

Airplane Flying Handbook



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the position (navigation) lights should also be on. Finally, just prior to starter engagement, the pilot should always call “CLEAR” out of the side window and wait for a response from anyone who may be nearby before engaging the starter.

When activating the starter, the wheel brakes must be depressed and one hand is to be kept on the throttle to manage the initial starting engine speed. Ensuring that properly operating brakes are engaged prior to starter engagement prevents the airplane from rapidly lunging forward. After engine start, the pilot manipulates the throttle to set the engine revolutions per minute (rpm) at the AFM/POH prescribed setting. In general, 1,000 rpm is recommended following engine start to allow oil pressure to rise and minimize undue engine wear due to insufficient lubrication at high rpm. It is important in low temperatures that an airplane engine use the proper grade of oil for the operating temperature range and engine preheat when temperatures approach and descend below freezing.

The oil pressure must be monitored after engine start to ensure that pressure is increasing toward the AFM/POH specified value. The AFM/POH specifies an oil pressure range for the engine, if the limits are not reached and maintained, serious internal engine damage is likely. In most conditions, oil pressure should rise to at least the lower limit within 30 seconds. To prevent damage, the engine should be shut down immediately if the oil pressure does not rise to the AFM/POH values within the required time.

Engine starters are electric motors designed to produce rapid rotation of the engine crankshaft for starting. These electric motors are not designed for continuous duty and should the engine not start readily, avoid continuous starter operation for periods longer than 30 seconds without a cool down period of at least 30 seconds to 1 minute (some AFM/POH specify times greater than these given). Engine starter motors service life is drastically shortened from high heat through overuse.

Although quite rare, the starter motor may remain electrically and mechanically engaged after engine start. This can be detected by a continuous and very high current draw on the ammeter. Some airplanes also have a starter engaged warning light specifically for this purpose. The engine should be shut down immediately if this occurs.

The pilot should be attentive for sounds, vibrations, smell, or smoke that are not consistent with normal operational experience. Any concerns should lead to a shutdown and further investigation.

Hand Propping

A spinning propeller can be lethal should it strike someone. Historically, when aircraft lacked electrical systems, it was

necessary to “hand prop” an aircraft for starting. Hand propping an aircraft is a hazardous procedure when done perfectly. The consequences of not mitigating the hazards associated with hand propping can lead to serious injury, fatalities, and runaway airplanes. All alternatives must be considered prior to hand propping an aircraft and, when a decision is made to do so, the procedure must be carried out only by competent persons who have been trained to accomplish the procedure, understand how to mitigate the hazards, and take all the necessary precautions.

Even though today most airplanes are equipped with electric starters, it is still helpful if a pilot is familiar with the procedures and dangers involved in starting an aircraft engine by turning the propeller by hand; however, a person unfamiliar with the controls must never be allowed to occupy the pilot’s seat when hand propping.

It is critical that the procedure never be attempted alone. Hand propping should only be attempted when two properly trained people, both familiar and experienced with the airplane and hand propping techniques, are available to perform the procedure. The first person is responsible for directing the procedure including pulling the propeller blades through. The second person must be seated in the airplane to ensure that the brakes are set, and controls are properly exercised, and to follow direction of the person pulling the propeller.

When hand propping is necessary, the ground surface near the propeller should be stable and free of debris—loose gravel, wet grass, mud, oil, ice, or snow might cause the person pulling the propeller through to slip into the rotating blades as the engine starts. Unless a firm footing is available, relocate the airplane to mitigate this dire consequences hazard.

Both participants should discuss the procedure and agree on voice commands and expected action. To begin the procedure, the fuel system and engine controls (tank selector, primer, pump, throttle, and mixture) are set for a normal start. The ignition/magneto switch should be checked to be sure that it is OFF. Then the descending propeller blade should be rotated so that it assumes a position slightly above the horizontal. The person doing the hand propping should face the descending blade squarely and stand slightly less than one arm’s length from the blade. If a stance too far away were assumed, it would be necessary to lean forward in an unbalanced condition to reach the blade, which may cause the person to fall forward into the rotating blades when the engine starts.

The procedure and commands for hand propping are:

- Person out front says, “GAS ON, SWITCH OFF, THROTTLE CLOSED, BRAKES SET.”

- Pilot seat occupant, after making sure the fuel is ON, mixture is RICH, magneto switch is OFF, throttle is CLOSED, and brakes are SET, says, “GAS ON, SWITCH OFF, THROTTLE CLOSED, BRAKES SET.”
- Person out front, after pulling the propeller through to prime the engine says, “BRAKES AND CONTACT.”
- Pilot seat occupant checks the brakes SET and turns the magnetos switch ON, then says, “BRAKES AND CONTACT.”

The propeller is swung by forcing the blade downward rapidly, pushing with the palms of both hands. If the blade is gripped tightly with the fingers, the person’s body may be drawn into the propeller blades should the engine misfire and rotate momentarily in the opposite direction. As the blade is pushed down, the person should step backward, away from the propeller. If the engine does not start, the propeller should not be repositioned for another attempt until it is verified that the magneto switch is turned OFF.

The words CONTACT (magnetos ON) and SWITCH OFF (magnetos OFF) are used because they are significantly different from each other. Under noisy conditions or high winds, the words CONTACT and SWITCH OFF are less likely to be misunderstood than SWITCH ON and SWITCH OFF.

When removing the wheel chocks or untying the tail after the engine starts, it is critical that everyone involved remember that the propeller is nearly invisible. Serious injuries and fatalities have occurred when people who have just started an engine walk or reach into the propeller arc to remove the chocks, reach the cabin, or in an attempt to reach the tail of the airplane. Before the wheel chocks are removed, the throttle should be set to idle and the chocks approached only from the rear of the propeller. One should never approach the wheel chocks from the front or the side.

The procedures for hand propping should always be in accordance with the AFM/POH and only accomplished if no alternatives are available, and then only by persons who are competent with hand propping procedures. The consequences of the hazards associated with hand propping are serious to fatal.

Taxiing

Taxiing is the controlled movement of the airplane under its own power while on the surface. Since an airplane is moved under its own power between a parking area and the runway, the pilot must thoroughly understand and be proficient in taxi procedures.

An essential requirement in conducting safe taxi operations is where the pilot maintains situational awareness of the ramp, parking areas, taxiways, runway environment, and the persons, equipment and aircraft at all times. Without such awareness, safety may be compromised. Depending on the airport, parking, ramp, and taxiways may or may not be controlled. As such, it is important that the pilot completely understand the environment in which they are operating. At small, rural airports these areas may be desolate with few aircraft which limits the potential hazards; however, as the complexity of the airport increases so does the potential for hazards. Regardless of the complexity, some generally accepted procedures are appropriate.

- The pilot should make themselves familiar with the parking, ramp, and taxi environment. This can be done by having an airport diagram, if available, out and in view at all times. *[Figure 2-13]*
- The pilot must be vigilant of the entire area around the airplane to ensure that the airplane clears all obstructions. If, at any time, there is doubt about a safe clearance from an object, the pilot should stop the airplane and check the clearance. It may be necessary to have the airplane towed or physically moved by a ground crew.
- When taxiing, the pilot’s eyes should be looking outside the airplane scanning from side to side while looking both near and far to assess routing and potential conflicts.
- A safe taxiing speed must be maintained. The primary requirements for safe taxiing are positive control, the ability to recognize any potential hazards in time to avoid them, and the ability to stop or turn where and when desired, without undue reliance on the brakes. Pilots should proceed at a cautious speed on congested or busy ramps. Normally, the speed should be at the rate where movement of the airplane is dependent on the throttle. That is, slow enough so when the throttle is closed, the airplane can be stopped promptly.
- The pilot should accurately place the aircraft centered on the taxiway at all times. Some taxiways have above ground taxi lights and signage that could impact the airplane or propellers if the pilot does not exercise accurate control. When yellow taxiway centerline stripes are marked, this is more easily accomplished by the pilot visually placing the centerline stripe so it is under the center of the airplane fuselage.
- When taxiing, the pilot must slow down before attempting a turn. Sharp high-speed turns place undesirable side loads on the landing gear and may