## COCKPIT MANAGEMENT

After entering the airplane, the pilot should first ensure that all necessary equipment, documents, checklists, and navigation charts appropriate for the flight are on board. If a portable intercom, headsets, or a hand-held global positioning system (GPS) is used, the pilot is responsible for ensuring that the routing of wires and cables does not interfere with the motion or the operation of any control.

Regardless of what materials are to be used, they should be neatly arranged and organized in a manner that makes them readily available. The cockpit and cabin should be checked for articles that might be tossed about if turbulence is encountered. Loose items should be properly secured. All pilots should form the habit of good housekeeping.

The pilot must be able to see inside and outside references. If the range of motion of an adjustable seat is inadequate, cushions should be used to provide the proper seating position.

When the pilot is comfortably seated, the safety belt and shoulder harness (if installed) should be fastened and adjusted to a comfortably snug fit. The shoulder harness must be worn at least for the takeoff and landing, unless the pilot cannot reach or operate the controls with it fastened. The safety belt must be worn at all times when the pilot is seated at the controls.

If the seats are adjustable, it is important to ensure that the seat is locked in position. Accidents have occurred as the result of seat movement during acceleration or pitch attitude changes during takeoffs or landings. When the seat suddenly moves too close or too far away from the controls, the pilot may be unable to maintain control of the airplane.

14 CFR part 91 requires the pilot to ensure that each person on board is briefed on how to fasten and unfasten his/her safety belt and, if installed, shoulder harness. This should be accomplished before starting the engine, along with a passenger briefing on the proper use of safety equipment and exit information. Airplane manufacturers have printed briefing cards available, similar to those used by airlines, to supplement the pilot's briefing.

## GROUND OPERATIONS

It is important that a pilot operates an airplane safely on the ground. This includes being familiar with standard hand signals that are used by ramp personnel. [Figure 2-9]

## ENGINE STARTING

The specific procedures for engine starting will not be discussed here since there are as many different

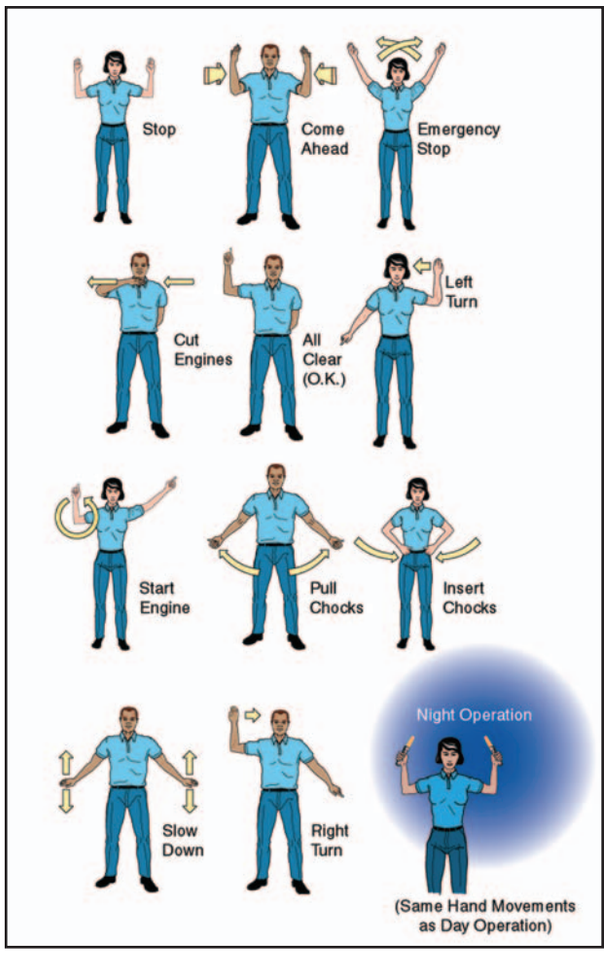


**Figure 2-9. Standard hand signals.**

methods as there are different engines, fuel systems, and starting conditions. The before engine starting and engine starting checklist procedures should be followed. There are, however, certain precautions that apply to all airplanes.

Some pilots have started the engine with the tail of the airplane pointed toward an open hangar door, parked automobiles, or a group of bystanders. This is not only discourteous, but may result in personal injury and damage to the property of others. Propeller blast can be surprisingly powerful.

When ready to start the engine, the pilot should look in all directions to be sure that nothing is or will be in the vicinity of the propeller. This includes nearby persons and aircraft that could be struck by the propeller blast or the debris it might pick up from the ground. The anticollision light should be turned on prior to engine start, even during daytime operations. At night, the position (navigation) lights should also be on.

The pilot should always call "CLEAR" out of the side window and wait for a response from persons who may be nearby before activating the starter.

When activating the starter, one hand should be kept on the throttle. This allows prompt response if the engine falters during starting, and allows the pilot to rapidly retard the throttle if revolutions per minute (r.p.m.) are excessive after starting. A low r.p.m. setting (800 to 1,000) is recommended immediately following engine start. It is highly undesirable to allow the r.p.m. to race immediately after start, as there will be insufficient lubrication until the oil pressure rises. In freezing temperatures, the engine will also be exposed to potential mechanical distress until it warms and normal internal operating clearances are assumed.

As soon as the engine is operating smoothly, the oil pressure should be checked. If it does not rise to the manufacturer's specified value, the engine may not be receiving proper lubrication and should be shut down immediately to prevent serious damage.

Although quite rare, the starter motor may remain on and engaged after the engine starts. This can be detected by a continuous 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 should this occur.

Starters are small electric motors designed to draw large amounts of current for short periods of cranking. Should the engine fail to start readily, avoid continuous starter operation for periods longer than 30 seconds without a cool down period of at least 30 seconds to a minute (some AFM/POH specify even longer). Their service life is drastically shortened from high heat through overuse.

## HAND PROPPING

Even though most airplanes are equipped with electric starters, it is helpful if a pilot is familiar with the procedures and dangers involved in starting an engine by turning the propeller by hand (hand propping). Due to the associated hazards, this method of starting should be used only when absolutely necessary and when proper precautions have been taken.

An engine should not be hand propped unless two people, both familiar with the airplane and hand propping techniques, are available to perform the procedure. The person pulling the propeller blades through directs all activity and is in charge of the procedure. The other person, thoroughly familiar with the controls, must be seated in the airplane with the brakes set. As an additional precaution, chocks may be placed in front of the main wheels. If this is not feasible, the airplane's tail may be securely tied. Never allow a person unfamiliar with the controls to occupy the pilot's seat when hand propping. The procedure should never be attempted alone.

When hand propping is necessary, the ground surface near the propeller should be stable and free of debris. Unless a firm footing is available, consider relocating the airplane. 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.

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. This 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, ignition/magneto switch is OFF, throttle is CLOSED, and brakes 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 ignition 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 certain the ignition/magneto switch is turned OFF.

The words CONTACT (mags ON) and SWITCH OFF (mags 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 after the engine starts, it is essential that the pilot remember that the propeller is almost invisible. Incredible as it may seem, serious injuries and fatalities occur when people who have just started an engine walk or reach into the propeller arc to remove the chocks. Before the chocks are removed, the throttle should be set to idle and the chocks approached from the rear of the propeller. Never approach the chocks from the front or the side.

The procedures for hand propping should always be in accordance with the manufacturer's recommendations and checklist. Special starting procedures are used when the engine is already warm, very cold, or when flooded or vapor locked. There will also be a different starting procedure when an external power source is used.

## TAXIING

The following basic taxi information is applicable to both nosewheel and tailwheel airplanes.

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

An awareness of other aircraft that are taking off, landing, or taxiing, and consideration for the right-of-way of others is essential to safety. When taxiing, the pilot's eyes should be looking outside the airplane, to the sides, as well as the front. The pilot must be aware of the entire area around the airplane to ensure that the airplane will clear all obstructions and other aircraft. If at any time there is doubt about the clearance from an object, the pilot should stop the airplane and have someone check the clearance. It may be necessary to have the airplane towed or physically moved by a ground crew.

It is difficult to set any rule for a single, safe taxiing speed. What is reasonable and prudent under some conditions may be imprudent or hazardous under others. The primary requirements for safe taxiing are positive control, the ability to recognize 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. When yellow taxiway centerline stripes are provided, they should be observed unless necessary to clear airplanes or obstructions.

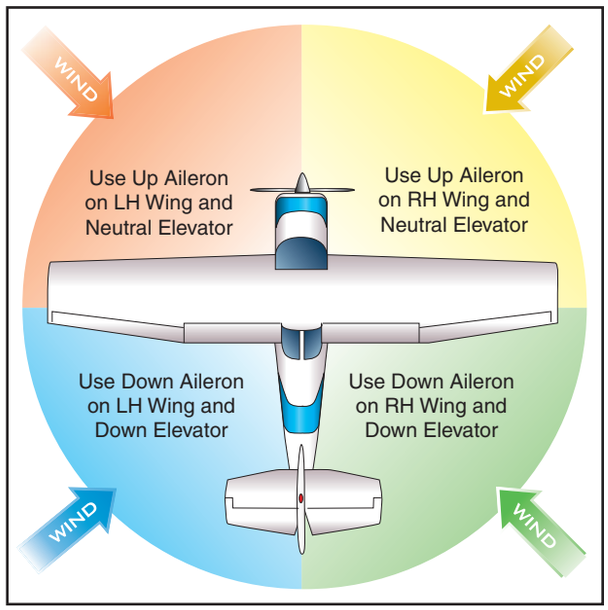


**Figure 2-10. Flight control positions during taxi.**

When taxiing, it is best to slow down before attempting a turn. Sharp, high-speed turns place undesirable side loads on the landing gear and may result in an uncontrollable swerve or a ground loop. This swerve is most likely to occur when turning from a downwind heading toward an upwind heading. In moderate to high-wind conditions, pilots will note the airplane's tendency to weathervane, or turn into the wind when the airplane is proceeding crosswind.

When taxiing at appropriate speeds in no-wind conditions, the aileron and elevator control surfaces have little or no effect on directional control of the airplane. The controls should not be considered steering devices and should be held in a neutral position. Their proper use while taxiing in windy conditions will be discussed later. [Figure 2-10]

Steering is accomplished with rudder pedals and brakes. To turn the airplane on the ground, the pilot should apply rudder in the desired direction of turn and use whatever power or brake that is necessary to control the taxi speed. The rudder pedal should be held in the direction of the turn until just short of the point where the turn is to be stopped. Rudder pressure is then released or opposite pressure is applied as needed.

More engine power may be required to start the airplane moving forward, or to start a turn, than is required to keep it moving in any given direction. When using additional power, the throttle should immediately be retarded once the airplane begins moving, to prevent excessive acceleration.

When first beginning to taxi, the brakes should be tested for proper operation as soon as the airplane is put in motion. Applying power to start the airplane