IALA Recommendation
V-125

On

The use and presentation of symbology at a VTS Centre

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Document Revisions

Revisions to the IALA Document are to be noted in the table prior to the issue of a revised document.

Date	Page / Section Revised	Requirement for Revision
December 2004	General Revision, including name change	Work underway in IMO and IEC (WG13) on the harmonization of symbols and terminology.
June 2012		Updates to introduce various new reference documents and to reduce unnecessary technical content relating to AIS.

IALA Recommendation on The use and presentation of symbology at a VTS Centre

(Recommendation V-125)

THE COUNCIL:

RECALLING the function of IALA with respect to Safety of Navigation, the efficiency of maritime transport and the protection of the environment;

RECALLING ALSO that the 1974 Convention on the Safety of Life at Sea, as amended, has mandated the carriage of AIS equipment on ships subject to the Convention;

RECOGNISING that IALA has recommended National Members and other appropriate Authorities to provide shore based AIS services (Recommendation A-123);

RECOGNISING ALSO that the arrangement for the integration and display of radar, AIS and other information in a VTS Centre is important for ensuring the effectiveness of the service;

RECOGNISING FURTHER the Draft Performance Standards for the Presentations of Navigation-Related Information (as presented at IMO NAV50);

CONSIDERING the report on the Workshop on the Training of VTS Personnel for the AIS World (3 -7 February 2003) and the VTS Committee on the display of data in a VTS Centre;

ADOPTS the principles for the use and presentation of Information at a VTS Centre as set out in the Annex to this Recommendation; and,

RECOMMENDS that National Members, and other appropriate VTS Authorities take into account the Annex to this Recommendation when integrating the display and other information from different sensors at VTS Centres.

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1   INTRODUCTION

The presentation of information is critical to meet SOLAS regulations, relevant IMO resolutions and IALA recommendations. Although there are many compelling reasons for the international standardisation 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 at VTS Centres that are port, coastal states or area specific.

The compilation of an accurate traffic image in the VTS Centre, thus allowing the evaluation of situations more accurately and decisions to be made more readily, is substantially dependent on the manner in which the data is presented. The display of on-board symbology for ECDIS is defined in IHO S52 Appendix 2. The display of on-board AIS symbology is further developed in IEC Standard 62288. The performance standards for automatic radar plotting aids (ARPA) are developed in IMO Res. A823 (19) as well as in IEC Standard 60872. The VTS portrayal should reflect the requirements of IMO SN Circ.243, IMO SN Circ.243 Add.1 and IEC 62288.

2   GENERAL PRINCIPLES

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

- recognising that VTSO would typically come from a maritime background, the portrayal of VTS information should reflect as far as possible the equivalent portrayal on board ships;
- the international on-board symbology and chart standards should be used as far as possible;
- symbology already identified for existing on-board use should not normally be assigned a different meaning for VTS purposes, however these symbols may be adapted to suit VTS requirements;
- any adaptations to symbology must not modify the agreed standard for data transfer;
- the clarity of the presentation and operator workload should be carefully considered.

3   SYMBOLOGY ELEMENTS

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.

3.1   Charting

Many VTS system providers have traditionally provided a mapping background of varying accuracy and detail. Based on operator preference, this has in many cases been in the form of yellow landmasses with the sea in varying shades of blue; the greater the depth, the darker the shade.

The increasing capacity of VTS hardware and software together with development in the commercial field of electronic charts now offer the potential for VTS backgrounds to be based on an accurate electronic presentation. Standards have been specified for electronic charting for on-board use. S-57 specifies how the data should be structured and transferred and S-52 specifies how it should be presented. S-57 has been further developed and remains current. Note also that IHO has already adopted a new standard for ENC, referred to as S-101. 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 that the use of on-board standards (e.g. ECDIS) should be used as far as possible for VTS purposes. It is probable that these standards will prove too limiting for VTS purposes. Equipment providers should, however, be able to provide the flexibility to adjust the S-52 and S-101 standards to meet the individual needs of VTS and to take full advantage of the technical capabilities of the VTS system. For example, VTS should be able to define own colour palettes, geographical information and symbology.

Note: the S-101 standard will also bring integration of data such as MSI/Notice to Mariners, etc.

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 effect 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 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. However, in the standard there is a lack of contrast between the various backgrounds.

The human/machine interface in the VTS environment is different than that required for navigational purposes on-board and therefore may also result in different needs. 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 in 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 on-board 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 standardisation with some restrictions on the number of options available to operators should also be recognised. 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 on-board palette options necessary? If night vision is not an issue, then some of the night-time options may be irrelevant. A reduction in 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 on-board 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 presentation of information will have an influence on the training of VTS personnel.

3.2   VTS Display

The VTS display should take into account the operational requirements at the VTS Centre concerned. Human-machine interface aspects should optimise 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.

3.2.1   Considerations

There are a number of issues that may need to be taken into account when considering the presentation of information in a VTS. These include Data Filtering and Track Labelling, Correlation, and the presentation of sensor information.

3.2.1.1   Data Filtering and Track Labelling

VTS Centres should consider carefully 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.

For general safety purposes the VTS Authority may authorise transmission of track data to users. Any track data selected for transmission should be clearly identified on the display.

3.2.1.2   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 enable the track sources to be correlated or de-correlated as necessary.

In addition, AIS specifies the provision of short safety related messages, despite this provision not being included in the standard GMDSS radio-communication, and it is important that a method is identified to draw the attention of the VTS operator to the receipt of such a message. However, use of AIS short safety-related messages is generally discouraged for alerting.

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

3.2.2   General Presentation

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 authority should determine the information that is important to the type of service offered by a particular VTS.

When considering the display of information relating to the traffic image, the following matters should be taken into account:

- target identification - should clearly 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 (IMO SN Circ.243) where appropriate;
- communication - presentation of target data should not lead to any misunderstanding in communication between VTS Centres and vessels.

Note: alert presentation should not obscure critical operation information or clutter the traffic image.

3.2.3   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 and sources;
- any other system failure.

3.2.4   Considerations concerning AIS

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

VTS authorities 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.

In developing a traffic image and maintaining situational awareness, the limitations of AIS, when used without the 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 of a particular vessel are available - such as position, speed and destination - means to select the preferred source of data should be provided.

3.2.5   Traffic Symbology

The VTS Authority 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 using radar and / or AIS should have the ability to default to a pre-set standard using integrated radar and AIS information as new targets are acquired. It should be possible to select AIS or radar targets separately, or to select a display using minimal symbology (i.e. radar target), e.g. in areas of extreme congestion. Apparent loss of such data from the display might create unexpected hazards that should be avoided.

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 clearly defined display of vessel data without causing overload or confusion.

The following are some of the matters that should be taken into consideration:

1   Track Labelling – This may be achieved either through the symbology itself or textual tagging, which may be split up into 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).

2   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.

3   Track – if the symbol used to identify the track of a vessel is in the shape of a ship, it should accurately display the vessel's dimensions, position and orientation.

The VTS Authority 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 the particular sectors or operational consoles.

Technology is capable of suppressing the display of radar and/or AIS targets. In the case of AIS, this may be by class or by individual track and may be applied to all displays within a VTS, to a workstation or to an individual screen within a workstation. This may be set as a default, such as a restriction of all AIS Class B symbology, or by selection, such as by specific AIS symbology or by area. If this capability is provided it should be possible to restrict the length of time that suppression may be applied and to time-out such suppression after a set period. Careful consideration should be given to what system settings for the suppression of AIS symbology are available to VTS personnel and the permissions granted to VTS Operators. VTS displays should indicate when AIS symbology has been suppressed.

The composing, sending and receiving of AIS messages should not interfere with the VTS traffic image.

4 DETAILED SYMBOLOGY CONSIDERATIONS

The following broad issues may need to be considered:

- kinematics;
- operational;
- geographical;
- environmental;
- commercial.

Whilst the VTS or Competent Authority will decide the actual method of display and the symbology used, the following checklist is provided to assist in developing their 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. Note 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.

4.1 Kinematics

- manual and automatic target acquisition;
- track history;
- vectors (vector length & appearance).

4.2 Operational

- 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 authorisation 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:

- - 53-9.3-2A V-125 on the use and presentation of symbology_final.docxDangerous 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 utilised to indicate vessels with defects or deficiencies;
- emergency situations – symbology may be utilised 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;
- 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

- 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 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 sea bed / 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

- 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

- prioritisation – symbology may be utilised 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.