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NATIONAL RESEARCH COUNCIL OF CANADA  
RADIO AND ELECTRICAL ENGINEERING DIVISION

ANALYZED

RANGE COMPARISON OF RADAR REFLECTORS  
FOR WOODEN SPAR BUOYS

H. R. SMYTH AND J. A. HEHIR

OTTAWA

SEPTEMBER 1956

NRC #21962

### ABSTRACT

At the request of the Department of Transport a comparison was made of the radar range performance of a 28-inch stack of 4 1/4-inch tetrahedrons and a single 14-inch tetrahedron for use on wooden spar buoys. The range obtainable with the single tetrahedron was 10 percent greater.

## RANGE COMPARISON OF RADAR REFLECTORS FOR WOODEN SPAR BUOYS

- H.R. Smyth and J.A. Hehir -

The Radio and Electrical Engineering Division of the National Research Council was asked by the Department of Transport to carry out comparative tests of two types of metallic radar reflectors: one, a single, large tetrahedron, the other a stack of smaller tetrahedrons, (see Plate I), for use on wooden spar buoys in the channel at the approaches to Yarmouth Harbour, Nova Scotia. The present wooden spar buoys are difficult to pinpoint on a radar screen, especially through sea clutter. With the addition of suitable metallic targets, radar echoes would be very easily identified. Two sizes of single tetrahedral reflectors — 14-inch and 18-inch — were constructed by the National Research Council for comparative tests with a 28-inch stack of 4 1/4-inch tetrahedrons received from the Department of Transport at Prescott, Ontario.

Several tests were carried out aboard the M.V. "Radel II" on the Ottawa River, using the three spar buoys at the down-river end of Lower Duck Island (see Fig. 1). The stacked reflector was mounted on red spar buoy No. 1 and remained there throughout all the test runs. No metallic reflector was mounted on black spar buoy No. 2. Each of the two NRC-built reflectors was mounted, in turn, on red spar buoy No. 3 for the duration of one test run. Reflector height above waterline was maintained at 7 to 8 feet.

Received echoes as seen on the radar screen were classified as follows:

<u>Good</u>	"Solid" echoes were received for every revolution of the radar antenna.
<u>Fair</u>	Echoes were received, sometimes "good", sometimes "weak", but four to five solid echoes for every ten revolutions of the radar antenna (about 50 percent). The weaker echoes were lost in sea clutter.
<u>Weak</u>	Two to three echoes were received for every ten revolutions of the radar antenna (about 33 percent). These echoes would definitely be lost if sea clutter prevailed.

On all test runs black spar buoy No. 2 was lost at ranges beyond 0.6 miles. The relative range performance of the metallic reflectors, in statute miles, is shown in Fig. 2. It is apparent that about 10 percent greater range is obtainable with the 14-inch reflector than with the stacked reflector. Substitution of the 18-inch reflector for the 14-inch reflector increased the range by about 25 percent. Since visual range in this part of the Ottawa River was restricted to about 4 miles, it was necessary to operate the radar below maximum gain to obtain relative range performance data. Maximum range obtainable with each reflector would be much greater than the range shown in Fig. 2.



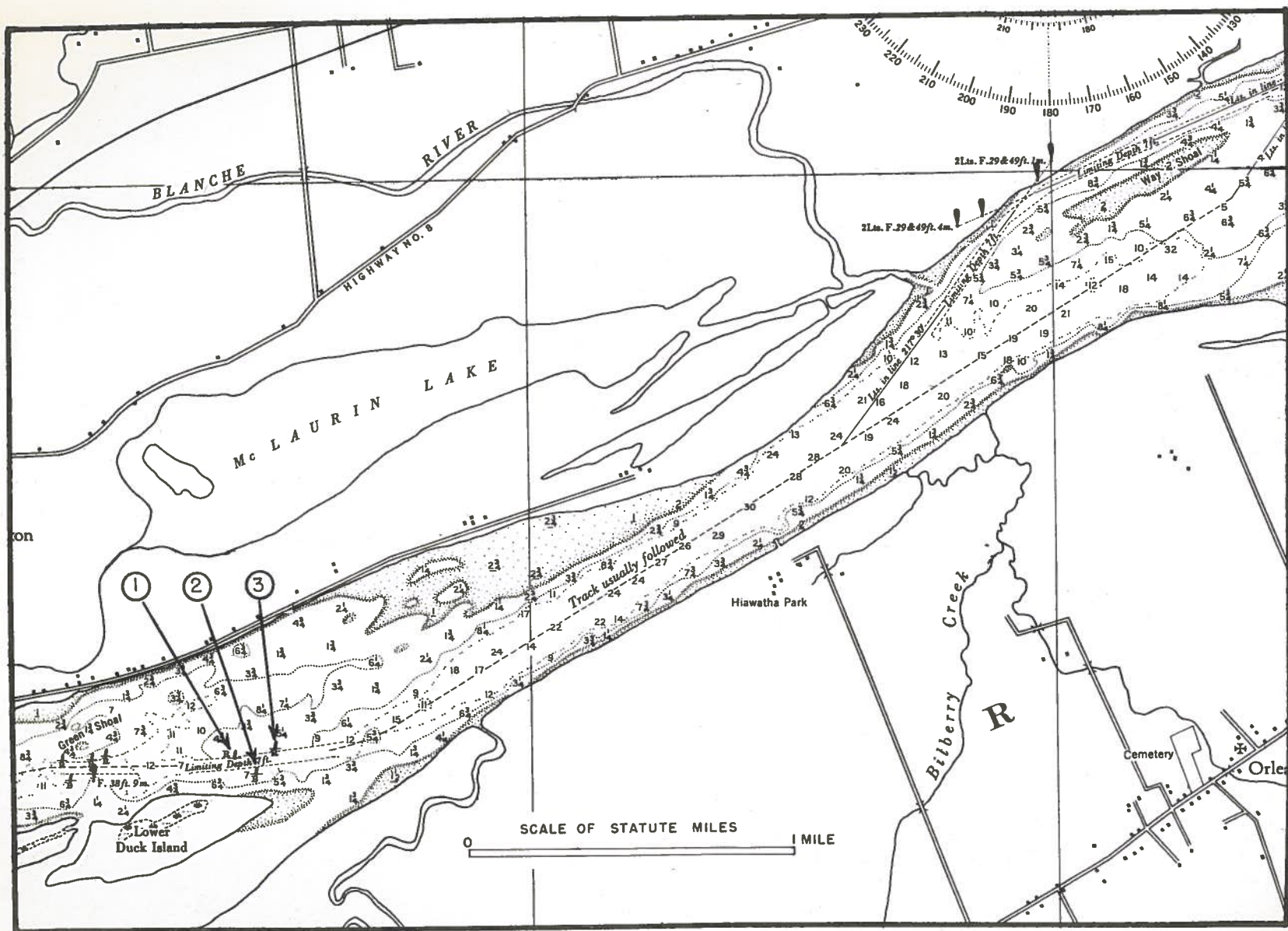


FIG. 1 SECTION OF OTTAWA RIVER USED FOR RANGE TRIALS



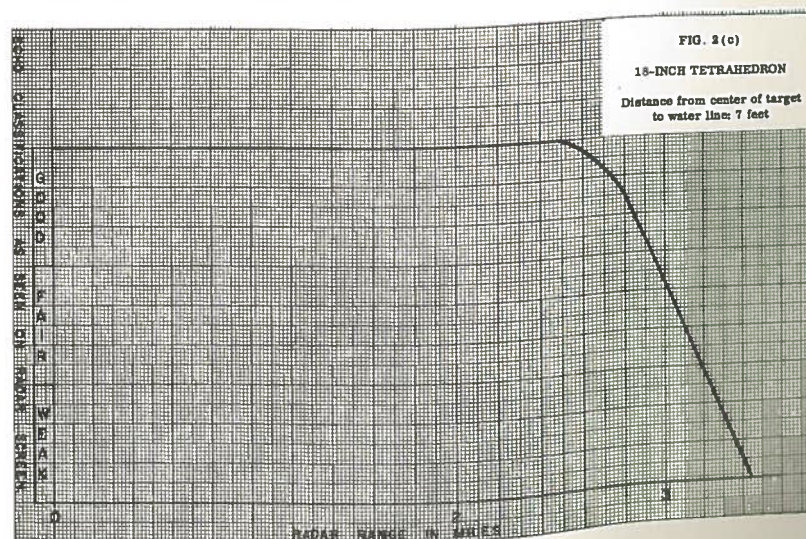
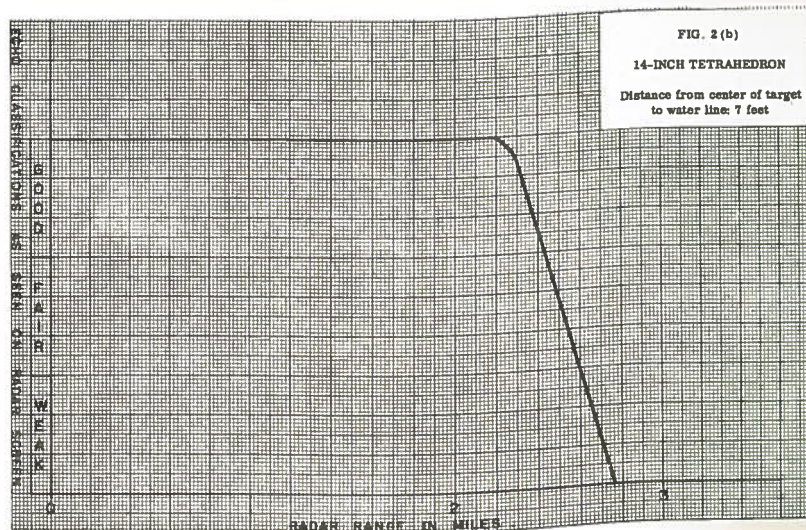
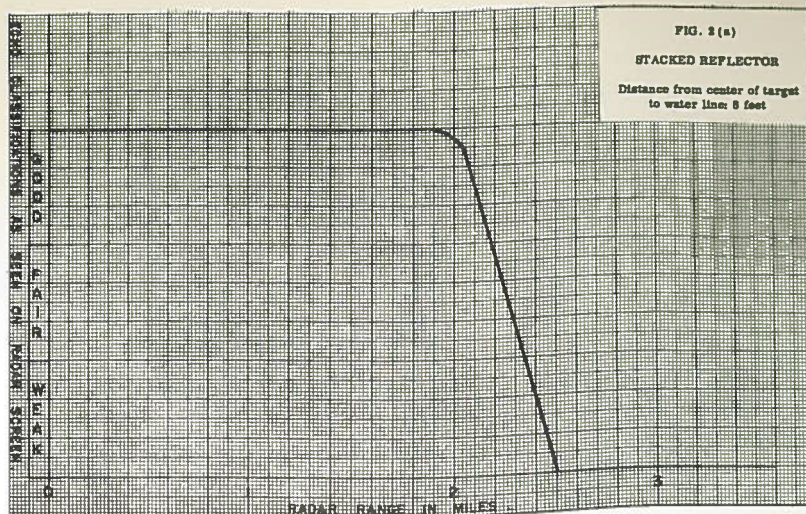


FIG. 2 RANGE PERFORMANCE OF THREE RADAR REFLECTORS



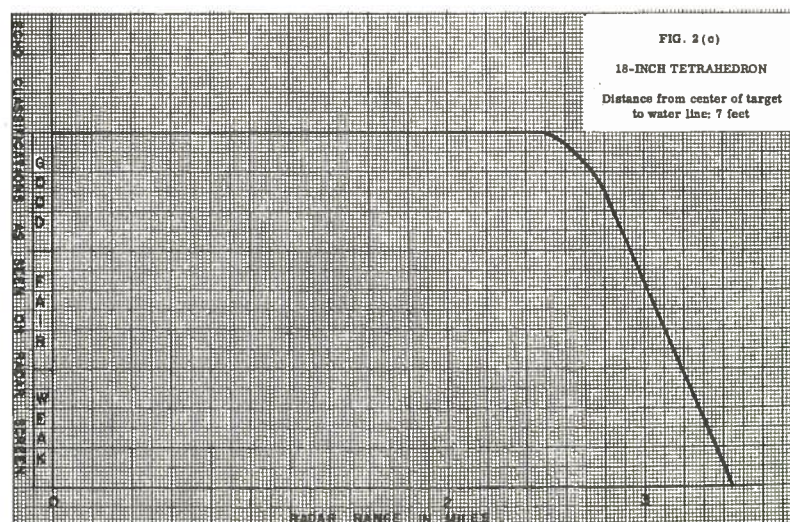
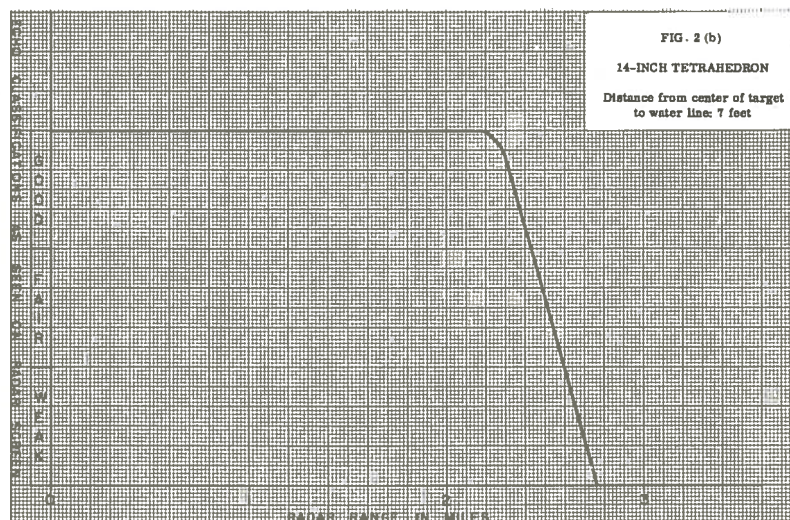
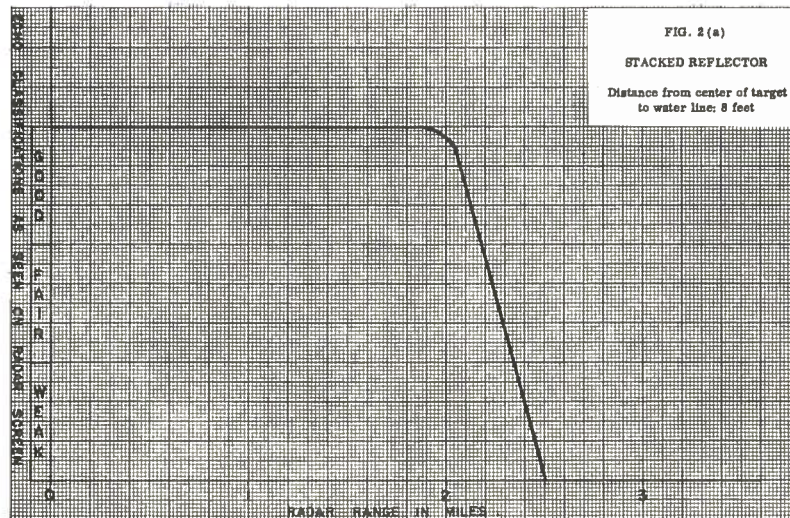


FIG. 2 RANGE PERFORMANCE OF THREE RADAR REFLECTORS

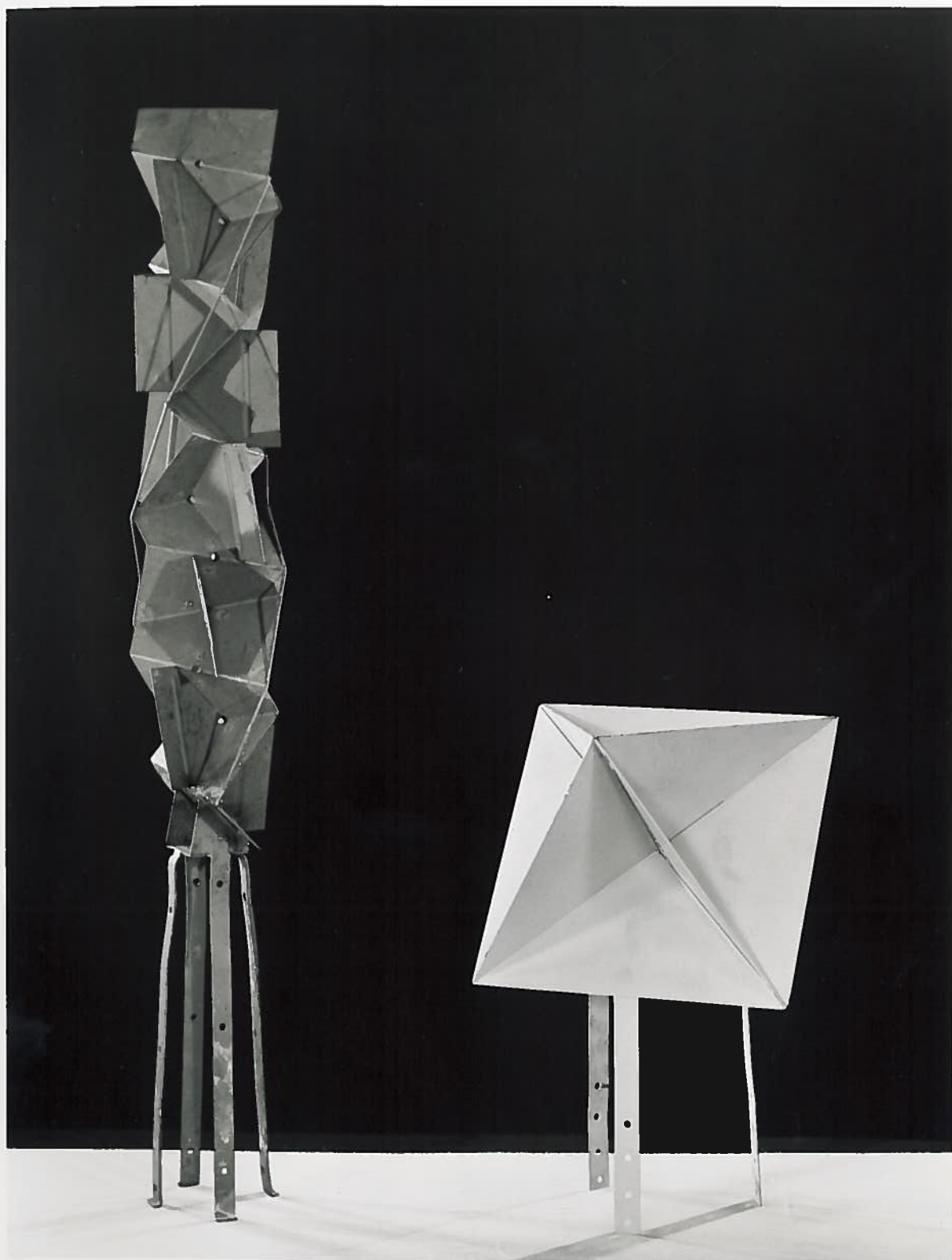


PLATE I

RADAR REFLECTORS FOR WOODEN SPAR BUOYS

(left) 28-inch stack of  $4\frac{1}{4}$ -inch tetrahedrons    (right) single 14-inch tetrahedron