



How to mount and swing a compass



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The process of mounting and adjusting ("swinging") an aircraft compass seems like a simple task, and with attention to some details, it can be. Still, locating and adjusting a compass to insure an accurate reading can be frustrating to the point of madness, since slight variations in positioning of the instrument in the cockpit can have a major effect on the adjustment process. Take it slow, read these instructions carefully from start to finish, and the task is very manageable.

COMPASS BASICS

A magnetic compass is a simple instrument. The most common are fluid filled chambers containing a rotating disk mounted on a pivot. A small magnet is mounted on the disk, and the outer rim of the disk is marked from 0 to 360 degrees. The outer rim of the disk is visible through a window in the chamber, and the center of the window is marked with a thin indicator line (the "lubber line"). The disk tends to want to stay aligned with the earth's magnetic field, so as the chamber is rotated the magnetic heading appears in the window under the lubber line. The fluid in the compass is usually a highly refined petroleum distillate which won't freeze no matter what, and remains clear for decades. The fluid dampens the tilting and rotation of the disk, so turbulence doesn't render the compass useless.

Compasses are equipped with compensators, which are mechanically adjustable ferrous metal pieces which can be moved in relation to the magnet to make the disk align with the earth's magnetic field. Using these compensators, the compass can be set to read 0° when the aircraft is pointing north, 90° for east, 180° for south and 270° for west, and be accurate at all intermediate points as well.

A note of caution though: you'll never get the reading to track the magnetic directions throughout the entire range of headings. The earth's own magnetic idiosyncracies, as well as those of your airplane, cause compass errors that just can't be adjusted away. Our goal is to minimize these errors.

MOUNTING

Compasses can be mounted in the instrument panel, on top of the instrument panel, on the windshield or windshield support. Charles Lindbergh had to mount his compass over his head (his panel was full) and read it in a mirror. The critical factor is magnetic interference from other instruments and radios. Many electrical instruments have small magnets inside, creating enough magnetic force to affect a nearby compass. If you want to mount the compass in the panel, you'll need to carefully place the compass near the various instruments in the panel to see which ones cause the compass disk to swing, and to be sure you can mount the compass as far away from those instruments as possible. Test the same way near radios and radio indicators with the power applied. Try transmitting on your comm radios too; often a comm radio presents significant magnetic interference only when transmitting. If you can't find a place in the panel which is not affected by interference, you'll need to move the compass to the instrument panel glare shield or to the top of the windscreen.

It's usually not possible to "shield" a compass from magnetic interference, as any effective shield would have to be ferrous (i.e., iron based). The shield itself would cause the compass magnet to turn.

SOUTHERN FIELD

If you live south of the equator, make sure and buy a compass compensated for the southern hemisphere. Otherwise, the disk will be tilted in the compass case and may be impossible to read

ADJUSTING

You'll need a small, brass, non-magnetic screwdriver and an airport with a compass rose. A compass rose is a pattern painted on the ground which accurately depicts magnetic headings. If you can't find an airport that has one, you can sometimes make your own using the known magnetic orientation of the runways at an airport. Be careful, just because a runway is marked "27" doesn't mean it is oriented at 270°. It might be 274° or 268°. Check with your state aeronautics department to get the precise orientation.

Position the aircraft at a known north heading using the compass rose or runway reference. **WARNING:** most compass compensators turn only one-half turn (180°). Turning more than that can ruin the instrument. Compensators are usually capable of **together** producing a +/-20° correction, which should be more than enough.

1. With the aircraft oriented North, the engine running, and all radios switched on, adjust the N-S adjusting screw until the compass reads due North, or 0°.
2. Rotate the aircraft to a known East heading, and use the E-W adjusting screw to make the compass read due East, or 90°
3. Rotate the aircraft to a known South heading. Note how many degrees off South the compass reads. Turn the N-S adjusting screw to remove one-half of the error.
4. Rotate the aircraft to a known West heading. Note how many degrees off West the compass reads. Adjust the E-W adjusting screw to remove one-half of the error.
5. Rotate the aircraft through the N,S,E,W headings again, confirming that the errors for North and South are the same, and the errors for East and West are the same. You may want to repeat steps 1-4 to

fine tune the correction.

6. Now rotate the aircraft from North, stopping at each 30° point on the compass rose (e.g., N, NNE, NE, ENE, E, etc.) Make a note of the actual compass reading at each point, and complete the compass calibration card, which you should then mount near the compass for reference.

If you cannot get a usable set of readings, you need to locate sources of magnetic interference. Look for steel screws, washers or other components near the compass. You should also experiment with aircraft electrical systems (lights, for example), to see whether activation of that equipment causes the compass to misbehave.