

Controlling the Engine

Note: For simplicity's sake, this article focuses on piston engines.

Engines can be humbling because they are reminders that humans really can't fly—at least not for long—without some help. So, you've got to be good to your aircraft's engine. Here are some operating tips that will help keep your aircraft's engine running strong.

Many gauges on the control panel monitor engine functions. Two important engine instruments that measure engine power are the tachometer (which indicates engine speed as measured in revolutions per minute, or rpm), and the manifold pressure gauge (which indicates the pressure of air moving into the cylinders).

Using the Engine Controls



Most modern piston engine aircraft have two or three engine controls. Piston aircraft with a fixed-pitch propeller have two basic engine controls: a black throttle control—which has the most direct effect on power—and a red mixture control to adjust the air/fuel mixture as the airplane climbs and descends.

Aircraft with a constant-speed propeller also have a blue propeller control to adjust the propeller's rotation speed.

Throttle Control

The throttle determines how much power the engine can develop by controlling the amount of fuel and air entering the engine cylinders. When fully open, the throttle allows the maximum amount of fuel and air to enter the system to produce maximum power. When the throttle is closed, only a small amount of fuel and air can enter the system, and the engine produces minimum power. To open the throttle, push the throttle control in. To close the throttle, pull the control out. The manifold pressure gauge on the instrument panel shows the pressure of the air moving into the engine's cylinders, and gives an approximate measurement of engine power. Generally speaking, the higher the manifold pressure, the more power you have available.

Mixture Control

Because an aircraft's engine operates over a wide range of altitudes, the fuel/air mixture can be adjusted for maximum efficiency as you climb into thinner air or descend into denser air. A mixture that is too rich contains too much fuel for the existing atmospheric conditions and may cause the engine to run rough and lose power. The solution is to "lean the mixture." As you climb, make the mixture leaner by pulling the mixture control back until the needle on the exhaust gas temperature (EGT) gauge peaks, then push the mixture control forward a little. Don't lean the mixture too much, though: a mixture that is too lean can cause the engine to overheat or result in a problem known as detonation, a sudden, strong, uncontrolled, and often damaging explosion of fuel and air within the cylinder.

Propeller Control and Managing Power

Piston engines are typically connected to a fixed-pitch or a constant-speed propeller.

Fixed-Pitch Propellers

Fixed-pitch propellers are bolted directly to the crankshaft of the engine and therefore always turn at the same speed as the engine. A fixed-pitch prop is somewhat like a transmission with only one gear.

This configuration makes up for its lack of efficiency by being very simple to operate. The only gauge that you need to monitor is the tachometer. Because the fixed-pitch propeller turns as fast as the engine, the engine's rpm is the best indicator of engine power. Use the tachometer to set your power during takeoff, cruising, and landing—the higher the rpm, the more power your engine is producing.

With a fixed-pitch propeller, managing power is simple. Push the throttle in, and rpm (and power) increases. Pull the throttle out, and rpm decreases. Be aware, however, that as airspeed increases, rpm tends to creep up, too. Monitor the tachometer carefully during descents at high speed to make sure that the rpm stays within limits.

Constant-Speed Propellers

A constant-speed propeller has a governor that adjusts the angle of the blades to maintain the rpm you select. This type of propeller makes much more efficient use of the engine's power. Adjusting the propeller in an airplane is very similar to using gears in a car. In low gears the engine turns fast to get you moving. Once you're underway, there's no need to use a lot of power, so you shift to a higher gear to make more efficient use of less power. In an airplane, the propeller control changes the angle at which the propeller blades meet the air, which affects how fast the engine turns. The tachometer on the instrument panel shows how fast your engine is turning.

During takeoff and during landing (in case you need to abort and take off again) you'll need every bit of power your engine can develop. So during these two phases of flight, keep the propeller control pushed in: the angle of the blades will be low, slicing through the air easily so you can get the engine's full power (like using a low gear in a car). During cruise, pull the propeller control out a bit: the angle of the blades will increase and take a bigger bite out of the air, making more efficient use of the engine's power (like using a high gear in a car). Any time you change the throttle setting a governor will automatically adjust the angle of the blades to maintain the propeller speed.

A constant-speed propeller makes power management a bit more complicated. You must monitor the manifold pressure gauge, controlled by the throttle, and the tachometer, which shows the propeller rpm. You adjust rpm with the prop control.

When using the throttle and prop controls, remember these basic rules to avoid overstressing the engine:

To increase power

1. Increase propeller speed by pushing the prop control forward.
2. Increase manifold pressure by pushing the throttle control forward.

To decrease power

1. Reduce manifold pressure by pulling the throttle control backward.
2. Decrease propeller speed by pulling the prop control backward.

Using the Engine Controls in Flight Simulator

In Flight Simulator, all three controls can be adjusted with the keyboard or the mouse (just drag the control in or out). Some joysticks have levers or sliders for these controls.

To feather the propeller

1. In the cockpit, click the propeller control knob.
2. Drag the knob to the desired position.
3. Fine adjustments can be made by rotating the mouse wheel.
- or -
Press **CTRL+F1**.

To adjust propeller feathering

1. Place the propeller at full forward speed by pressing **CTRL+F4**.
2. Decrease propeller speed by pressing **CTRL+F2**.
3. Increase propeller speed by pressing **CTRL+F3**.

To control the throttle

1. In the cockpit, click the throttle knob.
2. Drag the knob to the desired position.
3. Fine adjustments can be made by rotating the mouse wheel.

- or -

1. Press **F3** (or press **9** on the numeric keypad) to increase throttle.
2. Press **F2** (or press **3** on the numeric keypad) to decrease throttle.
3. Press **F4** to set the throttle at full open.

By default, mixture control is handled automatically in Flight Simulator, but you can override the automatic settings if you prefer.

To adjust the mixture manually

1. On the **Aircraft** menu, click **Realism Settings**.
2. Clear the **Enable Auto Mixture** check box.

To control mixture settings

1. In the cockpit, click the mixture knob.
2. Drag the knob to the desired position.
Fine adjustments can be made by rotating the mouse wheel.
- or -
3. Press **CTRL+SHIFT+F2** to lean the mixture.
4. Press **CTRL+SHIFT+F3** to enrich the mixture.
5. Press **CTRL+SHIFT+F4** to set mixture to rich.

For multi-engine aircraft, you may wish to control the engines independently.