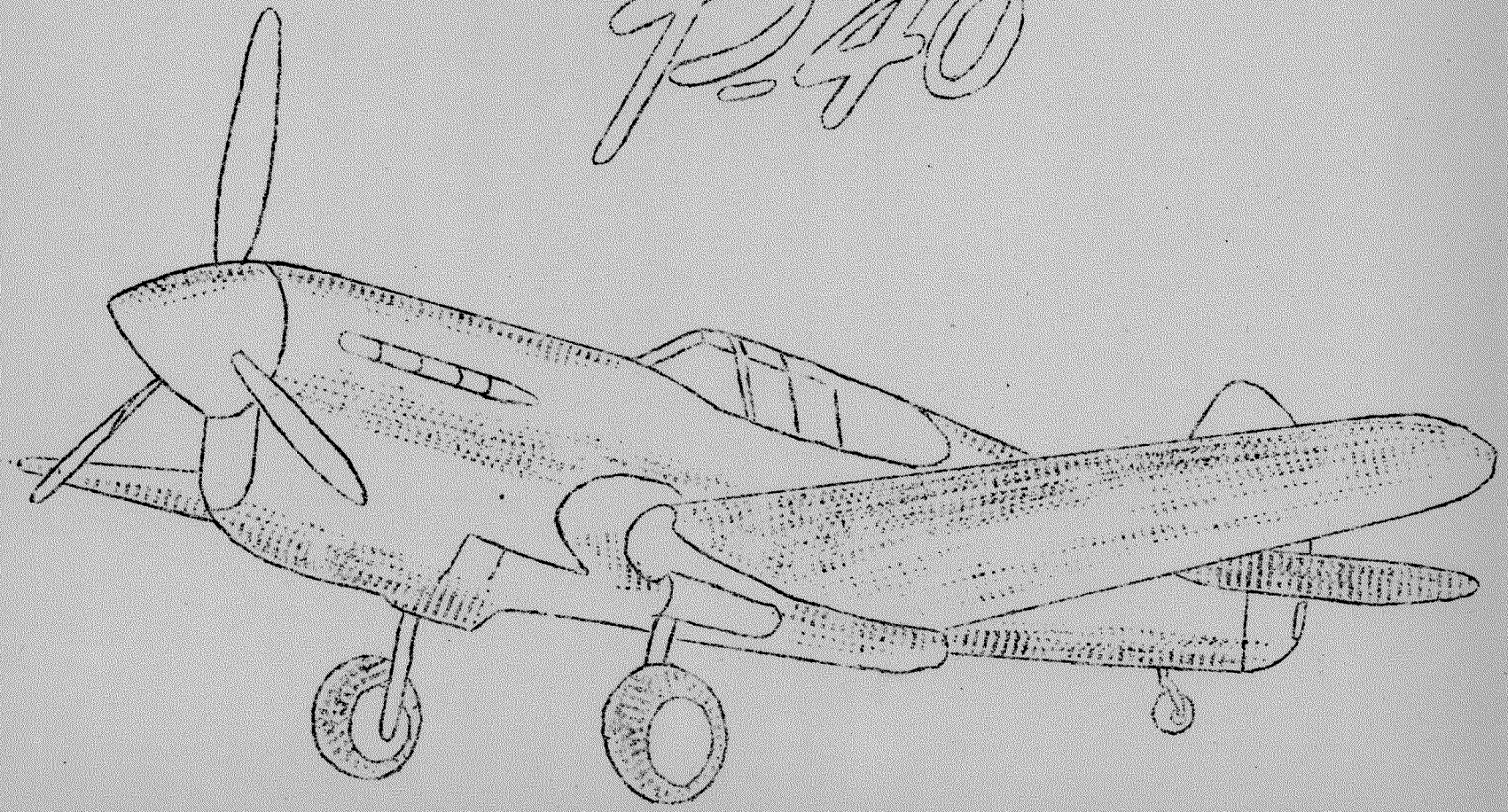
P-40



P-40

I. GENERAL DESCRIPTION

The P-40 is a single place low wing monoplane. All P-40's are powered by Allison engines except the P-40F and L which use a Packard V-1650-1 engine. The F and L models differ in no important way from other models except in their engine and cockpit engine controls. These changes will be detected and considered in the usual "LEFT to RIGHT" cockpit check. P-40N is powered with an Allison V-1710-99, 1360 HP engine, which is a liquid cooled, 12 cylinder, 60 Vee type. The engine drives a Curtiss three bladed, 11 foot diameter, electrically controlled, multi-position or constand speed propeller, with a high pitch of 54 1/2° and low pitch of 24 1/2°.

Unless otherwise stated, all the following material will concern and apply to the P-40N, since that model, and its series, of the P-40 is the only model extensively used by the Ferrying Division.

Specifications:

Span	37' 3 1/2"
Length	33' 3 3/4"
Height	10' 7"

Tank Capacities

Front Wing	35 U. S. gallons
Rear Wing	94
Fuselage	68
Belly	75
	232 U. S. gallons

Oil system 13 gallons
Cooling system 15.5 gallons

Weight

Empty	5800 pounds
Gross	8000 pounds

Familiarization with Aircraft

Airplane Controls - Flight controls are conventional and all models have only rudder and elevator trim tabs, except RP - K - F - L - M - N-25 which also have aileron trim.

A E S T A I C T E D

Landing Gear - Hydraulically operated by means of an electrically driven hydraulic pump. Not lowered above 175 MPH IAS. Indicators are yellow popups above oleo strut on each wing. A warning light is mounted on main instrument panel which flashes on when RPM is less than 1,000 and gear is not DOWN and LOCKED. All models before the P-40N models have autosyn type gear indicators. No models have both popups and autosyn. An auxiliary hydraulic hand pump is installed for use when electric pump fails.

Flaps - Hydraulically operated by the same electric pump the gear uses. Pop-up indicator on top trailing edge of left wing; 15° Green, 30° Yellow, 45° Red and fully extended.

Heating and Ventilating System - Hot air taken from coolant radiator, cold air from an opening in leading edge of wing. Control above and right of main electric panel. Push HOT, pull COLD, and lock by twisting.

Defroster - Will be installed for winter operation.

Fuel Gages - Front and rear wing tanks on cockpit floor. Fuselage on main panel.

Fuel Selector - Below throttle. If no belly tank is installed, do not move indicator through belly tank indication.

Fuel Pumps - One engine driven pump and also an electric booster pump.

Hydraulic System - Landing gear, tail wheel, and flaps. Pressure derived from electrically driven hydraulic pump and auxiliary hand pump.

Brakes - Hydraulically operated, independent system, expander shoe type.

Lights - Two cockpit spotlights. Navigation lights top and bottom. Instrument lights.

First Aid Kit and Map Case - Right of cockpit.

Emergency Exit Control - Top forward frame of canopy - pull the release. Nose over exit on lower left canopy frame, inboard, should be pushed or kicked out.

R E S T R I C T E D

Engine Controls - Throttle left side of cockpit. Maximum 52" hg., giving 1200 HP. War emergency power 57" hg., giving 1480 HP. Rated at sea level.

The P-40N-20 and N-25 have coordinated power controls. That is, the manual propeller governor control is linked directly to the throttle lever. When manifold pressure is increased by means of the throttle lever, the RPM is also increased. When the manifold pressure is decreased, the RPM also decreases.

Replacing the propeller governor control on the quadrant, is a lever marked Manifold Pressure Modifier. This lever is for economical long-range cruise, and will give from 1" - 10" MP more than the normal throttle setting. For normal cruise, at 2100 RPM, the engine will be drawing 27" MP. If one desires to cruise at 2000 RPM and still maintain 27" MP, the throttle lever is retarded until the tachometer indicates 2000 RPM. Then the MP Modifier is advanced until the setting of 27" MP is indicated. WARNING: The Mp Modifier should be fully OFF for take-offs and landings. As it can be seen, if the MP Modifier is in the forward position for take-off, MP will be reached before the propeller governor control linkage has reached full HIGH RPM; with the result that at 45" MP, the RPM will be about 2400 instead of 3000 as is desired. Remember, the modifier affects only manifold pressure and not RPM at any certain throttle setting.

Mixture Control - Adjacent throttle, IDLE CUT-OFF, AUTOMATIC RICH AND FULL RICH.

Prop Control - All models are equipped with a Curtiss Electric constant speed propeller. The change in pitch angle is made through a gear train driven by a reversible electric motor. The electric controls for the propeller consist of a propeller circuit breaker and a propeller selector switch. Both controls are located on the left side of the main switch panel.

The circuit breaker protects the propeller electric system from electrical overloads and shorting. This circuit breaker must be ON at all times. Any time the circuit breaker is OFF the propeller is in FIXED PITCH and cannot be changed until the breaker is ON.

The selector switch determines the propeller electric circuit to be used. The four positions are: AUTO CONSTANT SPEED, FIXED PITCH, DECREASED RPM MANUAL AND INCREASE RPM MANUAL.

With the selector switch in AUTO (circuit breaker ON) the propeller will automatically maintain the RPM desired at the respective throttle setting.

At any time the selector switch is in the OFF or FIXED PITCH position the propeller is actually in a FIXED PITCH and no constant speed operation can be made. In this case the RPM will follow the throttle.

DECREASE RPM MANUAL is for emergency operation. In the event of a failure in the auto circuit the RPM can be changed using the manual switch. With the circuit breaker ON the RPM can be increased by holding the switch in the INCREASE RPM position until the desired RPM is attained. As soon as the switch is released the prop will go to FIXED PITCH at the new blade setting.

Generator Line Switch - Located on main line switch panel. Switch is to insulate generator in the event of failure of the generator charging rate.

Cowl Flaps - One manually operated set of cowl flaps for both oil and coolant. Control located on right side of cockpit.

Ignition Switch - OFF, LEFT, RIGHT AND BOTH. Adjacent to propeller switch on main front panel.

Engine Primer - Beneath main switch panel.

Energizer and Engage Switch - Left lower panel.

Crank - In access compartment above electric junction box.

Carburetor Air Intake Control - Right side of instrument panel. COLD, HOT, AND FILTERED are the three positions.

II. COCKPIT FAMILIARIZATION AND PROCEDURES

Preliminary Check

1. Parking Brake ON
2. Adjust shoulder straps and belt
3. Check freedom of controls
4. Oil and coolant shutters FULL OPEN
5. Flap and landing gear control handles NEUTRAL
6. Fuel selector fuselage tank
7. Carburetor FULL COLD
8. Rudder tab 2-3° RIGHT, elevator tab TAKE-OFF position, aileron tab NEUTRAL (on K and N-25.)

Starting Engine

REFER to Starting Procedures Section VII.

Engine Warm-Up

1. Idle at 1000 RPM until oil pressure stabilizes at 60-70 PSI. When temperature begins to rise, gradually increase RPM to aproximately 1400 RPM
2. If known icing conditions exist, move carburetor air control to HOT.
3. Fuel Pressure for idling should be at 9 PSI and operating should be 16-18 PSI.
4. Avoid prolonged ground running of engine.
5. Set cowl flaps as temperature requirs.
6. In desert or sandy areas place filter control in FILTERED position.

Ground Test

1. For magneto and propeller check, refer to section II, page 14.
2. At 2300 RPM, check for low battery. The ammeter will show a charge only when the battery is taking current. If fully charged, ammeter will not indicate. Do not take-off if battery is taking over 35 amps. For an accurate battery check, the following procedure must be observed.

At 2300 RPM	Example
A. Take ammeter reading	45 AMPS
B. Battery switch OFF and take ammeter reading	20 AMPS
C. The difference between the two readings is the actual amperage entering battery.	25 AMPS

3. Check fuel and oil pressures; oil and coolant temperatures.

NOTE: For all high speed ground operations, be positive that the control stick is in full back position.

Before Take-Off

1. Set fuel selector fuselage tank.
2. Check that wing flaps are UP.
3. Be sure controls are free.
4. Regulate cowl shutters according to temperature.
5. Carburetor heat control COLD.

6. Tighten throttle friction lock.
7. Check that boost pump is ON.
8. Propeller set on 0.
9. Mixture Control AUTO RICH.

Desired Use of Power with 100 Octane Fuel and Power Control

	Manifold Pressure	RPM	Mixture
Take-Off	45"	3000	AUTO RICH
Climb	33" *	2350	AUTO RICH
Cruise	27" *	2100	AUTO RICH

Desired Use of Power with 100 Octane Fuel and Quadrant Propeller Control

	Manifold Pressure	RPM	Mixture
Take-Off	45"	3000 (HIGH)	AUTO RICH
Climb	35"	2600	AUTO RICH
Cruise	27"	2280	AUTO RICH

Landing Procedure, Normal

1. Mixture control AUTO RICH - unless the engine roughens when applying power, or on glide, then quickly change to FULL RICH. Roughening of engine is caused by mixture becoming too lean on long glides and extended periods of "power off".

2. Lower landing gear, not over 175 MPH indicated.

3. Adjust cowl shutters to prevent over-cooling.

4. On final approach extend flaps not over 140 MPH indicated.

5. Final approach speed, 105 MPH.

NOTE: Return landing gear and flap control levers to NEUTRAL after completion of retraction or extension. Neutral is the positive lock position.

After Landing

1. Continue rolling straight ahead until airplane can be completely controlled on ground.
2. Turn off runway as soon as possible.
3. Open cowl shutters and retract flaps while taxiing to parking line.

* The Resultant MP may vary slightly with these RPM settings.

R E S T R I C T E D

Stopping Engine

REFER to Stopping Procedures Section VII.

Before Leaving Cockpit.

1. Fuel selector OFF.
2. Battery line switch OFF
3. Lock controls.
4. Enter time and remarks in Form 1 and 14.

Auxiliary Operation of Landing Gear and Flaps

REFER to section on Precautions for P-40.

III. SYSTEMS

Fuel System

General

Carburetor: The Allison engine is equipped with a Bendix Stromberg downdraft pressure injection type carburetor, which incorporates an automatic altitude control, and a mixture regulator having four main control lever settings; FULL RICH, AUTO RICH, AUTO LEAN, and IDLE CUT-OFF. The mixture is manually adjusted by moving the mixture control lever between AUTO RICH and AUTO LEAN. Automatic altitude mixture control is also maintained for any fixed position of the control lever between AUTO RICH and AUTO LEAN. The Packard engine is equipped with a Bendix-Stromberg downdraft carburetor.

P-40N - There are three self-sealing fuel tanks and one belly tank. Front Wing Tank 35 U. S. gallons. Rear Wing Tank 54 U. S. gallons. Fuselage and reserve tank 68 U. S. gallons. Belly tank 75 U. S. gallons. This gives a total of 232 U. S. gallons. Normal consumption is 50-55 GPH at cruising AUTO RICH.

Wing tanks on all models are separate, except the model N which has interconnected Wing tanks.

P-40F and L - Front Wing tank 35 U. S. gallons. Rear Wing tank 50.5 U. S. gallons. Fuselage and reserve 62.5 U. S. gallons. Belly tank 75 U. S. gallons. This gives a total 223 U.S. gallons.

The flow of gasoline is into the selector, then up through the strainer to the engine driven pump, and finally to the carburetor. There is also an electric booster pump installed between strainer and engine pump to aid in building up pressure.

Fuel pressure 14-18 lbs. Normal
12 lbs. Emergency

R E S T R I C T E D

A vent line connects the carburetor fuel chamber to the fuselage tank; this vent allows air to be expelled from the top of the carburetor fuel chamber when it is being filled and prevents vapor lock. This passage is closed by a check valve when the chamber is full. This carburetor vent line and the boost pump are two aids for the prevention of vapor lock in the fuel system.

NOTE: Float-type fuel gage hands quite frequently stick in the full or empty positions. This should be considered in determining actual fuel quantity. Tap gage lightly if hand is believed stuck.

Use of Tanks With 100 Octane Fuel

1. Start and Take-off - fuselage tank, and burn all but 35 gallons, which is the reserve.

2. Drain belly tank.

3. Cruise wing tanks.

4. Land on fuselage tank.

Use of Tanks With 91 and 100 Octane Fuel

1. Start and taxi - fuselage tank

2. Run-up, take-off, and climb - wing tanks

3. Cruise - drain fuselage tank to 35 gallons for better stability.

4. Cruise - belly tank

5. Land - wing tanks.

The fuselage tank is used first because it is the vented tank for flowback from the carburetor. The normal flow-back is 2-10 gallons per hour.

Filling of Tanks When Using 91 and 100 Octane Fuel

1. Fuselage tank with 91
2. Wing tanks with 100
3. Belly tank with 91

A low octane fuel used in an engine equipped for high octane fuel causes detonation. Detonation can be decreased and sometimes eliminated by splitting the normal prop and throttle ratio. The three steps to be taken when detonation occurs under this situation:

1. Select a richer mixture if available
2. Increase the RPM . 200
3. Lower MP 2-3 hg.

Oil System

Oil flows from the bottom of the oil tank through a line in which is incorporated the "Y" drain cock, to the oil inlet connection on the engine, where it is circulated by one pressure and two scavenging pumps of the simple gear type. The pressure and main scavenging pumps are arranged in the unit at the right of the accessory housing. The oil supply is delivered from the oil tank to the pump. The pressure pump delivers the oil to the Cuno oil strainer. The Cuno strainer is equipped with a safety bypass valve set to open at a differential pressure of 100 PSI. Oil pressure at the outlet of the Cuno strainer is transmitted to the piston of a spring opposed relief valve which bypasses excess oil directly from the outlet to the inlet of the pressure pump. This arrangement maintains a constant oil pressure at the strainer outlet within the limit of the pump capacity. The relief valve is accessible for cleaning and adjusting to change the oil pressure, without removal of the oil pump.

The oil tank is located aft of the firewall and forward of the armor plate installation; is accessible by removing the fuselage cover between the firewall and windshield. The oil tank contains a hopper which keeps the oil in circulation and returns the same oil to the engine without mixing the oil with the oil in the tank. This is an aid in warming up the engine and also helps in oil dilution. The tank capacity is 8.75 U. S. gallons. The tank should be filled to the peg of the filler neck before each flight. Total system contains 13 gallons in P-40N, and 18 gallons in P-40F and L's. The desired oil temperature is from 70-85°C. *

* Minimum is 40°C and maximum is 90°C. Desired oil pressure is 60-70 PSI. Minimum is 60 PSI and maximum is 80 PSI.

An oil temperature regulator is installed in the return line from the engine to the tank. Incorporated in the regulator is a thermostatic and pressure relief valve which controls the flow of oil through the cooler core and the jacket of the cooler as required to maintain the correct oil inlet temperature to the engine. This valve is entirely automatic and no adjustment is to be made except by the manufacturer.

Normal oil dilution is accomplished with the engine operating at 1000-1200 RPM. The period for dilution is from 2 to 4 minutes, depending on temperature of the anticipated start. Dilution should be done with the oil temperature not over 50°C in order to prevent evaporation and to prevent a possible fire hazard. The amount of fuel entering the oil system during dilution, is about 1 quart a minute.

Cooling System:

The engine is cooled by means of a high temperature ethylene glycol cooling system. The capacity of the cooling system is 15.5 gals. The percentage of coolant in the cooling system is normally 97% glycol and 3% water. In colder climates, the percentage of water is increased and the glycol is decreased. The system contains two coolant radiators, centrifugal engine driven coolant pump, cowl flaps, vent lines, and expansion tank. The expansion tank is located aft of the firewall and its capacity is 3.5 gals. Incorporated in the tank is a pressure relief valve set to operate at 3 PSI. When the pressure, due to heat expansion, in the tank exceeds atmospheric pressure by 3 pounds, the valve opens to allow pressure in the tank to escape to the atmosphere. When engine cools, the coolant will contract, forming a negative pressure within the tank. To equalize the pressure, a sniffler valve is installed in the tank. When the pressure in the tank becomes 1/2 to 1 pound less than atmospheric pressure, the sniffler valve permits the proper amount of air to enter the tank. Normal operating temperature is 105-115°C. Minimum is 85°C and maximum is 125°C.

Hydraulic System and Controls

The P-40 hydraulic system can not be compared to the same system on most airplanes. An engine driven hydraulic pump that is constantly in operation, is installed in the majority of airplanes so that when a hydraulic selection is made, the operation is immediately begun. The P-40 is not equipped with

an engine driven pump, but has an electric pump that lies idle until the operation is desired. A toggle switch mounted on the control stick controls the electric pump. This switch must be depressed for the entire hydraulic operation and is released upon completion. There is no accumulator and pressure gauge since the system is not engine driven. There is not a constant surge pressure in the lines with the electric pump lying idle intermittently; therefore, seldom are there failures in the system due to worn lines. The system consists of the electrically driven pump, gear and flap selectors, auxiliary hand pump, and a hydraulic reservoir.

In the earlier series of the F model, there was located, just inboard of the auxiliary hand pump, an emergency hand pump. The emergency system is completely self contained with its own lines and reservoir. If the main hydraulic system fails and the auxiliary hand pump fails, the handle is removed from the auxiliary pump socket by depressing the clip at its base, and placing it on the emergency socket. The main wheels can be lowered with the gear selector in any position by opening both star valves and using emergency hand pump.

NOTE: The emergency hand pump will not operate the tail wheel or flaps. The emergency system is found only on the P-40F and K, and NOT on the L or N.

WARNING: In case of complete failure of the main system and the emergency hand pump, the gear cannot be operated. The reason for this is, the landing gear is locked up and down by means of hydraulic locks, and it is necessary to have hydraulic pressure to unlock the sliding locks.

Electrical System

It is a 24 volt system which operates the instruments, running lights, gunnery equipment, warning light, and electrically controlled propeller. The electrically driven hydraulic pump is driven by an Eclipse 24 volt motor. Power is supplied to the electrical system by a 50 ampere modified type M-2 generator, which is found on most P-40's. On a few early models is found a 100 ampere generator. The switches for the various circuits, the reostats, and the circuit breakers are located on the electrical control switch panel below the instrument panel. In P-40N's, the battery has been relocated from the access com-

max 35 max 50 amp check watt by turning off bat switch

partment to a position just ahead of the fire wall on the left hand side. The external battery plug-in has been moved to a position ahead of the left wing on the fuselage.

Circuit Breakers

Act the same as fuses, but do not burn out. Whenever there is a short or overload in any of the electrical circuits, the circuit breaker for that line will turn itself off. In case of an overload, when the load is relieved, the circuit breaker can and should be turned back on.

IV. PRECAUTIONS

Use of Brakes - On all later models of the P-40, a brake that does not have very positive action has been installed. Earlier models had more positive brakes and many nose-overs occurred. Even with the later brake, precaution must still be taken. After take-off, tap the brakes to stop wheels rotating. Wheels spinning within the wing gear nacelle will burn its canvas lining. There is very little danger of brakes locking due to excessive heat in drums and lining.

Shoulder Straps - It must be the habit of every pursuit pilot to always wear the shoulder straps, for the pilot will never know when an immediate emergency may arise. The pilot will probably not have enough time to put on his shoulder straps in that emergency, so they must be on before starting engine.

Engine Failure on Take-Off

1. Immediately depress the nose in order to maintain flying speed.
2. Make sure that the landing gear has started to come up. If only unlocked and on the way up, it will collapse on landing. Continue to retract the landing gear until the visual indicators show the wheels to be completely retracted.
3. Release belly tank by pulling up on the BOMB TANK RELEASE handle.
4. Shut off engine by moving mixture control to IDLE CUT-OFF.
5. Turn fuel selector valve OFF.
6. Turn electric boost pump OFF.

7. Ignition switch OFF.
8. Lower wing flaps.
9. Turn battery line switch OFF.
10. Land straight ahead.

Engine Failure During Flight

1. Nose down and obtain approximately 100 MPH glide.
2. If in doubt of condition of the terrain, land with gear UP, but remember, with engine failure there is still complete hydraulic operation.
3. Turn fuel selector OFF.
4. Ignition switch OFF.
5. Lower flaps.
6. Battery switch OFF, if gear is not to be lowered.
7. Release belly tank.
8. Open the cockpit enclosure by operating the control crank.

Engine Failure Over Water

It is not advisable to ditch airplane, but if it has to be done, make a nose high landing (GEAR RETRACTED) and come in slow as possible, still maintaining control. Have hatch open and be ready to leave airplane as soon as possible. Make sure your safety belt and shoulder straps are fastened properly.

Stalls

The stalling characteristics of the airplane are good and at normal operational loads the following are the approximate stalling speeds:

Landing gear up - flaps up -- 83 MPH
Landing gear down - flaps up -- 90 MPH
Landing gear up - flaps down -- 78 MPH
Landing gear down - flaps down -- 79 MPH

Diving

As the diving speed increases, the airplane tends to yaw to the right, and left rudder tab is required for correction. Elevator tab control is extremely sensitive and should not be used in recovery except in emergency.

1. Maximum permissable diving speed is 485 indicated.

2. Cowl shutters closed.
3. Power-off Dives - To decrease the possibility of engine malfunctioning and missing upon opening the throttle after pull-out from POWER-OFF DIVES, the following precautions will be observed:
   Do not close the throttle to allow a manifold pressure of less than 20 inches hg. during dive.

Aerobatics

Subject to any current restrictions, any normal aerobatics may be executed in this airplane. However, the following are prohibited:

1. Outside loops.
2. Inverted flight.
3. Inverted spin.
4. Snap roll at speeds excess of 140 MPH.
5. Slow roll at speeds excess of 285 MPH.
6. Spin of more than three turns.
7. Spin with baggage, auxiliary fuel, or any other overload

NOTE: With belly tank installed, all aerobatics and speeds excess of 285 MPH are prohibited.

CAUTION: It has been found that it is possible to cause locking of the rudder in the full left position on the P-40 as if the airplane is skidded with almost full left rudder at fairly low speeds and power is then suddenly applied. This causes air loading on the rudder to be reversed and the more that power is applied, the more the left rudder tends to remain locked in the left position. This condition is believed to have caused fatal spins. All pilots should be cautioned that the throttle should be cut immediately if the airplane is inadvertently stalled or spun. When power is reduced, the airplane will respond to normal recovery control.

Normal Flap Operation

1. Airspeed below 140 MPH.
2. Check that gear selector is neutral.
3. Place flap selector in desired position.
4. Operate electric hydraulic pump by pressing trigger switch on control column.
5. Check position of flaps by means of the pop-up on trailing edge of left wing.
6. Release trigger switch, and neutralize flap selector.

Flaps can be milked up by operating the selector handle; not by actuating the electric driven pump; one touch on the pump switch and flaps will retract completely. Do not attempt to milk flaps up below 500 feet.

Auxiliary Wing Flap Operation

If the electric hydraulic pump fails to extend the flaps, manually pump them down with the auxiliary hand pump. Place control valve in down position and use hand pump. Return valve to neutral after flaps are in desired position. Neutral is the positive lock in the lines.

1. Airspeed below 140 MPH.
2. Gear selector neutral.
3. Flap selector to desired position.
4. Operate Auxiliary hand pump.
5. When the flaps have reached the desired position (checking wing pop-up), return flap selector to neutral.

NOTE: If both the electric and auxiliary hydraulic pumps fail, there is no way to lower the wing flaps.

Normal Gear Operation

1. Airspeed below 175 MPH.
2. Retard throttle to 1000 RPM and check for warning light operation.
3. Flap selector in neutral.
4. Gear selector in desired position.
5. Operate electric hydraulic pump by pressing trigger switch on control stick.
6. Check position of gear by pop-ups on leading edge of each wing. Pop-ups must be fully extended for gear down.
7. Release electric trigger.
8. Operate Auxiliary hydraulic hand pump with gear selector down. When there is solid pressure, gear is locked in the desired position, up or down.
9. Return gear selector to neutral.
10. Retard throttle to 1000 RPM and check warning light.

If pop-ups indicate gear is fully down, auxiliary hand pump cannot be moved, but warning light is still on when engine is throttle below 1000 RPM; Retract and extend gear once again and if light still stays on, make positive gear selector is in neutral. When landing, take precaution in using brakes. If gear locks are not in place, sudden application of brakes would possibly collapse gear if hydraulic lines were leaking.

Auxiliary Landing Gear Operation

If the electric hydraulic pump fails to lower the gear, manually pump them down with the auxiliary hand pump. Place the valve control valve in down position and use hand pump. Return valve to neutral after gear is down because neutral is the positive locked position.

Gear can be pumped into any position by the auxiliary hand pump with gear selector in desired position.

1. Airspeed below 175 MPH.
2. Flap selector neutral.
3. Gear selector to desired position.
4. Operate auxiliary hand pump. When there is solid pressure, gear is down and locked or up and locked.
5. Neutralize gear selector handle.
6. Throttle back to 1000 RPM and check warning light.

Emergency Landing Gear Operation on P-40 F & K

If the electric hydraulic pump and the auxiliary hand pump fail, the landing gear can be lowered by transferring the pump handle from the auxiliary hand pump (outboard) to the emergency hand pump (inboard). Open both left and right shut-off valves. The landing gear can be lowered with the landing gear valve selector in any position. When resorting to emergency hydraulic system, gear can only be pumped down. The tail wheel will not lower with operation of the emergency hand pump.

1. Airspeed below 175 MPH.
2. Transfer the hand pump handle from the auxiliary hand (outboard) pump to the emergency hand pump (inboard). Release the clip at the base of the handle and place the pump handle in the emergency pump socket (inboard).
3. Open both star valves, both left and right.
4. Gear selector in any position, operate the emergency hydraulic hand pump.
5. When there is solid pressure, gear is down and locked.
6. Tail wheel and flaps will not operate by the emergency hand pump.
7. Check pop-ups and warning light (below 1000 RPM).

Warning Light

The warning light (or horn) is connected directly to the sliding locks in the main gear, retracting cylinder. When the locks slide in their locked position, the warning circuit is disconnected. If gear is not locked down, light or horn will operate when engine is throttled below 1000 RPM

Cold Weather Operation - Oil Dilution System

The oil temperature is not over 50°C, and the engine is operating between 1000-1200 RPM during dilution. The oil dilution selector is pulled and held out for a period normally of 2-4 minutes. In case of sub-zero temperatures, it may be necessary to dilute the oil for two or more periods in order to prevent the oil from congealing.

Starting the engine - If heavy viscous oil is indicated by high or fluctuating oil pressure, the dilution control may be used to correct this condition.

Engine cowlflaps - May be operated to control temperatures as desired.

Engine and Cockpit covers - for parking purposes.

Wing de-icers - are not normally provided; however, they are occasionally installed for cold weather operations.

Snow and ice tread tires - installed for operation on snow and ice.

Spark Plugs - are changed to hot-running.

Fire in Flight - There are no fire prevention or fighting provisions installed. If a fire develops in the engine compartment, close the cowl flaps. If the fire is not extinguished, leave the airplane. For bailing out, either slide off the wing or roll the airplane and fall out.

Carburetor Icing - When icing conditions exist, use the carburetor heat intermittently. Due to the automatic MP regulator, there is no drop in Manifold Pressure when ice is forming in the carburetor. In conjunction with known icing conditions, the carburetor air temperature gauge may indicate the presence of ice when the temperature is -8° to -12°C.

Take-Off Run - Because of the engine torque and the narrow width of the landing gear, there is a definite compression of the left oleo strut until flying speed is attained. Use a smooth and definite application of power.

Rudder Pedals Bucking - Because of the steerable tail wheel, during take-off and landing, the rudder pedals will buck

beneath the pilots' feet. This is caused by the slacking and tensing of the steerable cables on the tail wheel when it is on the ground at fairly high speeds. The tail wheel is a full-swiveling steerable type.

P-40 REVIEW

GENERAL

1. What type of engine does the P-40 have?
2. What is the approximate length, height, and span of the P-40N?
3. What is the empty weight, gross weight of the P-40N?
4. What purpose was the P-40 designed for?

LANDING GEAR

5. What type of landing gear is incorporated and how is it operated?
6. What and where are the position indicators?
7. Explain the warning system.
8. The landing gear should not be lowered above what speed?

BRAKES

9. What type of brake system is used?
10. What type of brake is used?
11. What precautions should be exercised in the use of the brakes?

FLAPS

12. What type of flaps are incorporated and how are they operated?
13. What type of flap position indicators are used?
14. The flaps should not be lowered above what speed?

FUEL SYSTEM

15. Where are the fuel tanks located and what are their capacities?
16. What is the total capacity of the tanks?
17. Should the fuel selector be moved through the belly tank position when no belly tank is being carried? Why?
18. Where are the fuel gauges located?
19. What types of fuel pumps are incorporated?

20. What feature aids in the prevention of vapor-lock?
21. What is the operating fuel pressure?

OIL SYSTEM

22. Where is the location of the oil tank and what is its capacity?
23. What is the total capacity of the oil system?
24. What is the normal operating oil temperature?
25. During oil dilution what should the RPM be? The oil temperature should be?

26. How long should the switch be held on in oil dilution?
27. If the oil temperature rises or remains high when the oil cooler shutters are open what should be done to lower the temperature?

HYDRAULIC SYSTEM

28. How is the hydraulic system driven?
29. Where is the switch located that actuates the system?
30. In the event of complete failure of the hydraulic system, can the landing gear be lowered?

COOLING SYSTEM

31. What are the operating temperatures of the coolant?
32. What is the capacity of the coolant expansion tank?
33. What is the capacity of the coolant system?
34. What is the purpose of the coolant expansion tank?
35. For normal operations what does the coolant consist of?

ELECTRICAL SYSTEM

36. What type of system is incorporated?
37. Where is the location of the circuit breaker panel?
38. What is the purpose of circuit breakers?

MISCELLANEOUS

39. Explain the control lock system.
40. What is the position of the propeller selector in starting?
41. What is the position of the throttle in starting?
42. What is the position of the mixture control?
43. With the mixture control out of IDLE CUT-OFF, should the electric booster pump be used when the engine is not firing?

44. How soon should oil pressure be established after starting engine?
45. If no oil pressure is established what should be done?
46. What are the power settings for take-off, for climb, and for cruise?
47. What maneuvers are prohibited without belly tank?
48. With gear and flaps down what should the final approach speed be?
49. What is the average gas consumption while cruising?