

**ANNEX 28**

**RESOLUTION MSC.164(78)**  
**(adopted on 17 May 2004)**

**REVISED PERFORMANCE STANDARDS**  
**FOR RADAR REFLECTORS**

THE MARITIME SAFETY COMMITTEE,

RECALLING Article 28(b) of the Convention on the International Maritime Organization concerning the functions of Committee,

RECALLING ALSO resolution A.886(21), by which the Assembly resolved that the functions of adopting performance standards for radio and navigational equipment, as well as amendments thereto, shall be performed by the Maritime Safety Committee on behalf of the Organization,

RECALLING FURTHER that the provisions of chapter V of the International Convention for the Safety of Life at Sea, 1974 (SOLAS), as amended, and chapter 13 of the International Code of Safety for High-Speed Craft (HSC Code), in force, require, if practicable, fitting of a radar reflector to all ships and craft under 150 gross tonnage to enable detection by radar,

RECOGNIZING that, for safety reasons, radar reflectors should produce reliable detection in practical conditions and perform in both 3 GHz (S-band) and 9 GHz (X-band),

HAVING CONSIDERED the recommendation made by the Sub-Committee on Safety of Navigation at its forty-ninth session,

1. ADOPTS the Recommendation on Performance Standards for Radar Reflectors, set out in the Annex to the present resolution;
2. RECOMMENDS Governments to ensure that radar reflectors:
  - (a) if fitted on or after 1 July 2005, conform to performance standards not inferior to those specified in the Annex to the present resolutions; and
  - (b) if fitted before 1 July 2005, conform to performance standards not inferior to those specified in the Annex to resolution A.384(X).

## ANNEX

### RECOMMENDATION ON PERFORMANCE STANDARDS FOR RADAR REFLECTORS

#### 1 INTRODUCTION

1.1 Radar reflectors carried under SOLAS chapters V and X should comply with the minimum performance requirements as specified in this Recommendation.

1.2 In the following paragraphs, radar cross sections<sup>1</sup> are specified for the frequencies of 3 GHz (S-band) and 9 GHz (X-band) whose wavelengths are 10 cm and 3 cm respectively.

1.3 The performance requirements stated should apply to either active or passive radar reflectors in both 9 GHz and 3 GHz bands. (Active radar reflectors are also known as radar target enhancers).

#### 2 APPLICATION

2.1 All ships required to be fitted with a radar reflector, if practicable, to enable detection by ships navigating by radar at both 9 GHz and 3 GHz bands.

#### 3 PERFORMANCE

3.1 The radar reflector should have a "Stated Performance Level" measured in square metres radar cross section ( $m^2$  RCS) of at least  $7.5 m^2$  in X-band and  $0.5 m^2$  in S-band mounted at a minimum height of 4 m above water level.

3.2 Required minimum level for reflector performance - the Stated Performance Level should:

- .1 be maintained over a total of at least  $280^\circ$  azimuth;
- .2 not remain below this level over any single angle of more than  $10^\circ$  - a null; and
- .3 not have distances between nulls of less than  $20^\circ$ .

3.3 For power driven vessels and sailing vessels designed to operate with little heel (catamaran/trimaran), this performance should be maintained through angles of (athwartships) heel  $10^\circ$  either side of vertical. For other sailing vessels, the reflector should maintain this performance over  $20^\circ$  either side of vertical.

3.4 Active reflectors should conform to Recommendation ITU-R M.1176.

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<sup>1</sup> The **Radar Cross Section** is a measure of the ability of an object to return microwave energy to the interrogating radar when compared to the actual reflectivity of a metal sphere.

## **4 CONSTRUCTION**

4.1 The reflector should be capable of maintaining its reflection performance under the conditions of sea states, vibration, humidity and change of temperature likely to be experienced in the marine environment as defined by resolution A.694(17)<sup>2</sup>.

## **5 INSTALLATION**

5.1 Fixing arrangements should be provided so that the reflector can be fitted either on a rigid mount or suspended in the rigging.

5.2 The recommended mounting height of 4 m and any preferred orientation should be permanently and clearly marked on the reflector.

5.3 The reflector should be clearly and permanently marked if it will meet the performance requirement to  $\pm 20^\circ$  inclination (heel).

5.4 For small-craft, the maximum weight for mounting at 4 m should be 5 kg. Reflectors designed for mounting at a greater height should be of weight calculated as equivalent to, or less than 4 m/5 kg. Physical sizes should be minimised and should not exceed 0.05 m<sup>3</sup>.

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