

FORUM

PPI Pictures on Charts

from Vice-Admiral Sir Archibald Day, K.B.E., C.B.,
D.S.O.

Hydrographer of the Navy

IN the discussion following the papers read on 'Methods of Air and Surface Navigation' at the Institute meeting on 15 January 1954 (see pages 159-164 of the *Journal*, Vol. VII, No. 2, April 1954), the question was again ventilated of including PPI pictures in the Admiralty Pilots or Sailing Directions.

The Hydrographer of the Navy is said to have been found not really very interested in the problem because of its magnitude. On the contrary he is most interested, even though it is only to stress the impracticability of the project and the consequent need for radar usage to be developed without expectation of any such assistance. Good examples of the difficulties were given by both Captain Wylie and Captain Topley, and at present the difficulties seem insurmountable.

Charts and Sailing Directions are prepared for the ordinary navigator in both the Royal and Merchant Navies. The purpose of the chart in respect of the land detail is to show it so that it may be understood from whatever bearing and distance it may be 'seen'. The Sailing Directions and their views draw attention to and aid recognition of the features which are readily identifiable.

Up to date it has only been found necessary to alter the visual chart by emphasizing the coastline as being the most identifiable land feature to radar. In addition, more contouring is used as being the most efficient way of showing hill forms. Coloured layering is being tried to emphasize certain contours, but it is a measure of the basic difficulty that opinions vary on which are the most important. Incidentally, the visual navigator can only infrequently make accurate use of hill features when they are distinctive in shape or standing solitary.

Mr. L. S. Le Page writes:

It is a pity that the Hydrographer of the Navy should be convinced that the inclusion of PPI pictures in the Admiralty Pilots and Sailing Directions is impracticable. That there are difficulties no one will deny; but might they not be sufficiently overcome by a moderate degree of compromise?

To deal with the particular difficulties referred to by the Hydrographer, Captain Topley's point about the difference in performance between Merchant Navy radars and Royal Navy long range radars becomes less formidable if it is realized that ships of the Royal Navy also carry a 'navigational' radar which is of the same type as that used in the Merchant Navy. Hence PPI pictures taken on this type of radar would be likely to benefit both services, and even if they cannot help the Royal Navy in circumstances in which extreme range is required at the expense of detail, they would probably be found of value on the majority of occasions.

Captain Wylie's remarks seemed to stress unduly the variation of the radar appearance of land with bearing and distance, as if such considerations were hardly applicable to direct vision. But in addition to the visual appearance of land

being affected by aspect, and by distance in so far as detail is concerned, it is also dependent upon the season, the weather, and the time of day. A coastline in winter, covered with snow, on a dull overcast day or with long shadows cast by a low sun, will be very different in everything save silhouette when seen on a bright summer's day. Such drawbacks have not, however, deterred publication of such views in the Pilots, even when there is little choice of quality.

As to the position from which each radar photograph is taken, this will almost settle itself. For pictures intended as an aid to landfall, the range should perhaps be that at which just sufficient land will paint on a normal set under normal conditions for identification to be positive. If super-refraction conditions exist when the landfall is being made, so much the better for identification; while sub-refraction of any material consequence is unlikely. The bearing of the position may be stated as well as the range—thus conforming to the practice established on so many of the existing views.

Accuracy Contour Maps of a Ship's Position

from N. Sameshima
(Nautical Society of Japan)

The writer has drawn the accuracy contour maps of a ship's position fixed by cross bearing, horizontal sextant angle method and Loran aid. The accuracy of the fixes has been evaluated in terms of the probability density.

In Fig. 1, P is the ship's position fixed from cross bearings of the objects A and B, and θ is the angle between two bearings. d_1 and d_2 are the distances of the objects. The displacement probable error in each of the lines of bearing at P is

$$r = d \sin \Delta Z \quad (1)$$

where ΔZ is the probable error in observed bearing.

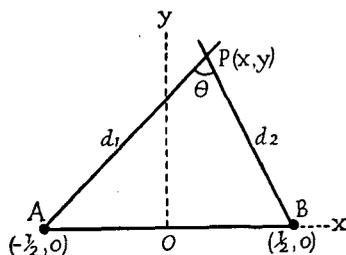


Fig. 1.

The probability density at P is given by

$$p = (1/2\pi\sigma_1\sigma_2) \sin \theta = (0.0724/r_1r_2) \sin \theta \quad (2)$$

where σ_1, σ_2 are the displacement standard errors in each line of bearing at P.

From equations (1) and (2)

$$p = (k/d_1d_2) \sin \theta \quad (3)$$

where $k = 0.0724/\sin^2 \Delta Z$.