Deviation vs. Variation:

What's The Difference?

*By Captain Bernie Weiss**

Despite the dazzling array of new electronics available for boaters, in the confined waters of Long Island Sound many of us continue to rely upon the conventional magnetic steering compass as our primary navigational tool. Binnacle-mounted, bulkhead-mounted, deck-mounted, hand-held or otherwise, your magnetic compass is a reliable fail-safe device. To improve its reliability and utility however, it should be compensated for deviation. But it cannot and will not compensate for variation.

What's the difference?

Magnetic deviation occurs on your boat due to concentrations of metallic materials in the immediate vicinity of the compass. Your engine, for example, likely causes the compass to deviate from indicating Magnetic North. Deviation is an on-board phenomenon; the intensity or degree of deviation is unique to your compass and your boat. You can and should compensate for compass deviation as described in a previous *WindCheck* article (November, 2004). Doing so contributes to more accurate piloting and steering, and minimizes the need for a deviation table.

Magnetic variation is a global phenomenon experienced by everyone, and it cannot be neutralized unless the compass has a source of electrical power and an accessory with which to calculate and display True North, yielding true bearings and steering courses. The fluxgate compass, an electro-magnetic device, is an example of such an accessory. (See *WindCheck*, October, 2005). Short of this, the skilled navigator pilots and steers the vessel using magnetic bearings and courses while making allowances for variation.

How is this done? One way (the old-fashioned way) is to plot courses and bearings on your chart using the inner circle of the nearest compass rose. Whereas the outer circle of the rose shows courses and bearings based on True North, the inner circle shows courses and bearings for Magnetic North. The angular difference between True North and Magnetic North is off-set for the inner circle. It's really that easy! (Sometimes the old-fashioned methods are still fashionable.)

Another way to do this is by using your GPS receiver. The receiver can be set to automatically compensate for variation in your region, displaying your courses and bearings as Magnetic instead of True. This needs to be done only once. You can then pilot the boat using your magnetic steering compass — no fancy footwork necessary. Again, it's really that easy.

Why are they different?

The Magnetic North Pole is currently positioned at La 82.7° N, Lo 114.4° W, beneath Prince of Wales Island in Canada's Northwest Territories. This is about 1,500 miles southwest of the True (geographic) North Pole, which is positioned atop the Earth's axis as the North rotational pole. The N on your magnetic compass points to the Magnetic North Pole.

Magnetic variation is usually expressed as an angle between your present position and the bearing to True North, and your present position and the bearing to Magnetic North. Thus, variation is experienced by everyone to varying degrees - literally. For example, in Casco Bay, Maine, the variation is approximately 17° west, meaning that the bearing to Magnetic North is 17 degrees west of the bearing to True North. In Long Island Sound, the variation is approximately 14° west. In Hampton Roads (the mouth of the Chesapeake Bay), the variation is approximately 11° west, and in the Straits of Florida, the variation is approximately 5° west. What's the variation where you do your boating? Again, look at your chart; the magnetic variation for the immediate area is clearly indicated at the center of the nearest compass rose.

Even in the same location, the magnetic variation changes over time. That's because the Earth generates its own magnetic field. At its core, our planet is a vast sea of molten iron, a dense fluid more than six times the volume of the moon. The molten iron, in ceaseless motion attributable to the spinning of the Earth and other influences, creates a fluctuating electro-magnetic field that radiates out to the Earth's crust and beyond. This magnetic field is polarized and is readily identifiable at its top as the Magnetic North Pole. As the core magnetic field moves, so does the Magnetic North Pole, although the annual incremental changes are small. The predicted annual change for an area is also indicated at the center of the compass rose. However, as a practical matter, the amount of annual change is so small as to be almost insignificant.

One more reminder: If you have set up your GPS receiver properly, as you move on your boat from one region to another, the GPS receiver will automatically account for changes in variation. Your magnetic compass cannot detect these changes, however. It continues to point directly to Magnetic North. Therefore, while you may use the magnetic compass for steering a GPS-derived course and obtaining bearings to navigational aids and GPS waypoints, if you intend to plot those bearings and courses on the chart, use the inner (magnetic) ring of the compass rose. ✦

** Captain Bernie Weiss is a delivery skipper with Atlantic Yacht Delivery (www.AtlanticYachtDelivery.com). Cap'n Bernie re-positions sailing and motor yachts along the Atlantic coast, Maine to Florida, but he calls Long Island Sound his "home waters." He also trains, lectures, and organizes workshops on electronic navigation, seamanship, boat-handling, and related subjects.*