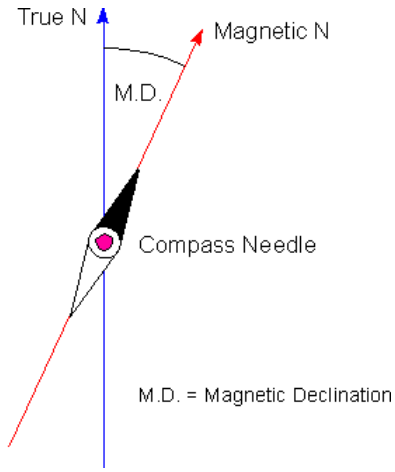
Chapter 14

Magnetic Declination

Since the magnetic poles of the earth do not coincide with the geographic poles and due to other irregularities of the earth's magnetic field, the needle of a magnetic compass, aligning itself with the horizontal component of the magnetic lines of force, usually does not point exactly in the direction of the geographic north pole. The angle between the direction of the compass needle and the local geographic meridian (true north) is called **magnetic declination** or, in mariner's language, **variation** (*Fig. 14-1*).

Fig. 14-1



Magnetic declination depends on the observer's geographic position and can exceed 30° or even more in some areas. The knowledge of the local magnetic declination is therefore important to avoid dangerous navigation errors. Although magnetic declination is often listed in the legend of topographic maps, the information may be outdated because magnetic declination slowly changes with time (up to several degrees per decade). In some places, magnetic declination may even differ from official statements due to local anomalies of the magnetic field caused by deposits of ferromagnetic ores, etc.

The azimuth formulas described in chapter 4 provide a powerful tool to determine the magnetic declination if the observer's position is known. A sextant is not required for the simple procedure:

1. We choose a celestial body being low in the sky or on the visible horizon, preferably sun or moon. We measure the compass bearing of the center of the body and note the time. We stay away from steel objects and DC power cables.

2. We extract GHA and Dec of the body from the N.A.

3. We calculate the LHA using our actual longitude. If the actual longitude is not known, we use the estimated longitude.

4. We calculate the azimuth, Az_N, of the body and subtract the azimuth from the compass bearing.

The difference is the magnetic declination at our position, provided the compass is error-free. Eastern declination (shown in *Fig. 14-1*) is positive, western negative. If the magnetic declination is known, the method can be used to determine the compass error.