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RESOLUTION A.423(XI)
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RADAR BEACONS AND TRANSPONDERS

THE ASSEMBLY,

RECALLING Article 16(i) of the Convention on the Inter-Governmental Maritime Consultative Organization concerning the functions of the Assembly,

RECOGNIZING the improvements in navigational information which radar beacons and transponders can offer to the safety of navigation,

HAVING CONSIDERED the recommendation made by the Maritime Safety Committee at its fortieth session,

1. ADOPTS:

- (a) The recommendation on marine uses of radar beacons and transponders set out in Annex 1 to the present resolution and considers that recommendation as the IMCO policy document on the subject;
- (b) The recommendation on operational standards for swept frequency radar beacons and the recommendation on operational standards for fixed frequency radar beacons set out respectively in Annex 2 and Annex 3 to the present resolution;
- (c) The recommendation on transponders set out in Annex 4 to the present resolution.

2. RECOMMENDS Member Governments to ensure that:

- (a) The use of radar beacons conforms with Annex 1 to the present resolution;
- (b) Radar beacons conform to operational standards not inferior to those shown in Annex 2 and Annex 3 to the present Resolution;
- (c) Transponders conform to the recommendations contained in Annex 4 to the present resolution.

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ANNEX 1

RECOMMENDATION ON THE MARINE USES OF RADAR BEACONS AND TRANSPONDERS

1 Introduction

1.1 The uncontrolled proliferation of radar beacons and transponders could cause significant degradation of a ship's navigational radar display, produce incompatibilities among devices developed for different uses, or necessitate a succession of modifications to shipborne radars to accommodate progressive developments of radar beacons and transponders.

1.2 To avoid these possibilities, the following recommendations are made concerning the appropriate applications for radar beacons and transponders, where an operational requirement for such a device exists, and measures for general administration of radar beacons and transponders.

1.3 The terms "radar beacon" (racon) and "transponder", as used in this recommendation, are understood to have the following meanings:

1.3.1 Radar beacon (racon): A receiver-transmitter device associated with a fixed navigational mark which, when triggered by a radar, automatically returns a distinctive signal which can appear on the display of the triggering radar, providing range, bearing and identification information. The terms "radar beacon" and "racon" should be reserved exclusively for this use and include devices mounted on fixed structures, or on floating aids anchored at fixed positions, for navigation purposes. Whether used alone, or mounted on another aid to navigation (such as a visible mark) the racon itself is considered a separate aid to navigation.

1.3.2 Transponder: A receiver-transmitter device in the maritime radionavigation service which transmits automatically when it receives the proper interrogation, or when a transmission is initiated by a local command. The transmission may include a coded identification signal and/or data. The response may be displayed on a radar PPI, or on a display separate from any radar, or both, depending upon the application and content of the signal.

2 General operational characteristics

2.1 Swept frequency radar beacon: A radar beacon in the maritime service which is capable of transmitting a warning signal, automatically, to any radar-equipped ship in its vicinity:

- .1 the beacon will be triggered automatically by the transmissions of any radar operating in the appropriate radar band;
- .2 the return signal is to be displayed on the PPI of the triggering radar.

2.2 Fixed frequency radar beacon: A radar beacon in the maritime radionavigation service which is capable of responding automatically to any radar-equipped ship in its vicinity, and which returns a signal on a fixed frequency which can be displayed on the PPI of a suitably configured radar:

- .1 the beacon will be triggered automatically by the transmission of any radar operating in the appropriate radar band;
- .2 the signal may be displayed continuously, either separately or superimposed on the radar picture, or may be switched off, at the option of the operator.

2.3 Transponders: A transponder is a device, which, when properly interrogated, can provide for:

- .1 ship radar target identification and echo enhancement with the proviso that such enhancer should not significantly exceed that which could be achieved by passive means on the radar PPI of an interrogating ship or shore station;
- .2 radar target correlation with voice or other radio transmission for identification on the radar PPI of an interrogating ship or shore station;
- .3 operator selectable presentation of transponder responses either superimposed on the normal PPI display, or free of clutter and other targets;
- .4 transfer of information pertinent to avoidance of collision or other hazards, manoeuvre, manoeuvring characteristics, etc.

3 Operational uses

3.1 Swept frequency radar beacons should be used only for the following purposes; under no circumstances should they be used to enhance the detection of marine craft:

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- .1* ranging on and identification of positions on inconspicuous coastlines;
- .2* identification of position on coastlines which permit good ranging but are featureless;
- .3* identification of selected navigational marks both seaborne and land-based;
- .4* landfall identification;
- .5 as a warning device to identify temporary navigational hazards and to mark new and uncharted dangers.

3.2 Fixed frequency radar beacons** should be used only for the following purposes:

- .1 ranging on and identification of positions on inconspicuous coastlines;

* If a fixed frequency radar beacon system is internationally agreed and introduced, swept frequency systems may, subject to review by IMCO, continue to be provided for these purposes at the discretion of the navigation authority concerned.

** If studies show that the present development of fixed frequency radar beacons justifies their use for the identification of marks used for general navigational purposes, they should be introduced in the following stages:

- .1 international operational standards are prepared;
- .2 international technical specifications are prepared;
- .3 details of a beacon facility requirement are incorporated in the IMCO performance standards for navigational radar equipment;
- .4 the requirement for a beacon facility is included in national specifications for navigational radar;
- .5 the International Convention for the Safety of Life at Sea, 1974, is amended to provide that all new radars installed on board ships be equipped with a beacon facility;
- .6 fixed frequency radar beacons to identify navigational marks are introduced in addition to swept frequency devices.

Note: Some of these stages may be introduced simultaneously.

- .2 identification of position on coastlines which permit good ranging but are featureless;
- .3 identification of selected navigational marks both seaborne and land-based;
- .4 landfall identification;
- .5 identification of off-shore structures.

3.3 Transponders should be used to meet the operational requirements for any of the following purposes:

- .1 identification of certain classes of ships (ship-to-ship);
- .2 identification of ships for the purposes of shore surveillance;
- .3 search and rescue operations;
- .4 identification of individual ships and data transfer;
- .5 establishing positions for hydrographical purposes.

4 General administration of radar beacons and transponders

4.1 The use of all radar beacons should be authorized by an Administration or by a competent navigation authority. Before authorizing or approving the use of a radar beacon, account should be taken of the density of such devices in the particular area and the need to prevent degradation of ships' navigational radar displays.

4.2 The use of all transponder systems designed to respond in a frequency band used by marine radars should be authorized by an Administration. Before authorizing such use, account should be taken of the effect such transmissions would have on ships' navigational radars.

ANNEX 2

RECOMMENDATION ON OPERATIONAL STANDARDS FOR SWEEP FREQUENCY RADAR BEACONS

1 Introduction

1.1 Swept frequency radar beacons should conform to the following minimum operational standards.

1.2 Swept frequency radar beacons should be operationally compatible with navigational radar equipment which conforms to the standards recommended by IMCO.

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2 Operating frequencies

2.1 Radar beacons designed to operate on a wavelength of 3 cm should be capable of being interrogated by any navigational radar equipment operating on any frequency between 9320 MHz and 9500 MHz and respond within the frequency band 9320 MHz to 9500 MHz.

2.2 Radar beacons designed to operate on a wavelength of 10 cm should be capable of being interrogated by any navigational radar equipment operating on any frequency between 2920 MHz and 3100 MHz and respond within the frequency band 2920 MHz and 3100 MHz.

3 Transmitter tuning characteristics

3.1 The tuning characteristics of the transmitter should be such that the beacon response can appear on a radar display in a recognizable form at least once every two minutes.

4 Operating range

4.1 The operating range should be compatible with the navigational requirements for the radar beacon at its location and should not normally exceed 30 nautical miles.

5 Response characteristics

5.1 On receipt of an interrogating signal, the radar beacon should commence its response in such time that the gap on the radar display between the radar target and the beacon response does not normally exceed approximately 100 metres. In certain cases the operational use of beacons may allow this delay time to be increased. Under such circumstances the delay time should be as short as practicable and the details should be shown in appropriate navigational publications.

5.2 The duration of the response should be approximately 20 per cent of the maximum range requirement of the particular beacon, or should not exceed 5 miles, whichever is the lower value.

5.3 The leading edge of the response should be sufficiently sharp to permit satisfactory range determination. Where identification coding is used, the leading edges of any other dots and dashes in the response should be such that they may, if required, be substantially removed from a radar display with minimum degradation to the radar echoes.

6 Identification coding

6.1 In some applications coded response formats may be required.

6.2 The form of identification coding when required should comprise the full length of the radar beacon response being divided into dashes and dots, with a ratio of 1 dash equal to 3 dots and 1 dot equal to 1 space.

6.3 The coding should normally commence with a dash and the design of beacons should permit the use of an additional three dots or dashes.

7 Construction

7.1 Radar beacons should be designed to operate continuously and with high reliability when permanently installed in a marine environment.

Note: Beacons which sweep the whole marine radar frequency band in less than 20 microseconds may not meet some of these operational requirements and some other requirements may not apply to them.

ANNEX 3

RECOMMENDATION ON OPERATIONAL STANDARDS FOR FIXED FREQUENCY RADAR BEACONS

1 Introduction

1.1 Fixed frequency radar beacons should conform to the following minimum operational standards.

1.2 Fixed frequency radar beacons should be capable of being interrogated by a radar which conforms to the standards recommended by IMCO.

2 Operating frequencies

2.1 Radar beacons designed to operate on a wavelength of 3 cm should be capable of being interrogated by any navigational radar equipment operating on any frequency between 9320 MHz and 9500 MHz and respond within the frequency band 9300 MHz to 9320 MHz.

2.2 Radar beacons designed to operate on a wavelength of 10 cm should be capable of being interrogated by any navigational radar equipment operating on any frequency between 2920 MHz and 3100 MHz and respond within the frequency band 2900 MHz to 2920 MHz.

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3 Operating range

3.1 The operating range should be compatible with the navigational requirements for the radar beacon at its location and should not normally exceed 30 nautical miles.

4 Response characteristics

4.1 On receipt of an interrogating signal, the radar beacon should commence its response in such time that the gap on the radar display between the radar target and the beacon response does not normally exceed approximately 100 metres.

4.2 The duration of the response should be approximately 20 per cent of the maximum range requirement of the particular beacon, or should not exceed 5 miles, whichever is the lower value.

4.3 The leading edge of the response should be sufficiently sharp to permit satisfactory range determination.

4.4 When a beacon is required to respond to several interrogators, interruptions in responding to each particular interrogator should be kept to a minimum.

5 Identification coding

5.1 The form of identification coding when required should comprise the full length of the radar beacon response being divided into dashes and dots, with a ratio of 1 dash equal to 3 dots and 1 dot equal to 1 space.

5.2 The coding should normally commence with a dash and the design of beacons should permit the use of an additional three dots or dashes.

6 Construction

6.1 Radar beacons should be designed to operate continuously and with high reliability when permanently installed in a marine environment.

ANNEX 4

RECOMMENDATION ON TRANSPONDERS

1 The design of transponder systems should ensure that there is no significant degradation of fixed frequency radar beacons, and the response of a transponder should not be capable of being interpreted as being from a radar beacon of any type.

2 Where a transponder is to be used with a marine navigational radar any modifications necessary to the radar should not degrade its performance, be kept to a minimum, be simple and be compatible with a fixed frequency radar beacon facility.

3 In-band transponder should not be used to enhance the detection of marine craft, except when specially authorized by Administrations for use in survival craft.
