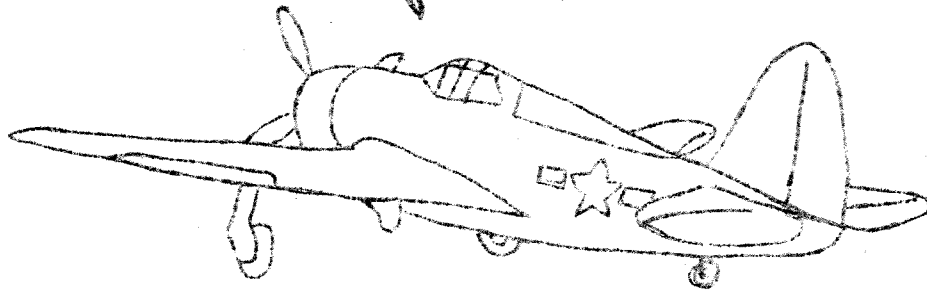


P-47



- (5) Manually lower the flaps.
- (6) Master battery switch OFF (P-47C, D, and G only).
- (7) If a suitable emergency landing field is available, the landing gear may be lowered. If not, keep the landing gear up and make a belly landing. If the terrain is too rough for even this, there is only one thing left to do - HIT THE SILK!

c. Emergency Exit during Flight - Release the canopy lock and push the canopy back in the usual manner. At high speeds, pull the handle on the right forward edge of the canopy releasing spoiler flaps which aid in sliding the canopy back. To release panels, turn the emergency release handle 180° until it snaps into place; push out the partition between the windows and push the windows out. On P-47D-25 and later models, the Bubble canopy is fully jettisonable, released by a switch just forward of the inter-cooler and oil cooler shutter switches.

2. USE OF BRAKES

When taxiing use cautions applying brakes. Instead of holding a constant pressure, pump them gently. Too much continuous use of the brakes cause the drums to become heated and expand and they are likely to lock. The same holds true when using the brakes in landing. Remember not to hold a constant pressure unless in an emergency.

3. EMERGENCY TAKE-OFF IF LANDING IS NOT COMPLETED

Open the throttle to FULL POWER but don't exceed 42". When applying full throttle watch the tendency to swing which is due to the sudden power application. Raise the landing gear at once. Milk the flaps up when an altitude of 500 feet is reached. Stay in pattern and try again.

4. FUEL

When the fuel tanks are being filled always check the caps. A red line is drawn through the center and when properly secured, the red line corresponds to two small red dots on either side of the tank filler neck. If the tank cap is turned 90° from the normal position the gas will spill and overflow creating a fire hazard.

C. Emergency Procedures

1. EMERGENCY TAKE-OFF

Use oil dilution to obtain proper oil pressure at moderate power, and as soon as the engine will take throttle, taxi out and take-off. Warning: Apply throttle slowly but steadily. Sudden application of full throttle greatly affects torque.

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2. ENGINE FAILURE DURING TAKE-OFF

Nose down. Land on field straight ahead. If too late, retract gear and land off field straight ahead. Caution: Do not attempt to turn back into the field.

3. ENGINE FAILURE DURING FLIGHT

Nose down. Ignition switch OFF (to BAT on P-47B only). If aircraft is equipped with external tanks, pull release lever immediately. Fuel selector valve OFF. Manually lower the flaps. Master battery switch OFF (P-47D, C and G only). If a suitable emergency airfield is available, the landing gear may be lowered. If not, keep landing gear UP and land airplane on its belly.

4. EMERGENCY EXIT DURING FLIGHT

Release canopy lock and push canopy back in the usual manner. At high speeds pull the handle on the right forward edge of the canopy, releasing spoiler flaps, which aid in sliding canopy back. To release panels, turn the emergency release handle 180° until it snaps into place. Push out the partition between the windows. Push out the windows.

5. EMERGENCY ENTRANCE ON GROUND

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

6. NORMAL PROCEDURE TO LOWER THE LANDING GEAR

1. Indicated air speed below 200 mph.
2. Test warning light for proper functioning.
3. Place the landing gear selector handle into the DOWN position.
4. Check the warning light.

7. EMERGENCY PROCEDURE TO LOWER THE LANDING GEAR

1. Indicated airspeed below 200 mph.
2. Check warning light.
3. Place gear selector handle to the DOWN position.
4. Yaw the airplane with rudders until warning light is out.
5. Check the position of the tail wheel lock, full forward.

8. NORMAL WING FLAP OPERATION

1. Airspeed below 195 mph.
2. Flap selector handle moved to the "DOWN" position and left down if full flaps are being used.
3. If using less than full flaps return the flap selector handle to the neutral position when the desired degree of flaps is reached.

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9. EMERGENCY WING FLAP OPERATION

1. Indicated air speed below 195 mph.
2. Gear selector handle "NEUTRAL".
3. Flap selector handle in the "DOWN" position.
4. Operate the emergency hydraulic hand pump until the desired degree of flaps is reached.
5. Return the wing flap selector handle to the "NEUTRAL" position.
6. Place the gear selector handle to the "DOWN" position.

CAUTION: DO NOT USE THE HAND PUMP TO LOWER THE LANDING GEAR. ANY ATTEMPT TO DO SO MAY USE UP THE RESERVE FLUID IN THE ACCUMULATOR WHICH IS ONLY SUFFICIENT FOR THE EMERGENCY OPERATION OF THE FLAPS. HOWEVER IF IN THE EVENT THE GEAR IS DOWN BUT HAS NOT ATTAINED THE FULLY DOWN LOCKED POSITION, OPERATE THE HAND PUMP UNTIL THE LOCKED SIGNAL IS GIVEN.

BEAR IN MIND THE POSSIBILITY OF PUMPING THE FLUID OVERBOARD IF THE HAND PUMP IS USED IN LOWERING THE GEAR. IT HAS BEEN FOUND THAT YAWING THE AIRPLANE HAS A MUCH GREATER EFFECT ON LOWERING THE GEAR THAN THE HAND PUMP.

WARNING: ALWAYS COMPLETE LANDING GEAR CYCLE IF POSSIBLE. IF HANDLE IS MOVED TO "UP" ALLOW GEAR TO GO COMPLETELY UP BEFORE CHANGING CONTROL. IF HANDLE IS MOVED TO "DOWN" ALLOW GEAR TO GO COMPLETELY DOWN BEFORE CHANGING CONTROL.

10. COLD WEATHER OPERATION

Always turn a cold engine over several times before engaging the starter. When available, use a battery cart or auxiliary generator unit for starting to prevent early depletion of the battery caused by cold weather operation. To successfully start the engine during extremely cold weather, considerable priming is necessary. A light priming should be given while the engine is being turned over. Always start the engine with cowl flaps CLOSED, intercoolers CLOSED, and oil coolers CLOSED. If, after 3 or 4 unsuccessful attempts, the engine does not start, take at least one spark plug from each cylinder and heat the plugs to 65°C. Make another attempt immediately after replacing the plugs. The only means of regulating the carburetor air is the intercooler doors. After starting the engine check oil pressure at once! If 25 pounds is not reached within 30 seconds shut the engine OFF. Normally, the oil pressure will go to about 150 or 200 pounds. DO NOT INCREASE the power above 1000 RPM until the pressure drops to normal. Excessive oil pressure may break an oil line. WAIT UNTIL THE PRESSURE DROPS. Run the engine at 800 to 1000 RPM until the pressure is normal and the oil temperature is 40°C. In cold weather close the oil shutters during warm-up. In warm weather open the cowl flaps and have

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oil shutters at OPEN. In extremely cold weather, when shutting off engine for overnight or a long period of time, use the double dilution system. First the oil temperature must be below 50°C and the head temperature below 150°C. Idle the engine at 800 RPM and hold the oil dilution switch down for a period of 2 to 4 minutes for normal dilution. For double dilution, after the first one has been accomplished, shut the engine off for fifteen minutes and repeat.

Between +4° and -12°C dilute for 3 minutes.

Between -12° and -29°C dilute for 5 minutes.

Between -29° and -46°C dilute for 7 minutes.

For each 5°C below -46°C add one minute dilution time

II. SECOND EXERCISE

A. Cockpit Familiarization — P-47

Location of controls — left to right taking each item and explaining in detail using cockpit mock-ups and photographs.

LEFT SIDE OF COCKPIT

1. The bypass filter valve is pulled to bypass the air going to the carburetor. Pushed in, the air is filtered. It is used mainly in dusty or sandy conditions to filter the air. It should never be used under icing conditions because the filter will ice up and will cause a drop in manifold pressure.

2. The three levers just underneath the trim tab quadrant are marked GUN HEAT, GUN CHARGER, and TANK RELEASE. These are operated by pulling the respective lever up to the STOP position: i.e., to release the external tanks, pull up on the control marked TANK RELEASE.

3. The trim tabs are more or less conventional. For left rudder trim turn the control counter-clockwise and move the indicator that is marked LEFT, RIGHT, NEUTRAL, and T.O. (setting for take-off). The aileron trim just opposite the rudder trim is turned right for right aileron and left for left aileron, the indicator showing the amount. The elevator just below the aileron and rudder is turned clockwise for nose bearing and counterclockwise for tail bearing, the indicator being just above. For take-off set the aileron tab NEUTRAL, rudder in T.O. and elevator NEUTRAL.

4. The flap control handle is pulled aft to lower and forward to raise. It has three positions: UP, DOWN, and NEUTRAL. No indicator is provided. The amount of flaps used is judged visually. The NEUTRAL position is used when milking the flaps up and when full flaps are not used. If half flaps are desired, push the control to the DOWN position and back to NEUTRAL.

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5. The landing gear control is pulled UP to retract and DOWN to lower the gear. To retract the gear the safety lock is pushed UP, the button on the end of the handle depressed and the handle pulled UP. The NEUTRAL position is used only when the flaps are being lowered manually.

6. The intercooler and oil cooler shutter indicators are marked CLOSED, NEUTRAL, and OPEN. They are operated by a toggle switch on the electrical switch panel. For take-off the oil cooler shutter is in NEUTRAL and the intercooler NEUTRAL.

7. The toggle switch just to the right of shutter indicator is pushed UP for the use of the camera, DOWN for the use of guns and cameras, and CENTER for off.

8. The first control on the throttle quadrant is marked "B" for the use of the supercharger. The second is the throttle with the mike button on the side. The third marked "P" is the prop control. The fourth marked "M" is the mixture control with three positions marked IDLE CUT-OFF, AUTO LEAN, AUTO RICH. A friction increase and decrease is located on the bottom of the quadrant. If friction is decreased too much, the throttle is spring loaded to spring forward to full power.

9. The fuel selector switch is marked in four positions. Nine o'clock for external tank, twelve o'clock for main, three o'clock for auxiliary, and 6 o'clock for off. When changing tanks be sure the valve is fully seated in the desired position.

10. On the electrical switch panel the prop control switch is marked UP for automatic constant speed, CENTER for fixed speed, RIGHT for increase RPM, and LEFT for decrease RPM. The circuit breaker just below is pushed in to reset. ALWAYS take-off with the selector switch in the UP or AUTOMATIC CONSTANT SPEED position.

11. The two switches just below the circuit breaker for the prop are the control switches for the intercoolers and the oil coolers. Pushed up the coolers are OPENED. Pushed down the coolers are CLOSED. The other switches on the electrical switch panel are conventional and self explanatory. On the P-47D-20 and later models these switches are located opposite the position indicators.

12. The emergency hydraulic pump handle is spring loaded. When turned one-fourth round counterclockwise the spring is released extending the handle twice the normal length making it easier to operate. The pump is used to supply pressure directly to the system for operation of either flaps or gear in event of engine-driven pump failure.

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13. The ignition switch is marked OFF, L for the left magneto, R for right magneto, and BOTH for both mags.

14. The battery switch is pushed UP to turn on and DOWN for off. It should be turned OFF when using a battery cart to start the engine.

15. The compound fuel gauge is marked left side for auxiliary and right for main.

16. The altimeter, gyro compass, air speed indicator, compass, turn and bank indicator, rate of climb, artificial horizon, manifold pressure gauge, tachometer, and clock, are all conventional.

17. The hydraulic pressure gauge which is located left and to the bottom of the compass is marked 0, 1000 and 2000. It should read from 800 to 1000 PSI min - max.

18. The fuel level warning light above the hydraulic pressure gauge flashes when approximately 40 gallons of fuel remain in the main tank.

19. The fuel pressure gauge, just right of the MP gauge, should read 16 to 17 PSI.

20. The cylinder head temperature gauge should read: minimum 100°C, maximum 250°C, desired 185°C.

21. The oil pressure gauge below the oil temperature should read 60 to 90 PSI min - max.

22. The oil temperature should read 45°C to 85°C. min - max.

23. Just right of the instrument panel is the engine primer.

24. Below the engine primer is the cowl flap control -- pull to open, push to close.

25. Below the compass is the parking brake control. To set, pull the knob, depress the pedals, and release the pedals then the knob.

26. The control lock is at the bottom of the stick. To lock, neutralize the controls and pull up on the lock.

27. The landing gear warning light which is just behind the instrument flight hood will flash on when the gear is not in an UP LOCKED or DOWN LOCKED position and when the gear is not down and locked with the throttle 3/4 closed.

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28. The starter switch, upper right of instrument panel, is pushed left to energize and right to engage.

29. Below the starter switch is the carburetor air temperature gauge.

30. The SCR-522 Radio Set, on the right, is equipped with four bands — A, B, C, and D. At the end of the set a toggle switch is installed and marked T for transmit, R for receive, and REM to transmit and receive.

31. The cockpit vent below the SCR-522 set is pulled out to force cold air into the pilot's compartment.

32. The tail wheel lock is pushed forward to lock and aft to steer.

33. The belly tank release control on earlier models of the P-47 is located left of the tail wheel lock. To release the tank the control is pulled up. Later models — on the left side of the cockpit below the trim tab quadrant.

34. The "Detrola" radio set above the map case is a low frequency set for receiving only (from 200 to 400 K.C.).

B. Operating Instructions for P-47

1. Obtain Flight Clearance.
2. Check Airplane Thoroughly.
 - a. Check airplane visually.
 - b. Check all control surfaces.
3. Enter cockpit.
 - a. Check all controls.
 - b. Check gear (see that handle is DOWN)
 - c. Check flaps (handle must be left in UP position)
 - d. Flap equalizer closed, DOWN.
 - e. Generator switch ON.
 - f. P-47B ignition switch to B.A.T. P-47C, D, and G ignition switch OFF and master battery switch ON.
 - g. Intercooler shutters NEUTRAL.
 - h. Oil cooler shutters NEUTRAL.
 - i. Propeller switch ON, selector in AUTOMATIC.
 - j. Fuel boost pump to START AND ALTITUDE (fully counterclockwise).
 - k. Check fuel pressure.
 - l. Gun switch OFF.
 - m. Adjust rudder pedal.

4. Starting Engine.
 - a. Turn propeller several revolutions by hand with ignition OFF.
 - b. P-47B ignition switch BAT.
 - c. P-47C, D, and G master battery switch ON.
 - d. Supercharger lever OFF (full rear position).
 - e. Fuel selector valve MAIN.
 - f. Crack throttle to OPEN 1/4" to 1/2".
 - g. Mixture control IDLE CUT-OFF.
 - h. Propeller switch AUTOMATIC, circuit breaker ON.
 - i. Propeller control MAXIMUM RPM (2700 RPM). Low Pitch-forward.
 - j. Fuel boost pump control on START AND ALTITUDE.
 - k. Prime 2 to 4 strokes if hot, and 4 to 6 if cold. As much as one-fourth throttle opening and heavy priming may be necessary in extreme cold.
 - l. Ignition switch to BOTH.
 - m. Energize and engage starter, push mixture forward to AUTO RICH as soon as engine fires. If engine stops due to being loaded, open throttle wide and return mixture to IDLE CUT-OFF until engine fires again then retard throttle and return mixture to AUTO RICH and throttle to 900 RPM.

5. Warm-Up and Take-Off
 - a. Check oil pressure; if 25 pounds is not reached in 30 seconds cut off engine.
 - b. Do not increase power above 1000 RPM if oil pressure is 150 to 200 pounds. Wait until it drops to normal (90°C or below).
 - c. Mag. Check - See Section II for correct procedure in checking mags and electric propeller.
 - d. With flap selector handle UP (fully forward) equalize flaps to insure that flaps will work together.
 - e. Unlock tail wheel and taxi.
 - f. Set trim tabs, rudder at take-off, elevators and ailerons at Neutral.
 - g. Mixture AUTO RICH.
 - h. Prop maximum RPM with prop switches ON and AUTOMATIC.
 - i. Fuel selector valve MAIN TANK.
 - j. Flaps UP.
 - k. Cowl flaps OPEN.
 - l. Lock tail wheel.
 - m. Open throttle to 30" holding with brakes ON.
 - n. Release brakes and open throttle wide, not to exceed 52". (42" with 91 octane)
 - o. Watch for over-heating. AVOID.

6. Power Settings
Take-off 48" and FULL RPM (if 91 octane is being used, do not exceed 42")
Climb 35" and 2500 RPM
Cruise 30" and 2100 RPM

7. Landing
 - a. Do not lower landing gear above 200 MPH. Normally 170 MPH.
 - b. Do not lower flaps above 195 MPH. Normally 150 MPH.
 - c. Never exceed 250 MPH with landing gear down.
 - d. Use of partial flaps return flap handle to NEUTRAL.
 - e. Do not use up all of runway, land near as possible to the beginning of the runway.

III. THIRD EXERCISE

Discussion of the Fuel, Oil, Hydraulic, and Supercharger Systems with the Use of Diagrams of Each

A. FUEL SYSTEM

All models of the P-47 have two (2) self-sealing tanks installed in the fuselage under and forward of the pilot's compartment. The P-47B, C, D, and G models up to and including the P-47D-15 have a main tank capacity of 205 U.S. gallons. The P-47D-20 and later models have a main tank capacity of 270 U.S. gallons. The auxiliary tank has a capacity of 100 U.S. gallons in all models including the P-47D-20 and later models. The total capacity of the P-47B, C, D, and G models up to and including the P-47D-15 models have a total capacity of 305 U.S. gallons. The P-47D-20 and later models have a total capacity of 370 U.S. gallons. There is a fuel level warning lamp for the main tank. It will come on when approximately 40 gallons remain in the tank. The amount remaining for reserve will vary between 2 and 20 gallons, depending upon the altitude of the airplane during run out. When operating at low power and low speed with a relatively high angle of attack, most of the fuel will be used up while on MAIN; and when operating in a nose low or high speed condition the main tank supply will be exhausted early leaving a relatively large amount of fuel available on reserve. Because of the above defect, ten U.S. gallons should be kept in the auxiliary tank for a safe, known reserve. Two 300 gallon wing tanks or two 150's and a 75 belly external tanks can be installed on the P-47C, D, and G airplanes underneath the fuselage fastened to a release mechanism built into the crash skid. After fuel has been exhausted from the external tanks, the tanks may be released by pushing the lock on the release handle aft and pulling up on the release handle. An electrically operated compound gauge is provided. It reads correctly only when the airplane is in flying position. A three point correction card is posted near the gauge for determining the quantity of fuel aboard when the ship is on the ground. Due to the inherent design, the main fuel gauge is not accurate below about 20 gallons. The selector valve is conventional. When turning valve be sure to feel that the valve seats itself in the new position. Fuel is supplied by means of a pump mounted directly on the engine, assisted by an electrically operated, variable-speed

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booster pump on the sump of each fuel tank. The booster pumps are turned on automatically by means of a rotary switch mounted on the fuel valve control shaft when the fuel valve is turned to the MAIN and AUXILIARY positions respectively. Both pumps are turned off automatically when the fuel valve is turned to the EXTERNAL or OFF positions. When either booster pump is turned on by placing the fuel cock in the MAIN or AUXILIARY position, the speed of that pump is controlled by the booster pump emergency rheostat which is located on the electrical switch panel. This control has no OFF position. When turned to the extreme counterclockwise position, marked START AND ALTITUDE, the pump operates at its normal speed. Turning the knob clockwise increases the pump speed and therefore, the delivery pressure. Minimum pressure is 16 PSI, maximum is 17 PSI, idling is 7 PSI. When climbing to high altitudes and normal fuel pressure cannot be maintained, adjust the rheostat clockwise which increases the speed of the booster pump thereby gaining more fuel pressure.

B. OIL SYSTEM

The oil tank is located in the upper part of the engine compartment with a filler on the left end of the tank and is accessible through the cowl door marked OIL. The total capacity of the tank is 28 U.S. gallons of which 19 U.S. gallons is normal and the rest overload. The normal capacity is obtained by filling the tank until oil drips from the normal level pet cock on the left end of the tank below the filler. Two oil coolers are installed, one on each side in the lower part of the engine compartment. Adjustable split doors are located in the exit ducts and are electrically operated and controlled from the cockpit by a switch on the main switch box. Shutter position indicators are located on the left side of the cockpit above the wing flap control handle. The heat of compression due to the turbines supercharger is removed from the inlet carburetor air by an intercooler. The intercooler exit is provided with sliding shutters, which are controlled by an electric switch on the main switch panel. Oil pressures should be as follows:

| | |
|---------|--------------|
| Maximum | 90 PSI |
| Minimum | 60 PSI |
| Idling | 25 PSI |
| Desired | 75 to 85 PSI |

Provisions are made for oil dilution for cold-weather starting or for emergency operations. The oil dilution switch is located on the electrical switch panel.

C. HYDRAULIC SYSTEMS

The hydraulic system of the P-47 series airplane is a two line system: that is, a pressure and return line are incorporated.

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The normal capacity of the entire system is 5.5 U.S. gallons. Five to six gallons per minute, at a pressure of 1000 pounds PSI, is maintained by use of an engine-driven pump. A hand pump located in the cockpit may be used to deliver the pressure directly to the system. An accumulator is provided. The accumulator will store 6.8 cubic inches of fluid between the cut-in and cut-out pressure of the pressure regulator (namely 800 pounds PSI and 1000 pounds PSI respectively). In the event any work is to be done on this system, this stored pressure must be dissipated by working the cowl flaps until the hydraulic pressure gauge in the cockpit reads zero. In the event that the engine pump should fail, the hand pump may be used to supply pressure to the system. The hand pump will not, however, deliver pressure to the accumulator of the pressure regulator. A check valve is incorporated between the hand pump and the accumulator and pressure regulator lines. The main relief valve bypasses any excessive pressures to the hydraulic supply tank. In order to gain synchronization of the wing flaps, the system for actuating the flaps has been designed as a "closed" system. The inlets and outlets of the wing flap cylinders are interconnected so that the flaps must retract or extend in a synchronized manner. The equalizing cylinder is "bottomed" before each flight by following the instructions on the instruction plate directly over the equalizing cylinder. The wing flaps are designed to operate at a certain maximum airspeed. In order to make sure that the wing flaps are not operated at above this speed, a relief valve is also incorporated in the system. The relief valve bypasses pressure to hydraulic supply tank until the air pressure on the wing flaps is sufficiently reduced to indicate the proper airspeed. With the wing flap control handle in NEUTRAL, it is conceivable that sufficient pressure could be exerted on the wing flaps to actuate the relief valve and depleted the wing flap system of part of its fluid. In that event, air could possibly be sucked past the gland packing and "air-lock" the wing flap cylinders. For this reason, the wing flaps will not be used as push points in maneuvering the airplane on the ground. If the hydraulic pressure gauge oscillates between 800 and 1000 PSI the function of the pressure regulator is acceptable. If, however, the pressure gauge oscillates between 1020 to 1080 PSI it signifies a defective pressure regulator.

The following is a detailed explanation of Normal and Emergency Procedures to lower the gear:

NORMAL PROCEDURE TO LOWER THE LANDING GEAR:

1. Indicated air speed 200 MPH or below.
2. On the electrical switch panel, push the "landing gear warning light test switch" to the UP position. The warning light will flash on indicating that it is functioning.

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3. Place the landing gear selector handle into the DOWN position. Note that the warning light is ON and will remain ON until the gear is down and locked. After the gear is down and locked, as an added check, momentarily close the throttle. If the gear is not down and locked the warning light will flash on. An added indication as to the position of the tail wheel is to check the "tail wheel lock". It will be fully forward when the tail wheel is extended and locked.

EMERGENCY PROCEDURE TO LOWER THE LANDING GEAR:

1. Indicated airspeed 200 MPH or below.
2. On the electrical switch panel push the "landing gear warning light test switch" to the UP position. The warning light will flash on indicating that it is functioning.
3. Place the landing gear selector handle into the DOWN position and yaw the airplane from side to side until the landing gear warning light goes off.
4. Make sure the "tail wheel lock" is fully forward; if not, push it forward.

D. SUPERCHARGER SYSTEM

The supercharger is a General Electric exhaust driven turbine unit. The exhaust from each cylinder is collected into the collector-ring and is forced by compression to turn the turbine that causes the supercharger to rotate. Cold air entering the air duct or air scoop is forced to the supercharger. As the supercharger rotates, the air is forced through the intercoolers into the carburetor. If the shutters are closed, the air is compressed and heated, which in turn heats the intercoolers. If the shutters are open, the air flows through the intercoolers and out the exit. Then the intercoolers are cooled and the air from the supercharger to the carburetor is cooled. The temperature of the air from the supercharger to the carburetor is controlled by the temperature of the intercoolers. The temperature of the intercoolers is controlled by the position of the shutters. During flight under normal cruise with the supercharger OFF it rotates between 200 - 400 RPM's per minute.

E. ELECTRICAL SYSTEM

The electrical system is basically of the 24 volt direct-current single wire type which employs the metallic structure of the airplane as a common ground return. The system is energized primarily from a storage battery located on the right side in front of the fire wall. The battery charge is maintained by an engine driven generator mounted on the right side of the engine. The electrical system operates automatic manual propeller, INCREASE-DECREASE RPM manual control, propeller control, instrument lights, cockpit lights, landing lights, position lights, compartment lights, elec-

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trical fuel pump rheostat, circuit breakers, intercooler shutters, oil cooler shutters, oil cooler shutters, gun sight light rheostat, generator, fuel warning light test, oil dilution, pitot tube heat, ammeter, and all radio equipment. The generator switch should be left on at all times while engine is running.

F. P-47 STARTER

The following will explain the proper operation of this starter. Also the damage following its improper operation.

Energy is stored by revolving a flywheel with a small electric motor, at a speed of about 20,000 r.p.m. The energy built up in this manner is then used to revolve the P & W R2800 through a planetary reduction gear ratio of about 200 to 1. This type of starter is necessary on this engine, as it is not possible to use a direct electric starter on an engine of this size and H.P. If a direct electric starter was used it would be very large and heavy, as it would be necessary to use a motor of several H.P. to revolve the engine direct, even though reduction gears were used. However, with the electric Inertia Starter a small, light electric motor of a fraction of a H.P. is used to revolve the flywheel at a high speed and store up the energy. The revolving wheel is then engaged with the engine through the gear train by meshing a starting dog (or gear) directly to the crankshaft extension. During the time that the switch is in the energize position, the Starter is entirely free from the engine and the only electrical energy required is the amount necessary to spin the small flywheel to about 20,000 r.p.m.

In order to obtain extra energy, in addition to that supplied by the flywheel, it is wired in a manner that supplies electric current to the motor while the Starter is in the "engaged" position. This produces some extra energy for a very short period of time, and if it is operated properly no damage should result from its use. If however, it is only slightly misused it will cause damage to the electric motor of the Starter. Continued improper operation, will in a very short time entirely ruin the electric motor.

For proper operation of the Starter on the P-47, the following procedure should be used.

When energizing the Starter, it shouldn't take over a maximum of 20 seconds, or preferable 15 to 18 seconds, which should bring the speed of the Starter up to approximately 20,000 R.P.M. This can be noticed by the high whine or pitch of sound of the motor. After energizing the Starter push the Starter toggle switch to Engage for about five to six revolutions of the propeller, the engine will normally start. If it does not, let the Starter cool for 1 minute before another attempt.

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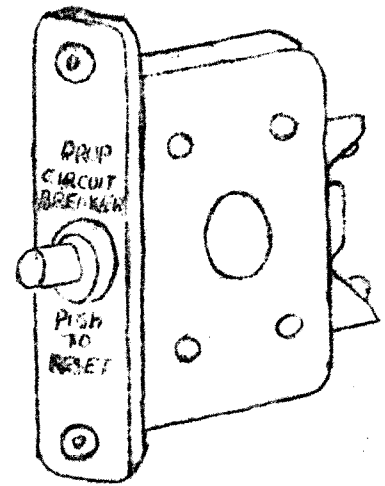
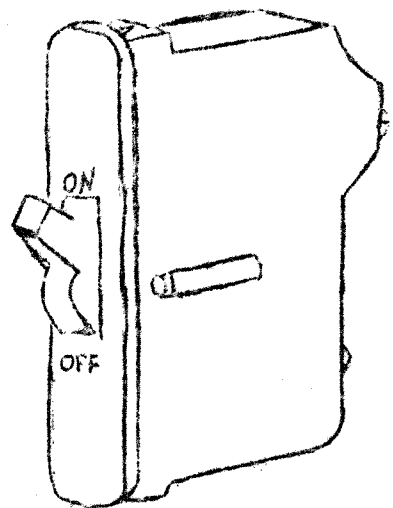
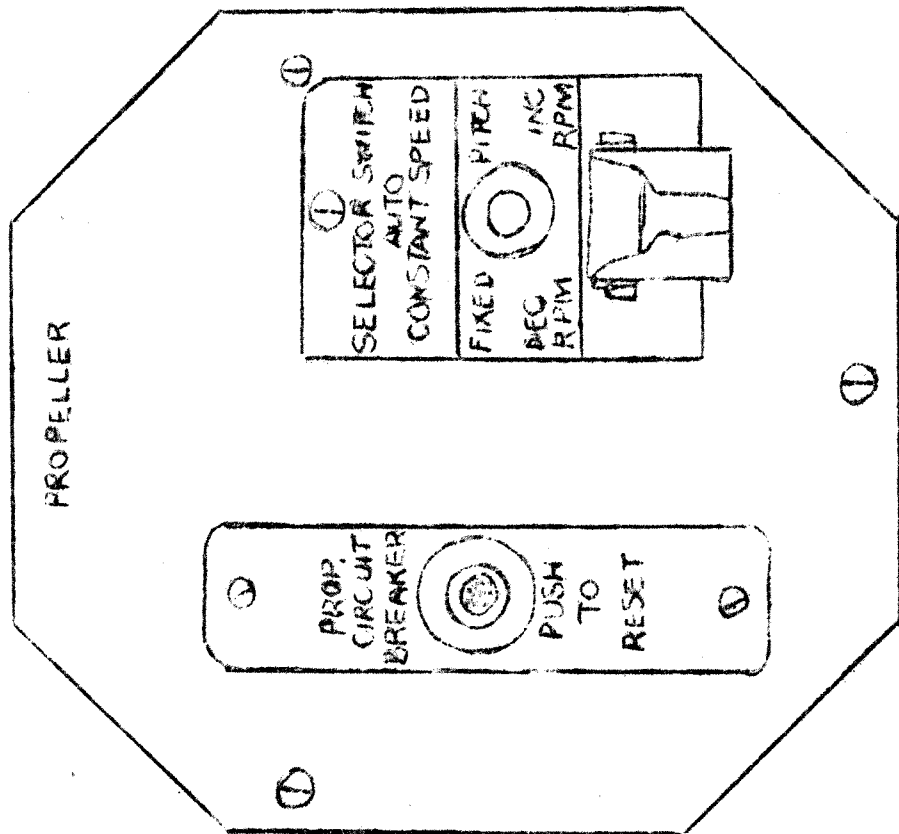
CAUTIONS

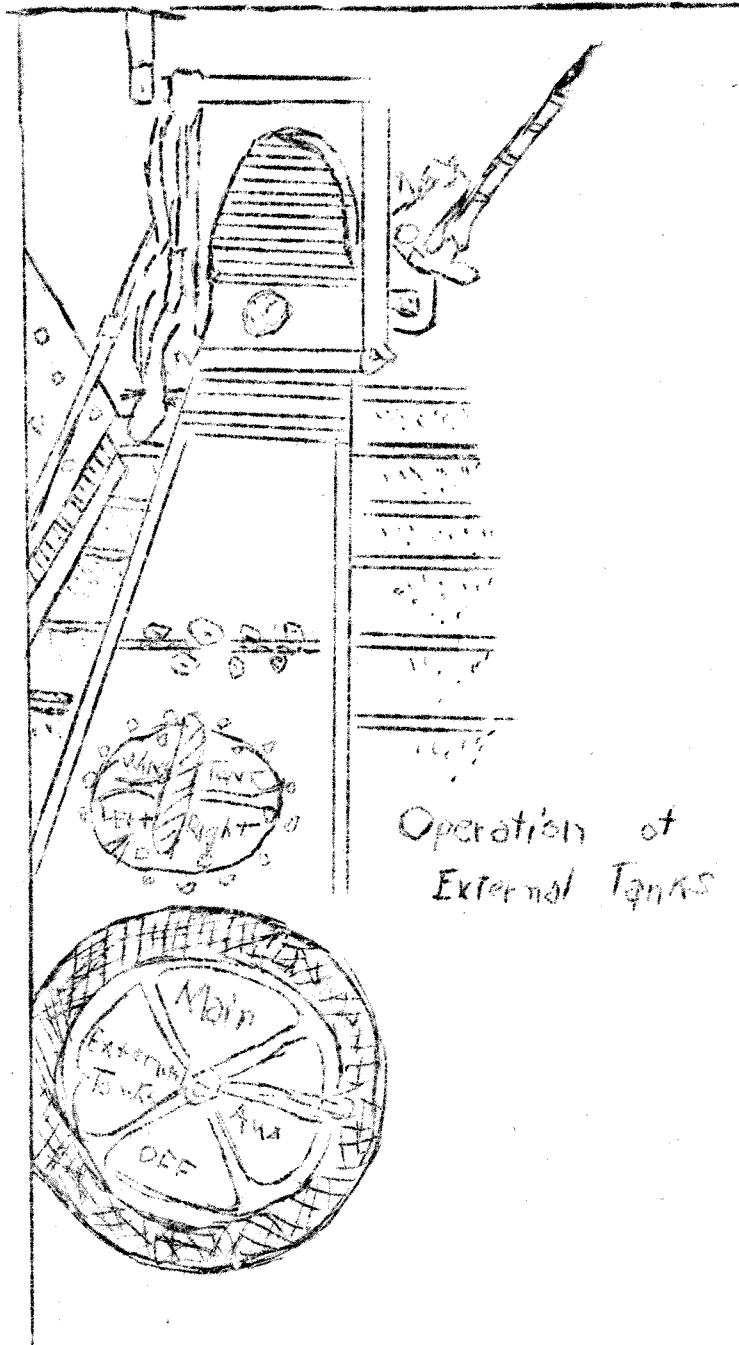
1. For electrical operation hold starter switch to Energize for a maximum period of 20 seconds---no more.
2. Hold the starter switch to engage for a period not to exceed 30 seconds. If the engine starts before the 30 seconds is up release the switch immediately.
3. Should the engine fail to start, the starter switch must not be held to engage until the engine stops rotating. A good procedure is to release the starter switch to the "off" position when the engine fails to fire and it seems obvious another trial will be necessary. Failing to observe this caution will cause an excessive amount of current to pass through the Starter (possible as high as 600 Amperes) and the result will probably be the melting of some vital part of the electrical system in the starter. Let the starter cool for 1 minute before attempting to start the engine again.

P-47 Review Questions

1. What is the total oil capacity? Normal oil capacity?
2. What is the capacity above normal left for expansion, foam and overload?
3. How many oil coolers are installed?
4. How are the oil cooler shutters operated and controlled?
5. Where are the shutter position indicators located?
6. What is the purpose of the intercooler?
7. Give oil pressures: Maximum _____ Minimum _____
Desired _____ Idling _____
8. What is the total gas capacity?
9. When the fuel level warning light comes on, how much gasoline remains and in which tank is the gasoline?
10. Why should a known amount of gasoline be left in auxiliary tank for a reserve?
11. When should the gasoline gauge correction card be used?
12. What is the least amount of gasoline which the gauge will correctly indicate?

13. Can you control your fuel pressure? How? What position must your selector valve be in?
14. What is the minimum fuel pressure? *- not desired*
15. Briefly in your own words describe the hydraulic system of the P-47.
16. How and when is the hand pump used?
17. Can the accumulator be charged by use of the hand pump?
18. What is the function of the "equalizing cylinder" in the flap system?
19. Is it possible to lower the flaps at a speed in excess of the placarded flap down speed?
20. What is indicated when the pressure gauge oscillates between 800 and 1000 PSI? Between 1020 and 1080 PSI?
21. Give procedure for engine failure: a. On take-off.
b. During flight.
22. How do you make an emergency exit during flight?
23. Give the emergency operation for the flaps.
24. Give the emergency operation for the gear.
25. Give the starting procedure for the P-47.
26. What is the first thing to check when the engine starts?
27. What position would the cowl flaps be in for starting?
28. What must be checked before you start taxiing?
29. What is the position of the cowl flaps for take-off?
30. Which gasoline tank is used for take-off?
31. How are the propeller controls set for take-off?
32. Give the power settings for take-off, climb, and cruise, Give RPM settings.
33. What are the maximum gear and flap down speeds?





Operation of
External Tanks

SIMPLIFIED
CURTISS PROP ELEC DIAGRAM

