FORUM

The Accuracy Contours of a Running Fix

A. N. Black

THE diagrams in the paper by Y. Namikawa and Y. Yamazaki with the above title (this *Journal*, **22**, 169) are based on a fallacious argument. Since the distance run between bearings is one of the parameters a navigator must choose, it is useless to express the error as a multiple of it. Consequently their final recommendations are also invalid.

Instead, the error should be expressed as a multiple of the shortest distance off, a distance which is not affected by the pattern of observation chosen. The navigator must then choose the angles off the bow, or more correctly off the course made good, to obtain the best fix.

Accepting for the moment the errors adopted by the authors, this means that their equation (9) must be rewritten

$$K = \operatorname{cosec} \phi_2 \operatorname{cosec} (\phi_2 - \phi_1) (\operatorname{cosec}^2 \phi_1 + 42{\cdot}6 (\sec \phi_1 - \sec \phi_2)^2/v^2)$$

where ϕ_1, ϕ_2 are respectively the angles between the course made good and the first, second bearings. Complete contours of K have not been drawn, but the following diagrams show the essential results for the 10- and 20-knot cases. Two lines are drawn; the steeper one shows the optimum value of ϕ_1, given ϕ_2, and the less steep one shows the optimum value of ϕ_2, given ϕ_1. On each line are plotted the corresponding values of K. The lines naturally cross at the overall optimum.

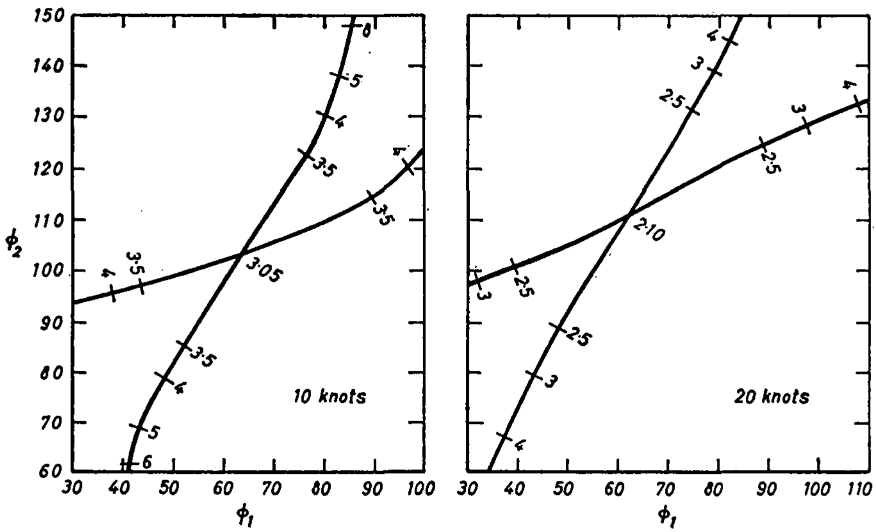

FIG. 1.

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The 20-knot diagram shows that the first bearing should be taken at about 62° relative bearing, the second at about 112°. The 10-knot diagram shows that the first should be taken at about 64°, the second at about 104°. The reduced change of bearing reflects the need, in the interests of accuracy, to shorten the run if the speed is such that uncertainties in the run have greater effect. If circumstances dictate a less than ideal choice for the first, or the second, bearing, the diagrams can still be used to indicate the optimum choice for the other bearing.

Next one may question the authors' estimate of the run accuracy. It is hard to believe that the error in the run can be given by one formula regardless of the circumstances. Off a prominent headland where the tides run hard (e.g. Portland Bill) the run must be much less accurate than in an area where the tidal streams are weaker and vary little from point to point (e.g. the late-lamented buoy in the middle of Lyme Bay). The existence or reliability of tidal data also varies from one region to another.

The difference between the two diagrams arises from the ratio of run error to bearing error. The run error can be expressed in terms of an 'angle', obtained by dividing the standard (or probable) error at the end of one hour by the distance run in an hour. Dividing this 'angle' by the standard (or probable) error of bearing gives a measure, r, of the ratio of run error to bearing error. The figures given by the authors yield $r = 4{\cdot}4$ for 10 knots and 2·2 for 20 knots. The navigator who prefers to estimate his own errors can calculate r and choose the appropriate diagram.

The Edge of a Needless Collision

Frank Coffman Bell

COMMANDANT L. OUDET in his contribution 'Lessons from a Needless Collision' (*Journal*, **20**, 30) may not have gone so far as to suggest that at no time ought either *Tenacious* or *Placid* to have altered course or speed then obtaining. Yet from his account this is plainly the case, a fact for which there must be some technical explanation, although he does not fully disclose it, saying rather, 'We have not sought to teach but only to stimulate thought among Masters and their shipowners.' No doubt others are not excluded. His pars. 2 & 3 give the facts in summary and the statement concerning the verdicts of *Tenacious* that 'at 1330 she finds the bearing is steady' plus some muttering about even worse than steady at 1340. This summary he later on amplifies slightly as to the facts:

(1) in par. 16, 'between 1344 and 1349...*Placid* made no (careful) observation.'

(2) in par. 18, '*Placid* did not detect this alteration (by *Tenacious* at 1340, from 130° to 160°).'

(3) in par. 20, 'In the first four minutes after the first radar observation, the range of the echo detected by *Placid* went from 4 miles to 2·6 miles, that is to say a reduction of 1·4 miles and a rate of closing of 21 knots.'

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