

**RESOLUTION A.820(19)**  
adopted on 23 November 1995

**PERFORMANCE STANDARDS FOR NAVIGATIONAL RADAR EQUIPMENT  
FOR HIGH-SPEED CRAFT**

THE ASSEMBLY,

RECALLING Article 15(j) of the Convention on the International Maritime Organization concerning the functions of the Assembly in relation to regulations and guidelines concerning maritime safety,

RECALLING ALSO resolution MSC.36(63) by which the Maritime Safety Committee, on 20 May 1994, adopted the International Code of Safety for High-Speed Craft (HSC Code),

RECALLING FURTHER resolution 1 by which the Conference of Contracting Governments to the International Convention for the Safety of Life at Sea (SOLAS), 1974, on 24 May 1994, adopted amendments to the 1974 SOLAS Convention, including a new chapter X on Safety measures for high speed craft, which makes the provisions of the HSC Code mandatory under that Convention for all such craft constructed on or after 1 January 1996,

BEARING IN MIND section 13.13 of the HSC Code which requires that all navigational equipment to which chapter 13 applies should conform to performance standards not inferior to those adopted by the Organization,

HAVING CONSIDERED the recommendation made by the Maritime Safety Committee at its sixty-fourth session,

1. ADOPTS the Recommendation on Performance Standards for Navigational Radar Equipment for High-Speed Craft set out in the Annex to the present resolution;
2. RECOMMENDS Governments to ensure that navigational radar equipment required to be carried on high-speed craft conform to performance standards not inferior to those set out in the Annex to the present resolution;
3. REQUESTS the Maritime Safety Committee to keep these Performance Standards under review and to adopt amendments thereto, as necessary.

## ANNEX

**RECOMMENDATION ON PERFORMANCE STANDARDS FOR NAVIGATIONAL  
RADAR EQUIPMENT FOR HIGH-SPEED CRAFT****1 INTRODUCTION**

1.1 The radar equipment is intended for installation in high-speed craft (HSC) with the following characteristics:

- .1 a maximum speed of 70 knots;
- .2 a maximum rate of turn 20°/s; and
- .3 a normal range of operation between latitudes 70°N and 70°S.

1.2 In addition to the general requirements contained in resolution A.694(17), the radar equipment should comply with the following minimum performance requirements.

**2 GENERAL**

The radar equipment should provide an indication, in relation to the craft, of the position of other surface craft, obstructions, buoys, shorelines and navigational marks, in a manner which will assist in navigation and in avoiding collision.

**3 RANGE PERFORMANCE**

The operational requirement, where the radar antenna is mounted 7.5 m above sea level, is that the equipment should give a clear indication of surface objects, such as for example, a navigational buoy having an effective echoing area of approximately 10 m<sup>2</sup> at 2.5 nautical miles in the absence of clutter.

**4 MINIMUM RANGE**

The surface objects specified in 3 should be clearly displayed from a minimum range of 35 m up to a range of one nautical mile, without the need to change the setting of controls other than the range selector.

**5 DISPLAY**

5.1 The equipment should, without external magnification, provide a multi-colour daylight display with an effective radar picture diameter of not less than 250 mm.

5.2 Day and night colours should be provided; it should be possible to adjust brightness.

5.3 The equipment should provide the following set of range scales of display:

0.25, 0.5, 0.75, 1.5, 3, 6, 12, and 24 nautical miles.

5.4 Additional range scales may be provided.

5.5 The range scale displayed and, when in use, the distance between range rings should be clearly indicated.

5.6 Off-centre facilities should be provided of at least a minimum of 50% and not more than 75% of range scale in use.

## **6 RANGE MEASUREMENT**

6.1 Fixed electronic range rings should be provided for range measurements as follows:

- .1 on the range scales of 0.25, 0.5 and 0.75 nautical miles, at least two range rings; and
- .2 on all other range scales, six range rings.

6.2 A variable electronic range marker should be provided with a numeric readout of range.

6.3 The fixed range rings and the variable range marker should enable the range of an object to be measured with an error not exceeding 1% of the maximum range of the scale in use, or 30 m, whichever is the greater.

6.4 It should be possible to vary the brilliance of the fixed range rings and the variable marker and to remove them completely from the display.

## **7 HEADING INDICATOR**

7.1 The heading of the craft should be indicated by a line on the display with a maximum error not greater than  $\pm 1^\circ$ . The thickness of the display heading should not be greater than  $0.5^\circ$  measured at maximum range at the edge of the screen.

7.2 Provision should be made to switch off the heading indicator by a device which cannot be left in the "heading marker off" position.

## **8 BEARING MEASUREMENT**

8.1 Provision should be made to obtain quickly the bearing of any object whose echo appears on the display.

8.2 The means provided for obtaining bearing should enable the bearing of a target whose echo appears at the edge of the display to be measured with an accuracy of  $\pm 1^\circ$  or better.

8.3 A minimum of two lines for parallel indexing should be available.

## **9 DISCRIMINATION**

9.1 The equipment should be capable of displaying as separate indications on a range scale of 1 nautical mile or less, in the absence of sea clutter, two  $10 \text{ m}^2$  targets at a range of between 50% and 100% of the range scale in use, and on the same azimuth, separated by not more than 35 m in range.

9.2 The equipment should be capable of displaying as separate indications two ( $10 \text{ m}^2$ ) targets both situated at the same range between 50% and 100% of 1 nautical mile range, on the 1.5 nautical mile range scale and separated by not more than  $2.5^\circ$  for X band radars and  $4^\circ$  for S band radars.

## **10 ROLL OR PITCH**

The performance of the equipment should be such that when the craft is rolling and pitching up to  $\pm 10^\circ$  the range performance requirements of 3 and 4 continue to be met.

## **11 SCAN**

The scan should be clockwise, continuous and automatic through 360° of azimuth. The scan rate should not be less than 40 revolutions per minute. The equipment should operate satisfactorily in relative wind speeds of up to 100 knots.

## **12 AZIMUTH STABILIZATION**

12.1 Means should be provided to enable the display to be stabilized in azimuth by an approved directional sensor. The equipment should be provided with an approved directional sensor input to enable it to be stabilized in azimuth. The accuracy of alignment with the approved directional sensor transmission should be within 0.5°, with a rate of turn of 20°/s.

12.2 The equipment should operate satisfactorily in the unstabilized mode when the main approved directional sensor is inoperative.

## **13 PERFORMANCE CHECK**

Means should be available, while the equipment is used operationally, to determine readily significant drop in performance relative to calibration standard established at the time of installation, and that the equipment is correctly tuned in the absence of targets.

## **14 ANTI-CLUTTER DEVICES**

Suitable means should be provided for the suppression of unwanted echoes, i.e. from sea clutter, rain and other forms of precipitation, clouds and sandstorms. It should be possible to adjust manually and continuously the anti-clutter controls.

## **15 OPERATION**

15.1 The equipment should be capable of being switched on and operated from the place at which the navigator normally operates the high-speed craft.

15.2 Operator controls should be accessible and easy to identify and use. Where symbols are used, they should comply with the recommendation of the Organization on symbols for control on marine navigational radar equipment.

15.3 After switching from cold, the system should be operational within 4 min.

15.4 A standby condition should be provided from which the equipment can be brought to an operational condition within 15 s.

## **16 INTERFERENCE**

After installation and adjustment on board, the bearing accuracy as prescribed in these performance standards should be maintained without further adjustment, irrespective of the movement of the craft in the earth's magnetic field.

## **17 DISPLAY MODES**

17.1 The equipment should be capable of operating both in relative and in true motion.

17.2 The radar origin should be capable of being off-set to at least 50% and not more than 75% of the radius of the display.

17.3 Where sea or ground stabilization is provided, the accuracy and discrimination of the display should be at least equivalent to that required by these performance standards.

## **18 ANTENNA SYSTEM**

18.1 The design of the antenna system should enable it to be installed in such a manner that the operational efficiency of the radar system as a whole is not substantially impaired.

18.2 The antenna system should be so designed as to withstand the forces expected to be experienced by such craft.

## **19 OPERATION WITH RADAR BEACONS**

19.1 All radars operating in the 3 cm band should be capable of operating in a horizontally polarized mode.

19.2 It should be possible to switch off any signal processing facilities which might prevent a radar beacon from being shown on the radar display.

## **20 MULTIPLE RADAR INSTALLATIONS**

Where it is required that two radar installations be carried, they should be so installed that each radar can be operated individually and both can be operated independently.

## **21 INTERFACE**

21.1 The radar system should be capable of receiving information from equipment such as gyro-compass, speed and distance measurement equipment (SDME) and electronic position-fixing systems (EPFS) in accordance with international standards<sup>1</sup>.

21.2 The radar should provide an indication when any input from an external sensor is absent. The radar should also repeat any alarms on status messages concerning the quality of the input data from its external sensors which may influence its operation.

## **22 NAVIGATIONAL INFORMATION**

The radar display should be capable of presenting in graphical form positions and navigational track lines, e.g. way-points and tracks between way-points, in addition to radar information. The source of the graphical information should be clearly indicated.

## **23 TARGET TRAILS**

Target trails should be displayed by the radar echoes of targets in the form of synthetic afterglow. The trails may be either relative or true. The true trails may be sea or ground stabilized.

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<sup>1</sup>Refer to IEC 1162:1994.