

IALA Recommendation V-125  
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Recommendation on the Integration and Display of AIS  
and other Information at a VTS Centre

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## Recommendation on the Integration and Display of AIS and other Information at a VTS Centre

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**Recommendation on the Integration and Display of AIS and other Information 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;

**RECOGNISING** 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 ALSO** that IALA has recommended National Members and other appropriate Authorities to provide shore based AIS services;

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

**NOTING** that the introduction of AIS at a VTS Centre will:

1. impact substantially on the development and display of the vessel traffic image; and,
2. influence the workload and training needs of VTS personnel;

**CONSIDERING** the report on the Workshop on the Training of VTS Personnel for the AIS World (3 -7 February 2003);

**CONSIDERING ALSO** the proposals of the VTS Committee on the display of data in a VTS Centre;

**ADOPTS** the principles for the integration and display of AIS and other Information at a VTS Centre 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 of AIS with other information at VTS Centres.

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## Annex

# The Integration and Display of AIS and other Information at a VTS Centre

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### 1. Introduction

Chapter V of the 1974 SOLAS Convention (as amended) requires mandatory carriage of Automatic Identification Systems (AIS) equipment on all vessels constructed on or after 01 July 2002. Implementation for other types and sizes of SOLAS Convention vessels is continuing and will be completed not later than 31 December 2004.

SOLAS Chapter V, Regulation 19, section 2.4.5 states that:

*“AIS Shall:*

- .1 provide automatically to appropriate equipped shore stations, other ships and aircraft information, including ship’s identity, type, position, course, speed, navigational status and other safety-related information;*
- .2 receive automatically such information from similarly fitted ships;*
- .3 monitor and track ships; and*
- .4 exchange data with shore-based facilities.”*

In addition, the IMO Performance Standards for AIS state:

*“1.2 The AIS should improve the safety of navigation by assisting in the efficient navigation of ships, protection of the environment and operation of Vessel Traffic Services (VTS), by satisfying the following functional requirements:*

- .1 in a ship-to-ship mode for collision avoidance;*
- .2 as a means for littoral States to obtain information about a ship and its cargo;  
and*
- .3 as a VTS tool, i.e. ship-to-shore (traffic management)*

IALA Recommendation A. 123 on the Provision of Shore Based Automatic Information systems (AIS) notes that *“The provision of shore based AIS will be necessary to attain the full benefit of the 1974 SOLAS Convention (as amended)”*.

The arrangement for the integration and display of AIS and other information is critical to meeting SOLAS regulations, relevant IMO resolutions and IALA recommendations. The extent to which AIS improves 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.

Although there are many compelling reasons for the international standardisation of methods of display of electronic sensors, including AIS, on board vessels, there may be differing or additional requirements for the display of information at VTS Centres that are port, country or area specific. It should also be noted that the form of presentation of information will have an influence the training of VTS personnel.

## **2. Factors affecting the use of AIS in a VTS Centre**

The use of AIS in VTS operations will assist in the development and maintenance of a traffic image, particularly with respect to the:

- identification of vessels;
- tracking of vessels;
- simplification of information exchange; and,
- provision of additional information to assist in vessel traffic management.

The contribution of AIS to VTS and the overall traffic image should be kept in context; responsibility for maintenance of a good lookout and for safe navigation of a vessel will always remain with the master.

AIS, on its own, may not provide a reliable picture of the actual traffic image in a VTS area as some ships may not have the system installed, and others may not have their equipment operating. In addition, the limitations of the AIS system should also be taken into account, including the possibility that the shore based AIS system may fail to receive information from a ship. (i.e. the transmission or reception medium may fail through radio interference, obstructions, etc).

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, will ensure redundancy of 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.

However, it should be borne in mind that:

- Unless there are additional appropriate national requirements, only vessels to which the 1974 SOLAS Convention (as amended) apply will be required to fit AIS;
- During the period of AIS introduction, not all vessels to which the 1974 SOLAS Convention apply will have a fully operational system,
- A Minimum Keyboard Display (MKD) only is required to be provided on board vessels,
- Shipborne personnel on vessels provided with operational AIS may not be familiar with the entry of variable voyage related data.

Where a VTS has the ability to integrate data from AIS with one or more other sources of information for tracking a participating vessel, means should be provided to enable the track sources to be correlated or de-correlated as necessary.

Received data should be treated with caution, and it should not be assumed that AIS data will be presented to mariners in a form that can be assessed readily and applied immediately.

AIS functions for control of reporting cycles, slot allocation, frequency allocation, transmission power-level, etc. may apply to a group of vessels or an individual vessel. All AIS control functions, and the effected AIS tracks, should to be clearly identified.

### **3. VTS Traffic Image display**

The integration of AIS into a VTS traffic image 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 display covering the area, sub-area or sector as appropriate.

The composing, sending and receiving of AIS messages should not be conducted on the VTS traffic image display.

#### **3.1 General**

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 Safety Related Messages.

Data Filtering and Track Labelling. The AIS and associated binary message(s) will permit the transmission of increased information associated with each and every suitably equipped vessel. VTS Centres should consider carefully the number and arrangement of VTS operator displays 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 in ports with high densities of vessel traffic or where individual VTS operators may need to carry out surveillance over a large area. Technical solutions that may 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 AIS detail needed to be displayed directly on the screen or available through pop – up menus/data fields.

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

Correlation. Correlation between AIS and other 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. AIS 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.

AIS is based on an international geodetic datum (WGS 84) with respect to position information. When integrating AIS with existing tracking systems care must be taken to superimpose the display of geodetic datum and reference points.

Safety Related Messages. AIS specifies the provision of short safety related messages, and it is important that a method is identified to draw the attention of the VTS operator to the receipt of such a message. Experience has yet to be gained on the use of this feature but there is no provision to limit its use by mariners. In considering how these messages may be displayed, a balance may need to be made between drawing attention to the presence of a safety related message and overloading or distracting VTS operators. The advantages and disadvantages of superimposing safety related messages and alerts on the traffic image or presenting them on a separate display should be considered.

Transmission of safety related messages by AIS should be made only to specific vessels. The messages should be short and require acknowledgement. Safety related messages of a general nature that are a function of an “information service”, a “navigation assistance service” or a “traffic management service” as described in IMO Resolution A. 875(20), should be transmitted by voice communications.

Information superimposed on the VTS traffic image display should never obscure or cause any confusion with the display of vessel targets. With the amount of AIS information that may be 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. Means<sup>1</sup> to select appropriate information necessary for the service during times of varying degrees of workload should be provided. However, it should be recognised that vessels could make changes to data that has been “filtered out” at the VTS Centre.

### 3.2 Presentation

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

- Target Identification - must clearly distinguish between the sensor device used (eg. radar, AIS, dead-reckoned source, or other data input.);
- Information Filters – filter of information pertaining to different classes of AIS fitted vessels should be possible in a VTS area however, if the filter is operational, it should be clearly displayed;
- Information Layers – information should be multi layered to meet the informational needs of the VTS operator at differing times or levels.(notes-track boxes/ship symbol);
- 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;
- Communication - presentation of target data should not lead to any misunderstanding in communication between VTS Centres and vessels.

### 3.3 Operational Warnings related to AIS

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

- Loss of AIS track or transmission;
- Inconsistency of data (AIS transmitted data versus database, i.e. ship’s length, etc.);
- Loss of correlation between AIS and other track sources;
- Change of navigational status as indicated in the AIS status message;
- Any other AIS system failure.

### 3.4 Symbolology

#### 3.4.1 AIS Symbols

A VTS traffic image 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), in areas of extreme congestion.

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.

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<sup>1</sup> An example to minimize the potential for information overload would be to move a mouse cursor over a target; the information concerning that target would then be displayed for as long as the cursor rests over the particular target. To keep this information on screen, click once. To remove it, click again on any target.



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

- Identification – target symbols should clearly distinguish between radar, AIS, dead reckoned source or other data input;
- Meaning – symbols used on VTS traffic image display should represent the same meaning as used for onboard presentation of AIS information to facilitate communications and situational awareness between the VTS and vessels;
- Mobile AIS stations (Class A, B, Aids to Navigation, SAR) – the symbols should clearly distinguish each of the four types of mobile AIS stations;
- Vectors – 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 accurately display the vessels dimensions, position and orientation based on the AIS transmitted data.

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

As an interim measure, an independent display of AIS data may be necessary until integration of the data can be programmed into the existing VTS system. To permit a step-by-step installation, while VTS personnel use both RADAR and AIS systems, the independent display must be adjacent to the VTS operator's existing display.

#### 3.4.2 General symbology

In translating the practical considerations in the use of AIS into equipment specifications for local or national requirements, the following broad issues may need to be considered:

- Operational;
- Geographical;
- Environmental;
- Commercial;
- Training.

Whilst the actual method of display and symbology used will be for individual nations and/or ports to decide, the following checklist is provided to assist VTS authorities 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. Not all of these are directly related to AIS, nor are the lists 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 size of the symbols displayed should be dependent on range scale in use. For example, it may be found more appropriate for AIS symbols to reduce proportionately to the range scale of display in use to reduce screen clutter.

### Operational

- Pilot on board – symbology may be used to indicate the status and requirements of vessels having a pilot onboard;
- 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.;
- 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 Cargoes/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 (harbour launch, pilot vessel, survey vessel, salvage etc)
- 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.

### 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 AIS information displayed;
- 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 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.

### Environmental

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

### 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.

## **4. Operator workload and training**

### **4.1 Operator workload**

The effect of the introduction of AIS at a VTS Centre on the workload of Operators should be kept under review. It is possible that, in the long term, the workload could be reduced; however, it is also possible that there could be an increase in the workload in the short to medium term.

Potential benefits that may be realised at an early could include:

- Greater confidence in accurate identification;
- Greater system reliability that will minimise “lost targets” and “target swap”;
- Greater positional accuracy.

The VTS Authority, while implementing AIS, should consider how much information from the available data needs to be presented on the VTS traffic image display. The amount of information should not overload VTS Operators or cause confusion.

### **4.2 Training**

VTS Authorities should ensure that VTS On-the-Job Instructors are provided with knowledge appropriate to the AIS equipment being installed and the AIS functions being implemented at the VTS Centre concerned. Subsequently, VTS On-the-Job Instructors should provide the training to VTS Operators necessary to ensure that they are capable of using AIS functions efficiently. (see IALA Guidelines on “The aspects of the Training of VTS Personnel relevant to the introduction of AIS”.)

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