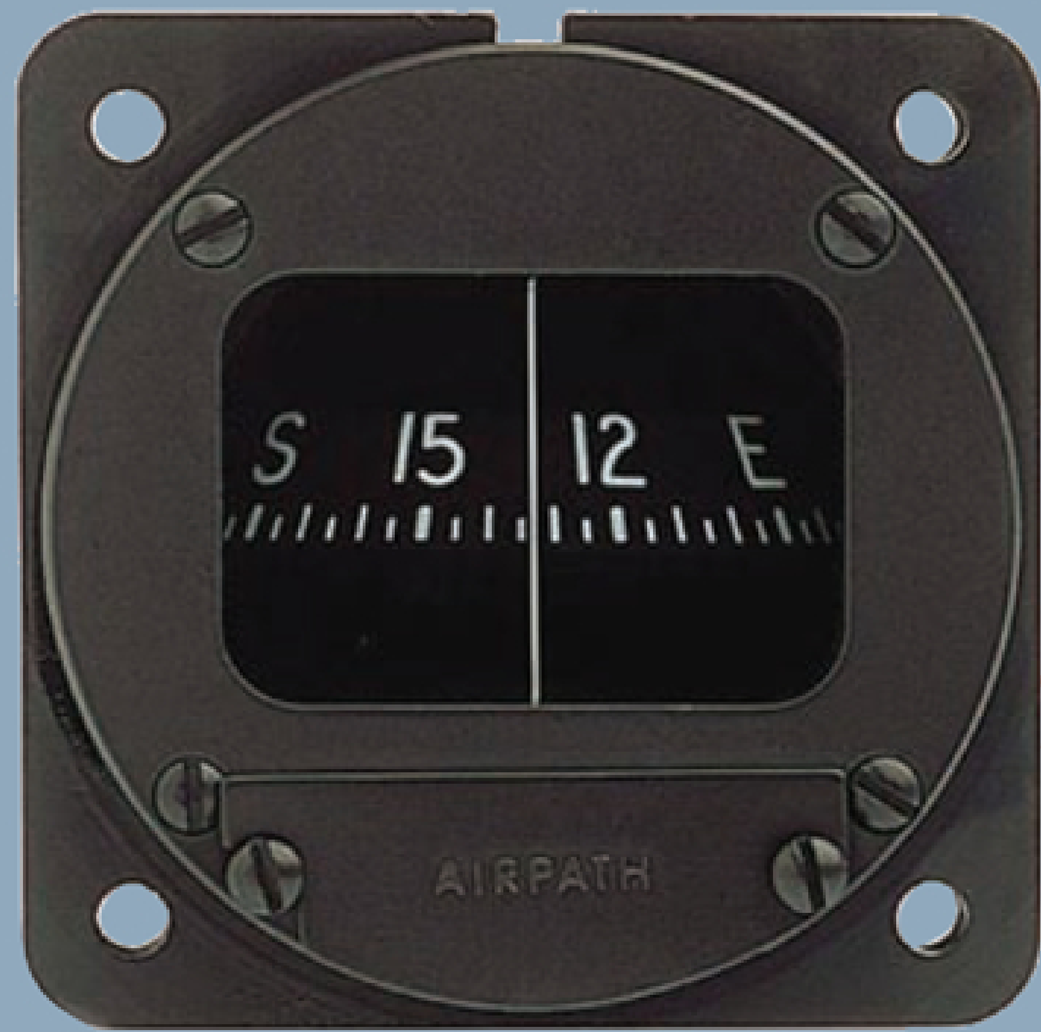
# Compasses And Magnets—How Do They Work?

The earliest known application of magnetism for navigation came courtesy of the Chinese, who discovered a piece of lodestone would always point in the same direction when properly suspended. Not long thereafter, began using such a device to find their way from one place to another.

That first, crude compass was subsequently refined, with numerous variations. Among them is what we know today as the wet, or "whiskey" compass, an example of which is pictured at right. Using a fluid inside the compass dampens its movement and improves stability. It also helps prevent various vibrations from reaching the mechanism, helping preserve its life.




But as any instrument student learns early in ground school, the average magnetic compass incorporates a dizzying array of shortcomings. There's the acceleration/deceleration error, for one, plus turning errors. Also, a magnetic compass is relatively stable when close to the equator. Move it toward either pole, however, and it becomes progressively less accurate, eventually pointing down when close.

The image below right is a representation of the earth's magnetic fields, which aren't linear or consistent. In fact, they're rather weak, leaving the compass easily susceptible to other magnetic fields, such as might be found near, say, steel tubing, electronic devices and energized wiring. You know—the kinds of things one encounters in the average personal aircraft. While a magnetometer usually is more stable and not susceptible to all of the same errors, it, too, has characteristics operators are wise to understand.