REFERENCE

1 Richey, M. W. (1975). The navigation of small craft. This *Journal*, **28**, 477.

D. H. Sadler comments

THE idea of an 'Altitude-Azimuth' almanac is not new though most effort (see this *Journal*, Vol. 1, 185, 1948; Vol. 2, 285, 1949) has been concerned with the Sun and planets rather than the stars. For the stars the simple problem is that observations are recorded in mean time (say G.M.T.) whereas the positions of the stars depend on sidereal time (L.H.A. Aries) given by: L.H.A. Aries = G.H.A. Aries + west longitude. A full account of star tables (and diagrams) using a mean-time argument (and thus avoiding using the Almanac to give G.H.A. Aries) is given in 'The Genesis of the E.A.N.T.s' (this *Journal*, Vol. 6, 333, 1953). Ignoring the complications arising from the motion of the observer between sights, and corrections for precession and nutation, there are innumerable methods of combining

(a) the observed mean time;
(b) a 'day' or 'year' correction to give the time-argument of the tables;
(c) corrections to altitude for non-tabular arguments;
(d) interpolation in the tables;
(e) plotting from a fixed position, or from one whose longitude is chosen to avoid interpolation.

For world-wide use the choice depends on the planned usage and on the relative merits of simplicity in arithmetic or in plotting, as well as with material considerations of the size and cost of the tables.

The tables described above relate to a small range of longitude only and, taking advantage of the limited duration of twilight, can use G.M.T. directly as argument. This may not be the most economical method, but it is certainly simple for the user. The brief description does not include a discussion of the effect of the possible use of large intercepts, of the possible errors in refraction for low altitudes, and the incorporation of corrections for precession and nutation. These should be examined if the method is extended to larger areas and the tables are used for many years.

A Position Line from an Object off the Chart

Captain A. B Moody U.S.N.R.

THE use of the traverse table for plotting a bearing from an object outside the coverage area of the chart, as described by Pesi Sorab,[1] suggests a graphical solution that might be preferred by some navigators. The method is analogous to advancing a position line by advancing the position of the object observed.

Refer to Fig. 1. The bearing of an object off the northern limit of the chart is observed. Any convenient point on the chart is selected as the position of the fictitious object, and the reciprocal of the measured bearing is plotted from this

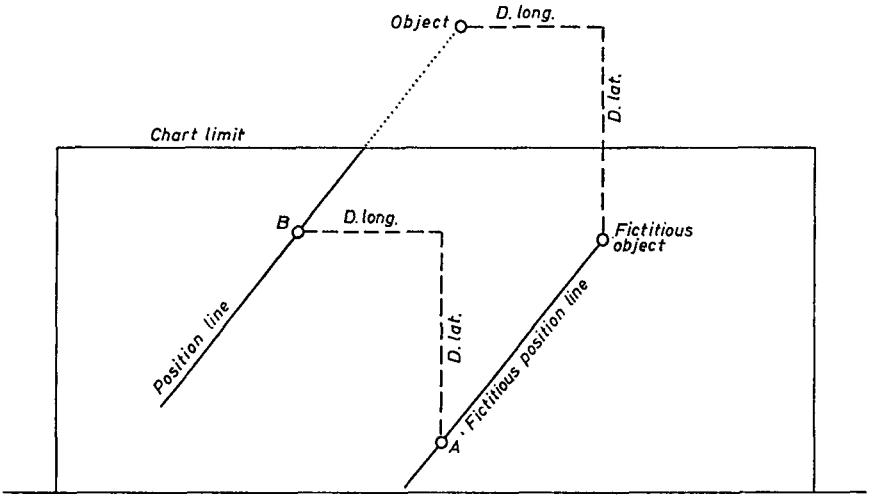

FIG. 1

point to produce a fictitious position line. The difference of latitude (D. lat) and difference of longitude (D. long.) between the fictitious object and the actual object are computed. From some convenient point, A, on the fictitious position line the D. lat. and D. long. (as determined *from* the fictitious object *to* the actual object) are plotted, locating point B. A line through B, in the direction of the bearing (parallel to the fictitious position line) is the actual position line, as indicated by the pecked extension beyond the chart limit.

If the distance of the vessel from the object is known, resulting in a circular position line, several points on the position line can be found by the method shown, and an arc drawn through them. If *both* direction and distance are known, as by radar, both bearing and circular position lines can be drawn from the fictitious object, producing a fictitious fix. This point can then be adjusted for D. lat. and D. long., in the manner shown, to find the actual fix.

Usually the method can be simplified by selecting the position of the fictitious object at the intersection of the meridian (or parallel) of the real object and the chart limit. Then only D. lat. (or D. long.) need be computed, and the fictitious position line adjusted in one direction only. Other variations may suggest themselves.

Like Sorab's method, the graphical solution requires knowledge of the coordinates of the object observed. It also assumes a constant chart scale throughout the area involved. Unlike Sorab's method, the graphical solution does not require the use of tables, and can be used for circular position lines. However, it cannot be used for objects a greater distance off the chart than the extent of the chart in the direction of the object, without an additional offset. Neither the tabular nor the graphical method is well adapted to radio or visual bearings of such great distance that a correction for convergence of the meridian is needed on a Mercator chart.

[1] Sorab, Pesi (1974). This *Journal*, **27**, 266.