NEW ELECTRONIC AIDS TO MARINE NAVIGATION

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The M. V. « Radel II », a converted Fairmile, is the National Research Council's new experimental vessel used for shipboard tests of experimental electronic navigational equipment. The vessel carried out operational trials in the Ottawa River, St. Lawrence River, Rideau River, and Lake Ontario during the 1950 navigation season.

ADVANCES IN THE SHORT-RANGE PRESENTATION OF MARINE RADARS DEVELOPED BY THE NATIONAL RESEARCH COUNCIL

The best of the marine search radars developed during World War II by the National Research Council was the Type-268 Radar, which was produced in quantity at Research Enterprises, Limited, during the last years of the war. From the experience gained in the development and operational use of this radar, a simplified and improved radar prototype was developed to fill the post-war need for an inexpensive merchant marine radar. This prototype was called « Merchant Marine Radar Type-B » (MMR-B).

Since many ships requiring radar were operated solely in the Great Lakes and their congested connecting waterways, a need was foreseen for a radar having an even better short-range presentation than the MMR-B. To this end, the new Experimental Navigational and Docking Radar was developed which was tested on the Great Lakes during the 1950 navigation season.

A comparative table of the pertinent specifications of the radars previously mentioned is given below. In this table it will be noted that the factors governing the presentation of a good short-range display are:

a) Reduction of pulse length;

b) Increase in receiver bandwidth;

c) Use of separate antennas for transmitting and receiving.

Decrease of antenna beam width and reduction of side lobes are also important factors in obtaining a sharp display presentation. All antennas appearing in the comparative table have a beam width of more than 2°. Compact antennas are now available with beam widths of the order of 1.6°, and the use of these should result in much sharper bearing discrimination.

COMPARATIVE SPECIFICATIONS OF MARINE RADARS

Radar	Minimum Range	Range Scales	Pulse Length	Pulse Recurrence Frequency	Peak Power	CRT	Receiver Bandwidth	Rotating Speed of Antenna	Type of Antenna
268	100 yards	Switched: 6, 000 yds. 30, 000 yds. 60, 000 yds.	1 μsec	500	40 kw	5"	3 mc	22 rpm	Single cheese, beamwidth * .... 3. 15°
MMR-B	25 yards	Continuously variable 2200 to 60, 000 yds.	0.25 μsec	1000	7 kw	7"	7 mc	24 rpm	Offset slice of parabolic cylinder, beamwidth * .... 2. 10°
Experimental Navigational and Docking Radar	10 yards	Continuously variable 400 to 10, 000 yds.	Switched: 0.25 μsec 0.12 μsec 0.08 μsec	1500	7 kw	10"	23 mc	24 rpm	Twin parabolic cheeses, beamwidth * .... 3. 20°

* (measured to half-voltage points)

Very considerable progress has been made during the past few years in accurately presenting a close-in picture in great detail. With the new Experimental Navigational and Docking Radar, navigation of the East and West Entrances of Toronto Harbour, which are 400 feet in width, is very simple and large vessels can be passed with ease. When the radar display is adjusted to full expansion the scale of the display is 100 yards to the inch, or about three times that of the largest available charts of Toronto Harbour.

EXPERIMENTAL NAVIGATIONAL AND DOCKING RADAR

The National Research Council's recently developed Experimental Navigational and Docking Radar possesses an extremely short minimum range (10 yards). Operational trials were conducted to assess the minimum range performance in blind navigation of small harbours, in passing ships at close quarters, and in docking. We give annexed to this description a series of photographs showing some of these trials.

In addition to its value as a navigational instrument, it was found that the extremely good definition of the radar display afforded a ready means of position fixing with the Radar and Chart Matching Unit shown on the figure. Depth readings taken from the Master Depth Viewing Display can then be charted immediately. This method is a great advance in carrying out echo sounding programs, since the necessity for laboriously fixing the ship's position from visual shore sites for each sounding is eliminated.

RADAR AND CHART MATCHING UNIT

The radar display produced by the Council's new Merchant Marine Radar (left) is duplicated in the Radar and Chart Matching Unit (center), in which the image of the chart and that of the radar display are superimposed. By this means the operator can determine immediately the ship's position.

The Radar and Chart Matching Unit may be used in conjunction with the Experimental Navigational and Docking Radar. Such a radar system appears to have many interesting applications. For example, a shore-based unit could monitor accurately all harbour traffic and direct it by radiotelephone. Also, a work boat equipped with standard echo sounding equipment and a « walkie-talkie » could be directed to any point or points to carry out an accurate harbour sounding program.

MICROWAVE DIRECTION FINDER

This is a simple, rugged, inexpensive navigational aid which will be particularly useful as a « homing device » for vessels too small to take advantage of radar equipment. The front face of the box, in which the receiver is housed, is shaped as a section of a paraboloid, serving as a reflector for a three-centimeter dipole. The whole assembly weighs only about 12 pounds. With this direction-finding device on the vessel and a simple microwave transmitter ashore, a fixed beacon path may be followed safely even in very narrow waters. In any one harbour area several beacon paths may be operated on the same frequency without mutual interference.