Primer *of* Celestial Navigation

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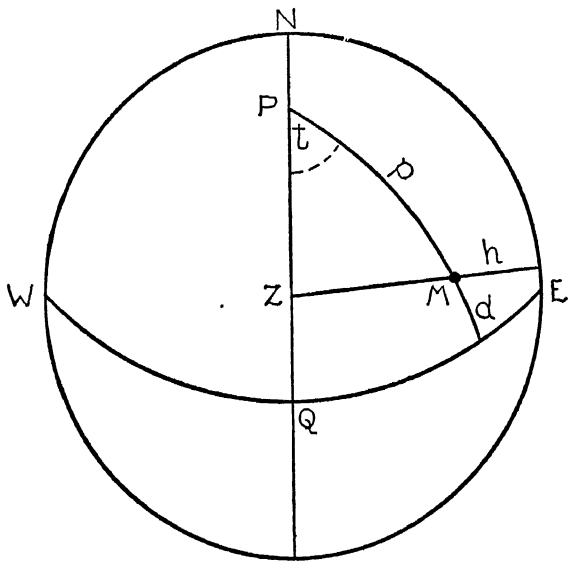
12. Longitude and Chronometer Error

THE LONGITUDE of a place is the arc of the equator intercepted between the prime meridian (Greenwich, England) and the meridian of the place, measured from the prime meridian toward the east or west through 180°.



Projection of the Celestial Sphere on the Plane of the Horizon.

WQE = Equator
Z = Zenith
P = Elevated Pole
M = Body
d = Declination
p = Polar distance
h = Altitude
QZ = Latitude
t = Local hour angle to be found

FIG. 36. Longitude by Time Sight.

The "Time Sight" method for longitude dates back to 1763 and is still much in use in the merchant service though not in the navy. It calls for (1) a single altitude of a body preferably near the prime vertical (bearing east or west), (2) G. C. T. of the observation and (3) known latitude. Practically, the body should be between 3 and 5 hours of meridian passage. (*See* FIG. 36.)

The long-used equation for this problem is:

$$\text{hav } t = \sec L \csc p \cos s \sin (s - h)$$
$$\text{where } s = \tfrac{1}{2}(h + L + p)$$

Having thus found t, it is combined with the G. H. A. from N. A. to give longitude.

Hulbert Hinkel, Jr. (U. S. N. I. P. April 1935) presented the following substitute equation for use with H. O. 211:

$$\csc^2 \tfrac{1}{2} t = \frac{\sec s \csc (s - h)}{\sec L \csc p}$$

Summary

1. Take sextant altitude of body.
2. Note G. C. T. and latitude.
3. Make usual altitude corrections.
4. N. A. for declination and G. H. A.
5. Solve by 211 method for t.
6. Combine t with G. H. A. for longitude.

NOTE: A method for finding the time at which the sun will be on the prime vertical will be found in Part III, Chap. 30, Problems.