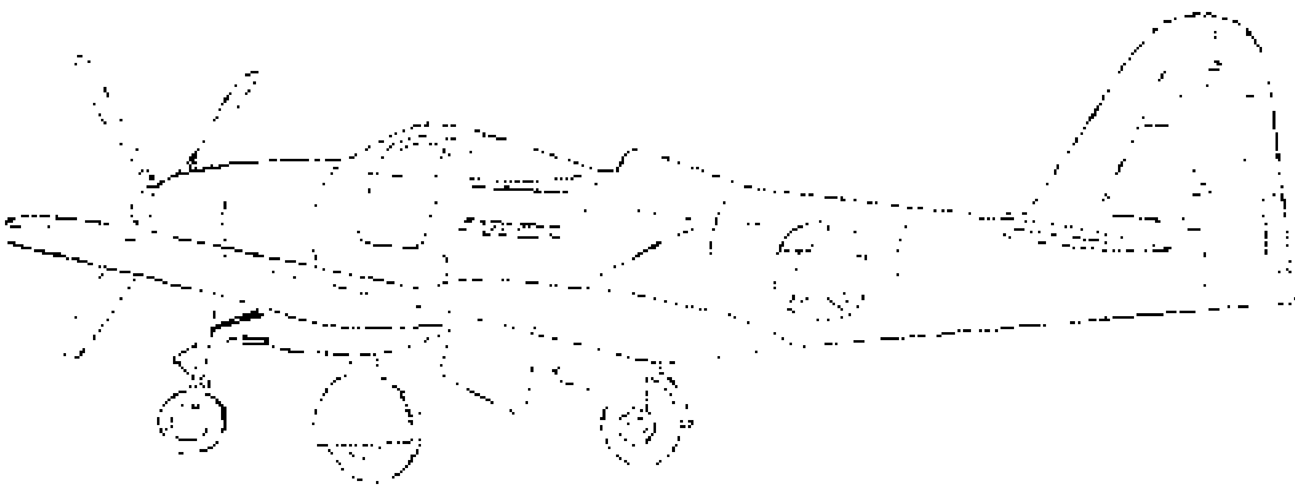
P-63



R E S T R I C T E D

[illegible] for P-63

I. [illegible]

The P-63 fighter airplane is a single place, low-wing, all metal land monoplane, powered with an Allison V-1710-93 liquid cooled engine mounted within the fuselage aft of the pilot.

The engine is connected to the 2.23:1 reduction gear box in the nose of the airplane by an extension drive shaft. Take-off rating of this engine is 1325 horse power at 3000 RPM and 54" Hg. manifold pressure at sea level. The propeller is a four blade Aeroproducts hydraulic propeller of the selective, automatic, constant speed, governor controlled type. Wing flaps and the tricycle landing gear are electrically controlled and operated.

II. DIMENSIONS

Span	38'4"
Length	32'8 3/8"
Height	11'2"
Gross Weight	8810 pounds
Tread	1[illegible]'9"
Fuel Capacity	Main Tanks-126 U.S.gallons Aux. Tanks- 64 gal. Belly and 75 gal.Wing
Coolant Capacity	13.5
Oil Capacity	With 126 gal.fuel 9.6 gal. With all gal.fuel 13.7 gal.
Oil Capacity Nose Gear Box	2 U.S. gallons

III. LANDING GEAR

The airplane is equipped with a fully retractable landing gear of the tricycle type consisting of two main wheels and one nose wheel. The nose wheel retracts aft into the forward fuselage. The retracting mechanism is operated by an electric motor through a system of torque tubes, worm and sector gears, screws, universal joints, gear boxes, and related connections. The operation of the landing gear motor is governed by a toggle type switch on the instrument panel. In the event of power failure, or for purposes of repair or adjustment, extension or retraction of the landing gear may be accomplished by use of an emergency manual ratchet handcrank to the right of the pilot's seat. The main landing gear installation consists of wheels, tires, brakes, air-oil struts, retractable mechanism, and

[illegible]

[illegible]

[illegible]

1. [illegible]
2. [illegible]
3. [illegible]

[illegible]

1. [illegible]
2. [illegible]
3. [illegible]

[illegible]

[illegible]

[illegible]
(1) [illegible]
(2) [illegible]
(3) [illegible]
[illegible]

[illegible]
1. [illegible]
2. [illegible]
3. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

It is no longer possible [illegible] a magneto check by noting the drop-off on the ground. [illegible] check on the ground must be [illegible] as the pilot performs magneto checks in the air — that is, by switching from both mags to right and left and noting the smoothness of the engine operation and apparent loss in the "feel" or power. If bad plugs are suspected [illegible] of this sort, it may be well to disconnect the [illegible] at the quadrant, push the propeller linkage to the full [illegible] position, and [illegible] a "drop-off" mag check as has been done before.

"[illegible]" of the propeller (if it does not seem to operate properly) may be [illegible] by changing manifold pressure from 20 [illegible] to 37 inches several times in succession.

Pilots who fly airplanes equipped with the synchronized [illegible] control will note that the [illegible] schedule gives them a lower RPM for equivalent manifold pressures than they have formerly used in the cruising range. This [illegible] to obtain [illegible] use of fuel and consequently greater range at cruising power.

MANIFOLD PRESSURE	DESIRED R.P.M.	LIMITED R.P.M.
20	1725	1725
25	1750	1750-1800
30	2000	2000-2100
35	2350	2350-2400
40	2700	2700-2750
45	3000	2850-3000
50	3000	3000-[illegible]

THE [illegible] REMARK [illegible] IS THAT THE RPM IS NOT ALLOWED TO DROP [illegible] FOR ANY OF THE MANIFOLD PRESSURES [illegible]. THIS IS NECESSARY TO AVOID [illegible] DETONATION [illegible] LOW GRADE FUELS.

I. PRE-FLIGHT CHECK [illegible] P-38

[illegible]

1. [illegible]
2. Check for signs of oil or hydraulic leaks.
3. [illegible] fuel. [illegible]
4. Verify that switch [illegible]
5. [illegible]
6. Check [illegible] for amount of fuel.
7. [illegible] (not visible from cockpit.)
8. [illegible]
9. [illegible]
10. Check [illegible]

[illegible]
[illegible] 4

[illegible]

11. [illegible]
12. [illegible]
13. [illegible]

II. [illegible]

1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]
5. [illegible]
6. [illegible]
7. [illegible]
8. [illegible]
9. [illegible]
10. [illegible]
11. [illegible]
12. [illegible]
13. [illegible]
14. [illegible]
15. [illegible]

III. [illegible]

IV. [illegible]

1. [illegible]
2. [illegible]
3. [illegible] variation (under [illegible]).
4. [illegible]
5. [illegible]
6. [illegible]
7. Check [illegible]
8. [illegible] for [illegible] turn. [illegible]
9. [illegible]
10. [illegible]

[illegible]

[illegible]

V. [illegible]

[illegible]

VI. [illegible]

1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]
5. [illegible]
6. [illegible]
7. [illegible]

VII. [illegible]

A. [illegible]
   1. [illegible]
   2. [illegible]
   3. [illegible]

B. [illegible]

C. [illegible]

1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]
5. [illegible]
6. [illegible]
7. [illegible]
8. [illegible]

[illegible]

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D. FUMES AND [illegible]

1. If coolant fumes begin entering the cabin, the cabin heater should immediately be switched to cold air. This is to prevent coolant fumes from entering the cabin through the hot air duct in case of a burst radiator or coolant line. Do not open door or windows unless immediate exit is contemplated.

   In case of fire, turn off fuel selector valve and ignition switch. Place mixture in IDLE CUT-OFF position close throttle. Attempt to extinguish flames by diving the airplane. If the fire is put out a dead stick landing may be made at the pilot's discretion. Turning on the fuel would probably restart the fire. Do not land if the plane is burning. Jumping or landing is up to the individual pilot.

E. RELEASE OF AUXILIARY TANKS.

1. Hold ship level when dropping tanks if possible.

2. [illegible] below 210 when releasing wing tanks.

F. RELEASE OF BELLY TANK

1. <u>Drop belly tank before a forced landing</u>. When it is necessary to drop the belly tank in flight pull the release handle located on the floor under the pilot's left side.

G. RELEASE OF WING TANKS;

1. Put wing tank control in "SELECT". (top switch on left inst. panel)
2. Press button on top stick ONCE to RELEASE left tank.
3. Press button TWICE to RELEASE right tank.

EMERGENCY RELEASE OF WING TANKS:

1. Put "SALVO" switch in UP position (second switch on left inst. panel)
   Putting switch UP, releases both wing tanks simultaneously.

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VII. [illegible]

[illegible]

1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]
5. [illegible]
6. [illegible]
7. [illegible]

VIII. FUEL SYSTEM

1. [illegible]

2. [illegible]

3. [illegible]

[illegible]

4. [illegible]

5. [illegible]

[illegible]

[illegible]

6. [illegible]

7. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] right fuel cell [illegible] 17 [illegible]

[illegible]

[illegible]

[illegible]

[illegible] carburetor [illegible]

[illegible]

7. [illegible]

[illegible] stage, hydraulically driving [illegible] controlled.

[illegible] supercharger [illegible] shaft of the engine [illegible] the main air scoop [illegible] fluid coupling. [illegible] directly to the inlet elbow [illegible] air duct (pressure [illegible]) conducts the [illegible] thus [illegible] of this system.

[illegible] it [illegible] the injector nozzle which [illegible] into the [illegible] supercharger. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] control tube [illegible]

[illegible] B-29 [illegible]

[illegible] - [illegible]

[illegible] distributors [illegible]

[illegible] altitude, [illegible]

[illegible]

III. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Mounted on top of the oil cooler, at the oil inlet, there is a thermostatic control valve of the rotating type, which, [illegible] the viscosity [illegible], eliminates the possibility of [illegible] cold oil building up a pressure in the cooler and causing [illegible].

The operating temperature of the oil in the cooler is maintained by means of air ducts, leading one each from the leading edge of the [illegible] section on each side into the front of the oil cooler. This air is controlled by means of a shutter door at the rear of the cooler [illegible] box.

In place of manual control as in the P-38, this shutter is electrically operated by a shutter actuator motor [illegible] mounted in the center section, [illegible]. This motor is controlled by a thermostat. The thermo bulb for the unit is tapped into the oil return line between the engine and the cooler. The electric actuator may also be controlled by a switch on the instrument panel. This switch has four positions: Auto, Open, Closed, Off.

An oil-in temperature gauge is located on the instrument panel. The thermo bulb for this unit is in the [illegible] of the oil [illegible].

The oil tank is vented into the engine on the right. A vent tube also is [illegible] into this vent line at a T fitting to vent the auxiliary stage supercharger. A second vent line from the oil tank extends down the left inclined deck and vents into [illegible].

OIL SUPPLY

The engine oil [illegible] provided: One [illegible] front of the engine, and [illegible]. Both [illegible] at the rear of the left upper engine [illegible] strut.

TOTAL OIL CAPACITY WITHOUT AUXILIARY TANK	[illegible] gallons
TOTAL OIL CAPACITY WITH AUXILIARY TANK	13.7 gallons
[illegible] OIL TEMPERATURE RANGE	[illegible]
	95° C maximum
[illegible] OIL [illegible]	55-65 pounds
[illegible] OIL PRESSURE	70-90 pounds

XII. OIL DILUTION

The oil dilution system consists of a solenoid operated oil dilution valve controlled by a momentary type toggle switch on the [illegible] hand side of the auxiliary switch box to the pilot's left in the cabin. Dilution of oil is obtained by the controlled addition of [illegible] to the oil tank outlet line. A warm-up compartment [illegible] the oil tank for the dilution system. Oil dilution thins the oil and allows the engine to turn over quite freely even after standing in sub-zero temperatures. It provides proper lubrication immediately after starting, and does away with the usual long warm-up period.

Normal oil dilution [illegible] with the engine at 1000 to 1200 RPM, [illegible] the oil temperature at 40° to 50°C to [illegible] evaporation of the gas and [illegible]. For [illegible] temperatures below 10°F [illegible] switch [illegible] oil dilution switch, [illegible] 2 quarts of gasoline [illegible] into the oil [illegible] at the rate of 1 quart per minute. For temperatures of -0°F or less dilute for a [illegible] minute period - 15 minutes after first dilution.

XIII. OPERATION

Opening of the oil dilution valve injects a quantity of [illegible] into the oil line, thus diluting the oil [illegible] which is rapidly circulated to the engine [illegible] it is admitted [illegible] warm-up compartment ([illegible] approximately 1.5 gallons) [illegible] the oil tank. Oil [illegible] from the engine is kept from the [illegible] which is [illegible] the hopper, [illegible] the hopper [illegible] main supply flows [illegible] the main supply of oil [illegible] oil at a [illegible] level. The upper [illegible] is open and [illegible] with the expansion space [illegible] tank. Continued heat of the [illegible] eventually vaporizes [illegible] in the oil and exhausts the vapor through the engine breather line. Distillation [illegible] minutes of [illegible] operation [illegible].

R E S T R I C T E D

XIV. COOLING SYSTEM

The P-63 coolant system utilizes two radiators in place of one as in the P-39. These radiators are located in the center section, below the engine and outboard of the longitudinal beams.

Cooling is accomplished by air currents passing through air ducts directly to the radiators. These air ducts are located on the leading edge of the wing butt (center section) leading directly to the forward end of the radiators. An additional duct (exhaust) is located aft of each radiator.

Temperature is controlled by shutters placed at the aft end of the exhaust ducts of the radiators; these shutters are electrically operated instead of manually as in the P-39.

The coolant shutter actuator motor assembly is installed outboard in the center section left, and operated by a thermo switch connected into the coolant tube underneath the engine. This unit is connected to control the right and left shutters automatically with the temperature changes. It is also connected to a switch on the instrument panel, which allows the pilot to control the shutters from the cabin. This switch has four positions; AUTO, OPEN, CLOSED, OFF.

The control assembly operates the shutters by a shaft, assembly connecting to the right and left shutters by rod assemblies. Fully open position is 14°.

The thermo-bulb for the coolant shutter actuator is located in the coolant outlet line which runs from the left bank of the engine to the left coolant radiator.

The temperature bulb for the coolant temperature gauge is of the same type and location as on the P-39, but a coolant temperature warning light has been added in the P-63. This light, mounted on the main instrument panel, indicates high engine temperature. A well is provided in the left cylinder bank coolant outlet line to accommodate the temperature bulb for this unit.

Coolant Capacity	15.5 gallons
Engine Capacity	5.[illegible] gallons
Minimum operating temp.	85°C
Maximum operating temp.	125°C
Desired operating temp.	105-125°C

The coolant expansion tank is located between the right and left banks of the engine, just aft of the turn-over beam. This tank has capacity of 1½ gallons as compared with three gallons in the P-39 tank. It is held in place by two straps which are riveted to the tank support brackets. The support for the tank is mounted between the banks of the cylinders and attached to the engine hold-down bolts by four U-bolts.

There are two lines running from this tank. One located at the aft section of the tank which carries the overflow aft along the top of the left bank to the rear of the engine and down to the coolant pump. The purpose of this line is to expell from the tank any coolant which might collect due to expansion. The other line originates at the top center of the tank, running aft along the left engine cowl former and through the outside skin. This line is used as a vent line to expel the air pressure which is built up by expansion of the coolant and is controlled by a pressure relief valve, set to open at 25 pounds pressure absolute, at the forward section of each bank of the engine and is then routed to the filler neck tube.

The coolant system is filled at the left side of the airplane through a flush type filler cap mounted on the outside of the turnover beam.

The coolant enters a line which passes through the turnover beam and connects to the left bank coolant outlet line. It should be noted that at no time during filling operations does the coolant enter the expansion tank.

IV. BRAKES

Each main wheel has a complete and separate multiple disc hydraulic brake system and a parking brake device which can be used to lock both main wheels against motion. The brakes can be used individually for ground steering.

The hydraulic brakes used are interchangeable so that the brake can be used on either the right or the left main wheel. The brakes are composed of ten stationary steel discs and nine rotating bronze faced discs assembly. The steel discs are held in place by steel inserts in the on the housing, while the grooves on the rotating bronze discs slip into tongues on the brake drum and rotate with the wheel. When the brakes are applied, these discs are pressed together against the brake adjuster plate by hydraulic pressure transmitted through the lines from the master brake cylinder to the brake housing, [illegible] against a neoprene ring seal behind the brake discs.

Parking Brake

The parking brake works in conjunction with both of the regular service brakes. It is applied by depressing the service brakes and then pulling out the parking brake handle. To release the parking brakes, depress the service brakes, thereby releasing the [illegible] and permitting the return of the parking brake to the "OFF" position.

THE ELECTRICAL SYSTEM OF THE P-63.

The most important electrical circuit on the P-63 is the battery and generator system.

The 24-volt storage battery in the P-63 is used as an electrical reserve supply in conjunction with a 28-volt generating system. The battery consists of 12 wet cells, connected in series, and generating electricity by the reversal of a chemical reaction previously produced in it by an electric current. The cells are enclosed in a hard rubber box or case which, in turn, is housed in [illegible] box. The battery is mounted forward of the fire tight bulkhead in front of the left rudder pedal, and is reached by the panel on the left side of the cowling.

The efficiency of the storage battery, [illegible] current it is able to produce, is dependent upon the state of charge of the battery. The internal resistance [illegible] the battery [illegible] discharged & [illegible] the battery becomes charged. A fully charged battery [illegible] a circuit, and [illegible] of current [illegible] fully charged. A battery [illegible] discharged [illegible] heavy current [illegible] and much [illegible] to improve its condition towards a full charge.

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[illegible] battery [illegible] subjected to [illegible] charging current.

A rubber [illegible] battery [illegible] the battery [illegible] battery cell.

The [illegible] generator [illegible] electrical [illegible] battery [illegible] charging current.

The [illegible] from [illegible] in the line. [illegible] electrically [illegible] battery [illegible].

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Either the battery or the generator can become overloaded easily. The combined safe power output from both is needed for the use of heavy current drawing apparatus. Should one be damaged or out of service the other is forced to attempt to carry the load.

A generator large enough to supply all necessities simultaneously is not desired, because the four heaviest current carrying circuits on the P-[illegible] (namely, the starter, landing gear, wing flap and landing light circuits) operate only a few minutes over a possible interval of several hours, each of these circuits being several times as heavy as any other circuit on the airplane.

Unless the pilot uses extraordinary skill in the use of the electrical devices a burned out generator will result each time a flight is made with a low battery installed. The battery may be overloaded in almost the same way, if the generator is not used in flight, either because of burnout or failure to turn on the generator control switch.

[illegible]

[illegible]

The following is extracted from [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]