ANNEX 33

RESOLUTION MSC.191(79)
(adopted on 6 December 2004)

PERFORMANCE STANDARDS FOR THE PRESENTATION OF NAVIGATION-RELATED INFORMATION ON SHIPBORNE NAVIGATIONAL DISPLAYS

THE MARITIME SAFETY COMMITTEE,

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

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

RECOGNIZING that harmonization of the requirements for the presentation of navigation-related information on the bridge will ensure that all navigational displays adopt a consistent human-machine interface philosophy and implementation,

RECOGNIZING FURTHER that, for safety reasons, the terms, abbreviations and symbols used for the display of navigation-related information on all shipborne navigation equipment and systems should be consistent,

HAVING CONSIDERED the recommendation on the performance standards for the presentation of navigation-related information on shipborne navigational displays made by the Sub-Committee on Safety of Navigation at its fiftieth session,

1. ADOPTS the Recommendation on Performance Standards for the Presentation of Navigation-related Information on Shipborne Navigational Displays, set out in the Annex to the present resolution;

2. RECOMMENDS Governments to ensure that navigational shipborne displays on the bridge of a ship installed on or after 1 July 2008 conform, from the presentation of navigation-related information point of view, to performance standards not inferior to those specified in the Annex to the present resolution.

ANNEX

RECOMMENDATION ON PERFORMANCE STANDARDS FOR THE PRESENTATION OF NAVIGATION-RELATED INFORMATION ON SHIPBORNE NAVIGATIONAL DISPLAYS

1 PURPOSE

These performance standards harmonize the requirements for the presentation of navigation-related information on the bridge of a ship to ensure that all navigational displays adopt a consistent human machine interface philosophy and implementation.

These performance standards supplement and, in case of a conflict, take priority over, presentation requirements of the individual performance standards adopted by the Organization for relevant navigational systems and equipment, and cover the presentation of navigation-related information by equipment for which performance standards have not been adopted.

2 SCOPE

These performance standards specify the presentation of navigational information on the bridge of a ship, including the consistent use of navigational terms, abbreviations, colours and symbols, as well as other presentation characteristics.

These performance standards also address the presentation of navigation information related to specific navigational tasks by recognizing the use of user selected presentations in addition to presentations required by the individual performance standards adopted by the Organization.

3 APPLICATION

The general principles of these standards are applicable for all displays on the bridge of a ship.*

These performance standards are applicable to any display equipment associated with the navigation systems and equipment for which individual performance standards have been adopted by the Organization. They also address display equipment associated with navigation systems and equipment for which individual performance standards have not been adopted.

In addition to the general requirements set out in resolution A.694(17)** display equipment should meet the requirements of these performance standards, as applicable.

4 DEFINITIONS

Definitions are given in the appendix.

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* The general principles are addressed in paragraphs 5 and 8.
** IEC Publication 60945 (see Appendix 1).

5 GENERAL REQUIREMENTS FOR THE PRESENTATION OF INFORMATION

5.1 Arrangement of information

5.1.1 The presentation of information should be consistent with respect to screen layout and arrangement of information. Data and control functions should be logically grouped. Priority of information should be identified for each application, permanently displayed and presented to the user in a prominent manner by, for example, use of position, size and colour.

5.1.2 The presentation of information should be consistent with respect to values, units, meaning, sources, validity, and if available, integrity.

5.1.3 The presentation of information should be clearly separated into an operational display area (e.g. radar, chart) and one or more user dialogue areas (e.g. menus, data, control functions).

5.2 Readability

5.2.1 The presentation of alphanumeric data, text, symbols and other graphical information (e.g. radar image) should support readability from typical user positions under all ambient light conditions likely to be experienced on the bridge of a ship, and with due consideration to the night vision of the officer of the watch.

5.2.2 Alphanumeric data and text should be presented using a clearly legible non-italic, sans-serif font. The font size should be appropriate for the viewing distance from user positions likely to be experienced on the bridge of a ship.

5.2.3 Text should be presented using simple unambiguous language that is easy to understand. Navigation terms and abbreviations should be presented using the nomenclature defined in SN/Circ.243.

5.2.4 When icons are used, their purpose should be intuitively recognized by appearance, placement and grouping.

5.3 Colours and intensity

5.3.1 The colours used for the presentation of alphanumeric data, text, symbols and other graphical information should provide sufficient contrast against the background under all lighting conditions likely to be experienced on the bridge of a ship.

5.3.2 The colours and brightness should take into account the light conditions of daylight, dusk and night. The presentation should support night viewing by showing light foreground information on a dark non-reflecting background at night.

5.3.3 The background colour and contrast should be chosen to allow presented information to be easily discriminated without degrading the colour coding aspects of the presentation.

5.4 Symbols

5.4.1 Symbols used for the presentation of operational information are defined in SN/Circ.243.

5.4.2 Symbols used for the display of charted information should comply with relevant IHO standards.

5.5 Coding of information

5.5.1 When colour coding is used for discrimination or conspicuousness of alphanumeric text, symbols and other graphical information, all colours in the set should clearly differ from one another.

5.5.2 When colour coding is used, the colour red should be used for coding of alarm related information.

5.5.3 When colour coding is used, it should be used in combination with other symbol attributes, such as size, shape, and orientation.

5.5.4 Flashing of information should be reserved for unacknowledged alarms.

5.6 Integrity marking

5.6.1 The source, validity, and where possible, the integrity of information should be indicated. Invalid information or information with low integrity should be clearly marked, qualitatively and/or quantitatively. Invalid information or information with low integrity may be quantitatively indicated by displaying absolute or percentage values.

5.6.2 When colour coding is used, information with low integrity should be qualitatively marked by using yellow, and invalid information should be qualitatively marked by using red.

5.6.3 In order to show that the screen is being refreshed, means should be provided to immediately make the user aware of a presentation failure on an operational display (e.g. “picture freeze”).

5.7 Alarms and indications

5.7.1 The operational status of information should be indicated as follows:

Status	Visual indication	Audible signal
Alarm, not acknowledged	Red, flashing	Accompanied by an audible signal
Alarm, acknowledged Invalid Information	Red	Suppression of audible signal
Important Indications (Warnings) (e.g. low integrity)	Yellow	Silence unless otherwise specified by the Organization
Normal state	None required, optionally green	Silence

5.7.2 A list of alarms should be provided based on the sequence of occurrence. Additional indication of priority, as set by the user, should be provided on displays showing alarms from multiple sources. Alarms that have been acknowledged and are no longer relevant should be deleted from the list of alarms, but may be retained in an alarm history list.

5.7.3 When a single display is used to present information from multiple navigation systems and equipment, the presentation of alarms and indications should be consistent for the display of the time of alarm occurrence, the cause of the alarm, the source of the alarm and the status of the alarm (e.g. acknowledged, not acknowledged).

5.8 Presentation modes

If displays are capable of presenting information in different mode(s), there should be a clear indication of the mode in use, for example orientation, stabilization, motion, and chart projection.

5.9 User manuals

The user manual and operator instructions should be available in the English language at least. The user manual or reference guide should include a list of all terms, abbreviations, and symbols and their explanations presented by the equipment.

6 PRESENTATION OF OPERATIONAL INFORMATION

6.1 Presentation of own ship information

6.1.1 When a graphical representation of own ship is provided, it should be possible for the user to select either a scaled ship's outline or a simplified symbol as specified in SN/Circ.243. The size of the ship's outline or the simplified symbol in the graphical presentation should be the true scale size of the ship or 6 mm, whichever is greater.

6.1.2 A heading line, and where appropriate a velocity vector, should be associated with own ship symbol and should originate at the position of the consistent common reference point (CCRP).

6.2 Presentation of charted information

6.2.1 The presentation of charted information that is issued by, or on the authority of a government authorized hydrographic office, or other relevant government institution should comply with the relevant IHO standards.

6.2.2 The presentation of proprietary charted information should comply with relevant IHO standards, as far as practical. There should be a clear indication when the presentation is not in accordance with IHO standards.

6.2.3 The presentation of user-added charted information should comply with the relevant IHO standards, as far as practical.

6.2.4 If chart data derived from different scales appear on the display, the scale boundary should be clearly indicated.

6.3 Presentation of radar information

6.3.1 Radar images should be displayed by using a basic colour that provides optimum contrast. Radar echoes should be clearly visible when presented on top of a chart background. The relative strength of echoes may be differentiated by tones of the same basic colour. The basic colour may be different for operation under different ambient light conditions.

6.3.2 Target trails should be distinguishable from targets and clearly visible under all ambient light conditions.

6.4 Presentation of target information

6.4.1 General

6.4.1.1 Target information may be provided by radar target tracking and/or by reported target information from the Automatic Identification System (AIS).

6.4.1.2 The operation of the radar target tracking function and the processing of reported AIS information, including the number of targets presented, related to screen size, is defined within the Performance standards for radar equipment, as adopted by the Organization. The presentation of radar target tracking and AIS information is defined within these performance standards.

6.4.1.3 As far as practical, the user interface and data format for operating, displaying and indicating radar tracking and AIS information should be consistent.

6.4.2 Target capacity

6.4.2.1 There should be an indication when the target tracking and/or reported target processing/display capacity is about to be exceeded.

6.4.2.2 There should be an indication when the target tracking and/or reported target processing/display capacity has been exceeded.

6.4.3 Filtering of AIS sleeping targets

6.4.3.1 To ensure that the clarity of the total presentation is not substantially impaired, it should be possible to filter the presentation of sleeping AIS targets (e.g. by target range, CPA/TCPA or AIS target class A/B, etc.).

6.4.3.2 If a filter is applied, there should be a clear and permanent indication. The filter criteria in use should be readily available.

6.4.3.3 It should not be possible to remove individual AIS targets from the display.

6.4.4 Activation of AIS targets

6.4.4.1 If zones for the automatic activation of AIS targets are provided, they should be the same as for automatic radar target acquisition, if available. Any user defined zones (e.g. acquisition/activation zones) in use should be presented in graphical form.

6.4.4.2 In addition, sleeping AIS targets should be automatically activated when meeting user defined parameters (e.g. target range, CPA/TCPA or AIS target class A/B).

6.4.5 Graphical presentation

6.4.5.1 Targets should be presented with their relevant symbols according to SN/Circ.243.

6.4.5.2 AIS information should be graphically presented either as sleeping or activated targets.

6.4.5.3 The course and speed of a tracked radar target or reported AIS target should be indicated by a vector that clearly shows the predicted motion. The vector time (length) should be consistent for presentation of any target regardless of its source.

6.4.5.4 The presentation of vector symbols should be consistent irrespective of the source of information. The presentation mode should be clearly and permanently indicated, including for example: True/Relative vector, vector time and vector stabilisation.

6.4.5.5 The orientation of the AIS target symbol should indicate its heading. If the heading information is not received, the orientation of the AIS symbol should be aligned to the COG. When available, the turn or rate of turn (ROT) indicator and/or the path prediction should indicate the manoeuvre of an activated AIS target.

6.4.5.6 A consistent common reference point should be used for the alignment of tracked target symbols and AIS target symbols with other information on the same display.

6.4.5.7 On large scale/low range displays, a means to present a true scale outline of an activated AIS target should be provided.

6.4.5.8 It should be possible to display the past positions of activated targets.

6.4.6 Target data

6.4.6.1 A target selected for the display of its alphanumeric information should be identified by the relevant symbol. If more than one target is selected for data display, the symbols and the corresponding data should be clearly identified.

6.4.6.2 There should be a clear indication to show that the target data is derived from radar or AIS or from a combination of these.

6.4.6.3 For each selected tracked radar target the following data should be presented in alphanumeric form: Source(s) of data, measured range of target, measured bearing of target, predicted target range at the closest point of approach (CPA), predicted time to CPA (TCPA), true course of target, true speed of target. Additional target information should be provided on request.

6.4.6.4 For each selected AIS target the following data should be presented in alphanumeric form: Source of data, ship's identification, position and its quality, calculated range of target, calculated bearing of target, CPA, TCPA, COG, SOG, navigational status. Ship's heading and rate of turn should also be made available. Additional target information should be provided on request.

6.4.6.5 If the received AIS information is incomplete, the absent information should be clearly indicated in the target data field as missing.

6.4.6.6 The data should be displayed and continually updated, until another target is selected for data display or until the window is closed.

6.4.6.7 Means should be provided to present own ship AIS data on request.

6.4.6.8 The alphanumeric displayed data should not obscure graphically presented operational information.

6.4.7 Operational alarms

6.4.7.1 A clear indication of the status of the alarms and of the alarm criteria should be given.

6.4.7.2 A CPA/TCPA alarm of a tracked radar or activated AIS target should be clearly indicated and the target should be clearly marked by a dangerous target symbol.

6.4.7.3 If a user defined acquisition/activation zone facility is provided, a target entering the zone should be clearly identified with the relevant symbol and for tracked radar targets an alarm should be given. The zone should be identified with the relevant symbology, and should be applicable to tracked radar and AIS targets.

6.4.7.4 The last position of a lost target should be clearly marked by a lost target symbol on the display, and the lost target alarm should be given. The lost target symbol should disappear if the signal is received again, or after the alarm has been acknowledged. There should be a clear indication whether the lost target alarm function for AIS targets is enabled or disabled.

6.4.8 AIS and radar target association

6.4.8.1 An automatic target association function serves to avoid the presentation of two target symbols for the same physical target. If target data from AIS and radar tracking are both available and if the AIS and radar information are considered as one target, then as a default condition, the activated AIS target symbol and the alphanumeric AIS target data should be automatically selected and displayed. The user should have the option to change the default condition to the display of tracked radar targets and should be permitted to select either radar tracking or AIS alphanumeric data.

6.4.8.2 If the AIS and radar information are considered as two distinct targets, one activated AIS target and one tracked radar target should be displayed. No alarm should be raised.

6.4.9 AIS presentation status

The AIS presentation status should be indicated as follows:

Function	Cases to be presented		Presentation
AIS ON/OFF	AIS processing switched ON / graphical presentation switched OFF	AIS processing switched ON / graphical presentation switched ON	Alphanumeric or graphical
Filtering of sleeping AIS targets (6.4.3)	Filter status	Filter status	Alphanumeric or graphical
Activation of Targets (6.4.4)		Activation criteria	Graphical
CPA/TCPA Alarm (6.4.7)	Function ON/OFF CPA/TCPA Criteria Sleeping targets included	Function ON/OFF CPA/TCPA Criteria Sleeping targets included	Alphanumeric and graphical
Lost Target Alarm (6.4.7)	Function ON/OFF Lost target filter criteria	Function ON/OFF Lost target filter criteria	Alphanumeric and graphical
Target Association (6.4.8)	Function ON/OFF Association criteria Default target priority	Function ON/OFF Association criteria Default target priority	Alphanumeric

6.4.10 Trial manoeuvre

A trial manoeuvre simulation should be clearly identified by the relevant symbol positioned astern of own ship within the operational display area of the screen.

7 OPERATIONAL DISPLAYS

7.1 General

7.1.1 If the display equipment is capable of supporting the presentation of multiple functions then there should be a clear indication of the primary function supported by the presentation (e.g. Radar, ECDIS). It should be possible to select the Radar presentation (see 7.2) or the ECDIS presentation (see 7.3) by a simple operator action.

7.1.2 If a radar image and an electronic chart are displayed together, the chart and the radar image should use a consistent common reference point and match in scale, projection and orientation. Any offset should be indicated.

7.1.3 Range scales of 0.25, 0.5, 0.75, 1.5, 3, 6, 12 and 24 NM should be provided. Additional range scales are permitted. These range scales do not apply when presenting raster chart data. The range scale should be permanently indicated.

7.1.4 When range rings are displayed, the range ring scale should be indicated.

7.1.5 No part of the operational display area should be permanently used for presentation of information that is not part of the navigation presentation (e.g. pop up displays, drop down menus and information windows). Temporary, limited and relevant alphanumeric data may be displayed adjacent to a selected symbol, graphic or target within the operational display area.

7.2 Radar display

7.2.1 General

7.2.1.1 Radar video, tracked radar targets and AIS targets should not be substantially degraded, masked or obscured by other presented information.

7.2.1.2 It should be possible to temporarily suppress all graphical information from the display, retaining only radar video and trails.

7.2.1.3 The brightness of radar echoes and associated graphic symbols for tracked radar targets should be variable. It should be possible to control the brightness of all displayed information. There should be independent means to adjust the brightness of groups of displayed graphics and alphanumeric data. The brilliance of the heading line should not be variable to extinction.

7.2.2 Display of chart information on radar

7.2.2.1 Vector chart information may be displayed on a radar presentation. This should be accomplished using layers selected from the chart database. As a minimum, the elements of the ECDIS Standard Display should be available for individual selection by category or layer, but not as individual objects. As far as practical, chart information should be presented in accordance with the ECDIS performance standards and with these presentation standards.

7.2.2.2 If chart information is displayed within the operational display area, the display of radar information should have priority. The chart information should be clearly perceptible as such. The chart information should not substantially degrade, mask or obscure the radar video, tracked radar targets and AIS targets.

7.2.2.3 When chart information is displayed, there should be a permanent indication of its status. Source and update information should also be made available.

7.2.3 Display of maps on radar

Map graphics may be displayed, but should not substantially degrade, mask or obscure the radar video, tracked radar targets and AIS targets.

7.3 ECDIS display

7.3.1 General

7.3.1.1 The ENC and all updates to it should be displayed without any degradation of their information content.

7.3.1.2 Chart information should not be substantially degraded, masked or obscured by other presented information.

7.3.1.3 It should be possible to temporarily suppress all supplemental information from the display, retaining only chart related information contained in the Display Base.

7.3.1.4 It should be possible to add or remove information from the ECDIS display. It should not be possible to remove information contained in the Display Base from the ECDIS display.

7.3.1.5 It should be possible to select a safety contour from the depth contours provided by the ENC. The safety contour should be emphasized over other contours on the display.

7.3.1.6 It should be possible to select a safety depth. Soundings equal to or less than the safety depth should be emphasized whenever spot soundings are selected for display.

7.3.1.7 An indication should be provided if the information is displayed at a larger scale than that contained in the ENC, or if own ship's position is covered by an ENC at a larger scale than that provided by the display.

7.3.1.8 Overscaled areas shown on the ECDIS display should be identified.

7.3.2 Display of radar information on ECDIS

7.3.2.1 Radar and target information may be displayed on ECDIS but should not substantially degrade, mask or obscure the chart information. As far as practical, radar and target information should be presented in accordance with the radar performance standard and with these presentation standards.

7.3.2.2 Radar and target information should be clearly distinguishable from the chart information. It should be possible to remove this information by a simple operator action.

7.3.3 Display of additional information on ECDIS

7.3.3.1 Information from additional sources may be displayed on ECDIS but should not substantially degrade, mask or obscure the chart information.

7.3.3.2 Additional information should be clearly distinguishable from the chart information. It should be possible to remove this information by a simple operator action.

7.4 User selected (task orientated) presentation

7.4.1 The user may configure a presentation for a specific task at hand. The presentation may include radar and/or chart information, in combination with other navigation or ship related data. When not fully compliant with the Radar or ECDIS performance standards, such a presentation should be identified as an auxiliary presentation.

7.4.2 As far as practical, the presentation of any radar and/or ECDIS related functions should be compliant with the requirements of the relevant performance standards and of these presentation standards, with the exception of size requirements for the operational area. Chartlets or windows of radar information may be presented along with other information associated with the task at hand.

8 PHYSICAL REQUIREMENTS

8.1 Display adjustment

8.1.1 It should be possible to adjust the contrast and brightness of the display provided, as applicable to the display technology. It should be possible to dim the display. The range of control should permit the display to be legible under all ambient light conditions.

8.1.2 It should be possible for the navigator to reset the values of contrast and/or brightness to a preset or default condition.

8.1.3 Where magnetic fields degrade the presentation of navigation information, a means to neutralise the effect of magnetic fields should be provided.

8.2 Screen size

8.2.1 Display equipment should be of sufficient size to support the requirements of the relevant performance standards adopted by the Organization.

8.2.2 The operational display area of the chart presentation for route monitoring should be at least 270 x 270 mm.

8.2.3 The operational display area of the radar presentation should be at least a circle of diameter of:

- 180 mm for ships smaller than 500 gross tonnage;
- 250 mm for ships larger than 500 gross tonnage and High-Speed Craft (HSC) less than 10,000 gross tonnage;
- 320 mm for ships larger than 10,000 gross tonnage.

8.3 Colours

8.3.1 Multicoloured display equipment should be used except where monochrome displays are permitted within individual performance standards adopted by the Organization.

8.3.2 Multicoloured operational displays including multifunction displays (e.g. conning displays) should provide a minimum of 64 colours except where permitted or not required by the Organization, or when used for a single specific purpose (e.g. speed log, echo-sounder).

8.4 Screen resolution

Operational display equipment including multifunction displays (e.g. conning displays) should provide a minimum screen resolution of 1280 x 1024, or equivalent for a different aspect ratio, except where permitted or not required by the Organization, or when used for a single specific purpose (e.g. speed log, echo-sounder).

8.5 Screen viewing angle

The display should support the reading of information under all ambient light conditions, simultaneously, by at least two users, from standing and sitting operator positions likely to be found on the bridge of a ship.

APPENDIX

DEFINITIONS

Activated AIS target	A target representing the automatic or manual activation of a sleeping target for the display of additional graphically presented information.
AIS target	A target generated from an AIS message.
Associated target	A target simultaneously representing a tracked radar target and AIS target having similar parameters (e.g. position, course, speed) and which comply with an association algorithm.
CCRP	The Consistent Common Reference Point is a location on own ship, to which all horizontal measurements such as target range, bearing, relative course, relative speed, closest point of approach (CPA) or time to closest point of approach (TCPA) are referenced, typically the conning position of the bridge.
Dangerous target	A target with a predicted CPA and TCPA that violates values preset by the operator. The respective target is marked by a "dangerous target" symbol.
Display base	The level of information which cannot be removed from the ECDIS display, consisting of information which is required at all times in all geographic areas and all circumstances. It is not intended to be sufficient for safe navigation.
ENC	Electronic Navigational Chart. The database standardized as to content, structure and format according to relevant IHO standards and issued by, or on the authority of, a Government.
Heading	Direction in which the bow of a ship is pointing expressed as an angular displacement from north.
Important indication	A marking of an operational status of displayed information which needs special attention, e.g. information with low integrity or invalid information.
Lost target	A target representing the last valid position of a target before its data was lost. The target is displayed by a "lost target" symbol.

Operational display area	Area of the display used to graphically present chart and radar information, excluding the user dialogue area. On the chart display this is the area of the chart presentation. On the radar display this is the area encompassing the radar image.
Past positions	Equally time-spaced past position marks of a tracked or reported target and own ship. The co-ordinates used to display past positions may be either relative or true.
Sleeping AIS target	A target indicating the presence and orientation of a vessel equipped with AIS in a certain location. The target is displayed by a "sleeping target" symbol. No additional information is presented until activated.
Selected target	A target selected manually for the display of detailed alphanumeric information in a separate data display area. The target is displayed by a "selected target" symbol.
Standard display	The level of information that should be shown when a chart is first displayed on ECDIS. The level of the information it provides for route planning or route monitoring may be modified by the mariner according to the mariner's needs.
Trial manoeuvre	Facility used to assist the operator to perform a proposed manoeuvre for navigation and collision avoidance purposes, by displaying the predicted future status of all tracked and AIS targets as a result of own ship's simulated manoeuvres.
User dialogue area	An area of the display consisting of data fields and/or menus that is allocated to the interactive presentation and entry or selection of operational parameters, data and commands mainly in alphanumeric form.
User selected presentation	An auxiliary presentation configured by the user for a specific task at hand. The presentation may include radar and/or chart information, in combination with other navigation or ship related data.

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