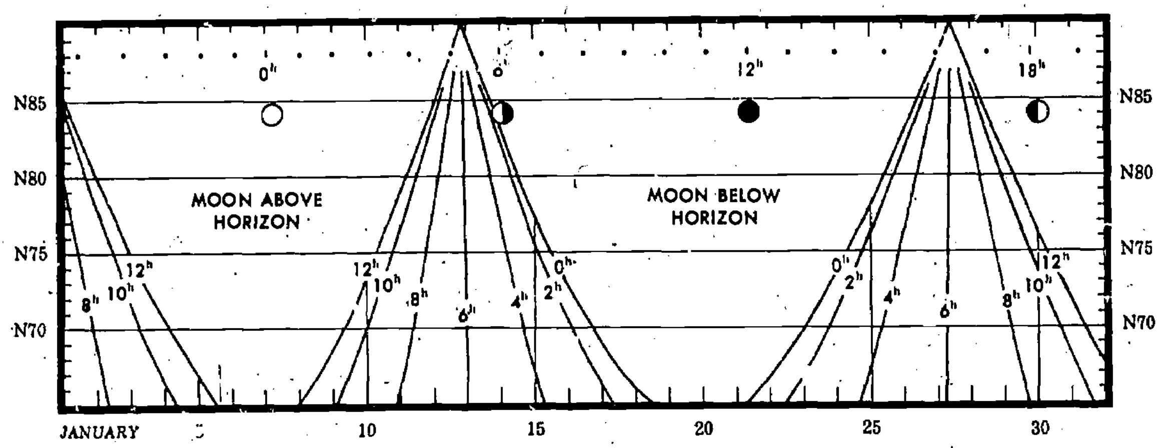

Figure 16-16. Semiduration of Moonlight

is 0914 LMT (1214 meridian passage — 3 hrs) and EET is 1514 LMT (1214 + 3 hrs).

The graphs, Semiduration of Moonlight (figure 16-16), give for the moon the same data as the graphs, Semiduration of Sunlight, give for the sun. The scales near the top give the LMT of meridian passage. The phase symbols on the graphs show the approximate date on which each phase occurs. Since the times of meridian passage and the semiduration change more rapidly from day to day for the moon than for the sun, special care is required in reading the graphs accurately.

TRUE HEADING BY CELESTIAL OBSERVATION

The periscopic sextant, in addition to measuring celestial altitudes, can be used to determine true headings and bearings. Any celestial body whose azimuth can be computed can be used to obtain a true heading. Except for Polaris, the appropriate volume of H.O. 249 is entered to obtain Zn (true bearing). In the case of Polaris the *Air Almanac* has an Azimuth of Polaris table and therefore does not require information from the H.O. 249 tables.

Three methods are used to obtain true heading with the periscopic sextant. Only the true bearing method requires precomputation of Zn. Post computation of Zn is possible with the relative bearing method and the inverse relative bearing method. The procedures are as follows:

True Bearing Method (TB)

- Determine GMT and body to be observed.
- Extract GHA from the *Air Almanac*.
- Apply exact longitude to GHA to obtain LHA.
- Enter appropriate H.O. 249 table and extract Zn (true bearing) and Hc (figure 16-17). If Polaris is used, obtain the azimuth from the Azimuth of Polaris table in the *Air Almanac,* and use your latitude instead of Hc (figure 16-18).
- Set Zn in the azimuth counter window with the azimuth crank and set Hc in the altitude counter window with the altitude control knob.
- Collimate the body at the precomputed time and read the true heading of the aircraft under the vertical crosshair in the field of vision. If you are using precomputation techniques, a true heading is available every time an altitude observation is made.

Relative Bearing Method (RB)

- Bring the body into collimation.
- Turn the azimuth crank (and the sextant as necessary), until 0° is under the vertical crosshair in the field of vision.
- At the desired time read the relative bearing of the body in the azimuth counter window.
- Compute Zn (true bearing) of the body and use the formula: TH = TB — RB.

Inverse Relative Bearing Method (IRB)

- Set 000° in the azimuth counter window with the azimuth crank (figure 16-19).
- Collimate the body. At the desired time, read the bearing (IRB) under the vertical crosshair in the field of vision.

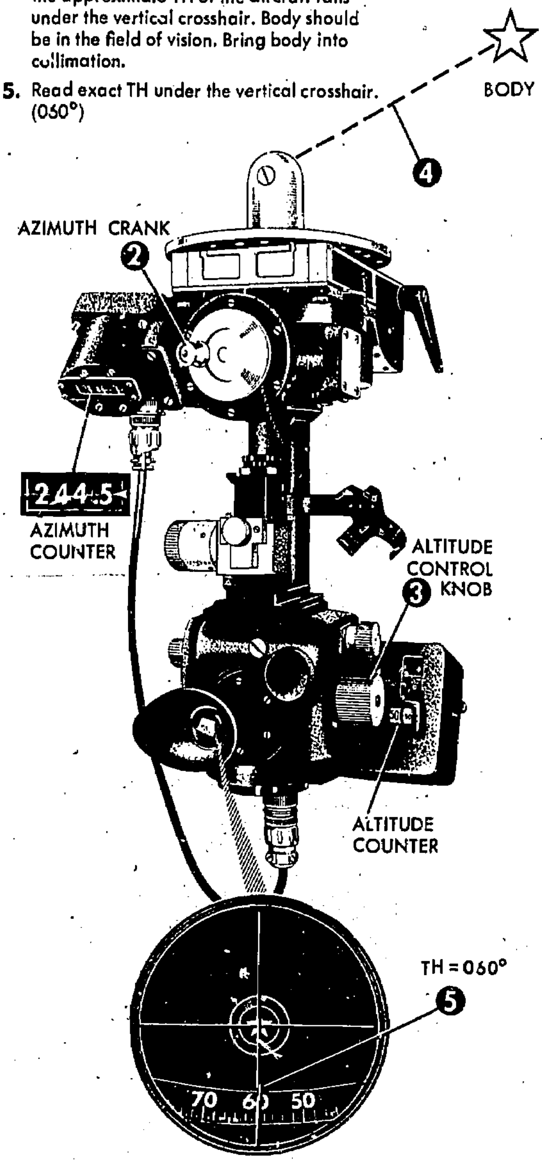

Figure 16-17. True Bearing Method (Except Polaris)

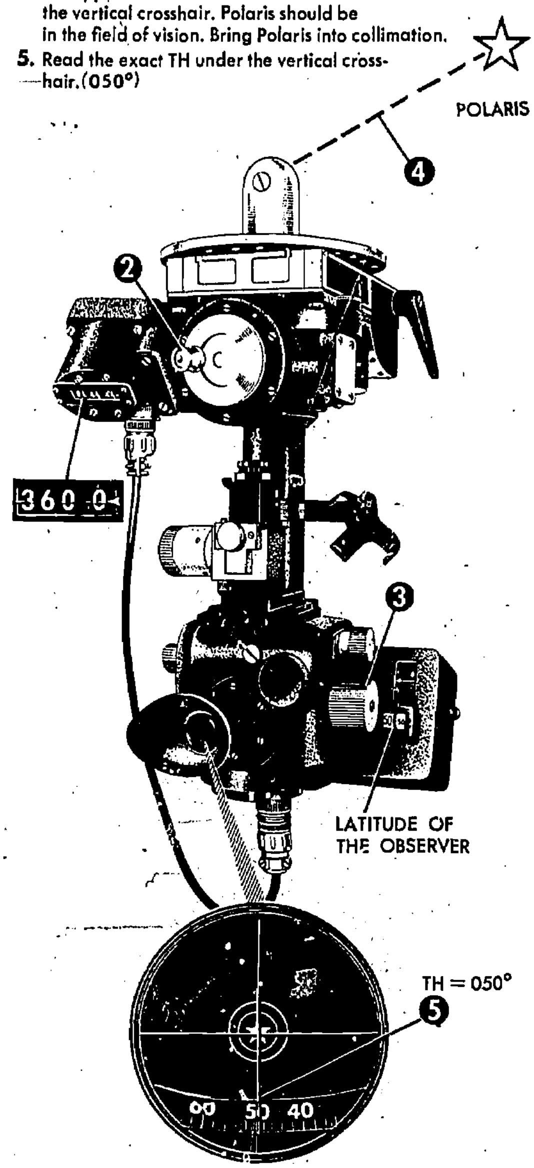

Figure 16-18. True Bearing Method (Using Polaris)

- Compute Zn of the celestial body and use the formula: TH = Zn + IRB.

Computing Zn for Heading Checks

More accuracy is needed when computing Zn's for heading determination than when computing Zn's for plotting LOPs. To obtain this accuracy, the entering arguments (latitude, LHA, and declination) are computed to the nearest half degree.

Example:

Given:	Position	31°08′N, 121°14′W
	GHA	190°41′
	Dec	S16°29′
Find:	Zn	

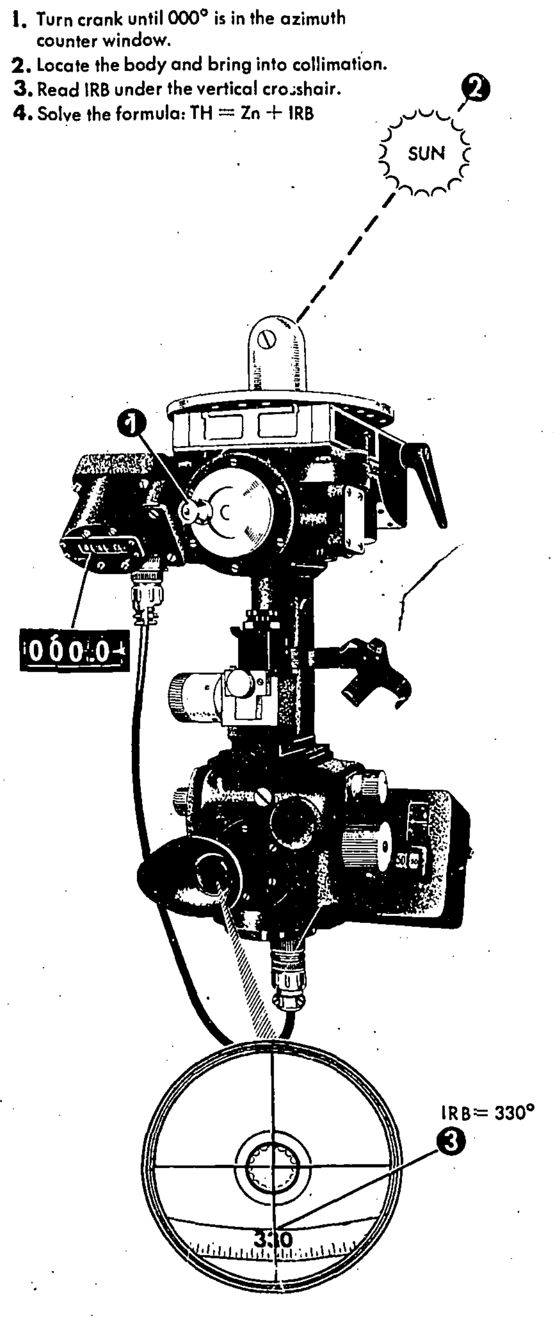

Figure 16-19. Inverse Relative Bearing Method

Solution:

Step 1. Compute the LHA (190°41′ — 121°14′ = 68°27′).

Step 2. Enter the slight reduction table, page LAT 31°, "Declination (15°-29°) Contrary Name to Latitude," with LHA 68° and 69° for declinations 16° and 17°. See figure 16-20.

Step 3. Interpolate between LHAs 68° and 69° under declinations 16° and 17° to obtain the correct Z (115½°).

Step 4. The position is in the Northern Hemisphere and the LHA is less than 180°; therefore, Zn = 360° — 115½° = 244½°.

CELESTIAL NAVIGATION IN HIGH LATITUDES

Celestial navigation in polar regions is of primary importance because (1) it constitutes the principal method of determining position other than by dead reckoning, and (2) it provides the only means of establishing direction over much of the polar regions. The magnetic compass and directional gyro are useful in polar regions, but they require an independent check, which is provided only by celestial bodies. Celestial navigation is of such importance in polar regions that the navigator customarily devotes almost full time to it.

Timepieces should be given special care. They should be wound regularly and their errors checked by time signal before each flight. They should not be exposed to very low temperatures. Below approximately —40° (F or C), a precision watch becomes unreliable. A wristwatch receives sufficient heat from the body, but any other timepiece should be protected from severe temperatures. This may be done by keeping it in an inside pocket where it will be warmed by body heat. Even though a watch may be operating properly, its rate may be changed by a large change in temperature.

At high latitudes, the sun's daily motion is nearly parallel to the horizon. In areas of continuous sunlight the moment chosen as the start of the day is of little importance. Hence, GMT is customarily used for flights. The *motion of the aircraft* in these regions can easily have greater effect upon the altitude and true azimuth of the sun than the motion of the sun itself. At latitude 64°, an aircraft flying west at 400 knots keeps pace with the sun, which appears to remain stationary in the sky. At higher latitudes the altitude of a celestial body might be increasing at any time of day, if the aircraft is flying toward it, and a body might rise or not, at any azimuth, depending upon the direction of motion of the aircraft relative to the body.

Since the apparent motion of celestial bodies is nearly horizontal, and their azimuth relation-