IALA GUIDELINE

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PORTRAYAL OF VTS INFORMATION

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DOCUMENT REVISION

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CONTENTS

1. INTRODUCTION

The presentation of information is critical to meet SOLAS regulations, relevant IMO resolutions and IALA guidance documents. Although there are many compelling reasons for the international standardization of methods of display of electronic charts and data from electronic sensors, including radar and AIS, on board vessels, there may be differing or additional requirements for the display of information to support the delivery of VTS.

The compilation of an accurate traffic image in the VTS Centre is substantially dependent on the manner in which the data is presented.

A key objective of this document is to provide guidance to VTS providers to implement portrayal that best support VTS operators. This objective can be achieved when the presentation for VTS Operators and mariners comprises a similar portrayal of common information (although not necessarily having to be identical).

2. GENERAL PRINCIPLES

The general principles for the presentation of all symbology on a VTS display are that:

- To improve harmonization of onboard and shore-based presentation, the portrayal of VTS information should reflect as far as possible the equivalent portrayal on board ships;
- the international onboard symbology and chart standards should be used as far as possible;
- symbology already identified for existing onboard use should not normally be assigned a different meaning for VTS purposes, however these symbols may be adapted to suit VTS requirements;
- the clarity of the presentation and operator workload should be carefully considered and additional (navigational) information may be displayed, but should not mask, obscure or degrade essential information required for the display by its primary task.

2.1. CORE OBJECTIVES

The portrayal of VTS related navigational information should facilitate one or more of the following core objectives:

- vessel traffic monitoring and management from shore facilities, where appropriate.
- communications, including data exchange, between ship and shore, shore to shore including other stakeholders.
- opportunities for improving the efficiency of transport and logistics.
- the effective operation of contingency response and search and rescue services.
- defined levels of accuracy, integrity and continuity appropriate to a safety-critical system.
- provision of information through a human-machine interface which maximizes navigational safety benefits and minimizes any risks of confusion or misinterpretation on the part of the user.
- provision of information to assist in managing the workload of the VTS users, while also motivating and engaging the VTS user and supporting decision-making.
- allow safe and secure navigation of vessels with regards to hydrographic, meteorological and navigational information and risks; (e.g. safety messages sent by shore-side agencies which may contain symbols or icons).
- incorporation of training and familiarisation requirements for the VTS users throughout the development and implementation process.

- route monitoring.
- collision avoidance.
- flexible, operator role specific layout.

3. VTS DISPLAY

The VTS display should take into account the operational requirements at the VTS Centre concerned. Human-machine interface aspects should optimize the performance of VTS, thus ensuring that the traffic image is enhanced by the acquisition of accurate information. This will enable full evaluation of traffic situations and facilitate decision-making. All tactical information relating to the traffic image should be presented on one suitable set of displays covering the area, sub-area or sector as appropriate.

3.1.1. CONSIDERATIONS

There are a number of issues that may need to be taken into account when considering the presentation of information in a VTS and these are listed below:

- Although the portrayal of VTS information onboard ships or ashore does not have to be identical, there is a benefit to all users if information is displayed in a consistent and unambiguous manner. This includes the use of standard symbology, icons, and colour schemes as defined, for example, by IHO.
- The portrayal should allow a user to view the traffic situation and relevant input data and take action efficiently.
- To the extent possible, the portrayal should indicate invalid and incorrect user input.
- The portrayal should be able to display a log of significant events e.g. warnings and alarms.
- Where the portrayal normally displays the real-time traffic situation and related data, the portrayal should also support the replay of historical data.
- Information superimposed on the VTS display should never obscure or cause any confusion with the display of vessel targets.
- With the amount of information available, there is a risk of information overload.
- The VTS provider should determine that the information presented to VTS Personnel is adequate for the task at hand.
- Target identification - may distinguish between the sensor device used (e.g., radar, AIS, RDF, dead-reckoned source or other data input).
- Operation and status of any information filter should be clearly indicated to the operator.
- The operator should be aware of any information layer that has been applied.
- Vessel data - display of vessel data must not obscure critical operational information or clutter the traffic image.
- Terminology – all displayed information should be clearly defined, adopting the guidelines for the presentation of navigation-related symbols, terms and abbreviations (e.g., IMO SN.1/Circ.243, as amended) where appropriate.
- Communication - presentation of target data should not lead to any misunderstanding in communication between VTS centres and vessels.
- Alert presentation should not obscure critical operation information or clutter the traffic image.

- Role definition capabilities to support different portrayal profiles, such as Operators, Supervisors, and/or other users as required.
- Ergonomic HMI considerations with the goal of reducing and mitigating operator fatigue, distraction, and other factors that may negatively impact overall safety and efficiency.
- Minimize steps needed to retrieve the necessary information to assist in real-time decision-making.
- Alarms should be presented to draw attention in an appropriate manner. A clear distinction should be made between operational alarms (related to navigation safety) and system alarms (related to technical deficiencies with the operating system).
- A portrayal should consider the presentation of the system health status.
- A portrayal should consider layering the presentation of information to provide flexibility in presentation of information as standards and recommendations develop.

3.1.1.1. Charting

Many VTS system providers have traditionally provided a mapping background of varying accuracy and detail. The form of landmasses and the sea may, therefore, be presented in various colours, shades and saturations.

The increasing capacity of VTS hardware and software, together with development in the commercial field of electronic charts now offers the potential for VTS backgrounds to be based on an accurate electronic presentation. Standards have been specified for electronic charting for onboard use. In particular, the IHO S-52 standard addresses chart presentation, including colours and symbology. While S-52 remains current, it will gradually be replaced by product specifications in the IHO S-100 framework, such as the S-101 Electronic Navigational Chart product specification. The S-100 framework was developed to address a number of limitations in standards, like S-52.

A limited number of colour palettes for day, dusk and night-time use have been identified to provide the officer of the watch at sea with a range of choices dependent on ambient light levels and the need to retain night vision as appropriate. These standards (including consideration of similar palette options) should be considered for VTS portrayal, where appropriate.

In accordance with the general principles stated at paragraph 2 above, it is recommended to use standard onboard presentation (e.g., ECDIS) for VTS purposes as far as possible and practical. Where S-52 and S-101 standards prove too limiting for VTS purposes, presentation may be adapted to meet the individual needs of VTS operations and to take full advantage of the technical capabilities of the VTS system.

There is a difference between changes to the presentation of data provided within the ENC and the addition of further data, which is not featured in the baseline ENC. Additional uncharted information should be achieved within additional layers upon the original ENC delivered through hydrographic offices. This way, electronic updates will not affect or even nullify the additional information.

The S-52 standard is limited and, therefore, reduces some of the flexibility needed in a VTS Centre. For example, there may be a requirement to differentiate between the type of vessel or its cargo or whether it carries a pilot through the use of variations in colour, shape or other attributes.

The capability of a VTS Operator to carry out a particular task can be reduced if the symbology available does not correspond to the requirement and, therefore, fails to present the VTS Operator with suitable tools to enable the task to be completed satisfactorily.

For example, the standard scale on the symbology may be in conflict with the scale on the map or/and the need for the use of zooming a picture. The size of an AIS target symbol may cause difficulties in areas of high traffic density due to the sheer number and size of these targets. However, without specialist software, there is no means of suppressing the constant display of these targets.

In the S-52 standard, the presentation of the map (land and sea) is restricted in terms of the choice of colours available for differentiating between land and sea, as well as in the choice of colours available for the combination of sea and land. VTS Operators may prefer a dark background with lighter colour symbols.

The human/machine interface in the VTS environment should support the VTS operational needs and processes. For example, the VTS Operator is working in an "office type" environment where there is a need to look at a computer screen for many hours on the watch. The colours available in the S-52 standard have not necessarily been designed with this in mind. The ability to change the colours on the screen can considerably help to reduce VTS operator fatigue.

For applications that include S-52 presentation, it is likely that all variations of the onboard options will be available. S-52 also enables the adjustment of the colour palette to replicate the traditional presentation of earlier mapping backgrounds preferred by many operators, but this can now include the greater flexibility that electronic charting brings. The charting details can be broken down into "layers" of information that make up specific parts of the overall chart, such as the inclusion of aids to navigation and the inclusion of depth soundings and/or depth contours. Careful consideration should, therefore, be given to the options for the background chart. Whilst S-52 offers considerable choice to the operator, the benefits of standardization with some restrictions on the number of options available to operators should also be recognized.

It is recommended that the following more general considerations should form part of the fundamental assessment in selecting charting options to meet individual local needs:

- What level of charting detail is required? Too much detail could be a distraction to operators. It could also slow the system down to unacceptable levels.
- Are all the onboard palette options necessary? If night vision is not an issue, then some of the night-time options may be irrelevant. A reduction in the choice of presentation may reduce the chance of human error.
- Is the system to be used by VTS qualified staff only? Would the inclusion of the traditional presentation be appropriate? Would use by mariners, specifically pilots, make the addition of one of the standard onboard presentation pallets desirable?
- What is the likely traffic density, and is the level of detail compatible with the superimposition of the traffic image.

It should also be noted that the form of information presented will have an influence on the training of VTS personnel.

3.1.1.2. Data Filtering and Track Labelling

VTS Centres should carefully consider the number and arrangement of displays for the presentation of the VTS traffic image and how much information on individual tracks is presented. Whilst it may be valuable to have detailed information on-screen, equally it may tend to clutter the screen. Technical solutions that include pop-up displays or other means of displaying the details of individual tracks may need to be introduced. When developing such technical solutions, consideration should be given to the density of traffic, the VTS area, sub-area or sector concerned, and the amount of detail needed to be displayed directly on the screen or available through pop-up menus/data fields.

The section on charting above identifies options that involve filtering data that may result in a presentation that differs from the *S-52* and *S-101* on board standards. Careful consideration should be given to the suppression of data to ensure that this does not impact on safety and the interpretation of potential navigational dangers of which the VTS Operator should be aware.

3.1.1.3. Track Fusion and Correlation

Correlation between sensor information needs to be considered. Systems may be capable of automating the correlation process, and it may be appropriate to indicate on, or adjacent to, the display the source(s) of information being presented. Signals may be lost, and consideration should be given to the presentation of the elapsed time since the loss occurred and any automatic change between sensors.

Where a VTS has the ability to integrate data from one or more other sources of information for tracking a vessel, means should be provided to display the data of the contributing sensors.

In addition, it is recommended that the terminology used for alerts (alarm, warning and caution) reflects the maritime standards contained in IMO *MSC.302(87) Adoption of Performance Standards for Bridge Alert Management* unless particular local circumstances require otherwise.

3.1.2. Operational Warnings and Alarms

All warnings and alarms should be highlighted by means of an audible and/or visual alarm. These may include:

- Loss of track or transmission
- Operational alarms (e.g., off-route, anchor-watch, etc.)
- Inconsistency of data
- Loss of correlation between sensors and/or sensor sources
- Any other system failure

3.1.3. Considerations Concerning AIS

The use of AIS in VTS operations assists in the development and maintenance of a traffic image.

VTS providers should take into account the fact that AIS, on its own, cannot be relied upon to provide a complete picture of the actual traffic image in a VTS area due to ship based and shore-based equipment limitations. Additionally, not all vessels may actively transmit AIS data. The reliability of AIS data depends upon the correct entry of dynamic and static data available on board a vessel and successful interaction between ship and shore systems.

In developing a traffic image and maintaining situational awareness, the limitations of AIS, when used without input from other sensor devices, should be taken into consideration. However, whilst AIS data should normally be integrated with data from other sources, in some cases - such as monitoring of coastal and inland waterways - AIS may be the only source of positional data available. The degree of accuracy required may vary, depending on the service for which the AIS data is being provided. When assessing the degree of reliance that can be placed on the information displayed, it is important to take into consideration the level of validation that can be obtained from other sensors.

In many circumstances AIS, as an additional sensor device in a VTS, may provide redundancy of some data. Information from different sources should be analysed to ensure, as far as practicable, that the data used in the traffic image is the most accurate available. Where redundant sources of information on a particular vessel are available, such as position, speed and destination, means to select the preferred source of data should be provided.

3.1.4. Traffic Symbology

The VTS provider should consider how much information, from the available data, needs to be presented on the VTS display. The amount of information should not overload VTS Operators or cause confusion.

A VTS display should have the ability of a pre-set default setting of the presentation using integrated radar and/or AIS information. It should be possible to select individual settings depending on the traffic situation and the scaling of the display.

The VTS system should have the capability to display radar video with all the traffic symbology turned off in order that the VTS operator may be able to check radar performance and that clutter settings and the modes of operation of the radar are properly adjusted.

Identical or similar symbols may be used for different purposes depending on the individual port or area and their specific operations. While these should not be restricted, the objective in any symbology should be to keep it as simple as possible in order to produce a clearly defined display of vessel data without causing overload or confusion.

The following are some matters concerning symbology that should be taken into consideration:

- Track Labelling - This may be achieved either through the symbology itself or textual tagging, which may be split up into, e.g., a short label and additional drop-down window for more detailed information. The level of detail must be carefully considered (see paragraph 3.2./data filtering and track labelling).
- Vectors - when used, graphical presentation of symbols should unambiguously display the course over ground (COG)/speed over ground (SOG) and/or actual heading if both or either are displayed. If the actual heading vector is displayed, the COG vector should always be simultaneously displayed.
- Track - if the symbol used to identify the track of a vessel is in the shape of a ship, it should display the vessel's dimensions, position and orientation.

The VTS provider should determine all information required by a VTS. VTS operators, however, may require different levels of information to maintain effective traffic management. The display software should be sufficiently flexible to allow for selection of information needed for particular sectors or operational consoles.

Technology is capable of suppressing the display of individual radar and/or AIS targets when, for example, these targets do not represent actual vessels (false targets). If this capability is provided, it should be possible to restrict the length of time that suppression may be applied. Careful consideration should be given to system settings for the suppression of any symbology that is available to VTS personnel. VTS displays should indicate when symbology has been suppressed.

The composing, sending and receiving of AIS messages should not cover critical information about the VTS traffic image.

4. DETAILED SYMBOLOGY CONSIDERATIONS

In translating the practical considerations into equipment specifications for local or national requirements, symbology can be considered within the two elements of the background chart and the traffic image that is overlaid upon it.

The VTS provider or competent authority for VTS should decide the actual method of display and the symbology used. The following areas may need to be considered when developing requirements for the identification of specific attributes for which awareness in the VTS Centre may be aided through the provision of appropriate display equipment and symbology***:**

- Kinematics
- Operational
- Geographical
- Environmental
- Commercial

The following lists are provided to assist when considering and developing requirements for the attributes:

Note that these lists may not be all-inclusive. Where symbology is linked to other charting standards, such as IHO, care should be taken to ensure that any symbols selected solely for use in VTS are compatible with those that have already been specified under other standards.

*****The display of onboard symbology for ECDIS is defined in IHO *S52 Appendix 2*. The display of onboard AIS symbology is further developed in IEC Standard *62288*. Guidelines for the presentation of navigation-related symbols, terms and abbreviations can be found in IMO *SN.1/Circ.243, as amended*. The performance standards for automatic radar plotting aids (ARPA) are developed in IMO Resolution *A.823(19)* as well as in IEC Standard *60872.* The VTS portrayal should reflect these standards and guidelines.

4.1. KINEMATICS

Kinematics symbology considerations include:

- Manual and automatic target acquisition
- Track history
- Vectors (vector length & appearance)

4.2. OPERATIONAL

Operational symbology considerations include:

- Pilot on board - symbology may be used to indicate the status and requirements of vessels having a pilot on board.
- Pilot exemptions - symbology may be used to define the status and area of authorization for individual Pilot Exemption Certificate (PEC) holders.
- Size of vessel - restrictions dictated by the geography of the port or surveillance area should be considered in deciding whether additional attributes are required to the symbology dependent on the size of vessels operating in the area or passing in or through a channel.
- Scaling - careful consideration should be made to the need for the scaling of particular symbols.
- Type of vessel/vessel characteristics - symbology may be used to provide a clear indication of specialist vessels or those for which special operational considerations may be appropriate.

  For example:

  - Dangerous cargos/ Goods - Ports may have their own regulations that may determine the requirement for the subdivision of vessel or cargo types through the colour or shape of the target image.
  - Harbour authority vessels (e.g., harbour launch, pilot vessel, survey vessel & salvage).
  - Vessels restricted in their ability to manoeuvre.
  - Vessels constrained by draught.
- Quality of survey / background charting and display - symbology may be used in the form of an overlay or area designation to indicate the accuracy of survey information being displayed on the background chart in use.
- Security - symbology could be used to provide visual cues to VTS operators in support of evolving security considerations.
- Non-standard targets - it may be appropriate to develop a symbol to indicate the existence of hazards such as floating or semi-submerged obstructions.
- Defects or deficiencies - symbology could be utilized to indicate vessels with defects or deficiencies.
- Emergency situations - symbology may be utilized to indicate the status, duties or tasking of assets involved in emergency situations, such as Search and Rescue (SAR).
- Port State control - identification of vessels of special interest or non-compliance under Port State control may be indicated through symbology.

- Marine Aids to Navigation - the status of such aids may be indicated through appropriate symbology. (It should be noted that electronic charting offers the flexibility of removing charting details to simplify presentation, if required).

4.3. GEOGRAPHICAL

Geographical symbology considerations include:

- Port access - the number and design of approach channels should be taken into account when deciding display presentation and the size/scale of symbology used.
- Berth locations - adjacent berths may dictate the need to reduce scale/size and the amount of VTS information displayed.
- Use of exclusion areas.
- Areas of high traffic density where collision risk is identified.
- Temporary Danger Areas - areas that temporarily become dangerous and should be avoided by ships may be displayed using appropriate symbology.
- Naval Exercises Areas - appropriate symbology may be required to indicate naval activities that may impact on the control of vessel traffic through the area.
- Recreational Areas - symbology may be required to indicate areas where recreational activities are taking place.
- Sites of Special Scientific Interest (SSSIs)/Fish farms/Ecological - symbology may be developed to indicate the existence of sites where environmental considerations may require some form of traffic restriction, regulation or control.
- Mobile seabed/sandbanks - areas subject to changes in seabed structure may require to be identified (see “Quality of survey” above);
- Oil/Gas fields/Oil and Energy Installations (OEIs);
- Location of pipelines – the existence and presence of pipelines may be indicated by symbology if not already disseminated through chart amendments.

4.4. ENVIRONMENTAL

Environmental symbology considerations include:

- Hydrological - tide, current
- Meteorological - wind, visibility, sea-state
- Ice - ports/areas that experience the seasonal phenomenon of sea ice may require developing symbology to identify the areas affected

4.5. COMMERCIAL

Commercial symbology considerations include:

- Prioritization - symbology may be utilized to indicate movement priorities.
- Information sharing - a need to exchange/share the presentation of the traffic image with other parties or users may dictate the choice/development of specific symbology.

For VTS Portrayal examples, see Annex A.

5. DEFINITIONS

The definitions of terms used in this Guideline can be found in the *International Dictionary of Marine Aids to Navigation* (IALA Dictionary) and were checked as correct at the time of going to print. Where conflict arises, the IALA Dictionary should be considered as the authoritative source of definitions used in IALA documents.

6. ABBREVIATIONS

AIS	Automatic Identification System
ECDIS	Electronic Chart Display and Information System
ENC	Electronic Navigational Chart
GMDSS	Global Maritime Distress and Safety System
IEC	International Electrotechnical Commission
IHO	International Hydrographic Organization
MSC	Maritime Safety Committee
RDF	Radar Direction Finder
SOLAS	International Convention for the Safety of Life at Sea
VTS	Vessel traffic service or vessel traffic services (dependent on context)

7. REFERENCES

[1] IHO. S-52 Portrayal Bulletins.

[2] IEC. Standard 62288 Maritime navigation and radiocommunication equipment and systems - Presentation of navigation-related information on shipborne navigational displays - General requirements, methods of testing and required test results.

[3] IMO. Circular SN.1/Circ.243/Rev.1 – Amended Guidelines for the Presentation of Navigational-Related Symbols, Terms and Abbreviations.

[4] IMO. Resolution A823(19) Performance Standards for Automatic Radar Plotting Aids (ARPAs).

[5] IEC. Standard 60872 Marine automatic radar plotting aids (ARPA) Operational requirements - Methods of testing and test results.

[6] IHO. S-57 Encoding Bulletins.

ANNEX A VTS PORTRAYAL EXAMPLES

Types of VTS tasks (examples) that should be portrayed:

- Enter a command
  - Manually acquire a target
  - Identify a track
- Modify data
  - Create or modify a vessel's intended route
- Manage the portrayal
  - Chart pan, zoom in, zoom out, etc.
  - Perform measurements, CPA, distance
  - Handling of alarms (grounding, etc.) received
  - Handling from alarms received by MOB's, etc.
  - Handling of (system) errors on inputs (e.g. radar, AIS)
  - Filtering of information
  - Managing AtoNs
  - Managing (temporary) obstructions
- VTS support tasks
  - Recent information playback
  - Reporting dangerous situations/accidents
- VTS auxiliary tasks
  - Shift on and shift off operators
  - Maintenance tasks and diagnostics
  - Sensor controls
  - Housekeeping tasks