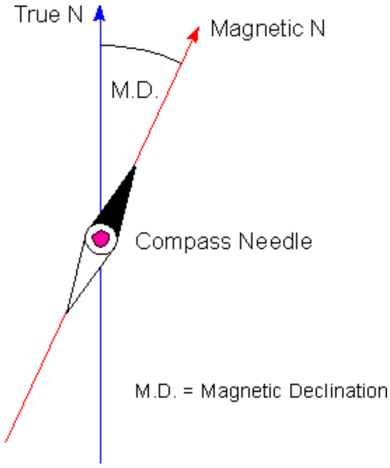


Magnetic Declination

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 horizontal component of the magnetic field at a given position, called **magnetic meridian**, usually forms an angle with the local geographic meridian. This angle is called **magnetic declination** or, in mariner's language, **magnetic variation**. Accordingly, the needle of a magnetic compass, aligning itself with the local magnetic meridian, does not exactly indicate the direction of true north (*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. Knowledge of the local magnetic declination is therefore necessary to avoid dangerous navigation errors. Although magnetic declination is often given in the legend of topographic maps, the information may be outdated because magnetic declination varies with time (up to several degrees per decade). In some places, magnetic declination may even differ from official statements due to local distortions 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 at a given position. If the observer does not know his exact position, an estimate will suffice in most cases. 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 magnetic compass bearing, B, of the center of the body and note the time. The vicinity of cars, steel objects, magnets, DC power cables, etc. has to be avoided since they distort the magnetic field locally.

2. We extract GHA and Dec of the body from the Nautical Almanac or calculate these quantities with a computer almanac.

3. We calculate the meridian angle, t (or the local hour angle, LHA), from GHA and our longitude (see chapter 4).

4. We calculate the true azimuth, Az_N, of the body from Lat, Dec, and t. The time sight formula (chapter 4) with its accompanying rules is particularly suitable for this purpose since an observed or computed altitude is not needed.

5. Magnetic declination, MD, is obtained by subtracting Az_N from the compass bearing, B.

$$MD = B - Az_N$$

(Add 360° if the angle thus obtained is smaller than –180°. Subtract 360° if the angle is greater than +180°.)

Eastern declination (shown in *Fig. 14-1*) is positive (0°...+180°), western negative (0°...–180°).