together with the divided circle on the dial, suggests that the instrument might have been designed for use at sea.

REFERENCE

1 See, for example, the title page of Digges's *A Prognostication everlastinge . . .* (1576), as reproduced in *The Art of Navigation in England . . .*, by D. W. Waters, Hollis & Carter, 1958.

A Radar Display for Collision Avoidance

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In the October issue of the *Journal* (19, 529), Commander Clissold puts forward a type of radar display which might be useful for collision avoidance, as it intends to show the aspect of the ship representing the danger. To achieve this a long afterglow screen would be used and the display would be oriented head-up, i.e. ship's head at the top of the picture to correspond as closely as possible with a possible visible situation. An electronic cursor, bearing line, would indicate a danger of collision if on constant bearing. This type of display is said to show tracks true relative to own ship's course.

Apart from the fact that 30 seconds afterglow, decaying exponentially as an excited phosphor screen would, might be too short for showing up tracks efficiently, there are some other difficulties as well with such a display. Obviously aspects of target ship would not be shown but implied only by the afterglow track. Furthermore, a display of this kind would be a true-motion type display not necessarily north stabilized but nevertheless showing all motion of other ships in true, if own ship's speed is compensated for in displacing the origin of the radial scan. The difficulty will arise if own ship changes heading and unless this heading change is also compensated for, like in a north-up stabilized true-motion display, smearing of all echoes will occur. A heading change of own ship, therefore, will produce additional apparent tracks of other ships and the apparent displacement of fixed targets.

A north-up stabilized true-motion display, as it is usually known, would provide all the necessary information except the smearing of the electronic bearing line due to the long afterglow phosphor. What is really wanted is that some information should show remanence, i.e. show up the tracks of the target ships. On the other hand, some others, like bearing line, should not have an afterglow at all, or very short only. Technically, this cannot be achieved with a single display and several suggestions have been mentioned in the *Journal* where instantaneous recording of radar signals is divorced from a stored display. I am referring to the scan conversion technique described by B. W. Manley in the *Journal* (15, 172), A proposed system to produce true motion in relative displays (British Patent No. 838,256). History recording and display using photographic systems might be an alternative way to achieve the same aim.

The difficulty with the electronic bearing line could possibly be overcome by using hand or automatically operated mechanical cursor; unchanging bearing would indicate threat of collision.

A Note on Hariot's Method of Obtaining Meridional Parts

Jon V. Pepper

In an article in this *Journal* some years ago, the late Professor E. G. R. Taylor and Dr. D. H. Sadler drew attention to and discussed Hariot's calculation of meridonal parts.[1] The question was raised but not answered as to 'how Hariot discovered the extremely complex and far from obvious method' that he used. This note draws attention to a possible, and indeed a very likely, way in which the method may have been discovered.

The conformal property of the stereographic projection of the surface of a globe from a pole on to its equatorial plane has been known since antiquity. It is used in the design of the astronomer's astrolabe.[2] Hariot's manuscripts[3] contain in more than one place a diagram for a proof of the property. One of these is reproduced in a recent article[4] on Hariot. Halley, in an article on meridional parts,[5] says of the conformal property, 'But this not being vulgarly known, must not be assumed without a Demonstration'. From this result he obtains the formula for meridional parts, unaware that the same proof may have been used almost exactly a hundred years previously. In fact, he says, 'I hope I may be entituled to a share in the emprovements of this useful part of Geometry' on the basis of 'having attained . . . a very facile and natural demonstration of the said Analogy'.

Rhumb lines, which cut meridian lines at a constant angle, are projected stereographically into equiangular spirals, which cut their radius vectors at the same constant angle. If $r_0, r_1, \ldots, r_n$ are the lengths of equally spaced radius vectors of the spiral, then

$$\frac{r_1}{r_0}=\frac{r_2}{r_1}=\frac{r_3}{r_2}=\cdots=\frac{r_n}{r_{n-1}},$$

and hence

$$\frac{r_n}{r_0}=\left(\frac{r_1}{r_0}\right)^n. \qquad (1)$$

In Fig. 1, PNOS is a plane section of a globe of radius r_0, poles N and S, and centre O. P is a point on the surface through which the rhumb line passes, P* its projection on the equatorial plane, and A is the foot of the perpendicular from P

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