Letters to the Editor

RADAR USAGE AND SPEED IN FOG

SIR,

As everyone who has had occasion to put the Collision Regulations into practice at sea knows, none of the rules which concern manœuvring give precise instructions, other than Article 21 (which is not relevant in this context). Generally speaking, they define the responsibility without specifying the nature of the action to be taken; they stick firmly to ground on which there can be no compromise, and leave the infinite variety of circumstance to the intelligence of the seaman.

While the advent of radar has given the seaman a tool which may greatly aid the exercise of his intelligence in particular cases, it has done nothing to simplify the general problem; on the contrary, it has brought its own substantial set of variables and the total is still infinite. The wise men who wrote the Rules must have had to resist very strongly the natural desire to be precise; that Captain Robb has not similarly restrained himself is my main criticism of his very interesting study on Radar Usage and Speed in Fog (Vol. IV, p. 149).

If one admits, as I believe one must, that any addition to the Rules or any accepted interpretation of them must be incapable of compromise, the proposed rule or interpretation must be applicable in all relevant circumstances and must take into account, not only the vagaries of ships, the sea and the weather, but also those of human nature. When radar is in the picture the field of perversity is widened.

If this attitude is permitted one is free, in examining the efficacy of a rule, to assume the worst in each of any particular set of circumstances. I doubt that anyone would accept, in this connection, a guarantee of safety based on the law of averages. If he did, he would hardly be expected to worry about risk of collision in any case.

It may not, therefore, be unfair in examining Captain Robb's formula to take the case of two ocean-going vessels in mid-Atlantic, proceeding at 20 knots and approaching head-on, both of which can take off their way in $1\frac{1}{2}$ miles, taking $7\frac{1}{2}$ minutes to do so; visibility is varying from $\frac{1}{2}$ to $1\frac{1}{2}$ miles; ship A has radar and makes contact with B at 6 miles; B has no radar and is directly up-wind from A.

Three minutes after radar contact (range now 4 miles), A decides to stop and take his way off; $10\frac{1}{2}$ minutes after contact he is stopped, having run $2\frac{1}{2}$ miles. B has heard no fog signal, has overestimated visibility and, not having reduced, runs $3\frac{1}{2}$ miles in $10\frac{1}{2}$ minutes. B, of course, would sight A at whatever the visibility happened to be at the moment and might hear his fog signal at about the same time. The situation would, however, be unpleasant.

The situation chosen may be considered fanciful, though I think that most seamen will agree that none of the particular factors is unusual in itself. I believe that any formula designed to permit a liberal and useful interpretation of moderate speed will leave itself open to destruction in particular and not unreasonable cases. A further disadvantage of any formula is that the unintelligent will press it to its limit and forget the variables which it cannot include.

It will be noted that the formula suggested by Captain Robb takes no account of the degree of visibility, the ability of seamen to estimate it or the swiftness and sureness of seamen in taking action on sighting at close quarters. It is obviously impossible for any formula to do so, but it has to be remembered that conditions in a 'pea-souper' in which non-radar ships may be going dead slow may not be substantially more dangerous than a visibility of 1 mile in which all are going full speed. The effect of applying the formula to radar ships would be considerably different in the two cases.

A point worth mentioning perhaps is that, in the example chosen, ship A has only three minutes between first radar contact and the time he should take action. The action is presumably to be based on knowledge, deduced from radar observation and plotting, of the position, course and speed of B. This time interval is extremely short for obtaining information of any exactitude, except perhaps in the simple head-on case.

Far more important than the evolution of a moderate speed formula is, I believe, that of appreciation of the moment at which it becomes risky to try to avoid the close-quarter situation. In my view Captain Robb's article may tend to concentrate attention too much on the speed factor and the need to stop, and too little on the early and bold alteration of course which will, or should, remove collision risk in the earliest stages of the encounter.

Admittedly there must be a connection between radar-detection range and safe speed, but in his endeavour to obtain a formula which will embrace all kinds of targets in a 'locality', he has been forced in the ocean case to take a detection range at which, in my view, the action should have already been completed.

The advantages of early action are, of course, that it leaves plenty of time for continued observation and plotting of the other vessel's movements and that it should avoid a close-quarter situation and, by keeping out of sound range, the restrictions imposed by para. 2 of Article 16 of the Rules. The advantages of bold action are that, other things being equal, the risk is the more rapidly reduced and that, if the other ship has radar, one's own alteration will become obvious to her the sooner. If action is delayed there comes a time after which the consequences of ill-advised or haphazard action by the other ship may be extremely difficult to circumvent, and when even the 'seamanlike' practice of slowing or stopping may precipitate catastrophe.

Hence, in my view, good detection ranges of all kinds of targets are highly to be desired and the emphasis on early action cannot be too strong.

If I may refer to para. 3 of R. S. Mortimer's letter in Vol. IV, No. 3, I would like to express the opinion that if radar is to be of general service, service, that is, to those using it and those without it (by reducing mutual risks) it should not impose any fresh difficulties on the non-radar vessel. I believe it is generally agreed to be quite wrong for any ship to use the signals in Article 28 unless she is in sight of another. One is always somewhat at a loss when such signals are heard from vessels out of sight, but there seems to be no justification for radar vessels adding to the confusion by misusing the rule.

With regard to Mr. Mortimer's paras. 4 and 5, the ship not fitted with radar is bound by Article 16, para. 2, whatever kind of whistle he hears. I think he would be doing no service to himself or the radar-fitted ship by reacting differently to different sounds. He is in a similar position to the pedestrian crossing a motor road; a steady or predictable course and speed gives the motorist something to work on.

I hope that Mr. Mortimer's final sentence will not prove to be a true forecast and that all officers will realize that radar will not prevent collisions, that when the close-quarter situation is reached they will have already had the best opportunities for using its information, and that their greatest chance of safety then lies in extreme circumspection.

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Yours faithfully,
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ASTRO-FIX BY RANGES

SIR,

I was very interested to read Professor Collins's paper on astro-fixing by ranges (Vol. IV, p. 20); and also the letters from Dr. Palm and Rektor Möhn in the following number.

Restricting the difference in azimuth to 12° in Schöenberg's method may reduce errors due to accelerations and simplify the observing, but it also reduces the pairs of bright stars that can be used; so much so that either the method could seldom be used or present-day sextants would need much more 'transparent' optical systems for the fainter stars.

Although precomputed tables are desirable, they would be voluminous, and perhaps computation from Schöenberg's formula would suffice: the formula looks simple in that the computation should be short.

If the sight is to be reduced by plotting on a gnomonic chart, as Professor Möhn suggests, the average scale should be not less than 1:4M; the area of the charts required would then be at least 40 square feet. This covers an octant of the globe. All the sheets would have to be carried for every flight and several used for plotting each observation, some twice. Lines to be drawn on the charts would be up to 8 feet long. Thus reduction by plotting would demand more drawing accuracy and space than is available in the air.

An alternative graphical method, somewhat laborious, would be to prepare before the flight a set of gnomonic charts covering the area of sky to be traversed, drawing in the great circles for all the visible pairs of stars against coordinates of S.H.A. and declination. Plotting the D.R. position on the gnomonic chart would show instantly which stars were suitable for observation and, on making the observation, the position line could easily be transferred to the plotting chart.

But without a simple observing instrument and some means of 'preselection' of suitable stars, astro-navigation by ranges will not be able to compete for popularity with the standard method of aerial astro-navigation with sextant and H.O. 249 (where, incidentally, the stars need not even be identified).

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Yours faithfully,
J. D. PROCTOR.