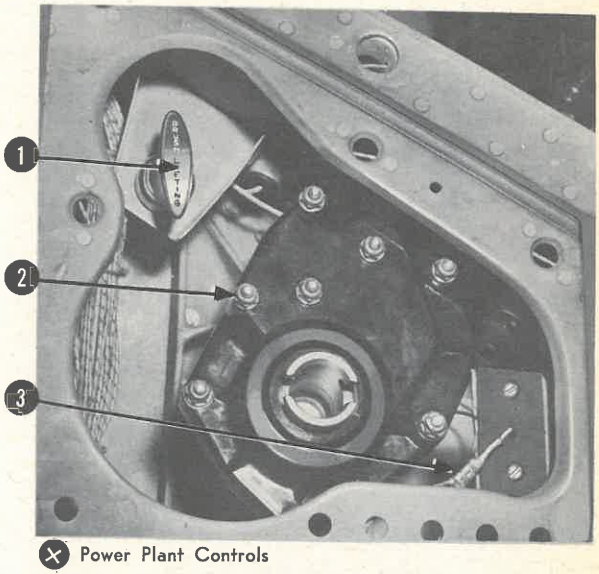
(4) Prior to take-off, the oil inlet temperature should be at least 25°C, and the coolant temperature 80°C. The oil pressure gage may fluctuate during warm-up, but this should subside as the oil temperature increases, eventually becoming practically steady. The oil shutter control switch (56, figure 11) should be placed in "AUTOMATIC" position.

(5) Allowable engine operation for take-off is as follows:

(a) Maximum rpm 3000 at sea level (using fuel Specification No. AN-F-28): Manifold pressure 54 inches *Hg* (five-minute operation only.)

Note

For instrument operating range limits, see figure 28.



Power Plant Controls

1. Brush Lifting Handle
2. Starter Crank Gear Housing
3. Starter Engagement Cable

Figure 27—Manual Starting Compartment

1. WAR EMERGENCY RATING.—Maximum rpm 3000 at sea level (using fuel Specification No. AN-F-28): Manifold pressure 61 inches on P-63A-1 through P-63A-7; Manifold pressure 75 inches on P-63A-8 and subsequent airplanes equipped with water injection). Dry war emergency ratings are allowed for five minute operation only. Wet war emergency ratings (airplanes equipped with water injection) are allowed 10 minute operation.

(b) ENGINE OIL PRESSURE.—(55 pounds per square inch minimum; 85 pounds per square inch maximum.)

(c) DESIRED OIL TEMPERATURES. — (25°C minimum; 95°C maximum; 110°C maximum —P-63A-8 and subsequent.)

(d) FUEL PRESSURE.—(Nine pounds per square inch idling; 16-18 pounds per square inch desired . Booster pumps switch on "NORMAL.")

(e) COOLANT TEMPERATURE. — (85°C minimum; 125°C maximum.)

(f) REDUCTION GEAR OIL PRESSURE.—(30 pounds per square inch minimum; 190 pounds per square inch maximum; 70 to 190 pounds per square inch desired .)

(g) CARBURETOR AIR TEMPERATURE.—(50°C maximum.)

(6) NEW ENGINES.—New engines should receive special care during the first 10 hours of operation. Do not exceed 40 inches manifold pressure and 2700 rpm during take-off for the first 10 hours. It is permissible to exceed this limit only in emergency.

b. GROUND TEST.

(1) MAGNETOS.—Prior to normal take-off, the magnetos should be checked individually at 26 to 28 inches *Hg*. This speed is recommended to avoid vibration of the four-bladed propeller. Switch from both

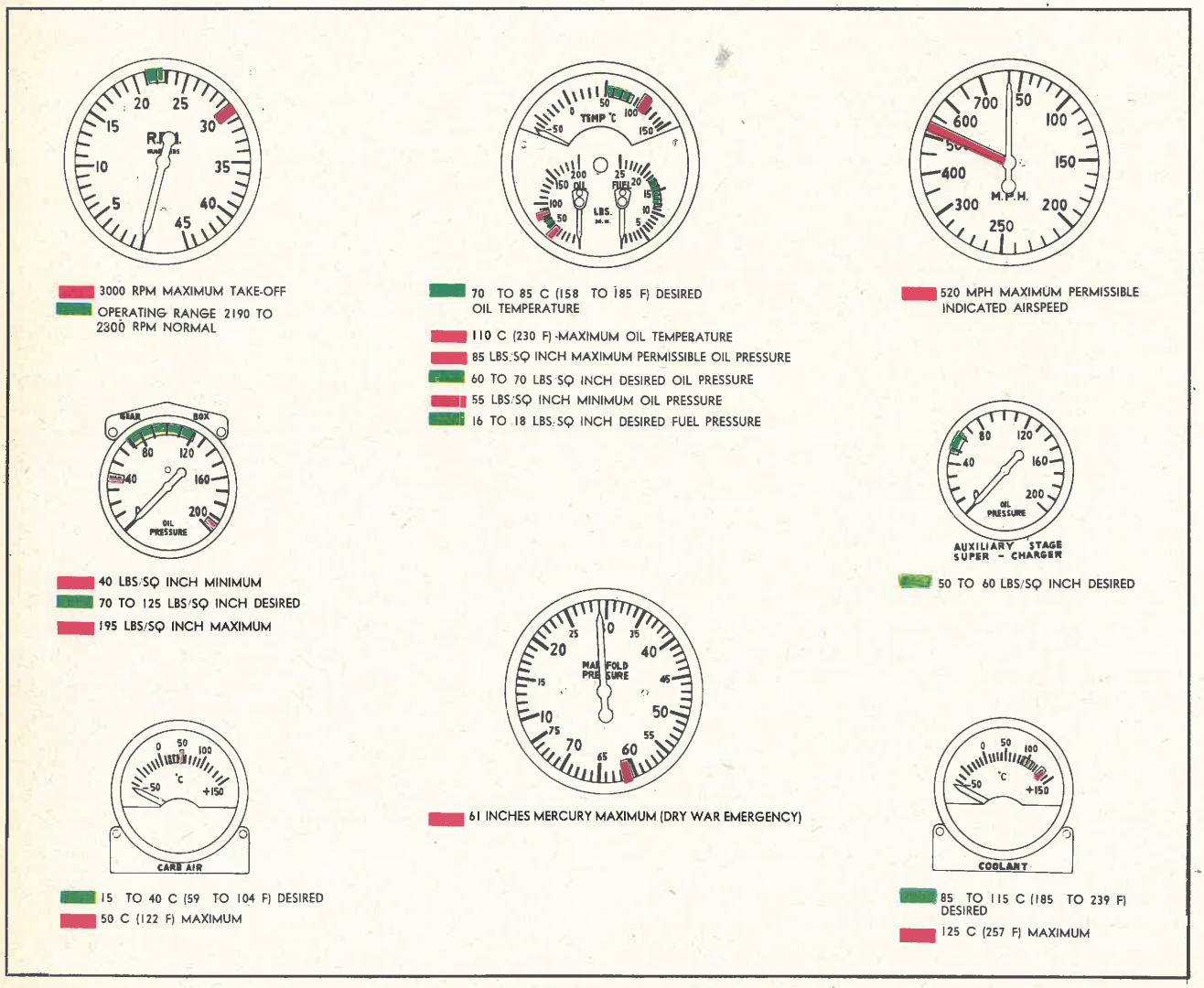


Figure 28—Instrument Limitations Diagram

to one magneto, feel and listen for engine roughness. Return to both until operation is smooth. Then switch to the other.

Note

Rpm will not drop during magneto check.

(2) PROPELLER.—Check propeller operation. (See section I, paragraph 6.)

(3) SUCTION GAGE.—Check operation of vacuum suction gage: 3.75 to 4.25 inches *Hg* desired.

(4) GENERATOR.—Check the ammeter at about 1250 rpm to see that the generator is charging properly. Ordinarily the ammeter will give a reading only with some electrical equipment in operation, or if the battery is low.

(5) GROUNDING CHECK.—The "OFF" position of the ignition switch (43, figure 11) should be checked to assure the proper connection of the ground wires. This check should be made at the end of the engine warm-up period with the engine turning at about 700 rpm. The switch should be turned to the "OFF" position momentarily to note whether or not the engine stops firing and immediately returned to the "BOTH ON" position. Two or three seconds is ample time for the switch to remain in the "OFF" position.

(6) ARTIFICIAL HORIZON.—The artificial horizon (16, figure 11), or flight indicator should be left uncaged at all times except during acrobatics or other maneuvers which exceed its operating limits of 90 degrees bank or 60 degrees climb or glide. If the horizon bar is not level after the engine is started, cage and immediately uncage the gyro at least five minutes before take-off.

c. For further data on engine warm-up, consult the Power Plant Chart in section III of this Handbook.

6. SCRAMBLE TAKE-OFF.

a. Place oil and coolant shutter switches (54, and 56, figure 11) in "AUTOMATIC" position.

b. When using oil dilution to hasten oil temperature rise and pressure drop, the following limitations are recommended:

(1) Depress the oil dilution switch (28, figure 11) only long enough to bring oil pressure from extremely high to normal — i.e., from approximately 90-100 pounds per square inch to 80 pounds per square inch. Never allow the dilution to continue after a minimum of 40 pounds per square inch has been reached, as over-dilution is likely to result from diluting the oil in a cold engine. If dilution is necessary during warm-up, oil pressure should be carefully watched during the remainder of warm-up and take-off to insure that over-dilution has not occurred.

CAUTION

Do not take off until oil temperature reaches 25°C minimum, and oil pressure reaches 55 pounds per square inch minimum, or 85 pounds per square inch maximum.

7. TAXIING INSTRUCTIONS.

a. Release the parking brake by depressing both brake pedals.

b. From a standing start it is not possible to start a sharp turn in one direction if the airplane has been stopped with the nose wheel pointed in the opposite direction. Get the airplane moving and then apply brakes in the direction of the desired turn.

c. The airplane rolls easily along the ground, and visibility from the cabin is good. Taxi slowly so as to avoid excessive use of the brakes. It is recommended that the stick be held forward when running up the engine.

d. Clear the engine by a burst of throttle and taxi down the runway for take-off position. It is recommended that oil and coolant shutters be left in "AUTOMATIC."

8. TAKE-OFF.

a. NORMAL TAKE-OFF.

Note

For data on take-off, consult the Take-Off, Climb, and Landing chart, appendix I of this Handbook.

(1) DOORS.—Both cabin doors must be tightly closed and the auxiliary latch (figure 23) above each door securely fastened. These latches prevent the doors from opening at high speeds. In case of emergency, the cabin doors can be immediately released by rotating the emergency release handles (9, figure 12) 90 degrees.

(2) TRIM TABS.—It is recommended that trim tabs be set for take-off as follows:

(a) RUDDER TRIM TAB. *(See 9, figure 15.)* —Four graduations RIGHT RUDDER.

(b) ELEVATOR TRIM TAB. *(See 10, figure 15.)*—Three or four graduations NOSE UP, depending on the load.

(3) IGNITION.—Be sure the ignition switch (43, figure 11) is turned to "BOTH."

(4) MIXTURE CONTROL.—Set mixture control (4, figure 4) at "AUTO. RICH."

(5) Clear the engine by running it up with the brakes set prior to take-off if the engine has been kept running at slow speeds for any length of time.

(6) Make sure that the shoulder harness (6, figure 13) is locked back.

(7) Release brakes.

(8) Slowly advance the throttle lever (1, figure 4), holding right rudder as necessary to maintain course. Because of the tricycle landing gear, it is good practice to ease the airplane from the ground when the indicated airspeed is approximately 95-100 mph IAS.

CAUTION

Do not drag the right brake during take-off. The high engine output during take-off may cause a severe left yaw if the throttle is fully opened before sufficient airspeed is attained to provide rudder control. Therefore, gradual throttle opening and use of right rudder will hold airplane on course. If brake is dragged, it will probably overheat, the discs will seize and a locked brake landing will result.

(9) After reasonable altitude has been gained, and at an airspeed not over 180 mph, turn the landing gear switch (2, figure 11) to "UP," raising the landing gear. Warning lights (4 and 5, figure 11) will go out when the wheels are fully retracted. Return switch to "OFF" position.

(10) Throttle down to a manifold pressure of about 43.2 inches *Hg*, reducing the engine speed to about 2600 rpm.

b. MINIMUM RUN TAKE-OFF.—The minimum run take-off for the P-63A airplane is completely mechanical. Recommended procedure is as follows:

(1) Run the airplane up to 40 inches *Hg*, manifold pressure with the brakes set.

(2) Set the flaps to the halfway extended position.

(3) Release the parking brakes, and increase the manifold pressure to 54 inches for the take-off run.

(4) Keep the tail up for the take-off run.

9. ENGINE FAILURE DURING TAKE-OFF.

If the engine fails on the take-off, immediately get the airplane into a glide at a minimum speed of 120 mph. Raise the landing gear if the ground is not level ahead and fully lower the flaps. Drop auxiliary tanks (if installed), turn fuel supply (2, figure 15) "OFF," turn ignition (43, figure 11) and battery (42, figure 11) switches "OFF," and land in the nearest clear area.

WARNING

Always drop the auxiliary tanks or bombs before a forced landing. In this emergency, do not arm the bombs before dropping them.

10. CLIMB.

For climb data, refer to the Power Plant Chart in section III, and the Take-off, Climb, and Landing Chart in appendix I. Best climbing speeds for P-63A airplanes are as follows:

Altitude	*IAS (MPH)*
Sea Level	165
10,000 feet	165
15,000 feet	160
20,000 feet	155
25,000 feet	150
30,000 feet	145
35,000 feet	140
40,000 feet	135

11. GENERAL FLYING CHARACTERISTICS.

The general flying characteristics of the P-63A airplanes are excellent. The airplane responds rapidly to the ailerons at all speeds, and there is no flat spot or tendency for the ailerons to over-balance at low speeds. Very little change in elevator trim is necessary for change in speed. The rudder requires a certain amount of trimming for changes in power and speed. Minimum gliding speeds are 120 mph IAS power off; or 110 mph IAS power on, for safe control. At speeds lower than these, the airplane settles quite rapidly. Complete data for flight operation is found in the Flight Operation Instruction Charts, appendix I, and in the Power Plant Chart in section III of this Handbook.

a. GAGES.—In flight, the following gages and their respective readings give the most satisfactory indication of the engine's performance:

Note

Instrument limitations are shown on figure 28.

(1) ENGINE OIL PRESSURE.—(55 pounds per square inch minimum; 60 to 70 pounds per square inch desired; 85 pounds per square inch maximum.)

(2) AUXILIARY STAGE SUPERCHARGER OIL PRESSURE.—(45 pounds per square inch minimum; 65 pounds per square inch maximum.)

(3) OIL TEMPERATURE.—(25°C minimum; 70° to 85°C desired; 110°C maximum.)

(4) COOLANT TEMPERATURE.

(a) 2600 RPM AND BELOW.—(85°C minimum; 105°C desired; 110°C maximum; shutters in manual selection.)

(b) ABOVE 2600 RPM.—(100°C minimum; 121°C desired; 125°C maximum; shutters in manual selection, unless in combat. Then shutters should be in "AUTOMATIC.")

b. ALLOWABLE ENGINE OPERATION.

(1) MILITARY POWER (Fifteen-minute operation only).—Throttle against stop should give:

(a) 54 inches *Hg* manifold pressure to 12,000 feet *(b)* 53 inches *Hg* manifold pressure to 18,000 feet *(c)* 52 inches *Hg* manifold pressure to 20,000 feet *(d)* 50 inches *Hg* manifold pressure to 24,000 feet	Must use 3000 rpm

(2) WAR EMERGENCY.—Full throttle: 61 inches *Hg* manifold pressure — dry war emergency, 5-minute operation only; 75 inches *Hg* manifold pressure—wet war emergency, P-63A-8 and subsequent, 10-minute operation only.

Note

If oil dilution has been used, it is desirable that the engine be given 10 to 15 minutes operation at 80 per cent normal to military power prior to using war emergency power.

(3) NORMAL RATED (Maximum continuous) RPM-2600.

(4) MAXIMUM CRUISE RPM-2300.

(5) DIVING MAXIMUM RPM.—3120.

c. CHANGING THE CONDITION OF POWER.

(1) INCREASING ENGINE POWER.

(a) Adjust mixture control (4, figure 4) to obtain the mixture setting specified for the power desired.

(b) Adjust throttle control (1, figure 4) to obtain the desired manifold pressure and rpm.

(c) Readjust mixture control if necessary.

(2) DECREASING ENGINE POWER.

(a) Adjust throttle control to obtain the desired manifold pressure.

(b) Readjust the mixture control to obtain the desired mixture setting.

(3) Above desired cruising manifold pressure and rpm, the mixture control lever shall be set at "AUTO. RICH."

(4) At or below desired cruising manifold pressure and rpm, the mixture may be set at "AUTO. LEAN" if fuel economy is important.

(5) When operating at "AUTO. LEAN," the setting should be changed to "AUTO. RICH" immediately before an appreciable change in engine operating conditions is made.

(6) Always reduce manifold pressure first, and then rpm. Move throttle control slowly.

d. GENERAL RESTRICTIONS WHEN CARRYING AUXILIARY FUEL LOAD.

(1) Observe the following speeds with the 175 US (145.8 Imperial) gallon belly tank:

Minimum cruising	175 mph IAS
Minimum for turning near the ground	150 mph IAS
Maximum—any altitude	300 mph IAS

(2) Do not exceed 250 mph IAS with external wing tanks installed. Drop wing tanks below 210 mph IAS.

12. STALLS.

The stalling characteristics of the P-63A airplanes are normal. The airplane will "mush" at stalling speeds, but will not fall immediately into a spin; the effectiveness of the ailerons is entirely adequate at or below stalling speeds. The airplane will stall at the following speeds:

Approximate Gross Weight	Wheels and Flaps Up	Wheels and Flaps Down
8000 Pounds	96 mph IAS	88 mph IAS
8700 Pounds	100 mph IAS	92 mph IAS
9500 Pounds	105 mph IAS	96 mph IAS

13. SPINS.

Five-turn spins have been satisfactorily demonstrated on the airplane; both the right- and left-hand spin oscillate violently and recovery is prompt. Entry to a right-hand spin is considerably more difficult than a left-hand spin, and recovery takes more time. During the spin, a rudder buffeting is felt to a considerable extent and once during each oscillation a force is felt on the elevator and on the rudder, tending to throw them against the spin.

a. SPIN RECOVERY PROCEDURE.

(1) From a steady spin condition, power off, with pro spin controls (rudder full with spin, elevator full up, aileron neutral), apply full rudder and full ailerons against the spin simultaneously. Approximately one-half turn later, move the stick briskly to the full forward position, maintaining the ailerons and rudder full against the spin.

(2) The foregoing recovery is recommended regardless of wing guns or loading conditions.

14. PERMISSIBLE ACROBATICS.

The P-63A airplane will perform normal loops, slow rolls, immelmanns, chandelles and vertical reversements with ease.

CAUTION

Always cage gyro instruments before acrobatics. Gyro instruments will be uncaged at all other times.

15. DIVING.

a. Dive tests have been conducted on the P-63A airplanes. The airplanes will satisfactorily withstand an 8 "G" pullout. The airplane has a tendency to roll during high speed pullouts, particularly at high altitudes. The application of opposite aileron is not immediately effective. When the aileron does take effect, the airplane will roll in the opposite direction and a wallowing will result. To correct this tendency, push forward on the stick to relieve the "G's." This tendency to roll and hunt will not be alarming if the limiting speeds given in the following paragraph are adhered to. High speed stalls may result in a half snap roll. Therefore, high speed stalls should be avoided in any situation where a snap roll would be dangerous.

b. Safe indicated diving speeds must be limited as altitude is increased as follows:

Altitude Feet	*Dive Speed (MPH)*
Sea Level	525
Sea Level to 10,000	500
10,000 to 15,000	450
15,000 to 20,000	400
20,000 to 25,000	350
25,000 to 30,000	300
30,000 to 35,000	250

16. NIGHT FLYING.

a. FLUORESCENT LIGHTS.—The two fluorescent lights (5 and 6, figure 12) are mounted in snap-in brackets so that they may be removed and used as hand-held cabin lights. Operation of the lights is as follows:

(1) Adjust the rheostats on the right- and left-hand instrument panels. (See 29 and 39, figure 11.)

(a) To turn the fluorescent light on, turn the "START" position on the dial and release the knob. Then when the lighting element has heated sufficiently to light, the knob will automatically snap back to the "ON" position, and the light will be full on.

(b) To reduce intensity of the light, turn the knob counterclockwise toward the "OFF" position; to increase light intensity, turn the knob clockwise toward the "ON" position.

(c) To turn fluorescent light off, turn the rheostat to the "OFF" position.

(2) For visible light for map reading, etc., shutters on the light should be full open. (See figure 29.)

(3) For fluorescent light (invisible) to irradiate instruments, rotate the knurled rim on the light until the shutters are closed. (See figure 29.)

Note

Properly set for this position (irradiation of instruments) the instrument panel and the instrument faces are not lighted. Only the markings (figures, hands, pointers, knobs, etc.) will be lighted.

b. WARNING LIGHTS.—The various warning lights on the instrument panel, fuel level and landing gear, can be dimmed if desired. Intensity of the light is adjusted by turning the knurled rim around each light—clockwise for bright; counterclockwise to dim.

c. SIGNAL LIGHT.

(1) P-63A-1 THROUGH P-63A-9.—The signal light is clipped to the right-hand cabin door, just below the glass. (See figure 7.)

(2) P-63A-10.—The signal light is clipped to the forward side of the turn-over beam, left-hand side of the pilot's seat.

d. RECOGNITION LIGHTS. (P-63A-10).—The control box for the recognition lights is located on the cabin floor at the right of the pilot's seat. (See 5, figure 13.)

17. APPROACH AND LANDING.

a. APPROACH.

(1) Turn fuel selector valve control (2, figure 15) to "R & L MAIN" (both) tanks.

(2) Move mixture control (4, figure 4) to "AUTO. RICH."

(3) Lower the landing gear at a speed not over 180 mph IAS. The landing gear warning lights, (4 and 5, figure 11) will go out when the wheels are fully extended. Return switch (2, figure 11) to "OFF" when operation is completed.

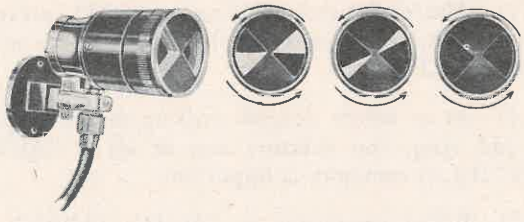


Figure 29—Fluorescent Light Shutters

(4) Lower the flaps to full down or as desired at a speed not over 180 mph IAS.

(5) Return flap switch (12, figure 15) to "OFF" position.

(6) A normal landing approach is a glide. The airplane has a fairly flat gliding angle. Some movement of the elevators is required to maintain the usual landing attitude. Recommended approach speed is 120 mph IAS power off; or 110 mph IAS power on, flaps extended. Approach speed with flaps not extended is approximately 10 mph faster than speed with flaps extended.

b. LANDING.

(1) Bring the control stick back enough to hold the nose wheel off the ground until the speed has been considerably reduced. DO NOT APPLY THE BRAKES UNTIL THE NOSE WHEEL IS ON THE GROUND.

(2) Do not lock or apply the brakes continuously, but alternately apply and release them to prevent excessive tire wear and overheating.

(3) Retract the flaps while standing at the end of the landing run.

(4) While taxiing to the hangar, watch oil and coolant temperatures.

c. CROSS-WIND LANDING.—In making a cross-wind landing, either the crab or wing-low type of landing may be made, as in the case with conventional type landing gear.

d. MINIMUM RUN LANDING.—Because of the tricycle landing gear there is no danger of nose-over during the landing of the P-63 airplanes. Approach the landing at minimum landing speed (110 mph IAS), using full flaps, and apply brakes according to the amount of run available.

e. EMERGENCY TAKE-OFF IF LANDING IS NOT COMPLETED.—In the event it is found necessary to interrupt the glide to make another landing approach, simply push the throttle (1, figure 4) ahead. The rpm will be automatically controlled.

18. STOPPING THE ENGINE.

a. OIL DILUTION.—When ground temperatures below 10°F (−12.2°C) are anticipated, dilution of the oil will be necessary to insure free crankability of the engine prior to starting. To prevent excessive loss of oil from the crankcase breathers, and to insure that the engine is not starved for oil when starting, it is imperative that the following be adhered to *strictly*.

(1) OIL DILUTION PROCEDURE.

(a) DO NOT DILUTE with oil temperatures above 50°C.

(b) Operate the engine at between 1000 and 1200 rpm.

Note

"P-63A-10 only" Temp.-30 to -10 dilute 3 min. total. Temp.-10 to -60 dilute 7 min. total. Dilute in two separate periods to obtain total.

(c) If anticipated ground temperature is between 10°F (−12.2°C) and −10°F (−23.°C) (prior to the next take-off), hold the oil dilution switch on for one minute, stop the engine, and service the oil tank.

(d) If anticipated ground temperature is between −10°F (−23.3°C) and −30°F (−34.4°C), hold the oil dilution switch on for one minute, stop the engine, service the engine oil tank, and dilute an additional one minute with the engine running.

(e) If anticipated ground temperature is between −30°F (−34.4°C) and −68°F (−51°C), hold the oil dilution switch on for one and one-half minutes, stop the engine, service the engine oil tank, and dilute an additional one and one-half minutes with the engine running.

(2) Before attempting to start the engine, determine that the engine will start easily by pulling the propeller through by hand. When the engine is stiff, apply heat by means of D-1 or F-1 ground heaters through the external heat access doors, in the bottom of the fuselage at the rear of the engine, and in the propeller reduction gear box cowling. (See figure 44.) After heat has been applied, check the drain to determine that oil will flow freely through the engine. If the oil does not flow freely, continue the application of heat.

(3) Take-offs may be made five minutes after starting the engine if there has been sufficient oil temperature rise (40°C minimum) to enable the engine oil pressure to stabilize at its normal operating pressure and the engine runs smoothly; or the take-off may be made as soon after five minutes as these operating conditions are obtained.

b. If oil dilution is not necessary, set the mixture control lever (4, figure 4) in the "IDLE CUT-OFF" position, and at the same time move the throttle lever (1, figure 4) to the "FULL OPEN" position.

c. When the propeller ceases to revolve, turn the ignition switch (43, figure 11) "OFF."

19. BEFORE LEAVING THE PILOT'S COMPARTMENT.

a. It is advisable to lower the flaps fully when parking the airplane. This is to prevent damage to the

flaps by ground personnel who might mistake them for the trailing edge of the wing.

b. Place all light switches, pitot heater switch, battery switch, fuel selector valve control, etc., in "OFF" position. (See figure 11.)

c. Set parking brakes.

d. Set control lock: Pull throttle lever (1, figure 4) back, push lock lever forward, work control stick (11, figure 12) in neutral position until locking click is heard, and work rudder pedals (2, figure 14) in neutral position until locking click is heard.

e. Unlock auxiliary door latches (figure 23) prior to opening cabin doors.

f. Turn fuel selector valve control (2, figure 15) handle to the "OFF" position.

20. MOORING.

a. MOORING POINTS.—Mooring points on the airplane are located as follows:

(1) Two tie-down rings are attached to the upper aft side of each main wheel strut to which mooring ropes or cables may be attached. (See figure 30.)

(2) A mooring line may be run through the hollow axle of the nose wheel.

(3) If necessary, mooring lines can be passed through the aft hoist tube holes. Some slack should be allowed in these lines.

b. MOORING KIT.—The mooring kit is located on the aft cabin deck.

Note

Arrows for the kit are expendable, and should be replaced upon return to the home base. The remaining items also are expendable, but recoverable.

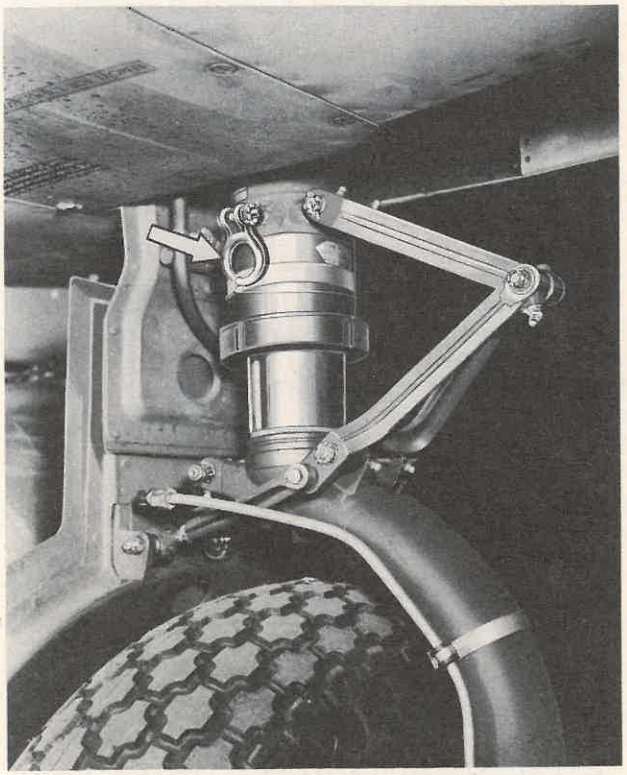


Figure 30—Tie-Down Rings

SECTION III
OPERATING DATA

1. AIRSPEED LIMITATIONS.

a. DIVING.—Maximum permissible dive speeds for a clean airplane is 525 mph IAS. (See section II, paragraph 15.) Maximum permissible diving rpm is 3120 for the V-1710-93 engine.

b. Landing gear and flaps should not be lowered above 180 mph IAS.

2. POWER PLANT CHART.

A self-explanatory Power Plant Chart will be found in this section, outlining engine operating limits, fuel flow, oil consumption, temperature and pressure limits, and other pertinent data.

3. WAR EMERGENCY RATINGS.

The basis for establishing war emergency ratings in appendix I has been given to make available to a pilot in combat the absolute maximum power which can be taken, with reasonable safety limits, from the V-1710-93 engine for a short period under emergency conditions. This period is five minutes on the P-63A-1 airplanes through P-63A-7 airplanes; and 10 minutes on the P-63A-8 and subsequent airplanes (equipped with water injection). These ratings are considerably in excess of the ratings given in the engine specification under which the engines were delivered, and the use of the ratings will appreciably decrease the service life and time obtained between overhauls, over the time obtained when engines have been operated in compliance with the operating limits previously specified. Emergency rating operation should, therefore, be held for use only where emergency conditions exist.

4. AIRSPEED CORRECTION TABLE.

In order to obtain the flight duration, pilot's indicated airspeed must be converted to true airspeed divided into the air miles to be flown. True airspeed may be obtained by correcting the pilot's indicated airspeed for position error to obtain an approximate calibrated indicated airspeed. The following table shows the approximate true airspeed corresponding to pilot's indicated airspeed on P-63A series airplanes:

AIRSPEED INSTALLATION CORRECTION TABLE

I. A. S.	CORRECTION
FLAPS RETRACTED	
100 MPH	SUBTRACT 2 MPH
150 MPH	SUBTRACT 5 MPH
200 MPH	SUBTRACT 8 MPH
250 MPH	SUBTRACT 11 MPH
300 MPH	SUBTRACT 14 MPH
350 MPH	SUBTRACT 17 MPH
400 MPH	SUBTRACT 21 MPH
FLAPS EXTENDED	
90 MPH	SUBTRACT 2 MPH
100 MPH	SUBTRACT 3 MPH
110 MPH	SUBTRACT 4 MPH
120 MPH	SUBTRACT 5 MPH
130 MPH	SUBTRACT 6 MPH
150 MPH	SUBTRACT 7 MPH

POWER PLANT CHART

SYNCHRONIZED PROPELLER CONTROL

AIRCRAFT MODEL(S)	PROPELLER(S)	ENGINE MODEL(S)
P-63A-1-BE thru P-63A-10-BE	Aero Products A-20-156	V-1710-93

GAUGE READING	FUEL PRESS.	OIL PRESS.	OIL °C TEMP.	COOLANT °C TEMP.	Aux. St. Oil Pr.	OIL(1) CONS.
DESIRED MAXIMUM	16-18 19	60-70 85	70-85 110	105-121 125	50-60 65	5 Normal 14 Max.
MINIMUM IDLING	14 9	55 15				

MAXIMUM PERMISSABLE DIVING RPM: 3120
MINIMUM RECOMMENDED CRUISE RPM: 1800
MAXIMUM RECOMMENDED TURBO RPM:

OIL GRADE: (S) 1120 (W) 1100
FUEL GRADE: 100/130 Spec. AN-F-28

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 MAX. CYL. HD. TEMP.			UNLIMITED			UNLIMITED		
Auto-Rich 3000			Auto-Rich 3000			MIXTURE R. P. M.			Auto-Rich 2600			Auto-Lean 2300		
MANIF. PRESS.	SUPER-CHARGER	FUEL(2) Gal/Min	MANIF. PRESS.	SUPER-CHARGER	FUEL(2) Gal/Min	STD. TEMP. °C	PRESSURE ALTITUDE	STD. TEMP. °F	MANIF. PRESS.	SUPER-CHARGER	FUEL GPH(3)	MANIF. PRESS.	SUPER-CHARGER	FUEL GPH(3)
			F.T.		1.0	-55.0	40,000 FT.	-67.0	F.T.		34	F.T.		27
			F.T.		1.0	-55.0	38,000 FT.	-67.0	F.T.		40	F.T.		30
			F.T.		1.0	-55.0	36,000 FT.	-67.0	F.T.		46	F.T.		33
			F.T.		1.5	-52.4	34,000 FT.	-62.3	F.T.		52	F.T.		36
			F.T.		1.5	-48.4	32,000 FT.	-55.1	F.T.		57	F.T.		40
			F.T.		1.5	-44.4	30,000 FT.	-48.0	F.T.		63	F.T.		43
			F.T.		2.0	-40.5	28,000 FT.	-40.9	F.T.		69	F.T.		46
			F.T.		2.0	-36.5	26,000 FT.	-33.7	F.T.		78	F.T.		50
			F.T.		2.5	-32.5	24,000 FT.	-26.5	38.0		90	F.T.		54
F.T.		2.5	F.T.		2.5	-28.6	22,000 FT.	-19.4	38.0		92	F.T.		56
F.T.		2.5	F.T.		2.5	-24.6	20,000 FT.	-12.3	38.0		92	34.5		59
F.T.		2.5	F.T.		2.5	-20.7	18,000 FT.	- 5.2	38.0		92	34.5		59
F.T.		3.0	F.T.		2.5	-16.7	16,000 FT.	2.0	38.0		92	34.5		59
F.T.		3.0	F.T.		2.5	-12.7	14,000 FT.	9.1	38.0		92	34.5		59
F.T.		3.0	F.T.		2.5	- 8.8	12,000 FT.	16.2	38.0		92	34.5		59
F.T.		3.0	54.0		2.5	- 4.8	10,000 FT.	23.4	38.0		92	34.5		58
F.T.		3.0	54.0		2.5	- 0.8	8,000 FT.	30.5	38.0		91	34.5		58
F.T.		3.0	54.0		2.5	3.1	6,000 FT.	37.6	38.0		91	34.5		58
61.0		3.0	54.0		2.5	7.1	4,000 FT.	44.7	38.0		91	34.5		58
61.0		3.0	54.0		2.5	11.0	2,000 FT.	51.8	38.0		91	34.5		58
61.0		3.0	54.0		2.5	15.0	SEA LEVEL	59.0	38.0		91	34.5		57

GENERAL NOTES

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

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

TAKE-OFF CONDITIONS:
3000 RPM, 54.0" Hg. M.P.

CONDITIONS TO AVOID:

SPECIAL NOTES

Supercharger Type: Two stage with Hydraulic Coupling Drive for Auxiliary Stage Automatically Controlled—8.1:1 Eng. Stage, 6.85:1 Aux. Stage.

AAFMC-526
4-1-44

DATA AS OF 8-21-44 BASED ON Tests

SECTION IV
EMERGENCY OPERATING INSTRUCTIONS

1. IN CASE OF FIRE IN THE AIR.

In case of fire, turn off fuel selector valve (2, figure 15), battery switch (42, figure 11), and ignition switch (43, figure 11). Place mixture control (4, figure 4), in "IDLE CUT-OFF" position; close throttle. (See 1, figure 4.) Attempt to extinguish flames by diving the airplane. If the fire is put out, make a dead stick landing rather than turning on fuel again, since the latter procedure might re-start the fire. If impossible to extinguish the flames by diving, skidding or slipping, and if impossible to make an immediate landing, fly the airplane to a safe altitude and away from populated districts and continue attempts to extinguish flames as long as practical. If still unsuccessful, abandon the airplane. It is extremely dangerous to attempt to land a badly flaming airplane of this design, since the aft fuselage may burn away during the final stages and cause the airplane to fall out of control at low altitude. A considerable amount of individual judgment is necessary in such cases.

2. ENGINE FAILURE DURING TAKE-OFF.

If the engine fails on the take-off, immediately get the airplane into a glide at a minimum speed of 120 mph IAS. Raise the landing gear if the ground ahead is not level and fully lower the flaps. Then turn ignition switch (43, figure 11), battery switch (42, figure 11), and fuel selector valve (2, figure 15) "OFF;" drop auxiliary tanks or bombs; and land in the nearest clear area.

WARNING

Always drop auxiliary tanks or bombs before a forced landing. In this emergency, do not arm bombs before dropping them, as altitude may not allow sufficient time to escape the explosion.

3. ENGINE FAILURE DURING FLIGHT.

a. Should the engine fail during flight, the altitude at which the airplane is flying will greatly determine the action of the pilot. If altitude is sufficient, switch to available fuel tanks in succession and try to pick up fuel. Check ignition switch (43, figure 11) to see that it has not been turned off. Check mixture lever. (See 4, figure 4.) If the engine fails to start after these measures have been attempted, drop auxiliary tanks or bombs, turn ignition switch (43, figure 11), battery switch (42, figure 11) and fuel selector valve (2, figure 15) "OFF," and secure harness before landing.

b. If flying at a sufficiently high altitude, proceed as follows:

(1) Judging from the landscape, determine the best place to land and put the nose of the airplane down sufficiently to maintain a gliding speed of 120 mph to reach the point where the landing is to be made. (The minimum glide speed for the airplane is 110 mph IAS.) The pilot must decide whether or not it is advisable to lower the landing gear.

(2) If the field is rough or soft, leave the landing gear retracted. If the field is smooth and hard, extend the landing gear. If in doubt, leave the gear retracted. Use full flaps and land in the largest clear area. Drop auxiliary tanks or bombs, fasten shoulder harness, and turn battery switch (42, figure 11), ignition switch (43, figure 11) and fuel control (2, figure 15) "OFF," before landing.

c. If the airplane is flying at rather low altitude, it is recommended that the pilot proceed as follows:

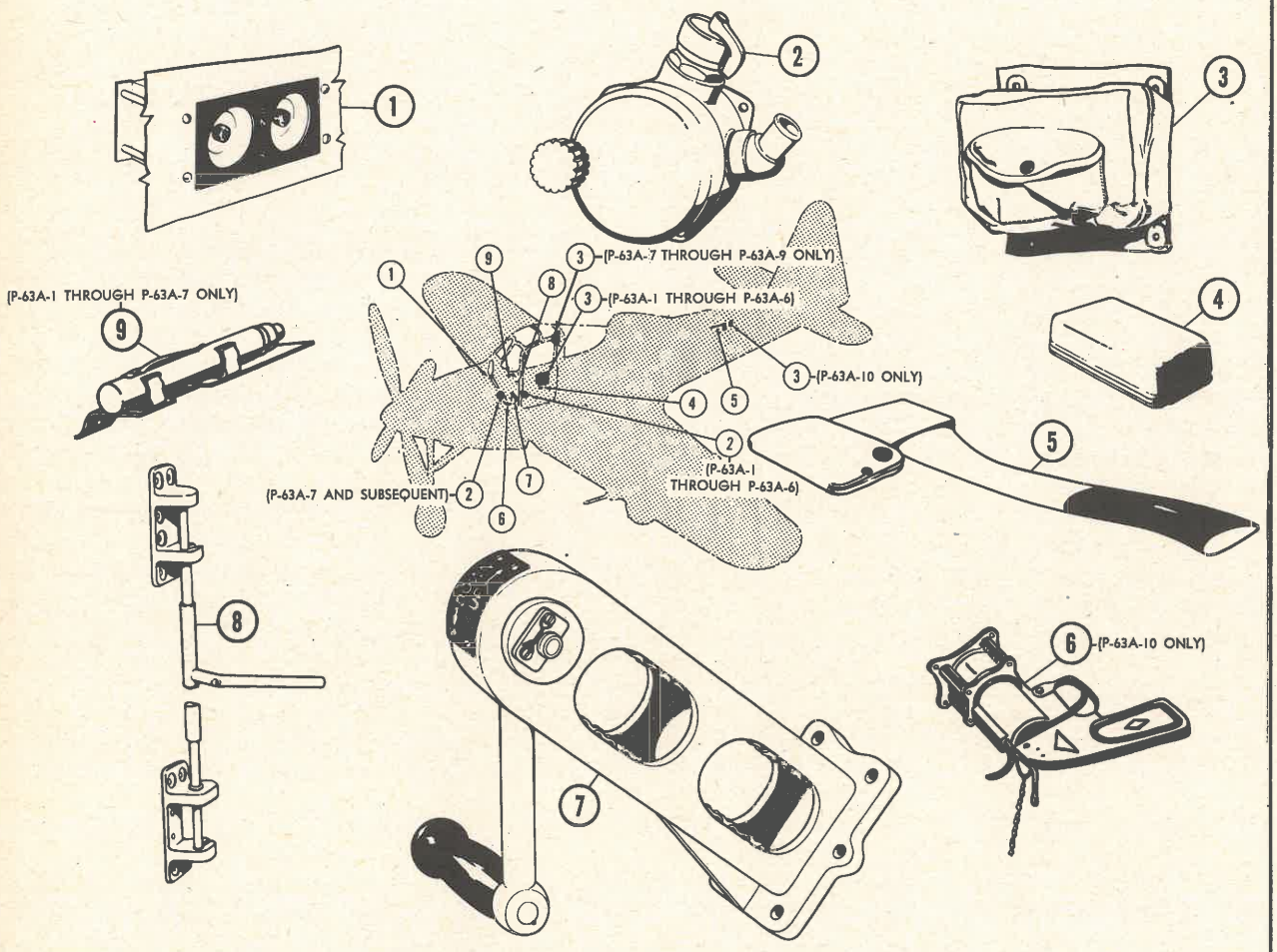
(1) Turn the ignition switch (43, figure 11), battery switch (42, figure 11), and fuel selector valve (2, figure 15) "OFF." Drop auxiliary tanks or bombs. Secure shoulder harness. (See 6, figure 13.) Leave the landing gear retracted, and keep the nose of the airplan down to help maintain flying speed. As the airplane nears the ground, it is advisable to lower the flaps and land with as high an angle of attack as possible (tail down).

4. SPIN RECOVERY.

a. The recommended spin recovery procedure for P-63 type aircraft is as follows:

(1) From a steady spin condition, power off, with pro spin controls (rudder full with spin, elevator full up, aileron neutral), apply full rudder and full ailerons against the spin simultaneously. Approximately one-half turn later, move the stick briskly to the full forward position, maintaining the ailerons and rudder full against the spin.

(2) The foregoing recovery is recommended regardless of wing guns or loading conditions.



1. Radio Detonator Buttons
2. Oxygen A-12 Demand Regulator
3. First Aid Kit
4. Spare Lamps Box
5. Hand Axe
6. Pyrotechnic Pistol (P-63A-10)
7. Landing Gear Emergency Hand Crank
8. Emergency Door Release Lever
9. Flash Light (P-63A-1 Through P-63A-7)

Figure 31—Emergency Equipment Diagram

5. EMERGENCY EXIT.

a. Trim the airplane nose heavy and turn the ignition and battery switches "OFF." (See 43, and 42, figure 11.) Bank slightly toward the door that is be the exit (right-hand door is recommended, since there are no obstructions on that side). Pull up almost to a stall before bailing out. Pull the emergency release lever (9, figure 12) and push out on the door; slide off wing. (The emergency door release levers are located forward of each cabin door. The door is released when the lever is pulled back approximately 90 degrees.) For emergency exits during spins, the door on the outer periphery of the spin should be used inasmuch as the air flow on that side will lend more assistance in releasing it.

b. In case an emergency necessitates alighting on water, (ditching), retract the landing gear, extend flaps, drop bombs or auxiliary tanks, lock harness back, release the parachute harness, and RELEASE BOTH DOORS PRIOR TO HITTING THE WATER.

6. EMERGENCY OPERATION OF THE LANDING GEAR.

a. A hand crank for raising or lowering the landing gear manually in an emergency is located at the right-hand side of the pilot's seat. (See 8, figure 15.) Turning the crank *forward* lowers the wheels; turning the crank *aft* raises the wheels. A small ratchet lever on the hub of the crank (7, figure 15) controls the direction of turn as follows:

(1) With the crank handle down, and the ratchet lever *forward,* the crank will engage by turning aft, raising the wheels.

(2) With the crank handle down, and the ratchet lever *aft,* the crank will engage by turning forward, lowering the wheels.

b. Operation of the crank is as follows:

(1) Turn landing gear switch (2, figure 11) to the "OFF" position.

(2) Place the ratchet lever (7, figure 15) in the desired position.

(3) Turn the crank handle (10, figure 13) in the desired direction for raising or lowering the wheels.

(4) Turn the hand crank at least 1/4 revolution in the opposite direction to the turn used for operation (do not change ratchet position), and secure the handle to the clip on the housing.

WARNING

Failure to "back off" the hand crank 1/4 turn may cause the handle to spin vigorously upon electrical operation, which might inflict injury should the handle strike the pilot's hand.

c. In case the landing gear should jam during retraction or extension, and the electrical system is operative, do not immediately attempt to use manual operation to force further travel; wait a few moments for the landing gear motor to cool and try electrical operation a second time. The force exerted by the motor on the retracting mechanism has been found to be greater than is possible by manual operation.

Note

One-quarter revolution of the landing gear hand crank is necessary before the crank drive rod engages the retracting mechanism. Therefore, recommended use of the crank is to turn in complete continuous revolutions of the handle, rather than short, half-turns, since half of the motion in this operation is lost.

7. CLEARING CASE JAM (Cannon).

a. In case the cannon should become jammed, proceed as follows:

(1) Pull charging handle (17, figure 11), taking up slack.

(2) Pull approximately four inches more.

(3) Release handle. Cannon is ready to fire if there is no slack.

8. OXYGEN REGULATOR EMERGENCY KNOB.

The red emergency knob on the front of the type A-12 oxygen regulator (5, figure 14) is turned on only in the event of failure of the regulator mechanism. With the emergency knob "ON," oxygen is then supplied at an emergency fixed rate of flow.

9. PYROTECHNIC PISTOL. (P-63A-10)

A pyrotechnic pistol for discharging flares is installed on the left-hand side of the drive shaft cover, slightly aft of the portable range receiver, convenient to the pilot's left hand. Cartridges for the pistol are strapped to the cabin floor, just to the right of the drive shaft, approximately opposite the pistol. (See 18, figure 12.) Complete instructions for use of the pyrotechnic pistol are given in section I, paragraph 7., *m.*

SECTION V
OPERATIONAL EQUIPMENT

1. OXYGEN EQUIPMENT.

(See figure 33.)

a. DESCRIPTION.

(1) CYLINDERS.

(a) P-63A-1 THROUGH P-63A-6.—Two type D-2 cylinders are located in the fuselage gun compartment between stations 44-1/4 and 50-5/16, on the left-hand side. Provisions are made for installation of two additional cylinders on the right-hand side of the fuselage at the same stations.

(b) P-63A-7 AND SUBSEQUENT.—Four type D-2 cylinders are located in the fuselage gun compartment between stations 44-1/4 and 50-5/16, two on each side of the fuselage forward inclined deck.

(2) REGULATOR.

(a) P-63A-1 THROUGH P-63A-6.—The type A-12 demand regulator is located on the floor of the cabin at the right of the pilot's seat.

(b) P-63A-7 AND SUBSEQUENT.—The type A-12 demand regulator is located on the right-hand side of the cabin, forward of the door. (See 8, figure 14.)

(3) INSTRUMENTS.—An oxygen flow indicator (31, figure 11), and a cylinder pressure gage (30, figure 11), are located on the right-hand instrument panel.

Note

The oxygen supply warning light is not installed on some P-63A-9 and all P-63A-10 airplanes.

(4) FILLER VALVE.—The oxygen filler valve (figure 32) is located in the nose of the airplane between stations 50-5/16 and 53-5/8, left-hand side. It is accessible through a door at this point.

b. OXYGEN DURATION.—Oxygen duration for one man with the type A-12 regulator is as follows:

Bottles	10,000 ft.	15,000 ft.	20,000 ft.	25,000 ft.	30,000 ft.	35,000 ft.
1	1.8 Hrs.	1.7 Hrs.	1.4 Hrs.	1.2 Hrs.	1.0 Hrs.	0.9 Hrs.
2	3.5 Hrs.	3.4 Hrs.	2.8 Hrs.	2.4 Hrs.	2.0 Hrs.	1.8 Hrs.
4	7.0 Hrs.	6.8 Hrs.	5.6 Hrs.	4.8 Hrs.	4.0 Hrs.	3.6 Hrs.

c. USE OF THE TYPE A-12 REGULATOR.—The type A-12 demand type regulator normally requires no adjustment; the mixing of air and oxygen is fully automatic. Should the pilot desire pure oxygen, the automatic mixture lever (6, figure 14) at the side of the case should be turned to the "OFF" position and no air will enter the regulator mixture chamber. The red emergency knob on the front of the regulator (5, figure 14), is turned on only in the event of failure of the regulator mechanism. With the emergency knob "ON," oxygen is then supplied at a normal fixed rate of flow. With the automatic mixture lever set in the auto-mix position, the mask may be worn and connected at any altitude. With an increase in altitude, the ratio of oxygen to air also increases until that degree of altitude is reached at which the pilot will be breathing pure oxygen. The pilot's oxygen mask is connected to the supply hose by means of a rubber bayonet connector. (See 4, figure 13.) The pilot should make sure the connector will fit the supply tube and check the security of the mask tube connection before each take-off.

d. USE OF OXYGEN.

(1) Oxygen will be used when operating above 10,000 feet pressure altitude.

(2) Oxygen will be used from the ground up on all combat or tactical flights at night. Place auto-mix

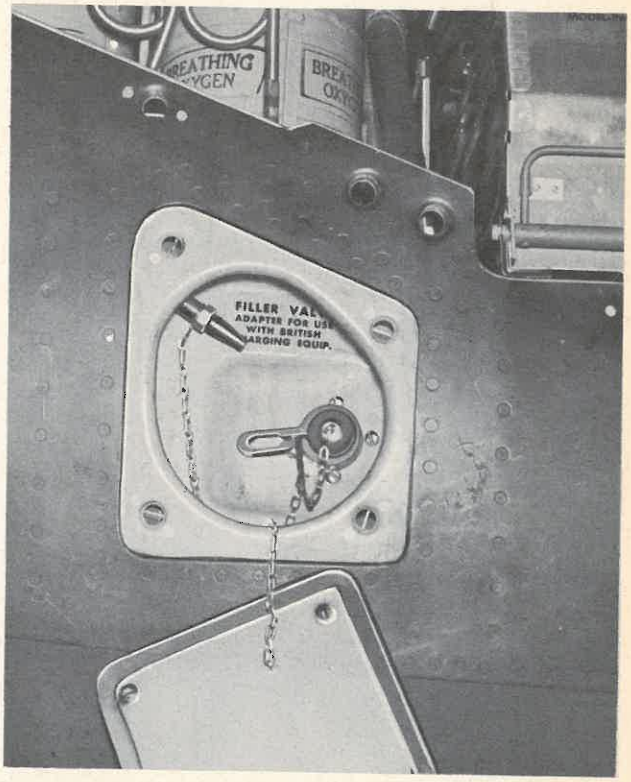


Figure 32—Oxygen Filler Valve

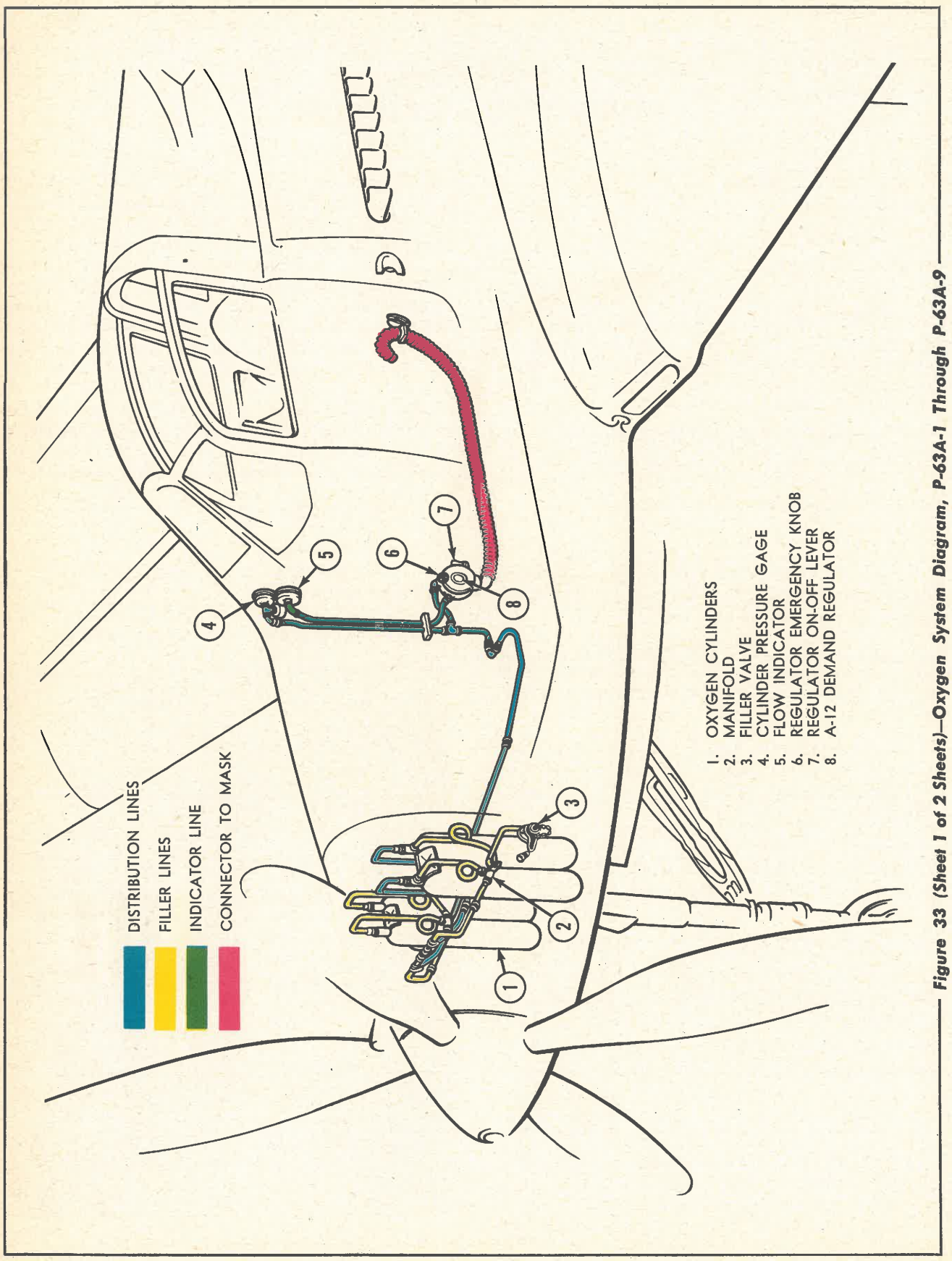


Figure 33 (Sheet 1 of 2 Sheets)—Oxygen System Diagram, P-63A-1 Through P-63A-9

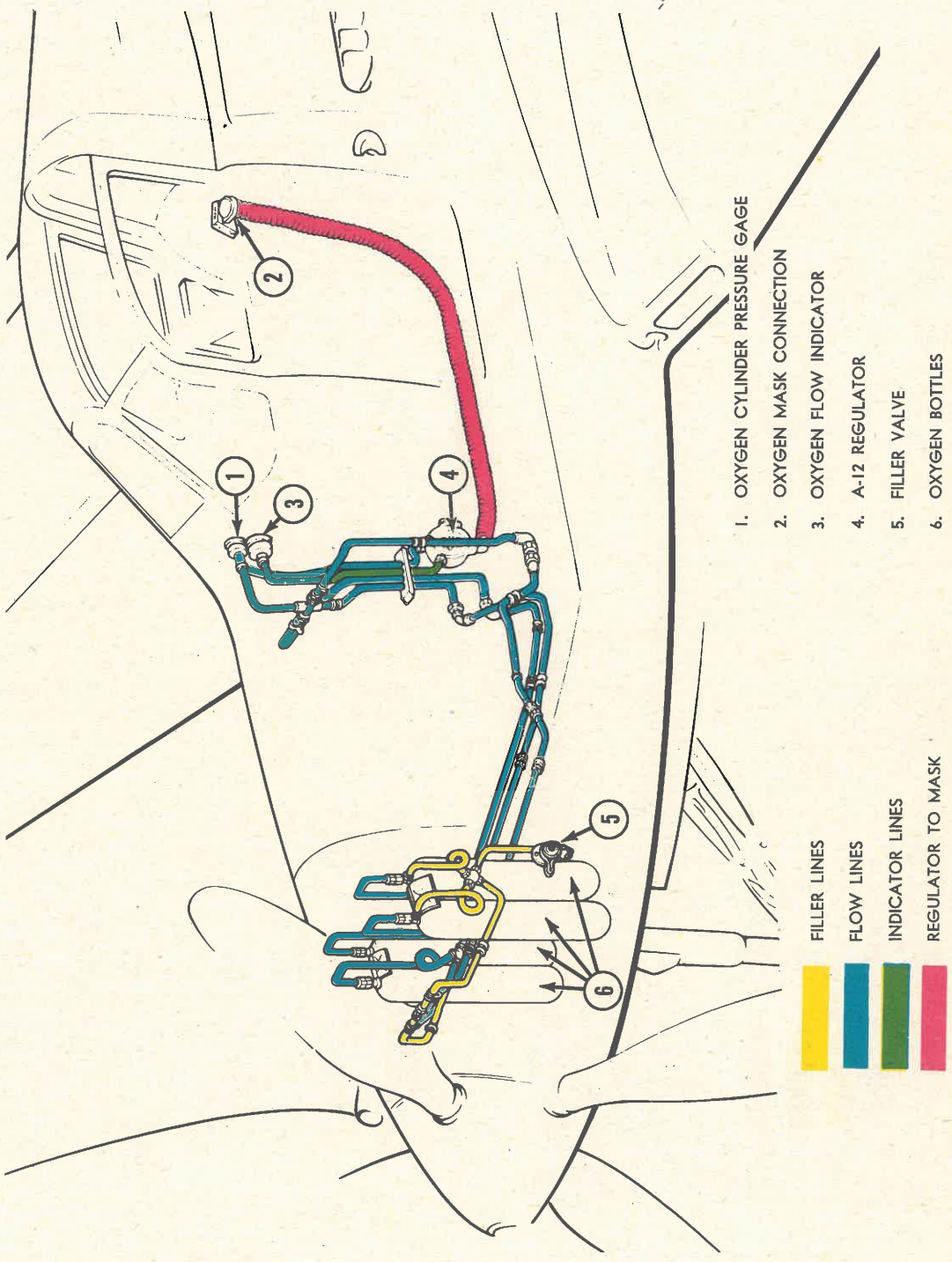


Figure 33 (Sheet 2 of 2 Sheets)—Oxygen System Diagram, P-63A-10

dilution control handle (6, figure 14) on the A-12 demand regulator in the "OFF" position in all night flights.

(3) Oxygen will be used above 8,000 feet for flights in excess of four hours at that altitude.

2. COMMUNICATION EQUIPMENT.

a. GENERAL.—Alternate installations of radio sets are provided for in the airplane. The installation or combination installations is to be determined by the Army Air Forces. Operating instructions for any of the sets that may be installed are outlined in this section.

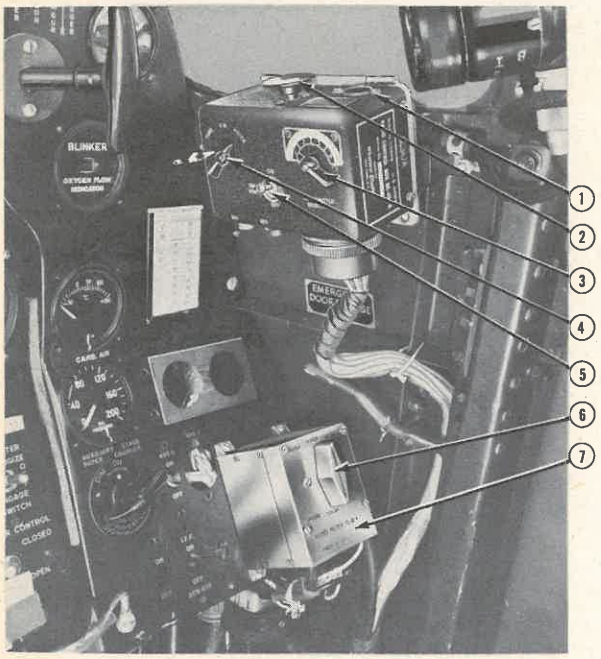
b. OPERATING INSTRUCTIONS—SCR 274-N COMMAND RADIO.

(1) The SCR-274-N command radio installation incorporates a radio control box composed of individual controls (figure 35) for three separate receiver units of various range: from 3 to 6 megacycles, from 6 to 9.1 megacycles, and from 190 to 550 kilocycles. To operate these receivers, move the battery switch (5, figure 35) from "OFF" to the "CW" (continuous wave) or "MCW" (modulated continuous wave) positions. Place the "TEL" switch (1, figure 35) to either "A" or "B" to correspond to the jack used for the head set plug. Set filter switch box control (6, figure 34) to "RANGE," "VOICE" or "BOTH," as desired. Tuning is accomplished by cranking the large tuning dial (3, figure 35) while adjusting for suitable volume with the "INCREASE OUTPUT" knob. (See 2, figure 35.)

(2) Two transmitters are installed, only one being used at a time, and are pre-set with the different frequencies recorded in the "write-in" space on the transmitter control. When transmitting, move the "TRANSMITTER SELECTION" switch (3, figure 34) to the frequency desired. Set the "TRANSMITTER POWER" toggle switch (5, figure 34) to "ON." It requires about 15 seconds to warm up the transmitter tubes. Set the emission switch (4, figure 34) on "TONE," "CW," or "VOICE," press the microphone control button on the throttle control knob (2, figure 4) and speak clearly and distinctly into the throat microphone. In the "VOICE" position, the transmitting dynamotor will not start until the microphone control button on the throttle lever knob has been closed. Side tone should be heard distinctly whenever transmitting. With the emission switch on "TONE" or "CW," the dynamotor will be running continuously, but the transmitter will not be on the air until the transmitter key is pressed.

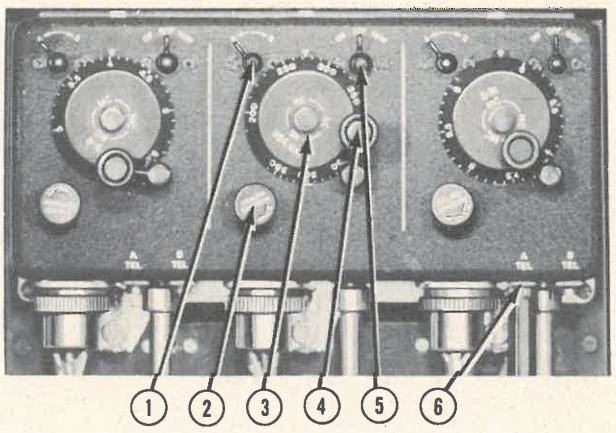
(3) The "TRANSMITTER POWER" toggle switch (5, figure 34) should be left "ON" throughout the flight to avoid repetition of the 15 second warm-up period.

(4) To reduce battery drain and increase dynamotor life, the emission selector switch (4, figure 34) should remain on "VOICE" unless continued use on "TONE" or "CW" is expected.



1. Transmitter Control Box
2. Key
3. Transmitter Selector Switch
4. Emission Control Switch
5. Transmitter Power Switch
6. Filter Selector Switch
7. Filter

Figure 34—SCR 274-N Radio Transmitter Controls



1. Line Channel Switch
2. Volume Control
3. Frequency Dial
4. Frequency Dial Knob
5. Emission Control Switch
6. Audio Output Jack

Figure 35—SCR 274-N Radio Receiver Controls

CAUTION

The dynamotor generates 600 volts DC. Before attempting to connect or disconnect a transmitter or power plug, determine that it is not running by touching the dynamotor to note the absence of vibration. When tuning up the antenna circuit of the transmitter, DO NOT TOUCH THE ANTENNA WHEN THE POWER IS ON.

c. OPERATING INSTRUCTIONS—SCR 695-A IDENTIFICATION RADIO.—Complete instructions for operation of the SCR 695-A identification radio will be given by the Communications Officer-in-Charge at the base. Switches for operating this radio are located on the lower portion of the right-hand instrument panel. (See figure 36.)

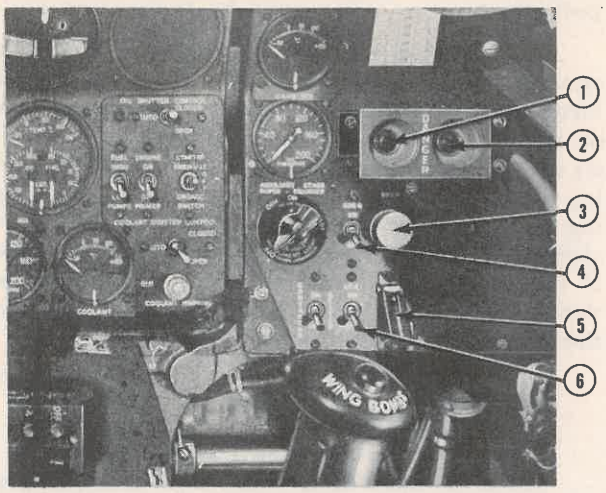
(1) STARTING THE EQUIPMENT.

(a) Throw the "IFF ON-OFF" switch (4, figure 36) on the right-hand instrument panel to the "ON" position.

(b) Set the six-position switch on the selector control box, (located in the aft cabin), to the position specified by the Communications Officer-in-Charge. In the absence of specific information, set the selector switch to position 1.

(c) Direction will also be given as to the employment of the G-band switches.

(d) Details concerning the use of the emergency switch (5, figure 36) can also be obtained from the Communications Officer-in-Charge.



1. Detonator Push Button (2)
2. Detonator Push Button (2)
3. SW-180 Switch
4. Off-On Switch
5. Emergency Switch
6. I.F.F. Switch

Figure 36—SCR 695 Radio Controls

(e) When the airplane is ready to take off, or preferably as soon as it is in the air, insert the destructor plug PL-177 in the destructor unit.

(2) STOPPING THE EQUIPMENT.

(a) Place all switches in the "OFF" position.

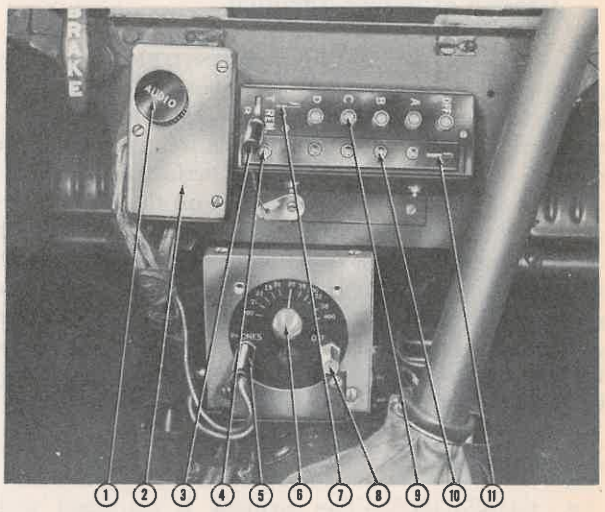
(b) Remove the destructor plug PL-177 from the destructor unit as soon as the airplane lands in friendly territory.

Note

After removing the destructor plug from the destructor unit, stow in receptacle provided on the aft cabin deck.

d. OPERATING INSTRUCTIONS—SCR 522-A COMMAND RADIO.

(1) To start the radio equipment, push the button "A," "B," "C," or "D" on control box (9, figure 37), which is located on the radio control panel. Each button mentioned above selects a different crystal-controlled frequency channel. (The commanding officer will give instructions regarding the frequency channel to be used.) An indicator lamp below each channel-selector button shows the operator which channel is being used. (See 10, figure 37.) Dimmer masks are provided to prevent glare from the channel-indicator lamps during night operations. (See 11, figure 37.) Move the dimmer mask lever to the right to cover the channel-indicator lamps.



1. Volume Control
2. Jack Box
3. T-R-REM Switch
4. Dial Light
5. Audio Output Plug (Portable)
6. Dial Knob (Portable)
7. T-R-REM Switch Locking Lever
8. ON-OFF and Volume Control Switch (Portable)
9. Channel Push Button
10. Channel Indicator Light
11. Dimmer Mask Lever

Figure 37—SCR 522-A Radio Controls and Range Receiver

(2) After pressing the channel-selector button (9, figure 37), allow approximately one minute for the tubes to warm up before attempting to use the radio.

(3) Place the "T.-R.-REM." switch (3, figure 37) in the "REM" position for throttle button control of the transmitter.

(4) To transmit, hold in the button on the throttle control knob (2, figure 4), close the microphone switch and speak into the microphone. Always turn off the microphone switch when the radio is not in use. This will prevent the transmission of extraneous noise of engine, machine guns, and side tones which would be constantly received by the pilot, tending to jam the radio channel.

(5) To receive, release the button on the throttle handle.

(6) To stop the equipment, press the "OFF" button on the switch panel.

WARNING

The operation of this radio equipment involves the use of high voltages which are dangerous to life. A dangerous potential exists on both the transmitter and receiver whenever the equipment is in either the transmit or receive condition.

e. RANGE RECEIVER.—A portable range receiver with a frequency of approximately 200 to 400 kilocycles (beacon and weather bands) may be inincluded in some P-63A radio installations. The range receiver is located beneath the main radio control panel in the cabin. The tuning dial on the set includes the following: Phone jack (5, figure 37), tuning knob (6, figure 37), volume control (8, figure 37), and off-on switch. (See 8, figure 37.) To receive, plug in phones, turn switch "ON" and volume up. (Switch and volume control are both operated by the same knob.) Select wave length by means of the tuning knob and regulate volume as desired.

3. ARMAMENT.

a. GUNSIGHT.—The airplane is equipped with an electrically operated gunsight, located above the center instrument panel in line with the pilot's eyes. (See 3, figure 12.) The gunsight illumination is controlled by a rheostat located on the left-hand instrument panel. (See 25, figure 11.) The gunsight types included on the P-63A airplanes are as follows:

(1) P-63-A-1 through P-63A-8, type N-3B gunsight.

(2) P-63A-9, type N-3C gunsight.

(3) P-63A-10, type N-9 gunsight.

b. GUNS.

(1) DESCRIPTION.—The airplane is equipped with one 37mm cannon located in the forward fuselage and firing through the hollow hub of the propeller; two .50 caliber machine guns located in the forward fuselage and synchronized to fire between the propeller blades; and two additional .50 caliber machine guns, one under each wing panel, mounted to fire outside the propeller arc.

(2) LOADING.

(a) CANNON.—To load the 37mm cannon, proceed as follows:

1. Pull loading handle (6, figure 11) once.
2. Pull charging handle (17, figure 11) once.

Note

Cannon and fuselage machine gun charging handles are located at the top of the left- and right-hand instrument panels.

CAUTION

Hold on to the handle when returning the charging and loading handles to position; otherwise the handles may deflect, resulting in a broken instrument or windshield.

(b) FUSELAGE MACHINE GUNS.—Pull the charging handles (7 and 18, figure 11) completely to the rear to charge; release to load. Do not hold onto the handles while they are returning to the forward position.

(c) WING MACHINE GUNS.—Wing guns must be charged while the airplane is on the ground. First free the fairing by pushing outboard and down on the release lever on the outboard side. Drop the aft end of the fairing down and push it forward, freeing the retaining pin at the forward end. The charging tool, a slender metal shaft, will be found inside, clamped to the bottom of the fairing. Insert one end of this tool into the hole in the forward end of the slot in the bottom of the gun and pull full to the rear; then release. Replace tool and fasten fairing.

(3) FIRING.

(a) CANNON.

1. P-63A-1 AND P-63A-5.—The cannon toggle switch is located on the left-hand instrument panel. (See 1, figure 11.) To fire the cannon, turn this switch "ON" and press the button located on the top of the control stick handle. (See figure 38.)

2. P-63A-6 AND SUBSEQUENT.—The cannon toggle switch is located on the left-hand instrument panel. (See 1, figure 11.) However, on these

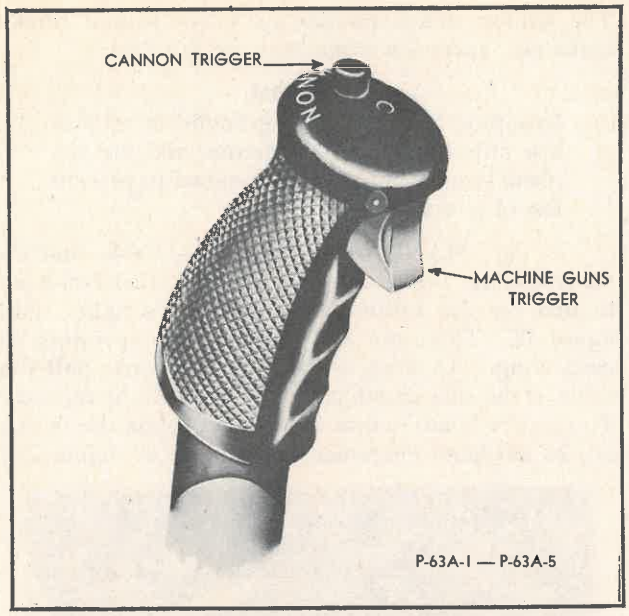


Figure 38—Control Stick Handle, P-63A-1 Through P-63A-5

airplanes the button on the top of the control stick handle is used for releasing bombs. After the cannon switch is turned "ON," firing of the cannon is accomplished by pressing the trigger on the forward side of the control stick handle (also used for firing the .50 caliber guns). (See figure 39.) The choice of which guns are to be fired is controlled solely by the gun control switches on the instrument panel.

3. Do not exceed a maximum of 15 round bursts, and limit the average burst to five rounds.

Figure 39—Control Stick Handle, P-63A-6 and Subsequent

(b) FUSELAGE AND WING MACHINE GUNS.—The toggle switches for the fuselage and wing machine guns are located on the left-hand instrument panel. (See 21 and 22, figure 11.) To fire the guns, turn this switch "ON" and squeeze the trigger located on the forward side of the control stick grip. (See figures 38 and 39.) For synchronized guns, where the guns are preheated, limit the initial burst to 50 rounds, and after about one minute, firing may be resumed and 15 to 20 rounds fired and repeated each minute thereafter.

Note

All machine guns can be fired simultaneously (providing the toggle switches are turned "ON") by squeezing the control stick trigger. The cannon also can be fired with the machine guns by squeezing both the control stick button and trigger (P-63A-1 and P-63A-5). Be sure the gun and cannon switches are "OFF" before landing.

c. BOMBING EQUIPMENT.

(1) P-63A-1 AND P-63A-5.—Provisions are included for the optional installation of a 300 or 500 pound bomb, or auxiliary fuel tank to be carried underneath the wing center panel. The installation consists of a bomb release handle, "ARM" and "SAFE" lever, and a bomb shackle to which the bomb or tank is attached. (See figure 40.)

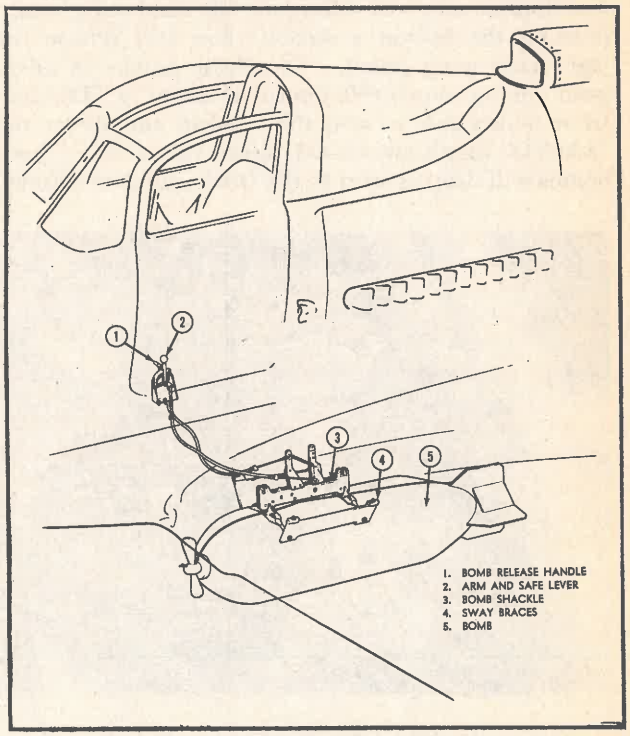


Figure 40—Bomb Release Mechanism

(a) The bomb release handle is located at the left of the pilot's seat near the cabin floor. To release the bomb or tank, pull this handle. (See 5, figure 15.)

(b) The "ARM" and "SAFE" lever is located on the left-hand side of the cabin floor, forward of the seat. (See 3, figure 15.) The lever, pushed to the forward position, arms the bomb for explosion. This lever incorporates a spring loaded handle which must be pushed down to release the locking pin from the sector before the handle can be moved.

CAUTION

If it is desirable to remove a bomb after landing, make certain the "ARM" and "SAFE" lever is in the "SAFE" position before releasing the bomb.

(2) P-63A-6 AND SUBSEQUENT AIRPLANES. —Provisions are made for the installation of two additional bombs, two auxiliary fuel tanks or two chemical tanks, to be carried one under each outer wing panel.

(a) WING BOMB CONTROLS.

1. ELECTRIC.—Switches for arming the bombs and releasing the bombs or auxiliary fuel tanks are located at the top of the left-hand instrument panel. (See figure 41.) To release the bombs in train, push the arming switch (20, figure 11) down to "TRAIN;" then press button on top of the control stick handle. (See figure 39.)

Pressing the control stick handle bomb release button once will release the left-hand wing bomb; pressing the button a second time will release the right-hand wing bomb. To release bombs in salvo, push arming switch (20, figure 11) down to "TRAIN" (if it is desirable to arm the bombs), and throw the "SALVO" toggle switch (23, figure 11) to "ON;" both bombs will drop as soon as the latter switch is thrown.

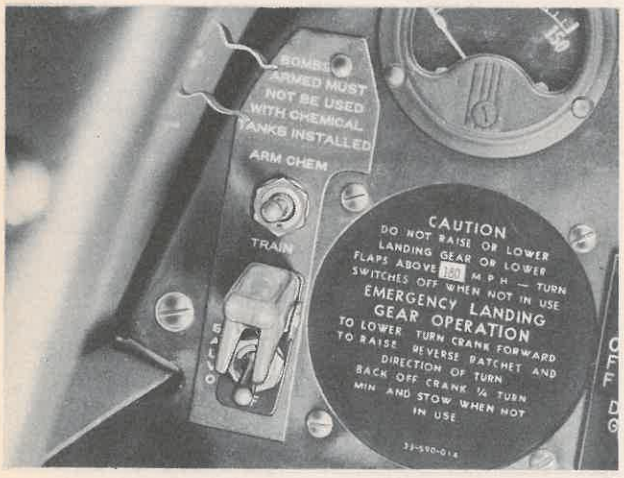


Figure 41—Wing Bombs Arming Switch and Salvo Switch

The arming switch pushed up, puts chemical smoke tanks into operation when they are installed.

CAUTION

Dropping 500 pound wing bombs in train at low altitudes can be dangerous, and the airplane should be carefully trimmed to prevent loss of control.

2. MANUAL—P-63A-10. — Cable controls for dropping the bombs or auxiliary fuel tanks are located on the cabin floor at the pilot's right. (See figure 42. There are two controls, one operating in each wing. To drop a bomb or fuel tank, pull the cable to the side on which the object is to be released. To arm the bomb before dropping, operate the switch on the left-hand instrument panel. (See 20, figure 11.)

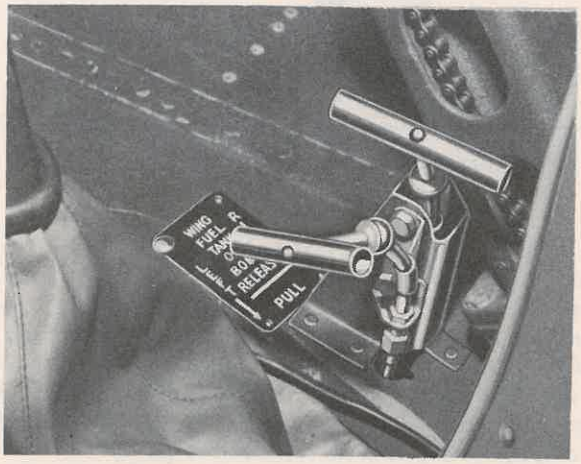


Figure 42—Wing Bombs or Tanks Manual Release

d. G.S.A.P. CAMERA.—A gunsight aiming point camera is installed in the right wing of the P-63A airplanes. (See figure 43.) The gun camera control switch (24, figure 11) is located on the left-hand instrument panel, in line with the gun and cannon switches. When the control switch is in the "ON" position, the camera is put into operation when the gun trigger on the control stick handle is pressed.

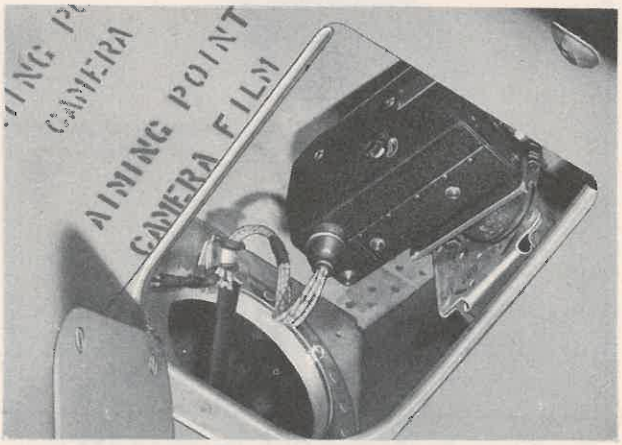


Figure 43—Gunsight Aiming Point Camera

SECTION VI
EXTREME WEATHER OPERATION

1. COLD WEATHER OPERATION.

a. PRE-FLIGHT INSTRUCTIONS AND PROCEDURES.

(1) USE OF EXTERNAL POWER.—The external power cart should be used in engaging the starter for a cold start.

(2) USE OF EXTERNAL HEAT.

(a) In cold weather starting, external heat should be applied when outside temperatures are below 0 °C (32 °F) through use of the D-1 or F-1 ground heater. Standard engine covers are provided with sleeves for attachment of heater hoses at the strategic points. (See figure 44.) If sufficient heat or means are not available for effectively heating the entire engine, concentrate on the rear accessory section with second priority going to the nose gearing and the propeller hub. Suitable canvas covers or snug fitting, reasonably air-tight tarpaulin makeshifts are essential to secure satisfactory engine heating.

CAUTION

Do not permit hot air from heaters to blast against ignition harness, flexible hose, or other rubberized or fabric materials unless the hand can comfortably be held for at least one minute in the same position as the part in question.

(b) When temperatures fall below −21°C (−5.8°F), heat when available should be applied to that portion of the airplane where instruments are located.

(c) An easier start may be obtained if a hot air blast is directed into the carburetor air intake while the starter is engaged. (See figure 45.) Care must be taken to prevent damage to equipment and injury to personnel engaged in such operations. Lacking heater equipment, a hot brick or stone may slightly improve starting if placed immediately in front of the carburetor air scoop. Do not permit the heated object to drop into the intake stack. Remove the heated object as soon as the start is assured.

(3) CLEANING THE SHOCK STRUTS.—Before take-off, the shock strut pistons must be wiped clean of all snow, ice, and dirt, after which they should be wiped with a rag soaked in hydraulic fluid (Army Air Forces Specification No. 3580 medium).

(4) DRAINING Y DRAIN AND OIL TANK SUMP.—Check the Y drain and oil tank sump for fluid oil; if no oil comes out, indications are that the drains are clogged with ice or congealed oil; apply heat to thaw. Be sure to lock drain immediately after water is drained or as soon as oil flow occurs.

(5) INSPECTIONS.—Inspection should be made to assure that fuel tank vents are free from ice, since condensation may permit droplets of water to form in the vent line, which upon freezing result in a stoppage, causing collapsing of the tank. Light blowing snow will accumulate in all parts of the airplane where openings remain uncovered. Prior to take-off, the wings and fuselage in the vicinity of all openings must be carefully inspected to prevent an attempted take-off with an overload consisting largely of drifted snow. When there are sharp changes from moderate to extreme cold, condensation will cause ice to form inside the wings and fuselage as well as outside. Careful inspection must be made to insure freedom of all controls and mechanism. Removal of such ice is difficult and generally can be accomplished only by application of heat, since chipping frequently results in damage to the airplane. With any marked change in temperature, pre-flight inspection should be made on all rigging cables, to insure that the tension is correct.

(6) REMOVE SNOW AND ICE FROM SURFACES.—Never take off with snow, ice, or frost on the wings. Even loose snow cannot be depended upon to

blow off and only a thin frost layer is necessary to cause loss of lift and very treacherous stalling characteristics. In some conditions, of extreme icing, it may be necessary to leave some covers on while taxiing to the take-off position. Evergreen boughs or light slats may be used for brushing off snow and frost.

(7) STARTING THE ENGINE.

(a) Remove wing covers, then engine cover.

(b) Pull propeller through five or six revolutions by hand before engaging starter (ignition switch "OFF").

Note

Do not attempt to start the engine if the propeller cannot be easily pulled through by two men. If this cannot be accomplished, check both the reduction gear box oil viscosity and the engine oil viscosity, by removing their respective drains (reduction gear box drain cock, and engine magnetic sump plug).

(c) In starting the engine, a normal start should be made without regard to the oil dilution system. After starting the engine, if a heavy viscous oil is indicated by oil pressure that is too high, or by oil pressure that fluctuates or falls back when the engine rpm is increased, the dilution control may be pushed momentarily several times to decrease the viscosity of the oil as a means of correcting this condition. This procedure must be used with caution as it is possible to cause an engine failure by supplying the engine pump with pure gasoline in case the oil is sufficiently viscous or stopped by ice so as not to permit flow; the oil pressure gage may indicate sufficient pressure due to the gasoline to cause operating personnel to believe oil is flowing, which may not be the case. This method is suggested only if time and extreme temperature conditions do not permit engine warm-up in the normal manner.

(d) To assure successful engine starts in extremely cold weather, considerable priming is necessary. A light priming should be given before the starter is engaged and then while the engine is being turned over the primer (55, figure 11) should be operated in short intervals until regularity of firing results. DO NOT prime the engine until actually ready to engage the starter.

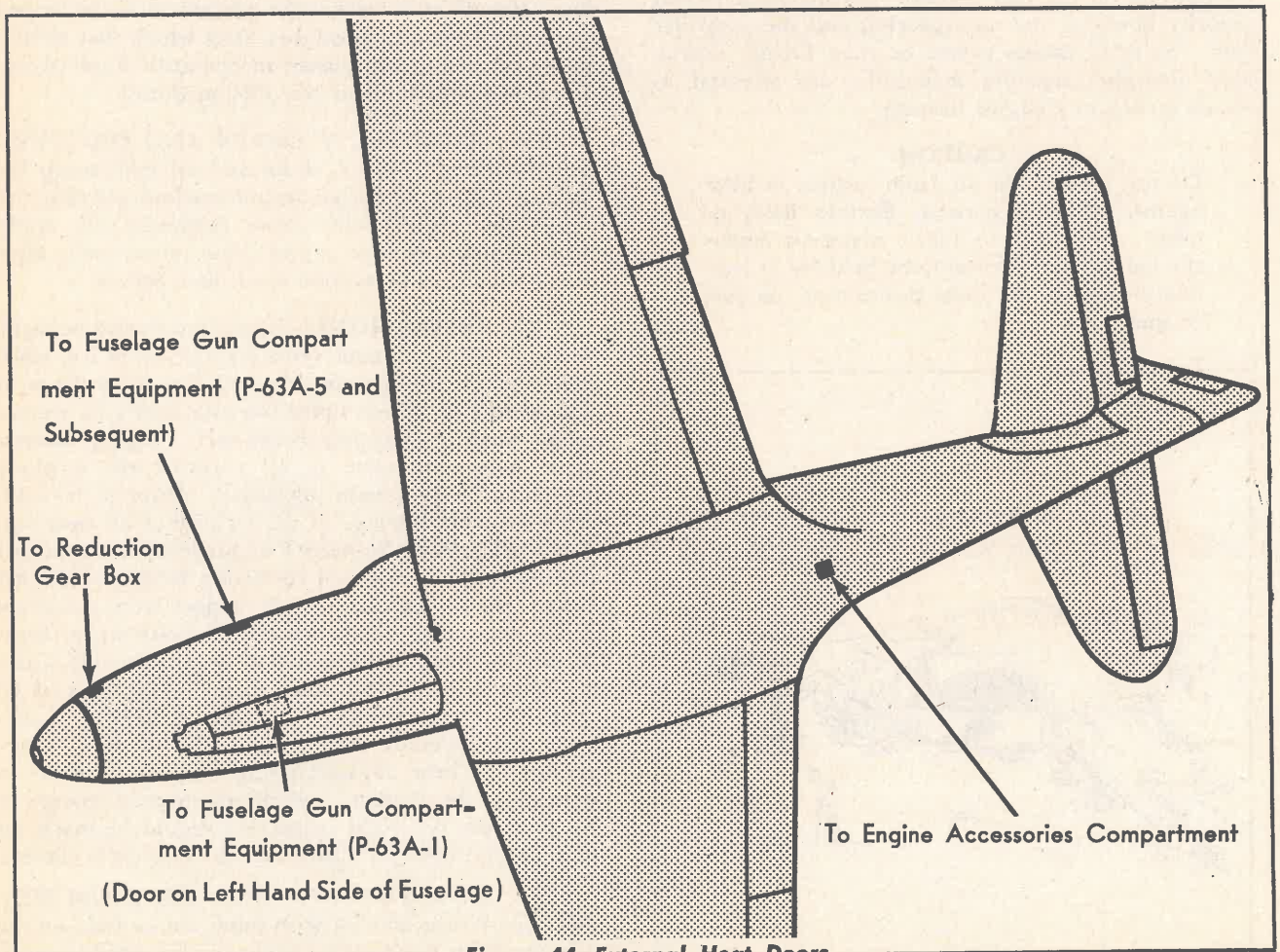


Figure 44—External Heat Doors

(e) If there is no oil pressure after 30 seconds, or oil pressure drops after a few minutes ground operation, check:

1. For blown lines or oil coolers.

2. Y drain for congealed oil or ice.

3. Oil tank drain (sump). If no oil flows, heat must be applied and water drained when heat has thawed the ice.

4. Oil strainer for bearing material which might indicate that engine failure is cause of low pressure.

(f) Warm-up is somewhat facilitated if carburetor air is put on hot as soon as the engine is firing regularly.

(g) The following methods have been tested to aid in starting this type of airplane and were found helpful:

1. DRAIN THE OIL AND PREHEAT.—Preheat the engine manifold and engine compartment; replace oil immediately before starting.

2. GROUND HEAT.—Place the tube from the ground heater into the carburetor air scoop, driving hot air into the engine and permitting better vaporization.

CAUTION

The heat from a large gasoline burner can be intense and precautions have to be taken to avoid damage to soldered radiators or other vulnerable items of equipment, while danger of fire must be guarded against.

b. FLIGHT INSTRUCTIONS AND PROCEDURE.

(1) TAKE-OFF.

(a) If oil dilution was used on previous shutdown, take-off can be made as soon as oil pressure is normal and oil temperature shows a slight rise. Cold oil, properly diluted, has the same viscosity as hot undiluted oil, and therefore, the same ability to circulate and properly lubricate an aircraft engine.

(b) CARBURETOR HEAT.—*Carburetor heat will not be used during take-off.* Under icing conditions, carburetor heat will be used immediately before take-off, to insure that all ice is removed from the induction system. However, immediately after take-off when power is reduced, carburetor heat will be adjusted to maintain the desired temperatures when icing conditions are indicated.

(c) USE OF BATTERY.—Storage batteries are of little or no value at sub-zero temperatures and attempted use may ruin the battery or electrical sys-

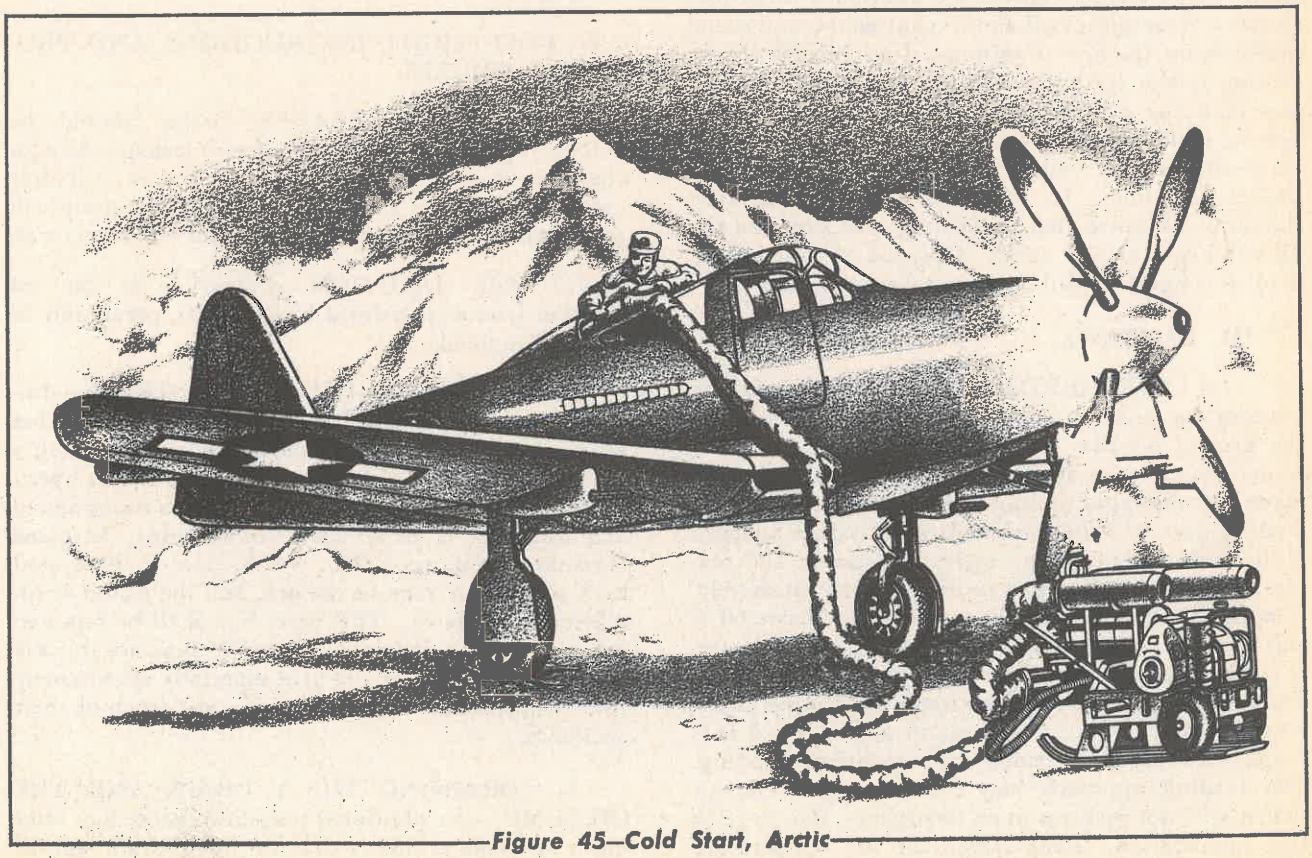


Figure 45—Cold Start, Arctic

tem. It is advised that no electrical equipment, even radio, be used until the airplane is in the air, unless an auxiliary power source is in operation.

(d) TAKING OFF.—If deep, heavy snow interferes with the take-off run, but permits the airplane to taxi, move slowly up and down the take-off course several times to pack down a runway before attempting the actual take-off. The depth and hardness of the snow will determine whether take-off or landing is practicable. When taking off on a narrow strip of clear ice, cross-winds are particularly dangerous due to the loss of maneuverability caused by lack of traction.

(e) GENERAL.—Following the take-off from a snow or slush-covered field, operate landing gear and flaps through a complete cycle two or three times to preclude freezing in the "UP" position.

(2) FLIGHT.

(a) CABIN HEATER.—Description and operation of the cabin heater are found in section I, paragraph 5 of this Handbook.

(b) CARBURETOR HEAT.—Instructions for use of carburetor heat are outlined in section I, paragraph 2., *j.* of this Handbook.

(c) OIL AND COOLANT TEMPERATURE AND PRESSURES.—Pilots are cautioned to be particularly observant of oil and coolant temperatures and pressures for the first 10 minutes after take-off. If the cooling system springs a leak due to congealed oil, it may take that long before it manifests itself by overheating or loss of oil pressure. High oil pressure and temperatures may indicate that oil is congealing the coolers and lines. In this case, oil cooler shutters should be closed so that congealing will stop and the oil will begin to flow again. Opening of the shutters, if oil is congealed, will only aggravate the condition.

(3) LANDING.

(a) CARBURETOR HEAT: Temperature inversions are common in winter in Arctic regions and the ground air may be 15° to 30°C (27° to 54°F) colder than that at altitude. Therefore care must be taken to avoid rapid cooling when letting down. Lower landing gear and use partial flaps to reduce airspeed while descending. Keep considerable power and regulate shutters to eliminate cooling engine excessively. If possible, maintain coolant temperatures above 60°C and oil temperatures above 30°C during all let downs. It is advisable to land with the carburetor heat "ON." Besides ice prevention, carburetor heat is necessary when landing to aid vaporization of fuel when it is found necessary to continue around without landing. The landing approach may cool the engine enough that it will not pick up in an emergency, due to poor fuel vaporization. Keep carburetor air temperature below 40°C in order to reduce loss of power due to excess heat. Upon landing, the airplane should be taxied to the line with carburetor heat on.

(b) While on the downwind leg the pilot should lower the landing gear, and at the same time pump the brake pedals several times to insure circulation of the sluggish oil.

(c) Landing and Brakes. When landing or taking off on a narrow strip of clear ice, cross-winds are particularly dangerous, due to the loss of maneuverability caused by the lack of traction. The airplane may, if the wind is gusty, be blown completely off the ice before control can be regained. Brakes should be used sparingly and not until absolutely necessary after setting the airplane down. Wheels should not be locked, especially on icy runways.

(d) Procedure for landing an airplane that has come through an icing region, and on which ice formation is noticeable, is to come in with a reasonable margin of speed above the stall, depending on the amount of ice carried, and land on the main wheels with the tail well up. It is an essential part of the taxiing procedure, particularly on a field with slushy spots on the runways, to position all control surfaces so that they will be least subject to damage caused by pieces of ice that may be blown against them by the slipstream. Similar care must be exercised during take-off and landing runs.

c. POST-FLIGHT INSTRUCTIONS AND PROCEDURES.

(1) PARKING BRAKES.—Brakes should be "ON" on parked airplanes, to prevent leakage through the brake seals. However, do not set brakes until after engine oil dilution procedure has been accomplished, so that the brakes will have cooled and will not freeze.

(2) OIL DILUTION.—Operation of the oil dilution system is outlined in section II, paragraph 18 of this Handbook.

(3) CLEANING THE SHOCK STRUTS.—Immediately after dilution the shock strut piston tubes must be wiped clean of all snow, ice, or dirt, using a rag soaked in hydraulic fluid (Army Air Forces Specification No. 3580). If hard dirt or grit is encountered and difficulty is experienced in cleaning, kerosene (Federal Specification No. VV-K-211a) shall be used as a solvent to remove the grit, and the piston again lubricated as above. This procedure shall be repeated before take-off. Shock absorber packings are quickly cut and spoiled by ice and grit, especially at extremely low temperatures when they have lost much of their resilience.

(4) DRAINING THE Y DRAIN AND THE OIL SUMP.—An additional shut-down procedure after flight in a cold region is to drain the Y drain and oil

sump drain to pass off any accumulation of moisture that might occur through condensation during flight. The oil tank sump drain is connected to a moisture drain cock which is located beside the oil Y drain. Open the drain cock until signs of moisture disappear in the oil that runs out. (Usually from 1/4- to 1/2-pint of drainage is sufficient.) Then close the valve.

(5) PARKING AND MOORING. (See figure 46.)—In parking an airplane on snow or ice in arctic regions, it is desirable to provide a layer of fabric, grass, straw, green boughs, or other insulating material under the wheels to prevent freezing into the surface. Lack of such precautions frequently results in the tearing off of large chunks of rubber from the tires when the airplane is again moved.

To provide mooring anchors, a log or heavy branch to which the mooring line is attached should be buried in the ground. Sacks, boxes, or other containers may, under certain conditions, be filled with sand and gravel and used as anchorage points. Frozen ground must be thawed by fire, and after the "Deadman" is placed in the hole thus formed, snow should be added to the earth or gravel covering.

2. DESERT OPERATION.

a. GENERAL.—This section contains information that will be helpful to pilots operating P-63A series airplanes in desert regions. In such regions intense heat and blowing sand are natural hindrances to airplane operation. Therefore, the pilot must be constantly on guard against them.

b. ENGINE WARM-UP. — Engine warm-up is much more rapid in the daytime heat of the desert, and coolant and oil temperatures may be expected to rise rapidly after the engine is started. When instruments show temperatures and pressures up to normal after starting the engine, the airplane should immediately take-off. Allowable engine operation for take-off is as follows:

Minimum Oil Temperature—(25°C).

Minimum Coolant Temperature—(85°C).

Minimum Engine Oil Pressure—(55 pounds per square inch.)

Minimum Reduction Gear Box Oil Pressure—(30 pounds per square inch.)

Minimum Fuel Pressure—(14 pounds per square inch.)

c. SHUTTERS.—Shutters of the coolant and oil cooling ducts should be open for starting, take-off, and after landing to allow the engine to cool as much as possible.

d. SAND ACCUMULATIONS.—Wing, tail, and fuselage surfaces should be kept free of sand, and any accumulations either inside or outside the airplane should be removed before the engine is started. Be sure there are no sand accumulations in the aft fuse-

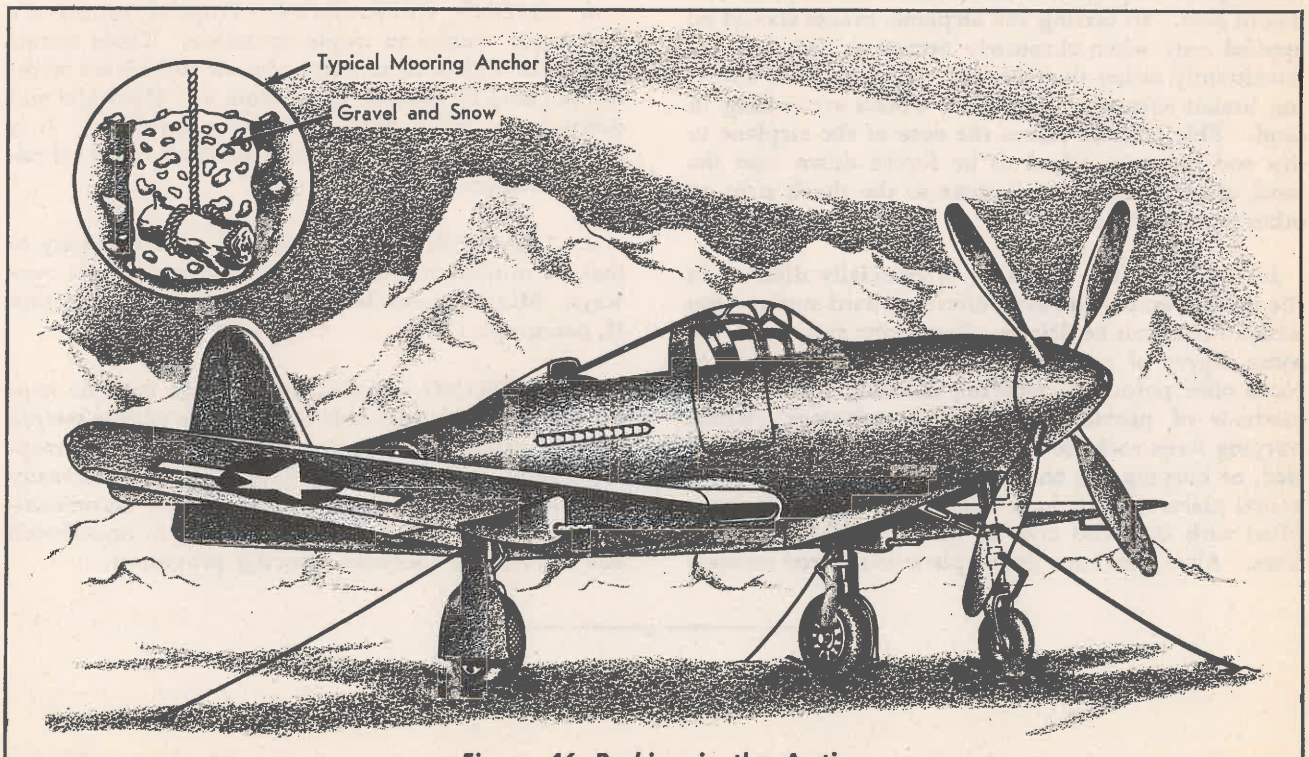


Figure 46—Parking in the Arctic

lage to cause an aft CG position which might become critical.

e. TAKE-OFF AND LANDING.

(1) TAKE-OFF.—In the take-off, the airplane should be lifted from the ground as soon as possible to prevent sand from being blasted against the surfaces by the propeller.

(2) LANDING.—In landing, set the airplane down as gently as possible to avoid forcing the wheels down into the sand. Prolonged taxiing is to be avoided. When landing for repairs away from the base, land on a plateau rather than in a valley if possible, since the air currents are likely to be less turbulent on the plateau.

CAUTION

Avoid unnecessary taxiing, and cut take-off and landing runs to the minimum. Long taxiing in sandy areas not only increases the danger of dust entering vital parts of the airplane, but also may cause overheating of the engine.

f. AIR FILTER (CARBURETOR).—In take-offs in dusty regions, filtered air should be supplied for the carburetor. This is accomplished by placing the toggle switch on the instrument panel in the "FILTER" position.

g. BRAKES.—Brakes should not be left on when the airplane is parked because they may stick or seal due to heat. In taxiing the airplane, brakes should be applied only when absolutely necessary, and then intermittently rather than steadily. Always avoid applying brakes abruptly when the wheels are rolling in sand. This practice causes the nose of the airplane to dip and the nose wheel to be forced down into the sand, often resulting in damage to the shock strut or other parts of the assembly.

h. MOORING.—Mooring is especially difficult in the desert because the sand offers no hard surface into which stakes can be driven. Extra long stakes provide some degree of anchorage, and sometimes bushes or rocks offer points for securing mooring lines. Other methods of providing points of anchorage include burying large rocks to which mooring lines have been tied, or burying the ends of long rods to which horizontal plates or rods have been attached. Containers filled with sand also may be used to anchor mooring lines. Always be sure the airplane is moored securely and that the controls are locked, since winds of high velocities are to be expected.

3. TROPIC OPERATION.

a. GENERAL.—Tropic operation is normal, except for certain limitations due to extreme heat, and at times, excessive moisture.

b. ENGINE WARM-UP.—In warming up the engine prior to take-off, oil and coolant temperatures should be carefully watched, that they do not become excessive. Daytime heat in tropical regions is extreme, and warm-up will require a much shorter time than in temperate climates. In the event of extreme moisture, be particularly watchful for engine roughness; this is usually due to worn ignition or electrical connections, and can cause a dangerous condition when flying.

c. TAKE-OFF.

(1) If engine roughness is evidenced on warm-up, do not take off; stop the engine and investigate the trouble. When flying over jungle terrain, the pilot is completely at the mercy of his engine, since there is small chance of finding a suitable area for a forced landing.

(2) Since most jungle runways are relatively short, it is often necessary to make a minimum run take-off; instructions for a minimum run take-off are found in section II, paragraph 8., *b.*

d. FLIGHT OPERATION.—Tropical storms are the major hazard in tropic operation. These storms will form within 20 minutes, and air turbulence within the cloud formations is tremendous. Up-drafts and down-drafts make flying extremely hazardous. It is advised, therefore, that the pilot avoid all cloud formations when possible.

e. LANDING.—In landing, it is often necessary to make a minimum run landing because of short runways. Minimum run landings are described in section II, paragraph 17., *d.*

f. MOORING.—Unless the airplane is to be kept on the alert, it is advisable to cover the engine section with tarpaulin or other suitable material, since tropical storms come up quickly and with such intensity that electrical and ignition equipment may become saturated. Standard mooring kits or lines to underbrush and trees make adequate mooring provisions.

APPENDIX I
OPERATING CHARTS AND DIAGRAMS

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. ARMOR PROTECTION DIAGRAM.

Sections of armor plate and glass are installed at vital points forward and aft in the airplane. The forward center panel of the cabin enclosure is armor glass, and on the P-63A-10 airplanes, the section behind the pilot's head is armor glass. The pilot is protected from enemy gunfire within the shaded areas shown on figure 47.

2. FLIGHT PLANNING.

a. GENERAL.

(1) The series of charts provided in appendix I is to aid in selecting the proper power and altitude to be used for obtaining optimum range of the airplane. A chart is provided for each airplane configuration with its proper range and gross weight.

(2) If the flight plan calls for a continuous flight where the desired cruising power and airspeed are reasonably constant after take-off and climb, and the external load items are the same throughout the flight, the fuel required and the flight time may be computed as a single section flight. If this is not the case, the flight should be broken up into sections, and each leg of the flight planned separately, since dropping of the external bombs or tanks causes considerable change in range and airspeed for given power. (Within the limits of the airplane, the fuel required and the flying time for a given mission depend largely on the speed desired. With all other factors remaining equal, in an airplane, speed is obtained at a sacrifice of range and range is obtained at a sacrifice of speed.)

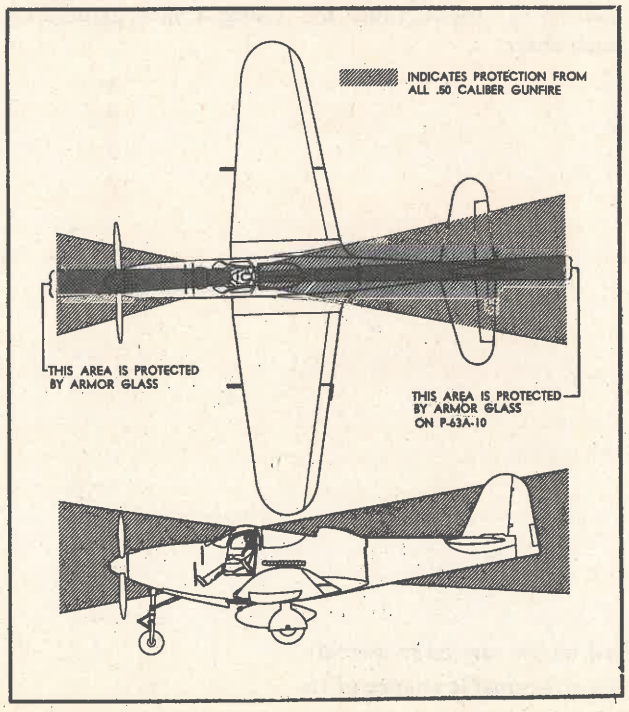


Figure 47—Armor Protection Diagram

b. TAKE-OFF, CLIMB, AND LANDING CHART. This chart contains data for flight planning for the primary variables involved: i.e., engine warm-up, take-off, climb, and landing.

c. FLIGHT OPERATING INSTRUCTION CHARTS.—These charts include information concerning range attainable and recommended power plant control settings for various combinations of gross weight, fuel load, altitude and airspeed. To avoid misuse of misinterpretation of the chart, cognizance should be taken of these items:

(1) The charted ranges make no allowance for warm-up, take-off and climb. Fuel consumed during these operations should be obtained from Take-off, Climb and Landing Chart. Similarly, no account is taken of the improved miles per gallon realizable during descent. Neglect of this latter factor is recommended to balance the fuel required for the landing operation.

(2) The operating data included on any one chart should be used only when the gross weight is within the limits specified in the title block. When diminishing fuel load causes the gross weight to decrease to a value included in the weight limits of the next chart, the operating data included in the corresponding column of that chart should be used. THIS IS ESSENTIAL, AS RANGES HAVE BEEN COMPUTED ON THIS BASIS. Ranges shown on charts listing external load items are based on the conservative assumption that these items are carried the entire distance.

(3) All data have been based on the maximum weight for which the chart is applicable. When gross weight is within the chart weight limits and less than the maximum (due to lighter initial weight or diminished fuel load), the airspeed should be slightly greater than that listed on the chart. To be conservative, no account has been taken of this factor.

(4) Experience has indicated that it is necessary to reduce calculated (red) range data by 15 per cent and reliable flight test (black) range data by 5 per cent to take account of variations in service airplanes and operating techniques. These allowances have been made on the Flight Operating Instruction Charts. NO ALLOWANCE HAS BEEN MADE FOR WING, NAVIGATIONAL ERROR OR OTHER CONTINGENCIES. NO ALLOWANCE HAS BEEN MADE FOR COMBAT OR FORMATION FLIGHT. APPROPRIATE ALLOWANCES FOR THESE ITEMS SHOULD BE DICTATED BY LOCAL DOCTRINE. The fuel quantity used in entering the chart, therefore, should be the fuel available after reaching flight altitude less allowances appropriate for the mission.

d. USE OF CHARTS.—Although instructions for their use are shown on the Flight Operation Instruction Charts, the following expanded information on proper use of the charts may be helpful.

(1) Select the Flight Operating Instruction Chart for the model airplane, gross weight and external loading to be used at take-off. The amount of gasoline available for flight planning purposes depends upon the reserve required and the amount required for starting and warm-up. The fuel required for warm-up is set forth on the chart. Reserve should be based on the type of mission, terrain over which the flight is to be made, and weather conditions. The fuel required for climb and time to climb to various altitudes is shown on the Take-off, Climb, and Landing chart. Fuel remaining after subtracting reserve, warm-up, and climb fuel from the total amount available is the amount to be used for flight planning.

(2) Select a figure in the fuel column in the upper section of the chart equal to, or the next entry less than, the amount of fuel available for flight planning. Move horizontally to the right or left and select a figure equal to, or the next entry greater than, the distance (with no wind) to be flown. Operating values contained in the lower section of the column number in which this figure appears, represent the highest cruising speeds possible at the range desired. It will be noted that the ranges listed in Column I under Maximum Continuous Power are correct only at the altitude shown by the note on the chart for this column. The ranges shown in Column II and other columns to the right of Column II can be obtained at any of the altitudes listed in the Density Altitude column. All of the power settings listed in a column will give approximately the same number of miles per gallon if each is used at the altitude shown on the same horizontal line with it. Note that the time required for the flight may be shortened by selection of the higher altitudes. In longe range cruising, it is important that altitude, airspeed, and rpm be held constant. The manifold pressure should be changed as required to hold the above values reasonably constant.

(3) The flight plan may be changed readily at any time en route, and the chart will show the balance of range available at various cruising powers by following the Instructions for Using Chart printed on each chart.

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.

AAFMC-527
4-1-44

AIRCRAFT MODEL(S)
P-63A-1-BE; P-63A-5-BE;
P-63A-6-BE; P-63A-7-BE

TAKE-OFF, CLIMB & LANDING CHART

ENGINE MODEL(S)
V-1710-93

TAKE-OFF DISTANCE FEET

GROSS WEIGHT LB.	HEAD WIND		HARD SURFACE RUNWAY						SOD-TURF RUNWAY						SOFT SURFACE RUNWAY					
	AT SEA LEVEL		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 RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.
7900 Clean Airplane	0	0	950	1550	1150	1850	1350	2100	1000	1600	1150	1850	1400	2150	1050	1650	1200	1900	1450	2200
	17	15	700	1200	850	1400	1000	1600	700	1200	850	1400	1000	1650	750	1250	900	1450	1050	1700
	34	30	450	850	550	1000	650	1200	450	850	550	1000	700	1200	450	850	600	1050	700	1250
	51	45	250	550	300	650	400	800	250	550	350	650	400	800	250	550	350	700	450	850
8650 75 Gal. B. Tank	0	0	1250	2050	1500	2400	1750	2800	1300	2050	1500	2450	1800	2850	1350	2150	1600	2500	1900	2950
	17	15	900	1550	1100	1850	1300	2200	900	1600	1100	1900	1300	2200	950	1650	1200	1950	1400	2300
	34	30	600	1100	750	1350	900	1650	600	1150	750	1400	900	1650	650	1150	800	1450	950	1700
	51	45	350	750	450	950	550	1150	350	750	450	950	600	1150	400	800	500	950	600	1200
9350 175 Gal. B. Tank	0	0	1550	2550	1850	3000	2150	3500	1600	2600	1900	3050	2200	3550	1700	2700	2000	3200	2400	3700
	17	15	1150	2000	1350	2350	1650	2750	1150	2000	1400	2400	1650	2800	1250	2100	1500	2500	1800	2950
	34	30	750	1450	950	1750	1150	2100	800	1450	950	1800	1150	2100	850	1500	1050	1850	1250	2200
	51	45	450	1000	600	1250	750	1500	500	1000	600	1250	750	1500	500	1050	650	1300	850	1600

NOTE: INCREASE CHART DISTANCES AS FOLLOWS: 75°F + 10%; 100°F + 20%; 125°F + 30%; 150°F + 40%

OPTIMUM TAKE-OFF WITH 3000 RPM, 54 IN.HG. & 0 DEG. FLAP IS 80% OF CHART VALUES

DATA AS OF 10-11-44 BASED ON: Calculations

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 F.P.M.	GAL. OF FUEL USED	BEST I.A.S.		RATE OF CLIMB F.P.M.	FROM SEA LEVEL		BEST I.A.S.		RATE OF CLIMB F.P.M.	FROM SEA LEVEL		BEST I.A.S.		RATE OF CLIMB F.P.M.	FROM SEA LEVEL		BEST I.A.S.		RATE OF CLIMB F.P.M.	FROM SEA LEVEL		BEST I.A.S.		RATE OF CLIMB F.P.M.	FROM SEA LEVEL	
	MPH	KTS			MPH	KTS		TIME MIN.	FUEL USED	MPH	KTS		TIME MIN.	FUEL USED	MPH	KTS		TIME MIN.	FUEL USED	MPH	KTS		TIME MIN.	FUEL USED	MPH	KTS		TIME MIN.	FUEL USED
7900	183	159	2274	14	183	159	2199	2.2	18	183	159	2119	4.6	21	183	159	1952	7.0	25	183	159	1763	9.7	29	183	159	1432	12.8	33
8650	155	135	1868	14	155	135	1780	2.7	18	155	135	1735	5.6	23	155	135	1532	8.6	27	155	135	1330	12.1	32	155	135	1028	16.4	38
9350	159	138	1663	14	159	138	1578	3.1	19	159	138	1529	6.3	24	159	138	1327	9.8	29	159	138	1140	13.9	35	159	138	844	18.9	42

POWER PLANT SETTINGS: (DETAILS IN SECTION III.)

DATA AS OF 10-28-44 BASED ON: Calculations

FUEL USED (U.S. GAL.) INCLUDES WARM-UP & 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.
7400	120	104	115	100	1000	1600	1100	1750	1200	1850	1100	1700	1200	1850	1300	2000	2350	2950	2550	3200	2800	3450
7100	120	104	115	100	950	1550	1050	1650	1150	1750	1050	1650	1150	1750	1250	1900	2200	2800	2400	3050	2650	3300

DATA AS OF 10-11-44 BASED ON: Calculations

OPTIMUM LANDING IS 80% OF CHART VALUES

REMARKS:

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

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

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.

FIG. NO. 48 TAKE-OFF, CLIMB & LANDING CHART (SHEET 1 OF 2 SHEETS)

AAFHC-527
4-5-44

AIRCRAFT MODEL(S)
P-63A-8-BE
P-63A-9-BE
P-63A-10-BE

TAKE-OFF, CLIMB & LANDING CHART

ENGINE MODEL(S)
V-1710-93

TAKE-OFF DISTANCE FEET

GROSS WEIGHT LB.		HEAD WIND M.P.H.	HEAD WIND KTS.	HARD SURFACE RUNWAY AT SEA LEVEL GROUND RUN	HARD SURFACE RUNWAY AT SEA LEVEL TO CLEAR 50' OBJ.	HARD SURFACE RUNWAY AT 3000 FEET GROUND RUN	HARD SURFACE RUNWAY AT 3000 FEET TO CLEAR 50' OBJ.	HARD SURFACE RUNWAY AT 6000 FEET GROUND RUN	HARD SURFACE RUNWAY AT 6000 FEET TO CLEAR 50' OBJ.	SOD-TURF RUNWAY AT SEA LEVEL GROUND RUN	SOD-TURF RUNWAY AT SEA LEVEL TO CLEAR 50' OBJ.	SOD-TURF RUNWAY AT 3000 FEET GROUND RUN	SOD-TURF RUNWAY AT 3000 FEET TO CLEAR 50' OBJ.	SOD-TURF RUNWAY AT 6000 FEET GROUND RUN	SOD-TURF RUNWAY AT 6000 FEET TO CLEAR 50' OBJ.	SOFT SURFACE RUNWAY AT SEA LEVEL GROUND RUN	SOFT SURFACE RUNWAY AT SEA LEVEL TO CLEAR 50' OBJ.	SOFT SURFACE RUNWAY AT 3000 FEET GROUND RUN	SOFT SURFACE RUNWAY AT 3000 FEET TO CLEAR 50' OBJ.	SOFT SURFACE RUNWAY AT 6000 FEET GROUND RUN	SOFT SURFACE RUNWAY AT 6000 FEET TO CLEAR 50' OBJ.
8400	(1)	0	0	1250	2000	1500	2380	1870	2960	1280	2030	1540	2410	1920	3010	1350	2090	1620	2490	2050	3140
		17	15	900	1520	1090	1820	1380	2300	920	1540	1110	1850	1420	2340	970	1590	1180	1910	2320	3240
		34	30	590	1080	730	1320	950	1700	620	1090	750	1340	980	1730	630	1130	790	1380	1180	1930
		51	45	340	710	440	890	590	1180	350	720	450	900	610	1200	370	740	480	930	740	1320
9150	(2)	0	0	1620	2630	1960	3140	2460	3960	1670	2670	2010	3200	2540	4050	1780	2780	2160	3340	2750	4260
		17	15	1190	2020	1450	2450	1840	3130	1220	2050	1490	2490	1910	3190	1300	2140	1600	2600	2060	3340
		34	30	790	1460	1000	1810	1290	2350	800	1480	1020	1840	1330	2400	860	1540	1100	1910	1440	2500
		51	45	480	990	620	1260	830	1670	490	1010	640	1270	860	1700	520	1040	680	1320	930	1770
9650	(3)	0	0	1950	3210	2350	3840	3010	4950	2000	3260	2420	3910	3100	5050	2160	3410	2620	4110	3170	5120
		17	15	1440	2500	1750	3010	2270	3940	1470	2530	1810	3070	2340	4010	1590	2650	1960	3220	2400	4070
		34	30	980	1840	1220	2260	1610	3000	1000	1860	1250	2290	1660	3050	1080	1940	1360	2400	1700	3090
		51	45	600	1260	770	1590	1060	2160	620	1280	790	1610	1090	2200	660	1330	860	1680	1110	2220

NOTE: INCREASE CHART DISTANCES AS FOLLOWS: 75°F + 10%; 100°F + 20%; 125°F + 30%; 150°F + 40%

OPTIMUM TAKE-OFF WITH 3000 RPM, 54 IN.HG. & 0 DEG. FLAP IS 80% OF CHART VALUES

DATA AS OF 10-23-44 BASED ON: Calculations

CLIMB DATA

GROSS WEIGHT LB.	AT SEA LEVEL BEST I.A.S. MPH	AT SEA LEVEL BEST I.A.S. KTS	AT SEA LEVEL RATE OF CLIMB F.P.M.	AT SEA LEVEL GAL. OF FUEL USED	AT 5000 FEET BEST I.A.S. MPH	AT 5000 FEET BEST I.A.S. KTS	AT 5000 FEET RATE OF CLIMB F.P.M.	AT 5000 FEET FROM SEA LEVEL TIME MIN.	AT 5000 FEET FROM SEA LEVEL FUEL USED	AT 10,000 FEET BEST I.A.S. MPH	AT 10,000 FEET BEST I.A.S. KTS	AT 10,000 FEET RATE OF CLIMB F.P.M.	AT 10,000 FEET FROM SEA LEVEL TIME MIN.	AT 10,000 FEET FROM SEA LEVEL FUEL USED	AT 15,000 FEET BEST I.A.S. MPH	AT 15,000 FEET BEST I.A.S. KTS	AT 15,000 FEET RATE OF CLIMB F.P.M.	AT 15,000 FEET FROM SEA LEVEL TIME MIN.	AT 15,000 FEET FROM SEA LEVEL FUEL USED	AT 20,000 FEET BEST I.A.S. MPH	AT 20,000 FEET BEST I.A.S. KTS	AT 20,000 FEET RATE OF CLIMB F.P.M.	AT 20,000 FEET FROM SEA LEVEL TIME MIN.	AT 20,000 FEET FROM SEA LEVEL FUEL USED	AT 25,000 FEET BEST I.A.S. MPH	AT 25,000 FEET BEST I.A.S. KTS	AT 25,000 FEET RATE OF CLIMB F.P.M.	AT 25,000 FEET FROM SEA LEVEL TIME MIN.	AT 25,000 FEET FROM SEA LEVEL FUEL USED
8400	174	151	2188	14	173	150	2110	2.3	18	169	147	2034	4.7	21	166	144	1866	7.3	25	166	144	1732	10.0	29	166	144	1426	13.3	34
9150	170	148	1886	14	168	146	1803	2.7	18	164	142	1724	5.5	23	164	142	1580	8.6	27	164	142	1407	11.9	32	164	142	1125	15.9	38
9650	170	148	1696	14	168	146	1611	3.0	19	164	142	1515	6.2	24	164	142	1378	9.7	29	164	142	1214	13.5	34	160	139	903	18.3	41

POWER PLANT SETTINGS: (DETAILS IN SECTION III.)

DATA AS OF 11-4-44 BASED ON: Calculations

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

LANDING DISTANCE FEET

GROSS WEIGHT LB.	BEST IAS APPROACH POWER OFF MPH	POWER OFF KTS	POWER ON MPH	POWER ON KTS	HARD DRY SURFACE AT SEA LEVEL GROUND ROLL	HARD DRY SURFACE AT SEA LEVEL TO CLEAR 50' OBJ.	HARD DRY SURFACE AT 3000 FEET GROUND ROLL	HARD DRY SURFACE AT 3000 FEET TO CLEAR 50' OBJ.	HARD DRY SURFACE AT 6000 FEET GROUND ROLL	HARD DRY SURFACE AT 6000 FEET TO CLEAR 50' OBJ.	FIRM DRY SOD AT SEA LEVEL GROUND ROLL	FIRM DRY SOD AT SEA LEVEL TO CLEAR 50' OBJ.	FIRM DRY SOD AT 3000 FEET GROUND ROLL	FIRM DRY SOD AT 3000 FEET TO CLEAR 50' OBJ.	FIRM DRY SOD AT 6000 FEET GROUND ROLL	FIRM DRY SOD AT 6000 FEET TO CLEAR 50' OBJ.	WET OR SLIPPERY AT SEA LEVEL GROUND ROLL	WET OR SLIPPERY AT SEA LEVEL TO CLEAR 50' OBJ.	WET OR SLIPPERY AT 3000 FEET GROUND ROLL	WET OR SLIPPERY AT 3000 FEET TO CLEAR 50' OBJ.	WET OR SLIPPERY AT 6000 FEET GROUND ROLL	WET OR SLIPPERY AT 6000 FEET TO CLEAR 50' OBJ.
7400	120	104	115	100	1000	1600	1100	1750	1200	1850	1100	1700	1200	1850	1300	2000	2350	2950	2550	3200	2800	3450
7100	120	104	115	100	950	1550	1050	1650	1150	1750	1050	1650	1150	1750	1250	1900	2200	2800	2400	3050	2650	3300

DATA AS OF 10-11-44 BASED ON: Calculations

OPTIMUM LANDING IS 80% OF CHART VALUES

REMARKS:

(1) Clean Airplane

(2) Clean Airplane + 75 gal. belly tank

(3) Clean Airplane + 2 (75 gal.) wing tanks

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

LEGEND

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

FIG. NO. 48 TAKE-OFF, CLIMB & LANDING CHART (SHEET 2 OF 2 SHEETS)

APPENDIX I

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.

AAFMC-528 4-1-44

AIRCRAFT MODEL(S)
P-63A-1-BE P-63A-5-BE
P-63A-6-BE P-63A-7-BE
ENGINE(S): V-1710-93

FLIGHT OPERATION INSTRUCTION CHART

SYNCHRONIZED PROPELLER CONTROL

CHART WEIGHT LIMITS: 7300 TO 7900 POUNDS

EXTERNAL LOAD ITEMS
None

NUMBER OF ENGINES OPERATING:

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.
WAR EMERG.	3000	61	—	A.R.	5	—	180
MILITARY POWER	3000	54	—	A.R.	15	—	150

FOR DETAILS SEE POWER PLANT CHART SECTION III

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING[1] MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (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).[1] 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 STAUTE	COLUMN I RANGE IN AIRMILES NAUTICAL	FUEL U.S. GAL.	COLUMN II RANGE IN AIRMILES STATUTE	COLUMN II RANGE IN AIRMILES NAUTICAL	COLUMN III RANGE IN AIRMILES STATUTE	COLUMN III RANGE IN AIRMILES NAUTICAL	COLUMN IV RANGE IN AIRMILES STATUTE	COLUMN IV RANGE IN AIRMILES NAUTICAL	FUEL U.S. GAL.	COLUMN V RANGE IN AIRMILES STATUTE	COLUMN V RANGE IN AIRMILES NAUTICAL
			SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING[1]								
265	230	100	360	315	445	385	550	480	100	640	555
240	210	90	325	280	400	345	490	425	90	575	500
210	180	80	290	250	360	315	440	380	80	510	445
185	160	70	255	220	315	275	385	335	70	450	390
160	140	60	215	185	270	235	330	285	60	385	335
130	115	50	180	155	225	195	275	240	50	320	280
105	90	40	145	125	180	155	220	190	40	255	220
80	70	30	110	95	135	115	165	145	30	190	165
50	45	20	70	60	90	80	110	95	20	130	115
25	20	10	35	30	45	40	55	50	10	65	55

MAXIMUM CONTINUOUS R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	PRESS ALT. FEET	(3.6 STAT. (3.1 NAUT.) MI./GAL.) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	(4.5 STAT. (3.9 NAUT.) MI./GAL.) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	(5.5 STAT. (4.8 NAUT.) MI./GAL.) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	PRESS ALT. FEET	MAXIMUM AIR RANGE R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.
Do Not Exceed 2600 RPM	Do Not Exceed 38 Inches	A.R.	97	353	307	40000 35000 30000	2590	Controlled by RPM See Note "A"	A.R.	79	336	292	2390	Controlled by RPM See Note "A"	A.R.	61	322	280	2150	Controlled by RPM See Note "A"	A.L.	46	297	258	40000 35000 30000	1850	Controlled by RPM See Note "A"	A.L.	35	264	229
		A.R.	98	337	293	25000 20000 15000																			25000 20000 15000						
		A.R.	98	322	280	10000	2530		A.R.	75	319	277	2370		A.R.	57	300	261	2090		A.L.	43	275	239	10000	1830		A.L.	33	245	213
		A.R.	99	308	267	5000	2480			71	301	261	2300		A.L.	54	284	247	2030		A.L.	40	253	220	5000	1800		A.L.	30	223	194
						S.L.	2350		A.R.	66	282	245	2300		A.L.	49	262	228	1980		A.L.	36	232	201	S.L.	1750		A.L.	26	196	170

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 48) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.

Note "A"—Do not exceed 2600 RPM and 38" M.P. when flying in A.R. setting.
Do not exceed 2300 RPM and 34.5" M.P. when flying in A.L. setting.
Reduce airspeed if necessary to stay within these limits.

EXAMPLE

AT 7780 LB. GROSS WEIGHT WITH 80 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 20 GAL.) TO FLY 350 STAT. AIRMILES AT 5000 FT. ALTITUDE MAINTAIN 2300 RPM AND IN. MANIFOLD PRESSURE WITH MIXTURE SET: A.L.

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
GPH : U.S. GAL. PER HOUR
TAS : TRUE AIRSPEED
KTS. : KNOTS
S.L. : SEA LEVEL
F.R. : FULL RICH
A.R. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.T. : FULL THROTTLE

DATA AS OF 11-28-44 BASED ON: Calculations

RED FIGURES ARE PRELIMINARY DATA, SUBJECT TO REVISION AFTER FLIGHT CHECK

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.

FIG. NO. 49 FLIGHT OPERATING INSTRUCTION CHART (SHEET 1 OF 6 SHEETS)

AAFMC-528
8-1-44

AIRCRAFT MODEL(S)
P-63A-1-BE P63A-5-BE
P-63A-6-BE P-63A-7-BE
ENGINE(S): V-1710-93

FLIGHT OPERATION INSTRUCTION CHART

SYNCHRONIZED PROPELLER CONTROL

CHART WEIGHT LIMITS: 7900 TO 8650 POUNDS

EXTERNAL LOAD ITEMS
75 Gal. Belly Tank
Wooden Sway Bracing
NUMBER OF ENGINES OPERATING:

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.
WAR EMERG.	3000	61	—	A.R.	5	—	180
MILITARY POWER	3000	54	—	A.R.	15	—	150

FOR DETAILS SEE POWER PLANT CHART SECTION III.

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING[1] MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (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).[1] 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 STAUTE	COLUMN I RANGE IN AIRMILES NAUTICAL	FUEL U.S. GAL.	COLUMN II RANGE IN AIRMILES STATUTE	COLUMN II RANGE IN AIRMILES NAUTICAL	COLUMN III RANGE IN AIRMILES STATUTE	COLUMN III RANGE IN AIRMILES NAUTICAL	COLUMN IV RANGE IN AIRMILES STATUTE	COLUMN IV RANGE IN AIRMILES NAUTICAL	FUEL U.S. GAL.	COLUMN V RANGE IN AIRMILES STATUTE	COLUMN V RANGE IN AIRMILES NAUTICAL
			SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING[1]								
515	445	211	675	585	835	725	990	860	211	1150	1000
490	425	200	635	550	790	685	940	815	200	1090	945
430	375	175	560	485	690	600	820	710	175	955	830
365	315	150	480	415	595	515	705	610	150	815	710
305	265	125	400	345	495	430	585	510	125	680	590
245	215	100	320	280	395	345	470	410	100	545	475
185	160	75	240	210	295	255	350	305	75	410	355
120	105	50	160	140	200	175	235	205	50	270	235
60	50	25	80	70	100	85	115	100	25	135	115

MAXIMUM CONTINUOUS R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. M.P.H.	APPROX. T.A.S. KTS.	PRESS ALT. FEET	(3.2 STAT. (2.8 NAUT.) MI./GAL.) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. M.P.H.	APPROX. T.A.S. KTS.	(4.0 STAT. (3.5 NAUT.) MI./GAL.) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. M.P.H.	APPROX. T.A.S. KTS.	(4.7 STAT. (4.1 NAUT.) MI./GAL.) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. M.P.H.	APPROX. T.A.S. KTS.	PRESS ALT. FEET	MAXIMUM AIR RANGE R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. M.P.H.	APPROX. T.A.S. KTS.
Do Not Exceed 2600 RPM	Do Not Exceed 38 Inches M.P.					40000 35000 30000		Controlled by RPM See Note "A"						Controlled by RPM See Note "A"						Controlled by RPM See Note "A"						40000 35000 30000		Controlled by RPM See Note "A"				
		A.R.	97	325	282	25000 20000 15000	2590		A.R.	83	311	270	2390		A.R.	64	299	260	2260		A.L.	51	282	245	25000 20000 15000	1960		A.L.	39	249	216
		A.R.	98	312	270	10000	2580		A.R.	78	295	256	2380		A.L.	60	277	241	2210		A.L.	47	262	228	10000	1910		A.L.	36	231	201
		A.R.	98	298	259	5000	2530		A.R.	74	279	242	2360		A.L.	57	264	229	2130		A.L.	43	239	208	5000	1870		A.L.	33	212	184
		A.R.	99	285	247	S.L.	2460		A.R.	70	264	229	2350		A.L.	54	249	216	2060		A.L.	40	219	190	S.L.	1840		A.L.	30	195	169

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 48) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.

Note "A"—Do not exceed 2600 RPM and 38" M.P. when flying in A.R. setting.
Do not exceed 2300 RPM and 34.5" M.P. when flying in A.L. setting.
Reduce airspeed if necessary to stay within these limits.

EXAMPLE

AT 8430 LB. GROSS WEIGHT WITH 175 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 36 GAL.) TO FLY 800 STAT. AIRMILES AT 20,000 FT. ALTITUDE MAINTAIN 2260 RPM AND IN. MANIFOLD PRESSURE. WITH MIXTURE SET: A.L.

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
GPH : U.S. GAL. PER HOUR
TAS : TRUE AIRSPEED
KTS. : KNOTS
S.L. : SEA LEVEL
F.R. : FULL RICH
A.R. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.T. : FULL THROTTLE

DATA AS OF 11-28-44 BASED ON: Calculations

RED FIGURES ARE PRELIMINARY DATA, SUBJECT TO REVISION AFTER FLIGHT CHECK

FIG. NO. 49 FLIGHT OPERATING INSTRUCTION CHART (SHEET 2 OF 6 SHEETS)

AAFMC-528 9-1-44

AIRCRAFT MODEL(S)
P-63A-1-BE P-63A-5-BE
P-63A-6-BE P-63A-7-BE
ENGINE(S): V-1710-93

FLIGHT OPERATION INSTRUCTION CHART

SYNCHRONIZED PROPELLER CONTROL

CHART WEIGHT LIMITS: 8650 **TO** 9350 **POUNDS**

EXTERNAL LOAD ITEMS
175 Gal. Streamlined Belly Tank

NUMBER OF ENGINES OPERATING:

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.
WAR EMERG.	3000	61	—	A.R.	5	—	180
MILITARY POWER	3000	54	—	A.R.	15	—	150

FOR DETAILS SEE POWER PLANT CHART SECTION III

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING[1] MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (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)[1]. 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 STAUTE	COLUMN I RANGE IN AIRMILES NAUTICAL	FUEL U.S. GAL.	COLUMN II RANGE IN AIRMILES STATUTE	COLUMN II RANGE IN AIRMILES NAUTICAL	COLUMN III RANGE IN AIRMILES STATUTE	COLUMN III RANGE IN AIRMILES NAUTICAL	COLUMN IV RANGE IN AIRMILES STATUTE	COLUMN IV RANGE IN AIRMILES NAUTICAL	FUEL U.S. GAL.	COLUMN V RANGE IN AIRMILES STATUTE	COLUMN V RANGE IN AIRMILES NAUTICAL
SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING[1]											
775	675	311	1005	875	1230	1070	1460	1270	311	1690	1470
685	595	275	890	775	1090	945	1290	1120	275	1495	1300
625	545	250	810	705	990	860	1175	1020	250	1360	1180
560	485	225	725	630	890	775	1055	915	225	1225	1065
500	435	200	645	560	790	685	940	815	200	1090	945
435	380	175	565	490	695	605	820	710	175	950	825
375	325	150	485	420	595	515	705	610	150	815	710
310	270	125	405	350	495	430	585	510	125	680	590
250	215	100	325	280	395	345	470	410	100	545	475
185	160	75	240	210	295	255	350	305	75	410	355
125	110	50	160	140	200	175	235	205	50	270	235
60	50	25	80	70	100	85	115	100	25	135	115

MAXIMUM CONTINUOUS R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	PRESS ALT. FEET	(3.2 STAT. (2.8 NAUT.) MI./GAL.) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	(4.0 STAT. (3.5 NAUT.) MI./GAL.) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	(4.7 STAT. (4.1 NAUT.) MI./GAL.) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	PRESS ALT. FEET	MAXIMUM AIR RANGE R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.
Do Not Exceed 2600 RPM	Do Not Exceed 38 Inches M.P.					40000 35000 30000		Controlled by RPM See Note "A"						Controlled by RPM See Note "A"						Controlled by RPM See Note "A"						40000 35000 30000		Controlled by RPM See Note "A"				
		A.R.	97	330	287	25000 20000 15000	2600		A.R.	84	317	275	2400		A.R.	65	303	263	2260		A.L.	52	289	251	25000 20000 15000	1980		A.L.	40	254	221
		A.R.	98	318	276	10000	2570		A.R.	79	300	261	2370		A.R.	61	286	248	2220		A.L.	49	270	234	10000	1940		A.L.	37	237	206
		A.R.	98	304	264	5000	2510		A.R.	75	284	247	2330		A.R.	57	265	230	2150		A.L.	45	246	214	5000	1900		A.L.	34	218	189
		A.R.	99	291	253	S.L.	2490		A.R.	71	268	233	2300		A.R.	54	253	220	2090		A.L.	41	225	195	S.L.	1850		A.L.	30	193	168

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 48) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.

Note "A"—Do not exceed 2600 RPM and 38" M.P. when flying in A.R. setting.
Do not exceed 2300 RPM and 34.5" M.P. when flying in A.L. setting.
Reduce airspeed if necessary to stay within these limits.

EXAMPLE

AT 8980 LB. GROSS WEIGHT WITH 250 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 61 GAL.) TO FLY 1350 STAT. AIRMILES AT 5000 FT. ALTITUDE MAINTAIN 1900 RPM AND IN. MANIFOLD PRESSURE WITH MIXTURE SET: A.L.

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
GPH : U.S. GAL. PER HOUR
TAS : TRUE AIRSPEED
KTS. : KNOTS
S.L. : SEA LEVEL
F.R. : FULL RICH
A.R. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.T. : FULL THROTTLE

DATA AS OF 11-28-44 BASED ON: Calculations

RED FIGURES ARE PRELIMINARY DATA, SUBJECT TO REVISION AFTER FLIGHT CHECK

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.

FIG. NO. 49 FLIGHT OPERATING INSTRUCTION CHART (SHEET 3 OF 6 SHEETS)

AAFMC-528
4-1-44

AIRCRAFT MODEL(S)
P-63A-8; P-63A-9; P-63A-10

ENGINE(S): V-1710-93

FLIGHT OPERATION INSTRUCTION CHART

SYNCHRONIZED PROPELLER CONTROL

CHART WEIGHT LIMITS: 7800 TO 8400 POUNDS

EXTERNAL LOAD ITEMS
None

NUMBER OF ENGINES OPERATING:

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.
WAR EMERG.	3000	61	—	A.R.	5	—	180
MILITARY POWER	3000	54	—	A.R.	15	—	150

FOR DETAILS SEE POWER PLANT CHART SECTION III

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING(1) MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (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). (1) 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 STAUTE	COLUMN I RANGE IN AIRMILES NAUTICAL	FUEL U.S. GAL.	COLUMN II RANGE IN AIRMILES STATUTE	COLUMN II RANGE IN AIRMILES NAUTICAL	COLUMN III RANGE IN AIRMILES STATUTE	COLUMN III RANGE IN AIRMILES NAUTICAL	COLUMN IV RANGE IN AIRMILES STATUTE	COLUMN IV RANGE IN AIRMILES NAUTICAL	FUEL U.S. GAL.	COLUMN V RANGE IN AIRMILES STATUTE	COLUMN V RANGE IN AIRMILES NAUTICAL
SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING (1)											
300	260	100	375	325	445	385	520	450	100	590	510
270	235	90	335	290	400	345	465	405	90	530	460
240	210	80	300	260	355	310	415	360	80	475	410
210	180	70	260	225	310	270	365	315	70	415	360
180	155	60	225	195	270	235	310	270	60	355	310
150	130	50	185	160	225	195	260	225	50	295	255
120	105	40	150	130	180	155	205	180	40	235	205
90	80	30	110	95	135	115	155	135	30	175	150
60	50	20	75	65	90	80	105	90	20	120	105
30	25	10	35	30	45	40	50	45	10	60	50

MAXIMUM CONTINUOUS R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. M.P.H.	APPROX. T.A.S. KTS.	PRESS ALT. FEET	(3.74 STAT. (3.25 NAUT.) MI./GAL.) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. M.P.H.	APPROX. T.A.S. KTS.	(4.46 STAT. (3.88 NAUT.) MI./GAL.) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. M.P.H.	APPROX. T.A.S. KTS.	(5.19 STAT. (4.51 NAUT.) MI./GAL.) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. M.P.H.	APPROX. T.A.S. KTS.	PRESS ALT. FEET	MAXIMUM AIR RANGE R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. M.P.H.	APPROX. T.A.S. KTS.
Do Not Exceed 2600 RPM	Do Not Exceed 38" M.P.					40000		Controlled by RPM See Note "A"						Controlled by RPM See Note "A"						Controlled by RPM See Note "A"					40000		Controlled by RPM See Note "A"					
		A.R.	83	378	328	35000																			35000							
		A.R.	89	369	320	30000																			30000							
		A.R.	90	355	308	25000															A.L.	53	325	282	25000			A.L.	43	296	257
						20000	2530		A.R.	83	365	317	2350		A.R.	66	349	303	2200		A.L.	53	325	282	20000	1975		A.L.	43	296	257
						15000	2490		A.R.	79	347	301	2300		A.R.	63	331	287	2170		A.L.	51	313	272	15000	1860		A.L.	40	276	240
		A.R.	89	339	294	10000	2460		A.R.	75	329	286	2250		A.R.	59	311	270	2090		A.L.	47	289	251	10000	1830		A.L.	37	257	223
		A.R.	88	322	280	5000	2430		A.R.	71	311	270	2200		A.R.	54	284	247	2040		A.L.	43	265	230	5000	1810		A.L.	34	233	202
		A.R.	86	306	266	S.L.	2390		A.R.	66	290	252	2200		A.R.	50	265	230	2010		A.L.	40	243	211	S.L.	1775		A.L.	28	198	172

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 48) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.

Note "A"—Do not exceed 2600 RPM and 38" M.P. when flying in A.R. setting.
Do not exceed 2300 RPM and 34.5" M.P. when flying in A.L. setting.
Reduce airspeed if necessary to stay within these limits.

EXAMPLE

AT 8220 LB. GROSS WEIGHT WITH 70 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 30 GAL.) TO FLY 400 STAT. AIRMILES AT 20,000 FT. ALTITUDE MAINTAIN 1975 RPM AND IN. MANIFOLD PRESSURE WITH MIXTURE SET: A.L.

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
GPH : U.S. GAL. PER HOUR
TAS : TRUE AIRSPEED
KTS. : KNOTS
S.L. : SEA LEVEL
F.R. : FULL RICH
A.R. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.T. : FULL THROTTLE

DATA AS OF 11-28-44 BASED ON: Calculations

RED FIGURES ARE PRELIMINARY DATA, SUBJECT TO REVISION AFTER FLIGHT CHECK

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.

FIG. NO. 49 FLIGHT OPERATING INSTRUCTION CHART (SHEET 4 OF 6 SHEETS)

AAFMC-528
A-1-44

AIRCRAFT MODEL(S)	FLIGHT OPERATION INSTRUCTION CHART	EXTERNAL LOAD ITEMS
P-63A-8; P-63A-9; P-63A-10	SYNCHRONIZED PROPELLER CONTROL	One (I) 75 Gal. Belly Tank
ENGINE(S): V-1710-93	CHART WEIGHT LIMITS: 8400 TO 9150 POUNDS	NUMBER OF ENGINES OPERATING:

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.	FOR DETAILS SEE POWER PLANT CHART SECTION III
WAR EMERG.	3000	61	—	A.R.	5	—	180	
MILITARY POWER	3000	54	—	A.R.	15	—	150	

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING(1) MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (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)(1). 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		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	
STAUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL
		*	SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING(1)						*		
615	535	211	750	650	880	765	1010	875	211	1140	990
585	510	200	710	615	835	725	955	830	200	1080	940
510	445	175	620	540	730	635	835	725	175	945	820
435	380	150	530	460	625	545	715	620	150	810	705
365	315	125	445	385	520	450	595	515	125	675	585
290	250	100	355	310	415	360	480	415	100	540	470
220	190	75	265	230	315	275	360	315	75	405	350
145	125	50	175	150	210	180	240	210	50	270	235
75	65	25	90	80	105	90	120	105	25	135	115

MAXIMUM CONTINUOUS						PRESS	(3.54 STAT. (3.08 NAUT.) MI./GAL.)						(4.17 STAT. (3.62 NAUT.) MI./GAL.)						(4.78 STAT. (4.15 NAUT.) MI./GAL.)						PRESS	MAXIMUM AIR RANGE					
R.P.M.	M.P. INCHES	MIX-TURE	TOT. G.P.H.	T.A.S. MPH.	T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	TOT. G.P.H.	T.A.S. MPH.	T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	TOT. G.P.H.	T.A.S. MPH.	T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	TOT. G.P.H.	T.A.S. MPH.	T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	TOT. G.P.H.	T.A.S. MPH.	T.A.S. KTS.
Do Not Exceed 2600 RPM	Do Not Exceed 38 "M.P.					40000		Controlled by RPM See Note "A"						Controlled by RPM See Note "A"						Controlled by RPM See Note "A"					40000		Controlled by RPM See Note "A"				
						35000																			35000						
						30000																			30000						
		A.R.	83	361	313	25000																			25000						
		A.R.	89	354	307	20000	2540		A.R.	84	349	303	2375		A.R.	69	337	293	2200		A.R.	55	307	267	20000	2010		A.L.	44	281	244
		A.R.	90	341	296	15000	2500		A.R.	80	334	290	2330		A.R.	65	321	279	2200		A.L.	54	303	263	15000	1940		A.L.	42	269	234
		A.R.	89	326	283	10000	2470		A.R.	76	318	276	2280		A.R.	62	302	262	2160		A.L.	50	283	246	10000	1890		A.L.	40	251	218
		A.R.	88	310	269	5000	2440		A.R.	72	300	261	2200		A.R.	55	272	236	2090		A.L.	46	259	225	5000	1840		A.L.	35	224	195
		A.R.	86	295	256	S.L.	2405		A.R.	67	280	243	2200		A.R.	51	252	219	2075		A.L.	42	238	207	S.L.	1825		A.L.	31	196	170

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.48) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.

Note "A"—Do not exceed 2600 RPM or 38 " M.P. when flying A.R. setting.
Do not exceed 2300 RPM or 34.5 " M.P. when flying A.L. setting.
Reduce airspeed if necessary to stay within these limits.
*Due to fuel cell change some models have less fuel capacity.

EXAMPLE

AT 8930 LB. GROSS WEIGHT WITH 175 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 36 GAL.) TO FLY 700 STAT. AIRMILES AT 15,000 FT. ALTITUDE MAINTAIN 2330 RPM AND IN. MANIFOLD PRESSURE WITH MIXTURE SET: A.R.

LEGEND

ALT.	PRESSURE ALTITUDE	F.R.	FULL RICH
M.P.	MANIFOLD PRESSURE	A.R.	AUTO-RICH
GPH	U.S. GAL. PER HOUR	A.L.	AUTO-LEAN
TAS	TRUE AIRSPEED	C.L.	CRUISING LEAN
KTS.	KNOTS	M.L.	MANUAL LEAN
S.L.	SEA LEVEL	F.T.	FULL THROTTLE

DATA AS OF 11-28-44 BASED ON: Calculations

RED FIGURES ARE PRELIMINARY DATA, SUBJECT TO REVISION AFTER FLIGHT CHECK.

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.

WP-3-31-44-10M

FIG. NO. 49 FLIGHT OPERATING INSTRUCTION CHART (SHEET 5 OF 6 SHEETS)

AAFMC-528 4-1-44

AIRCRAFT MODEL(S)
P-63A-8; P-63A-10; P-63A-10

ENGINE(S): V-1710-93

FLIGHT OPERATION INSTRUCTION CHART

SYNCHRONIZED PROPELLER CONTROL

CHART WEIGHT LIMITS: 8400 TO 9650 POUNDS

EXTERNAL LOAD ITEMS
Two (2) 75 Gal. Wing Tanks

NUMBER OF ENGINES OPERATING:

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.
WAR EMERG.	3000	61	—	A.R.	5	—	180
MILITARY POWER	3000	54	—	A.R.	15	—	150

FOR DETAILS SEE POWER PLANT CHART SECTION III

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING[1] MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (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).[1] 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		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
			SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING[1]								
		*							*		
805	700	286	970	840	1130	980	1285	1115	286	1445	1255
760	660	270	915	795	1065	925	1215	1055	270	1365	1185
675	585	240	810	705	945	820	1080	935	240	1215	1055
590	510	210	710	615	830	720	945	820	210	1060	920
505	440	180	610	530	710	615	810	705	180	910	790
425	370	150	505	440	590	510	675	585	150	760	660
340	295	120	405	350	475	410	540	470	120	605	525
255	220	90	305	265	355	310	405	350	90	455	395
170	150	60	200	175	235	205	270	235	60	305	265
85	75	30	100	85	120	105	135	115	30	150	130

MAXIMUM CONTINUOUS						PRESS	(3.38 STAT. (2.94 NAUT.) MI./GAL.)						(3.94 STAT. (3.43 NAUT.) MI./GAL.)						(4.50 STAT. (3.90 NAUT.) MI./GAL.)						PRESS	MAXIMUM AIR RANGE					
R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. M.P.H.	APPROX. T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. M.P.H.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. M.P.H.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. M.P.H.	APPROX. T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. M.P.H.	APPROX. T.A.S. KTS.
Do Not Exceed 2600 RPM	Do Not Exceed 38" M.P.					40000		Controlled by RPM See Note "A"						Controlled by RPM See Note "A"						Controlled by RPM See Note "A"					40000		Controlled by RPM See Note "A"				
						35000																			35000						
						30000																			30000						
		A.R.	83	345	300	25000																			25000						
		A.R.	89	340	295	20000	2550		A.R.	85	337	293	2400		A.R.	70	325	282	2200		A.R.	55	292	254	20000						
		A.R.	90	328	285	15000	2510		A.R.	81	322	280	2350		A.R.	67	310	269	2200		A.L.	54	289	251	15000	1955		A.L.	42	252	219
		A.R.	89	315	274	10000	2480		A.R.	77	308	267	2300		A.R.	63	292	254	2190		A.L.	52	274	238	10000	1900		A.L.	40	236	205
		A.R.	88	300	261	5000	2455		A.R.	73	291	253	2240		A.R.	58	268	233	2125		A.L.	48	253	220	5000	1860		A.L.	36	217	188
		A.R.	86	285	247	S.L.	2425		A.R.	69	273	237	2225		A.R.	54	249	216	2090		A.L.	44	231	201	S.L.	1825		A.L.	31	184	160

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 48) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.

Note "A"—Do not exceed 2600 RPM or 38" manifold pressure when flying in Auto-Rich setting.
Do not exceed 2300 RPM or 34.5" manifold pressure when flying in Auto-Lean setting. Reduce airspeed if necessary to stay within these limits.

*Due to fuel cell change some models have less fuel capacity.

EXAMPLE

AT 9375 LB. GROSS WEIGHT WITH 240 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 46 GAL.) TO FLY 940 STAT. AIRMILES AT 5000 FT. ALTITUDE MAINTAIN 2240 RPM AND IN. MANIFOLD PRESSURE WITH MIXTURE SET: A.R.

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
GPH : U.S. GAL. PER HOUR
TAS : TRUE AIRSPEED
KTS. : KNOTS
S.L. : SEA LEVEL
F.R. : FULL RICH
A.R. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.T. : FULL THROTTLE

RED FIGURES ARE PRELIMINARY DATA, SUBJECT TO REVISION AFTER FLIGHT CHECK

DATA AS OF 11-27-44 BASED ON: Calculations

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.

FIG. NO. 49 FLIGHT OPERATING INSTRUCTION CHART (SHEET 6 OF 6 SHEETS)