IALA GUIDELINE

1082

AN OVERVIEW OF AIS

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DOCUMENT REVISION

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

Date	Page / Section Revised	Requirement for Revision

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1. INTRODUCTION

AIS was developed to provide automatic reporting between ships and to shore, which contributes to the safety of navigation and facilitates traffic management by exchanging information such as identity, position, time, course and speed, autonomously and continuously.

1.1. SCOPE

This guideline provides an introduction to AIS at an overview level for shore authorities and references relevant documentation where further information can be found.

Further information on AIS documentation is provided at ANNEX E and is available on the IALA website.[1]

1.2. WHAT IS AIS?

AIS is a communications system using four worldwide channels in the VHF maritime mobile band, for the exchange of navigation data. There are numerous AIS devices, known as stations, which are identified by a unique Maritime Mobile Service Identity (MMSI)[2] and use an international open standard to communicate.

AIS stations are designed to operate autonomously (without interaction by ship or shore personnel) and may also be instructed to transmit in a different manner – for example may be interrogated (polled) or be commanded to transmit more frequently, or on a different frequency (assignment). AIS enables the automatic exchange of shipboard information from vessel sensors (dynamic data), as well as manually entered static and voyage related data[3], between one vessel and another and between a vessel and a shore station(s).

AIS has been mandated as a shipboard carriage requirement for vessels under the revised Chapter V of the International Convention for the Safety of Life at Sea, 1974 (as amended) (SOLAS 74) section 19.2.4. in addition, AIS is required domestically on non SOLAS vessels by some administrations.

- Information exchange between vessels within VHF range of each other, increasing situational awareness;
- Information exchange between a vessel and a shore station, such as a VTS, to improve traffic management in congested waterways;
- Automatic reporting in areas of mandatory and voluntary reporting;
- Exchange of safety related information between vessels, and between vessels and shore station(s).

The development of AIS has expanded to include devices such as AIS for Aids to Navigation (AIS AtoN), AIS on search and rescue aircraft and AIS search and rescue transmitters[4] (AIS-SART). Further explanation of the different AIS stations is included in section 4.

1.3. PURPOSE OF AIS

The AIS improves the safety of navigation and protection of the environment by assisting in the effective navigation of ships and the operation of VTS, by satisfying the following functional requirements:[5]

.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).

1 IALA Website - http://www.iala-aism.org/

2 ITU-R M.585 defines the assignment and format of MMSIs

3 Dynamic data is data provided from sensors such as gyro compass, GNSS device or rate of turn indicator; static data refers to data that doesn't change such as the length or beam of the vessel; voyage related data refers to items such as the vessel draft, port of destination or cargo.

4 Radar search and rescue transponders (SART) and AIS-SART are included in the Global Maritime Distress and Safety System (GMDSS). Radar SART are activated by the radar pulse (hence 'transponder') while AIS SART transmit at set rates.

5 IMO Resolution MSC.74(69) Annex 3.

AIS provides for increased situational awareness which enables effective response to emergencies such as search and rescue (SAR) as well as environmental pollution. Additionally, AIS can provide data to identify trends or improvements to the provision of services to enhance navigational safety.

1.3.1. AIS AND RADAR

AIS information may be used in conjunction with radar information to facilitate:

- Vessel identification, heading, course over ground (COG) and speed over ground (SOG);
- Improved vessel tracking (no target swap);
- Wider geographical coverage;
- Greater positional accuracy, dependent on the position input sensor;
- Information in radar shadow area ('sees' around bends and behind islands);
- Near real time manoeuvring data;
- No loss of targets in sea, rain and snow clutter.

It is important to be aware that not all ships are required to carry AIS and that it is permissible for the AIS to be switched off if the master believes that the continual operation of AIS might compromise the safety or security of his/her ship, or if security incidents are imminent.[6]

A vessel must inform the competent authority if it switches off its AIS whilst in a mandatory reporting area.

It should be noted that some data is entered or updated manually and so there is potential for incorrect entry and for the entered data to become out of date. This includes data related to static information (e.g. ship identity, dimension) and voyage related data (e.g. navigational status). Shore authorities should take the necessary action to ensure the integrity of the AIS data link and that the data transmitted on the link is correct.

1.4. DEVELOPMENT OF AIS

AIS developed through the cooperative efforts of a number of different international organisations, including the International Maritime Organization (IMO), the International Telecommunication Union (ITU), the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) and the International Electrotechnical Commission (IEC).

AIS references to these international documents are included in ANNEX E.

2. USE OF AIS BY IALA MEMBERS

AIS can be an effective tool to assist aids to navigation authorities in a number of areas, as identified in the IALA Guideline 1050 on the management and monitoring of AIS information. For example, AIS can be used to:

- Display traffic on electronic navigational chart and radar display;
- Provide information to VTS centres;
- Monitor shipping routes including mandatory and recommended routes;
- Enable trend analysis of AIS data (number and sizes of different types of ships; use of routeing measures);
- Provide data for risk analysis;
- Provide data for long term planning;
- Provide data for marine accident investigation;

6 IMO Resolution A.917(22) as amended by A.956(23).

- Improve the effectiveness and efficiency of planning, management and maintenance of waterways including the provision of Aids-to-Navigation.

Additional information on the use of AIS by Authorities is provided in the latest edition of the IALA VTS Manual, IALA Recommendation V-128 on Operational and Technical Performance Requirements for VTS (ANNEX 3 – AIS), and, the IALA AIS Recommendations and Guidelines listed in ANNEX E.

3. HOW DOES IT OPERATE

AIS stations communicate using a time-division multiple access (TDMA) communications scheme. Which means that the data link used is divided into a number of equal time slots which hold a set amount of data and are synchronised using GPS time. The primary methods by which AIS devices access the link (as detailed in ITU-R M.1371) are:

1 Self-Organised (SOTDMA) is the basic access method for mobile stations. Stations preannounce when they are going to transmit and plan their transmissions based on slot use information collected from other stations in order to prevent slot collisions (two stations picking the same slot to transmit their data packet).

2 Random Access (RATDMA)7 is used by AIS stations to access the link for unscheduled transmissions.

3 Fixed Access (FATDMA)8 is used by AIS stations that have a requirement to transmit data at predetermined intervals, and involves the reservation of particular slots for their exclusive use.

4 Carrier Sense (CSTDMA) – known as 'polite' behaviour is used by some mobile stations which can access the link only when they find an unused slot. These stations must listen to the beginning of a slot to detect occupancy and are therefore limited to a single slot transmission

Land AIS networks rely upon communication towers, referred to as Base Stations that manage the network in a similar manner to telephone 'cell' towers. When you experience a 'dropped' call on your mobile telephone it is usually because you are outside the cell (coverage area) or because the cell has too many other users. What makes AIS unique and very different from a mobile telephone network is the ability to 'self-organise'. Simply, each AIS station is its own cell tower so its cell, or coverage area, moves with it. This is possible because the network is continuously self-organizing around the user, thus reducing the likelihood of 'dropped call' (undelivered AIS messages).

3.1. PROTOCOL FOR DATA TRANSMISSION (LANGUAGE / SENTENCES)

AIS uses TDMA protocols, this is the method used to communicate amongst stations, using pre-defined messages (sentences), which are exchanged between stations via four designated VHF frequencies[9]. The protocols, frequencies and the messages together are defined as the VHF data link (VDL). The VDL is similar to an internet email service where international compatibility is assured by a strict protocol, whatever the content of the message might be.

3.1.1. TIMING

Correct synchronisation of each user's equipment is imperative to ensure proper functioning of the TDMA and is a critical part of the protocol for successful transmissions.

For AIS1 and AIS2, each minute of time (known as the 'frame') on each designated frequency is divided into 2250 slots, giving a total of 4500 for the two frequencies. Each frame of 2250 slots is repeated every minute. To ensure all units are synchronised, every AIS station contains a Global Navigation Satellite System receiver (GNSS – e.g. Global Positioning System (GPS)), which provides Universal Time Co-ordinated (UTC) as a timing reference. If GNSS timing is lost, synchronisation is provided by other mobile units or AIS Base Stations in the area.

7 Shore authorities should use FATDMA whenever possible instead of RATDMA to avoid slot collisions

8 Shore authorities are responsible for the allocation and reservation of FATDMA slots.

9 Ch. AIS1 (formerly 87B), Ch. AIS2 (formerly 88B), Ch. 75 (AIS3) and Ch. 76 (AIS4).

3.1.2. POSITION

Although AIS relies on GPS for timing it may also obtain its position reference from an external source. Any interference or loss of the GNSS signal will impact AIS position data.

3.2. VHF DATA LINK

The AIS has been designed for short range, VHF coverage, normally referred to as 'line of sight'. Although most AIS messages only use one (1) slot, some can occupy up to five (5) consecutive time slots. The greater the number of slots used by a message, and the larger the number of vessels in a coverage area, the greater the potential for data packet (slot) collisions. Since most AIS base stations typically have a high antenna position, large coverage area, this may result in messages not being decoded from more distant AIS units in an area where there are a very large number of AIS stations operating. However, data from these distant stations would continue to be transmitted and received correctly by closer AIS stations.

Administrations should organise the usage of the VDL by appropriate FATDMA[10] reservations and consider the total load on the VDL before introducing additional services which rely on AIS.

The information exchanged via the VDL is safety related and the usage of the VDL should be monitored and controlled to safeguard its proper function and avoid overloading. IMO has highlighted this need in IMO Resolution MSC.347(91).

Even though there are potentially some scenarios in which data collisions may occur, the AIS is quite robust, and has been designed to work at high VDL loading.

Class A stations also broadcast a Long Range AIS broadcast Message (Message 27) every 3 minutes on two VHF channels 75 (AIS3) and 76 (AIS4) for satellite reception. This message should be suppressed when the Class A station is within an AIS Base station coverage area by the group assignment message from the controlling base station.

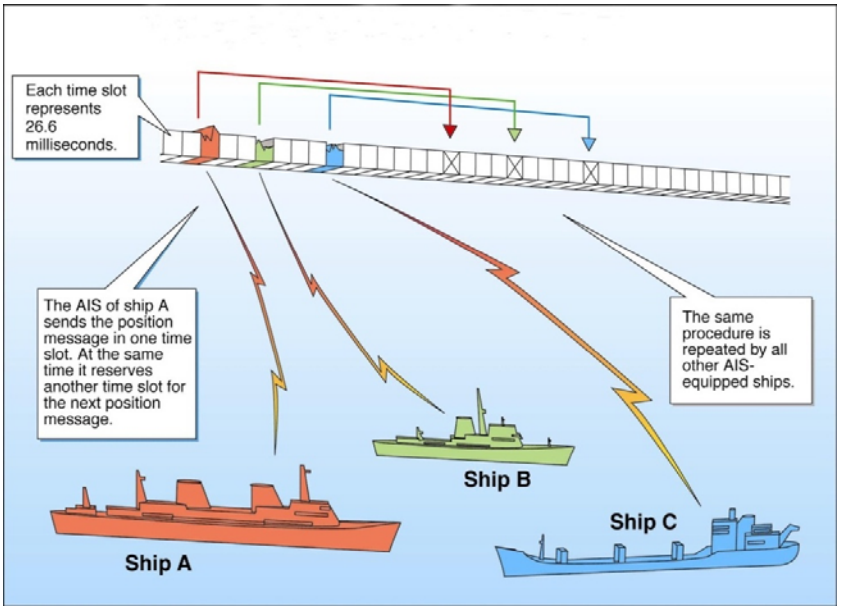

Figure 1 Protocol for AIS data transmission

3.3. PROCESS FOR DATA EXCHANGE

In addition to TDMA, AIS stations also use internationally adopted maritime digital interfaces and data sentences to exchange data amongst other devices, systems or networks (IEC 61162 / NMEA0183). This facilitates the display and use of AIS information on board the vessel and ashore, which enables the use of AIS to meet specific

10 FATDMA slot allocation should be coordinated amongst administrations, reference IALA Recommendation A-124 (Annex 14).

needs. On board the vessel the AIS provides data to the radar, ECDIS, chart-plotters etc., and ashore to VTS systems etc.

3.4. DISPLAY OF AIS DATA

AIS data can be displayed in different ways. AIS class A must have a Minimum Keyboard and Display (MKD), primarily intended for installation but displaying AIS target, name, bearing and range.

On vessels with AIS compliant navigational displays (IEC 62288), the manner in which targets are displayed depends on the type of AIS data:

- Ship dynamic data are typically displayed as triangular shaped icons (see Figure 2);
- Ship static data is typically shown as a textbox;
- Safety messages are also shown as a textbox;
- AIS AtoN messages as diamond shaped icons.

Meteorological and hydrological data in alphanumeric and / or in a graphical manner.

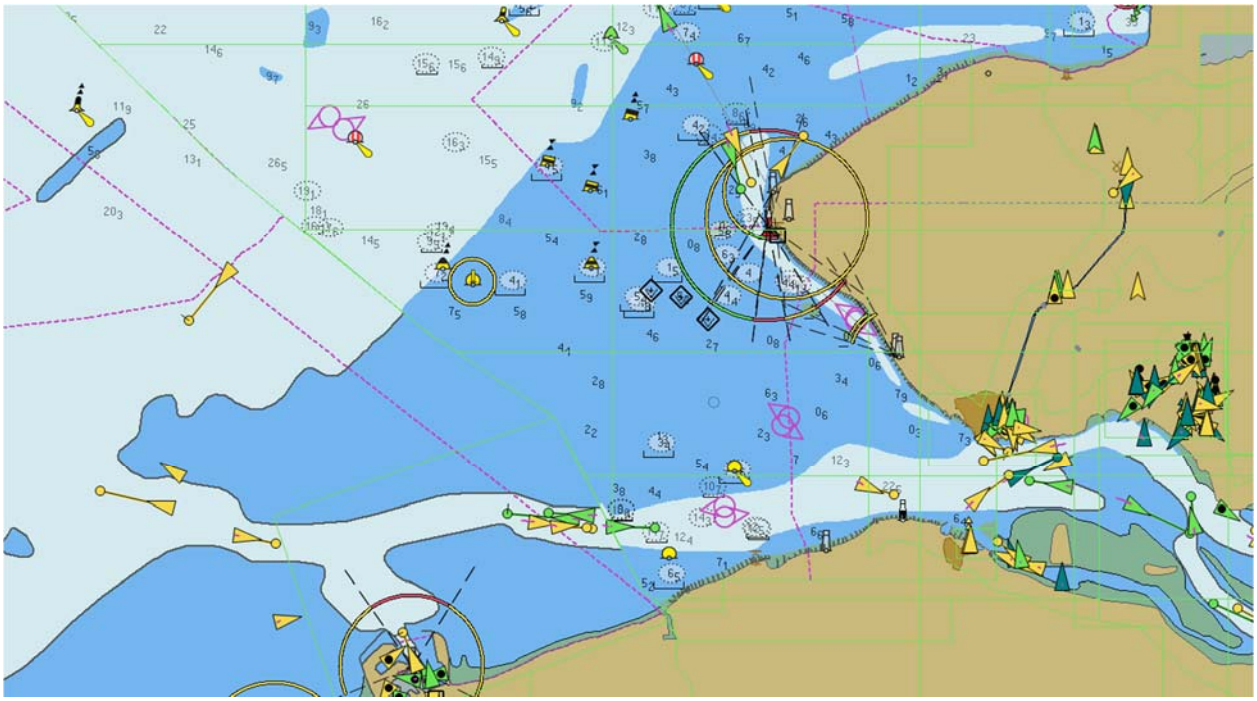

Figure 2 Display of AIS

3.5. AIS SERVICE

The AIS can be considered a maritime safety-related information service. The purpose of the AIS Service is to allow mariners and maritime administrations to interface with the different AIS stations on the VDL.

The AIS service provides a functional interface to access the available data from AIS stations. The purpose of this interface is to:

- facilitate the integration of the information from AIS into other applications;
- isolate the user from the technical details of the AIS technology and the way the AIS Service has been configured and implemented;
- allow for a simple point of control of what AIS data is shared with each client.

3.6. MESSAGES

The data exchange using AIS is based on well-defined messages, occupying between one (1) and five (5) consecutive time slots and are listed in Table 1. The majority of the messages are concerned with the transfer of navigational information, however some messages are application specific or have system management functions, and are specifically described in the sections below.

3.6.1. STANDARD MESSAGES

The standard messages used by AIS are given in the table below. These messages are approved by ITU for use by AIS. For further details, see ITU-R M 1371

Table 1 Standard AIS messages

Message ID	Name	Description
1	Position report	Scheduled position report
2	Position report	Assigned scheduled position report;
3	Position report	Special position report, response to interrogation; (Class A shipborne mobile equipment)
4	Base station report	Position, UTC, date and current slot number of base station
5	Static and voyage related data	Scheduled static and voyage related vessel data report; (Class A shipborne mobile equipment)
6	Binary addressed message	Binary data for addressed communication
7	Binary acknowledgement	Acknowledgement of received addressed binary data
8	Binary broadcast message	Binary data for broadcast communication
9	Standard SAR aircraft position report	Position report for airborne stations involved in SAR operations, only
10	UTC / date inquiry	Request UTC and date
11	UTC / date response	Current UTC and date if available
12	Safety related addressed text message	Safety related data for addressed communication
13	Safety related acknowledgement	Acknowledgement of received addressed safety related message
14	Safety related broadcast text message	Safety related data for broadcast communication
15	Interrogation	Request for a specific message type (can result in multiple responses from one or several stations)
16	Assignment mode command	Assignment of a specific reporting behaviour by competent authority using a base station to a single mobile station
17	DGNSS broadcast binary message	DGNSS corrections provided by a base station
18	Standard Class B equipment position report	Standard position report for Class B shipborne mobile equipment to be used instead of Messages 1, 2, 3
19	Extended Class B equipment position report	Extended position report for class B shipborne mobile equipment; contains additional static information
20	Data link management message	Used by base station(s) to reserve slots
21	Aids-to-navigation report	Position and status report for aids-to-navigation
22	Channel management	Management of channels and transceiver modes by a base station

Message ID	Name	Description
23	Group assignment command	Assignment of a specific reporting behaviour by competent authority using a base station to a specific group of mobiles
24	Static data report	Additional data assigned to an MMSI Part A: Name;(for any AIS station) Part B: Static Data (for Class B Shipborne mobile)
25	Single slot binary message	Short unscheduled binary data transmission (Broadcast or addressed)
26	Multiple slot binary message with Communications State	Scheduled binary data transmission (Broadcast or addressed)
27	Long-range AIS broadcast message	Scheduled position report designed for satellite detection (shipboard implementation post 2017)

3.6.2. APPLICATION-SPECIFIC MESSAGES (ASM)

Messages 6, 8, 25 and 26 provide a structure which can accommodate data suited for a specific application (e.g. meteorological and hydrological data, notifying of dangerous cargo, identifying a zone or a route, indicating pilotage requirements, etc.).

In addition to the message number, these applications are identified using a numbering system based on a unique three digit code known as the 'Designated Area Code' (DAC) and a two digit 'Function Identifier' (FI). This coding allows the correct use of the message if the necessary application software is available. These messages are similar to applications on a mobile telephone.

DAC 001, FI 00-09 identify international messages for technical purposes defined by ITU-R M.1371. DAC 001, FI 10-63 identify international messages defined and adopted by IMO, as described in SN.1/Circ.289.

DAC 010-999 identify regional functional messages, which may also be designated and adopted for use by administrations. Administrations are encouraged to register regional functional messages with IALA, who maintain the registry accessible from their website[11].

Prior to developing a regional functional message, administrations should verify if a message with identical content is already on the registry (in use). These messages may be used outside the region, but the 'ownership' and control of the messages belong to the administration responsible for AIS in the area indicated by the DAC. Administrations are encouraged to use existing messages as appropriate with their registered DAC and FI. However, any changes to the content of an existing message would require a change to the DAC and FI and should be registered with IALA.

3.6.3. MANAGEMENT MESSAGES

Management messages are used to control the behaviour of AIS stations and the use of the VDL. This functionality is performed solely by AIS base stations which should be controlled by a Competent Authority.

3.6.3.1. UTC and date inquiry (msg. 10) / response (msg. 11)

Stations may request / provide universal time coordinated information as needed.

3.6.3.2. Interrogation (msg. 15)

AIS stations may poll or interrogate other stations to request information other than UTC and date.

11 Regional registry **Erreur ! Référence de lien hypertexte non valide.** http://www.iala-aism.org/products/technical/ais-binary-messages.html.

3.6.3.3. Assignment command (msg. 16)

Assignments are used by base stations to control the reporting interval of a mobile station. Message 16 will define both the slot and the increment for a given mobile station.

3.6.3.4. DGNSS broadcast (msg. 17)

This message may be transmitted by a base station which is connected to a DGNSS reference source, and configured to provide DGNSS data to other stations. Use of message 17 will correct the internal AIS GNSS. The system has not been designed to interface to the vessel's GNSS (external to the AIS GNSS). The transmission of the differential broadcast can provide for more accurate positioning information where the AIS unit has an internal GNSS. In addition, the DGNSS reference source will warn the mariner and authorities about failures in the GNSS signal.

3.6.3.5. Data link management (msg. 20)

This message can be used by base stations to pre-announce the fixed allocation schedule (FATDMA) for one or more base stations and should be repeated as often as required. This message is used to reserve slots for a base station, or other fixed stations, to use. The mobile units will not use these slots. It is important to refresh the reservation of these slots, within the timeout period provided within the message, so that mobile units that are planning transmissions in future frames do not see the slots as available and new mobiles to the area receive the reservations in a timely manner. In addition, it is also important that slot reservation is coordinated so that the VDL remains available for the primary purpose of AIS, collision avoidance.[12]

3.6.3.6. Channel management (msg. 22)

Channel management provides the ability to 'require' ships within a defined area to transmit and receive AIS on frequencies other than the two international dedicated AIS frequencies (AIS1, AIS2).

This can be accomplished by sending a channel management message on the existing AIS frequencies or on DSC channel 70. The alternate channel(s) chosen must be free from other VHF traffic.

This channel management can be used where the existing AIS frequencies are not available for use, if there is interference on existing AIS frequencies or in areas of high activity on the VDL.

Channel management must be effectively coordinated with adjoining stations to ensure that situational awareness in the transition zones is not lost.[13]

It should be noted that experience has shown that not all units will respond properly to the DSC command to revert to the AIS channels, and the default timeout in the mobile unit is 30 days. Therefore, IALA does not recommend the use of channel management.

3.6.3.7. Group assignment (msg. 23)

Group Assignment provides the ability to 'require' ships within a defined area and criteria to change their operating mode. The Group Assignment Command is transmitted by a base station when operating as a controlling entity. This command can be applied to a mobile station within the defined region and as selected by a mobile's 'Ship and Cargo Type' or by 'Station type'. The following operating parameters of a mobile station may be commanded using this message:

- transmit/ receive mode;
- reporting interval;
- the duration of a quiet time.

12 Refer to IMO Resolution MSC140(76) Recommendation for the protection of the AIS VHF data link.

13 Refer to IALA Recommendation A-124 Annex 17.

4. AIS STATIONS

AIS is not solely used on board ship and can be grouped by 'class' (shipborne) and function. Shipborne AIS devices, which contribute the most to the flow of AIS information, are classified as either Class A or B. There are, however, other types of AIS stations that provide pertinent information or are used to manage AIS data. See Table 2.

Table 2 Overview of AIS stations

AIS Station (MMSI format)	Description of AIS Station
AIS Class A[14] (MIDxxxxxx[15])	Class A stations are shipborne units which meet and are required on most commercial ships by the IMO.
AIS Class B (MIDxxxxxx)	Class B stations are also shipborne units which are mainly compatible and very similar with AIS Class A but do not meet IMO technical or carriage requirements – primarily because they differ in power output and reporting rate. This Class has two variants based on the access scheme used: Carrier-Sense and Self-Organizing.
AIS base station (00MIDxxxx)	Base stations are designed for use by Competent authorities to manage the VDL and enable effective ship to shore / shore to ship transmission of information. They are the core of any AIS Service and can be networked to provide broad VTS or Coastal Surveillance coverage and overall maritime domain awareness.
AIS Aids to Navigation (99MIDxxxx)	AIS AtoN stations extend the visual or audible range of a traditional aid and provide current position or status; or they can provide 'aid' where a traditional aid does not yet exist, known as a virtual AtoN.
AIS on Search and Rescue (SAR) Aircraft (111MIDxxx)	AIS provides for a unique message intended for use by Search and Rescue Aircraft and to assist others in a SAR operation.
AIS-SART (970YYxxxx[16])	Search and Rescue Transmitters (SART) are part of the Global Maritime Distress and Safety System (GMDSS). AIS Search and Rescue Transmitters (AIS-SARTs) can be used in lieu of radar SART. AIS-SARTs provide much greater range than radar SART.
MOB-AIS (972YYxxxx)	Man Overboard AIS Transmitters operate in a similar manner to the AIS-SART, but are used to indicate the position of an individual in the water.
EPIRB-AIS (974YYxxxx)	Emergency Position Indicating Radio Beacons are part of the GMDSS and are based on a 406 MHz satellite detectable signal. An EPIRB-AIS also transmits an AIS message to assist with locating, and a 121.5 MHz signal to assist with homing.
AIS Repeater (00MID4xxx)	A station that repeats all non-system management messages to increase the range of the AIS VDL

For representation of some types of AIS see Figure 3. The behaviour of each station is shown in ANNEX B to ANNEX D.

14 Inland AIS as used in inland waterways is a derivative of Class A.

15 MID: Maritime Identification Digits which denotes the Administration having jurisdiction over the station so identified.

16 YY: Manufacturer ID code

Figure 3 Representation of some types of AIS Stations

An indication of the data broadcast by each AIS station is provided in ANNEX C.

4.1. MOBILE

4.1.1. SHIPBORNE

Class A equipment complies with the IMO AIS performance standards. Class B are compatible with Class A and are fully compliant with ITU requirements, but, report less frequently and at a lower power than Class A. See Table 3.

4.1.1.1. Class A

During the installation of AIS Class A, important static[17] ship-related information is entered into the AIS memory unit; this includes identity (i.e. name, call sign, MMSI), length and beam, type of ship and the location of the position-fixing antenna. Subsequent changes to this data require password access.

The shipborne AIS units rely on inputs from the ship's GNSS equipment (i.e. GPS), the heading device and rate of turn indicator. The requirement to feed this information to AIS is identified in SOLAS (e.g. SOLAS V/19.2.5 requires a gyro compass, or other means to determine and display heading, is provided as input into that AIS equipment).

Shipborne AIS units are also required to provide a number of interfaces to allow for integration of received information with a variety of onboard navigation equipment, including a minimum keyboard and display (MKD). This MKD is the mandated display tool for AIS Class A and provides for a minimum of three lines of data consisting of bearing, range and the name of a selected ship.

4.1.1.2. Class B

There can be two different variants of Class B stations, with different access methods (self-organizing TDMA and carrier-sense TDMA). Class B shipborne AIS stations are typically installed on non-SOLAS work craft and pleasure craft.

17 Static data refers to data that doesn't change such as the length or breadth of the vessel.

Class B units are not user configurable. Because of this, the units must be configured by the manufacturer or their representative (sales person) prior to use.

There is no requirement from IMO for carriage, installation or display of AIS Class B, however there are national requirements in some countries.

Table 3 Comparison table – AIS Class A and AIS Class B

Shipboard AIS Comparison	Class A (SOLAS compliant)	Class B/CS	Class B/SO (under development)
Transmit Power	12.5 watts (nominal) / 1watt[18] (low-power)	2 watts	5 watts (nominal) 1 watt[18] low power)
Major Communication Access Scheme	Self-organizing (SOTDMA)	Carrier-sense (CSTDMA) polite to Class A's	Self-organising (SOTDMA) polite to Class A's
Frequency Range & Bandwidth	156.025 - 162.025 MHz @ 25 kHz DSC (156.525 MHz) required	161.500 - 162.025 MHz @ 25 kHz DSC (156.525 MHz) receive only	161.500 - 162.025 MHz @ 25 kHz
Position Source and external inputs	External GNSS, heading, rate of turn indication required; AIS internal GNSS	AIS internal GNSS; heading optional; External GNSS optional	External GNSS, heading, rate of turn indication available; AIS internal GNSS
Display / digital interfaces	Minimum keyboard display (MKD); multiple input-output ports and single output	Optional	Optional
Safety text messaging	Receive and transmit	Transmit optional, and only preconfigured.	Receive only

4.1.2. AIS SART

A Search And Rescue Transponder (AIS-SART) is used in the final stages of the execution of a search to respond to the 'locating' element of the Global Maritime Distress and Safety System (GMDSS). An AIS-SART is capable of transmitting messages that indicate the position (Message 1) and safety information (Message 14) of a unit in distress and is compatible with existing AIS installations[19]. The station will transmit a safety related text message, containing 'SART ACTIVE' during an emergency and 'SART TEST' when under test.

4.1.3. MOD – AIS

Man Over Board (MOB) AIS transmitters operate in a similar manner to AIS-SART, but are used to indicate the position of an individual person. MOB-AIS transmit Message Type 1 with the Navigational status '14', and a Message Type 14 which states: 'MOB ACTIVE' or 'MOB TEST'.

4.1.4. EPIRB - AIS

Emergency Position Indicating Radio Beacons are part of the Global Maritime Distress and Safety System (GMDSS) and are based on a 406 MHz satellite detectable signal. EPIRBs use a 121.5 MHz for locating and an EPIRB-AIS also transmits an AIS Message Type 1 with the Navigational status '14', and a Message Type 14 which states: 'EPIRB ACTIVE' or 'EPIRB TEST'.

18 While Class A initially had a low-power of 2 watts, this was amended in a subsequent edition of ITU-R M.1371-3. The main issue that this change addressed was the requirement for limitations in power as identified in the International Safety Guide for Oil Tankers and Terminals (ISGOTT), fifth edition.

19 IMO Resolution MSC.246(83).

4.1.5. AIS ON SAR AIRCRAFT

AIS can be fitted to aircraft to support search and rescue and safety of navigation. The position report for AIS on SAR aircraft includes information on altitude.

4.2. FIXED AIS STATIONS

Fixed AIS stations refer to shore stations or AIS aid to navigation stations on lighthouses or other fixed locations.

4.2.1. AIS BASE STATIONS

The AIS base station is a device that is able to manage (see 3.6.3) the VDL. In high traffic areas the base station may benefit from a higher level application to fully take advantage of the benefits of AIS and management of the VDL.

4.2.2. AIS REPEATERS

AIS repeaters can be used to extend the range of other AIS stations. The repeater must be within the range (often referred to as the footprint) of the other station to enable consistent repeat capability.

4.2.3. AIS AID TO NAVIGATION

An AIS unit can be fitted to an AtoN to provide positive identification, position and status of the AtoN. AIS AtoN may be fixed (i.e. attached to a lighthouse) or floating (i.e. attached to a buoy).

AIS AtoN stations are divided, from a technical point of view, as follows:

1 Type 1. No receiver. Transmitter can only use pre-defined time slots (FATDMA), reserved by an AIS base station;

2 Type 2. Receiver used for control functions - for configuration only. Transmitter uses pre-defined time slots only (see Type 1);

3 Type 3. Full AIS receive capability typically used in an area without AIS base station coverage.

From an operational point of view AIS AtoN stations are identified as follows:

1 Physical AIS AtoN. The AIS station is physically located on the AtoN;

2 Synthetic AIS AtoN. AtoN messages for a specific AtoN are transmitted from a remote location (i.e. from another AtoN or a Base station).

3 Virtual AIS AtoN. A remote AIS Station (another AtoN or a Base Station) transmit a message to identify an AtoN in a location where it does not physically exist.

The virtual AIS AtoN can only be seen by other AIS units. An AIS AtoN station may transmit ASMs, Safety Related Messages (e.g. AtoN is out of position or malfunctioning) and may also repeat any AIS-SART message received. In addition, the stations can work in a chaining environment to extend the range of AIS.[20]

4.3. AIS STATION REPORTING RATE

AIS stations report at set rates, as indicated in 0.

In addition to the nominal reporting frequency, the opportunity is available to poll vessels for updated information. A Competent Authority may use a base station to require mobile AIS devices to report more frequently.

20 Reference IALA Guideline 1062 on the establishment of AIS as an aid to navigation and IALA Recommendation A-126 on AIS as an AtoN.

Table 4 AIS Station Reporting Intervals

Station Type	Nominal Interval
Class B < 2 knots	3 minutes
Class A < 3 knots in 'At anchor' or 'Moored' status	3 minutes
Class B > 2 knots	30 seconds
Class A > 3 knots in 'At anchor' or 'Moored' status	10 seconds
Class A 0-14 knots	10 seconds
Class A 0-14 knots and changing course	$3^{1}/_{3}$ seconds
Class B 'SO' 14-23 knots	15 seconds
Class A 14-23 knots	6 seconds
Class B 'SO' > 23 knots	5 seconds
Class A 14-23 knots and changing course; or > 23 knots	2 seconds
Search And Rescue Aircraft (airborne mobile equipment)	10 seconds
AIS Base Station	10 seconds
AIS Aid to Navigation	3 minutes
Transmissions of AIS Application Specific Messages	3 minutes
Transmissions of AIS Long Range Reports (message 27)	6 minutes
AIS-SART, MOB-AIS or EPIRB-AIS	8 messages / minute
Note: Class B 'CS' reporting rate will be impacted in high VDL loading situations.	

5. BASIC AIS SERVICE (BAS)

The purpose and functions of the AIS can be expressed in terms of services provided to the recipient. The most fundamental 'services' of the AIS are called 'Basic AIS Services'. The concept of 'services' make use of the information and features of the different AIS stations through the data transmitted over the VDL.

An AIS service can assist Administrations in meeting other IMO obligations such as providing a traffic image to assist VTS and addressing reporting requirements for traffic management schemes and ship reporting systems. It can assist in other shore-based safety-related services, including providing information to assist in the execution of a SAR operation. This AIS service consists of information delivery between ships and shore and vice versa.

Shore infrastructure for AIS normally includes a network connecting the different sources and users of AIS data within the area of responsibility of an Administration. The infrastructure can be as simple as a single AIS base station, with a way to display the data from the base station and a means to control or make use of the tools available in AIS (such as the messaging capability). The infrastructure can be thought of as a series of 'layers' that build up to provide control of the overall shore infrastructure. These layers include:

1 The Physical Shore Station (PSS) layer – consisting of one or more fixed AIS stations. (note – the PSS includes not only the actual AIS base station, but also all the connections, antenna, etc. required for the base station to actually operate).

2 The Logical Shore Station (LSS) layer – software that takes the AIS data from one or more PSS and delivers it, in a useable format, to the users of the AIS service. The LSS does not need to be co-located with the base station (the PSS).

3 The AIS Service Management (AIS-SM) layer – the top layer of the system, where the system can be controlled. The AIS-SM links to each base station, or group of base stations (PSS) through the software system (LSS) and controls the shore based AIS system. There is, however, a need to ensure reliable data transportation means between all association physical AIS shore stations.

The implementation of IALA guidelines for shore based AIS services (Annex F) allows for the creation of national, regional and international networks (e.g. Helcom, IALA-Net).

5.1. COVERAGE CONSIDERATIONS

AIS is designed to optimise close quarters ship-to-ship communications. When the VDL becomes congested, ships should still be able to receive messages from those ships with the strongest signal (usually those ships that are in close proximity). Depending on the received coverage, shore stations may not necessarily receive messages from the strongest signal as some of these messages may actually collide with other messages.

When determining coverage area for AIS, shore authorities should take into account:

- traffic congestion;
- antenna design;
- antenna height and distance from the theoretical monitoring area;
- required availability for the application (e.g. VTS, coastal surveillance, traffic statistical analysis).

5.2. AIS NETWORK

AIS data can be transferred over a fully transparent data transportation network (e.g. the Internet). This process does not comprise any AIS-specific technology and can be integrated within an existing network.

5.3. REDUNDANCY

With increased reliance on reception of AIS data to support VTS, search and rescue and other uses, comes a need for high availability and reliability. This can be achieved through redundancy of system components.

5.4. VULNERABILITY

All electronic devices, particularly radio equipment, are prone to radio frequency interference (RFI), particularly multi-pathing. Multi-pathing occurs when a radio signal (i.e. GPS signal) is received from two or more paths (e.g. bounced off a nearby large metal structure), this will commonly produce erroneous position calculations. AIS cannot and does not correct these errors—thus ghost targets arise. Such targets can also arise by malicious actions. AIS by design is non-secure, non-proprietary, open broadcast, as such it is not difficult to transmit deceptive or false broadcasts (spoof). AIS does provide for a means to verify targets, by being able to interrogate/poll any target for a new report should the user suspect spoofing. Those providing the false broadcasts are not likely to answer these polls with further reports because doing so could eventually reveal their location. False AIS reports can and should be expected of AIS and the AIS Service Manager layer may be able to provide automatic warning and verification if false targets are detected.

Spurious attacks or jamming of any VHF channels is relatively easy to do. VHF interference normally happens unintentionally or by poor design. Radio Direction Finding (RDF) equipment exists and is used to identify the source of interference, e.g. to locate a continuously transmitting VHF radio.

AIS is a non-secure open broadcast system and the devices themselves do not share a common operating system. The internal operation of every AIS is of a proprietary design, thus not easy prey to hacking. This said, it is still imperative that Administrations actively monitor the VHF data link so as to be able to quickly identify intentional disruptions to AIS services and have procedures in place to mitigate them. Common Internet cyber security measures should be adopted for any AIS systems that are networked[21].

6. FUTURE DEVELOPMENTS

AIS is a versatile tool and, as experience is gained in the implementation and use of the various AIS stations, enhancements and other uses are being identified.

21 ITU-T X.1205

6.1. e-NAVIGATION

e-Navigation is an International Maritime Organization (IMO) led concept based on the harmonisation of marine navigation information and supporting shore services driven by user needs.

e-Navigation is currently defined as:

> *e-Navigation is the harmonised collection, integration, exchange, presentation and analysis of maritime information onboard and ashore by electronic means to enhance berth to berth navigation and related services, for safety and security at sea and protection of the marine environment.*

IMO is working together with IALA to facilitate the e-Navigation concept for the mariner and the authorities. In this IALA is recommending future developments for AIS and other areas.

6.2. SATELLITE AIS

Satellite AIS can extend coverage to the entire Exclusive Economic Zone (EEZ) or even globally, including ocean and remote coastal areas.

Satellite AIS is capable of receiving shipborne AIS today on existing frequencies. However, since these frequencies are shared with fixed and mobile stations, its ability to do so is affected by the very wide footprint of the satellite and the number of stations (fixed and mobile) within the footprint. Message Type 27 has been created to assist with the satellite detection of Class A AIS mobile units.

6.3. VHF DATA EXCHAMGE SYSTEM (VDES)

VDES is being developed to include AIS and to efficiently handle future applications as well as low volume data communications for e-Navigation. This development is expected to improve data communications between ship and the shore for more efficient promulgation of Marine Safety Information, electronic chart updates, automated ship reporting etc. and may also provide a more secure transmission medium.

6.4. AIS IN GMDSS

Although all AIS Class A devices have an integrated dedicated Digital Selective Calling receiver, it cannot be used for distress communications. However, AIS is currently under consideration as IMO contemplates GMDSS modernisation.

AIS Search and Rescue Transmitters (AIS-SART) are locating devices within the GMDSS. Some Administrations recognise the Emergency Position Indicating Radio Beacon with AIS functionality (EPIRB-AIS) as distress locating devices.

7. ACRONYMS

AIS	Automatic Identification System
AIS 1	AIS Default Channel 1 - 161.975 MHz (Ch. 87B//2087)
AIS 2	AIS Default Channel 2 - 162.025 MHz (Ch. 88B/2088)
ASM	Application Specific Message
AIS-SART	AIS Search And Rescue Transmitter
AtoN	Aid(s) to Navigation
CH	Channel
CSTDMA	Carrier-sense Time Division Multiple Access
DAC	Designated Area Code
DGNSS	Differential Global Navigation Satellite Service
DSC	Digital Selective Calling

ECDIS	Electronic Chart Display and Information System
ECS	Electronic Chart System
EPFS	Electronic Position Fixing System
EPIRB-AIS	Emergency Position Indicating Radio Beacon – AIS enabled
FATDMA	Fixed Access Time Division Multiple Access
FI	Function Identifier
GMDSS	Global Maritime Distress and Safety System
GNSS	Global Navigation Satellite Service
GPS	Global Positioning System
Gyro	Gyrocompass
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IEC	International Electrotechnical Commission
IMO	International Maritime Organization
ITDMA	Incremental Time Division Multiple Access
ITU-R	International Telecommunications Union –Radiocommunication Sector
LSS	Logical AIS Shore Station
MID	Maritime Identification Digit
MKD	Minimum Keyboard and Display
MMSI	Maritime Mobile Service Identity
MOB-AIS	Man Overboard AIS device
MSG	AIS Message
MSC	IMO Maritime Safety Committee
NMEA	National Marine Electronics Association
PI	Presentation Interface
PSS	Physical AIS Shore Station
RATDMA	Random Access Time Division Multiple Access
RCC	Rescue Co-ordination Centre
RF	Radio Frequency
ROT	Rate of Turn
Rx	Reception
SAR	Search and Rescue
SART	Search And Rescue radar Transponder
SOG	Speed Over Ground
SOLAS	International Convention for the Safety of Life at Sea, 1974 (as amended)
SOTDMA	Self-Organising Time Division Multiple Access
TDMA	Time Division Multiple Access
UTC	Universal Time Co-ordinated
VDE	VHF Data Exchange
VDES	VHF Data Exchange System
VDL	VHF Data Link
VHF	Very High Frequency
VTS	Vessel Traffic Services
WG	Working Group

WGS84	World Geodetic System 1984 (Reference co-ordinate system used by GPS)
WRC	World Radiocommunication Conference

ANNEX A TIME-LINE OF THE DEVELOPMENT OF AIS

The following provides a chronological overview of the development of AIS from initial international discussions to implementation of the IMO SOLAS carriage requirements. AIS continues to evolve.

Sept. 1994	IMO, 40th session of the safety of navigation committee (NAV40) - UK reported successful results of trials of a VHF DSC-based system and proposed that, to enhance the implementation of mandatory reporting systems and to assist in collision avoidance, ships should be fitted with an automatic identification transponder. NAV agreed to develop functional and operational requirements, as well as performance standards, and invited members to submit proposals to NAV41.
Sept. 1995	NAV41 - Various proposals submitted including the VHF DSC by the UK; UHF and Satcom for long-range (France), VHF DSC gateways (USA) and a 'blended' approach using DSC, VHF and Inmarsat C for long range by Finland and Sweden. DSC was identified as a common factor, and was favoured for the overall implementation. The proposal by Finland and Sweden garnered interest, and IALA was invited to study the system with a view to developing standards to forward to ITU-R.
July 1996	The requirements for short and long-range systems were recognised. The Automatic Identification System (or AIS) was discussed and two designs were under consideration. VHF DSC was considered the most suitable for VTS requirements, but the concept of the system was growing, and VHF DSC was not considered the most suitable collision avoidance, which would require an automatic broadcast system (as opposed to the concept of transponders which 'squawk' when requested to do so). The WG considered that a 2-step approach would enable early implementation of VHF/DSC, with later introduction of a system with more functionality when available. A liaison statement to ITU included 3 possible solutions: 2-Channel VHF Broadcast; 1200-baud gateway from DSC Ch 20; or UHF (using existing documentation in ITU-R M.825 – Characteristics of a transponder system using digital selective calling techniques for use with vessel traffic services and ship to ship identification. The Finnish/Swedish proposal at that time, to use SOTDMA (Self-organising time division management access) was subject to patents, which raised some concerns over license fees.
Dec. 1996	IMO Maritime Safety Committee (MSC67) - considered proposals for early implementation of VHF DSC, and for the VHF and Broadcast system being developed in tandem. However, after considerable debate, the 2-step approach was eventually abandoned in favour of a single, universal AIS to meet all requirements, and this was referred to NAV43.
July 1997	NAV43 - carriage requirements were discussed and performance standards agreed. During discussions in the Technical Working Group (WG) the debate on technology intensified. It was agreed between delegations that they would not oppose the current ITU-R characteristics for a transponder system using VHF DSC (the ITU-R M.825-2). However, at the request of Germany, Finland, South Africa, Sweden and the USA, IALA undertook to host a meeting to discuss and agree on a common approach for the technical characteristics. It was at this meeting that all involved agreed on the 4S system, using SOTDMA. ITU World Radiocommunication Conference allocates two AIS VHF Channels.
1998	MSC 74 – IMO adopted the AIS performance standards in Resolution MSC.74(69 Recommendation ITU-R M1371 Ed. 0 published
2000	IMO amends the Safety of Life at Sea Convention, which amongst other things, establishes an AIS carriage requirement for tankers, passenger ships (regardless of size) and cargo ships of 300 gross tonnage or more; to be phased in from 2002 - 2008 (SOLAS Chap. V, Regulation 19.2.4)
2001	Recommendation ITU-R M1371 Ed. 1 published
2002	Following IMO diplomatic conference on maritime security the timeline for the mandatory adoption of AIS was shortened to 2004.
2006	Recommendation ITU-R M1371 Ed. 2 published
2007	Recommendation ITU-R M1371 Ed. 3 published

2010	Recommendation ITU-R M1371 Ed. 4 published
2012	World Radio Conference 2012 approves use of VHF channels 75 and 76 by AIS Class A mobile units for Message Type 27, and satellite detection of these messages.
2014	Recommendation ITU-R M1371 Ed. 5 published
2015	World Radio Conference 2015 approves additional channels for VDE, and designated the use of VHF channels 27 and 28 for VDE application specific messaging.
2015	Recommendation ITU-R M. 2092 Ed. 0 published

ANNEX B TABLE OF AIS STATIONS BY MESSAGE TYPE

Table 5 AIS Station Behaviour by Message Type

Msg#	Class A		Class B "SO"		Class B "CS"		AtoN		Base Station		Repeater		AIS-SART / MOB / EPIRB-AIS	SAR Aircraft*		Limited Base Station*	
1	R	T	R^p	N	R^p	N	R^3	N	R	T^p	R^r	T^o	T	R	N	R	N
2	R	T	R^p	N	R^p	N	R^3	N	R	T^p	R^r	T	N	R	N	R	N
3	R	T^i	R^p	N	R^p	N	R^3	N	R	T^p	R^r	T	N	R	N	R	N
4	R	N	R^p	N	R^p	N	R^3	N	R	T^i	R^r	T	N	R	N	R	N
5	R	T^i	R^p	N	R^p	N	R^3	N	R	T^p	R^r	T^o	N	R	N	R	N
6	R	T	R	T	R^o	T^o	R^3	T^o	R	T^v	R^r	T^o	N	R	T^o	R	T^o
7	R	T	R	T	R^o	T^o	R^3	T^o	R	T^v	R^r	?	N	R	T	R	T
8	R	T	R	T	R^o	T^o	R^3	T^o	R	T^v	R^r	T^o	N	R	T	R	T
9	R	N	R	N	R^p	N	R^3	N	R	T^p	R^r	T?	N	R	T	R	N
10	R	T		N		N		N	R	T^v	R^r	T	N		T	R	N
11	R	T		N		N		N	R	T^p	R^r	T	N		N	R	N
12	R	T	R^p	T	R^p	N	R^3	T^o	R	T^v	R^r	T	N	R	T	R	T
13	R	T	R^p	T		T^o	R^3	N	R	T^v	R^r	T	N	R	T	R	T
14	R	T	R	T	R^p	T^o	R^3	T^o	R	T^v	R^r	T	T	R	T	R	T
15	R	T	N	N	N	N		N	R	T^v	R^r	T	N	R	T	R	T
16	R	N	R	N		N		N		T^v	R^r	T	N	R	N	R	N
17	R	N	R	N	R^o	N	R^3	N	R	T^v	R^r	N	N	R	N	R	N
18	R	N	R	T^i	R^p	T^i	R^3	N	R	T^p	R^r	T	N	R	N	R	N
19	R	N	R	T^i	R^p	I	R^3	N	R	T^p	R^r	T	N	R	N	R	N

Msg#	Class A		Class B "SO"		Class B "CS"		AtoN		Base Station		Repeater		AIS-SART / MOB / EPIRB-AIS	SAR Aircraft*		Limited Base Station*	
20	R	N	R	N	R^p	N	R^3	N	R	T^v	R^r	T	N	R	N	R	N
21	R	N	R	N	R^p	N	R^3	T	R	T^p	R^r	T	N	R	N	R	T
22	R	N	R	N	R^p	N		N		T^v	R^r	T	N	R	N	R	N
23	R	N	R	N	R	N		N		T^v	R^r	T	N	R	T	R	N
24A	R	T^i	R	I	R^p	T^i	R^3	N	R	T^i	R^r	T	N	R	T^i	R	T^i
24B	R	N T^i	R	I	R^p	T^i	R^3	N	R	T^p	R^r	T	N	R	I	R	N
25	R	T	R	N	R^p	N	R^3	to	R	T^v	R^r	T	N	R	T	R	N
26	R	T	R	T	R^p	N	R^3	N	R	T^v	R^r	T	N	R	T	R	T
27		T		N		N		N	R^o	T^p		N	N		N		N

* AIS for SAR Aircraft and Limited Base Stations are still under development at IALA and/or IEC.

R Receives, processes, and forwards this message to the Presentation Interface (PI)
R^r Receives only, then repeats
R^3 Only AIS ATON Type III receive message
R^o Reception is optional
R^p Reception, processing and portrayal is optional
I Transmits only if interrogated by a msg 15

T Transmits this message
T^i Transmits this message, and if interrogated by a msg 15
T^o Transmission is optional
T^p Capable of broadcasting this messages via a VDM PI input, however, not recommended
T^v Transits this message, and via a VDM PI input

N Not allowed/prohibited

Note

This table supersedes the information in IALA Guideline 1059 on the Comparison of AIS Stations. Specifications or behaviour in the tables are subject to changes that may arise during further development. These will be incorporated in future revisions of this IALA Guideline.

ANNEX C DATA BROADCAST BY AIS STATION TYPE

Table 6 Data broadcast by AIS station type

EXACT DATA BROADCASTED VIA AIS BY STATION TYPE (Messages Used) Note: Not all data may be portrayed on shipboard or shore-side display systems		Class A (1,5,27)	Class B/SO (18,19, 24B)	Class B/CS (18,24A,24B)	Base Station (4,24A)	Repeater Station	AIS-SART/MOB/EPIRB (1)	SAR A/C (9,5)	AtoN (21)
PARAMETER NAME	DESCRIPTION & FORMAT								
User ID	MMSI Number	X	X	X	X	X	X	X	X
Longitude	Longitude in 1/10 000 min (180º, East = positive (as per 2's complement), West = negative (as per 2's complement). 181= (6791AC0h) = not available = default)	X	X	X	X	X	X	X	X
Latitude	Latitude in 1/10 000 min (±90°, North = positive (as per 2's complement), South = negative (as per 2's complement). 91° (3412140h) = not available = default)	X	X	X	X	X	X	X	X
RAIM-Flag	RAIM (Receiver autonomous integrity monitoring) flag of electronic position fixing device; 0 = RAIM not in use = default; 1 = RAIM in use. See Table 50 in ITU-R M.1371-5.	X	X	X	X	X	X	X	X
Position Accuracy	The position accuracy (PA) flag should be determined in accordance with Table 50 in ITU-R M.1371-5. 1 = high (=<10 m) 0 = low (>10 m) 0 = default	X	X	X	X	X	X	X	X
Time Stamp	UTC second when the report was generated by the EPFS (0-59, or 60 if time stamp is not available, which should also be the default value, or 61 if positioning system is in manual input mode, or 62 if electronic position fixing system operates in estimated (dead reckoning) mode, or 63 if the positioning system is inoperative)	X	X	X		X	X	X	X
SOG	Speed over ground in 1/10 knot steps (0-102.2 knots) 1 023 = not available, 1 022 = 102.2 knots or higher	X	X	X		X	X	X	
COG	Course over ground in 1/10° (0-3599). 3600 (E10h) = not available = default. 3 601- 4 095 should not be used	X	X	X		X	X	X	
True Heading	Degrees (0-359) (511 indicates not available = default)	X	X	X		X	X		

EXACT DATA BROADCASTED VIA AIS BY STATION TYPE (Messages Used) Note: Not all data may be portrayed on shipboard or shore-side display systems		Class A (1,5,27)	Class B/SO (18,19, 24B)	Class B/CS (18,24A,24B)	Base Station (4,24A)	Repeater Station	AIS-SART/MOB/EPIRB (1)	SAR A/C (9,5)	AtoN (21)
Type of Ship and/or Cargo Type	0 = not available or no ship = default; 1-99 = as defined in § 3.3.2, Annex 8 in ITU-R M.1371-5; 100-199 = reserved, for regional use; 200-255 = reserved, for future use. Not applicable to SAR aircraft	X	X	X		X		X	
Name	Maximum 20 characters 6 bit ASCII, as defined in Table 44 in ITU-R M.1371-5. '@@@@@@@@@@@@@@@@@@@@' = not available = default. For SAR aircraft, it should be set to 'SAR AIRCRAFT NNNNNNN' where NNNNNNN equals the aircraft registration number For AtoN stations there is an additional 14 characters allowed.	X	X	X	X	X		X	X
Assigned Mode Flag	0 = Station operating in autonomous and continuous mode=default; 1 = Station operating in assigned mode		X			X		X	X
DTE	Data terminal equipment (DTE) ready (0 = available, 1 = not available = default) (see § 3.3.1, Annex 8 in ITU-R M.1371-5) [The purpose of the data terminal equipment (DTE) indicator is to indicate to an application on the receiving side that, if set to available, the transmitting station conforms at least to the minimum keyboard and display requirements.	X	X			X		X	
Call Sign	7 × 6 bit ASCII characters, @@@@@@@ = not available = default. Craft associated with a parent vessel should use 'A' followed by the last 6 digits of the MMSI of the parent vessel. (Examples of these craft include towed vessels, rescue boats, tenders, lifeboats and liferafts.)	X	X	X		X		X	
Special Manoeuver Indicator	0 = not available = default,1 = not engaged in special manoeuvre 2 = engaged in special manoeuvre (i.e. regional passing arrangement on Inland Waterway)	X				X	X		
Rate of Turn ROT_{AIS}	0 to +126 = turning right at up to 708 degrees per min or higher; 0 to -126 = turning left at up to 708 degrees per min or higher Values between 0 and 708 degrees per min coded by ROT_{AIS}=4.733 SQRT(ROT_{sensor}) degrees per min where ROT sensor is the Rate of Turn as input by an external Rate of Turn Indicator (TI). ROT_{AIS} is rounded to the nearest integer value. +127 = turning right at more than 50 per 30s (No TI available) -127 = turning left at more than 50 per 30s (No TI available) -128 (80 hex) indicates no turn information available (default). ROT data should not be derived from COG information and is only required on vessels > 50,000GT.	X				X			

EXACT DATA BROADCASTED VIA AIS BY STATION TYPE (Messages Used) Note: Not all data may be portrayed on shipboard or shore-side display systems		Class A (1,5,27)	Class B/SO (18,19, 24B)	Class B/CS (18,24A,24B)	Base Station (4,24A)	Repeater Station	AIS-SART/MOB/EPIRB (1)	SAR A/C (9,5)	AtoN (21)
Navigational Status	0 = under way using engine, 1 = at anchor, 2 = not under command, 3 = restricted manoeuvrability, 4 = constrained by her draught, 5 = moored, 6 = aground, 7 = engaged in fishing, 8 = under way sailing, 9 = reserved for future amendment of navigational status for ships carrying DG, HS, or MP, or IMO hazard or pollutant category C (HSC), 10 = reserved for future amendment of navigational status for ships carrying DG, HS or MP, or IMO hazard or pollutant category A (WIG); 11 = towing astern, 12 = towing ahead, 13 = reserved for future use, 14 = AIS-SART (active), MOB-AIS (active), EPIRB-AIS (active) 15 = not defined = default (also used by AIS-SART, MOB-AIS, EPIRB-AIS under test)	X				X	X		
Class B Unit Flag	0 = Class B SOTDMA unit; 1 = Class B 'CS' unit		X	X		X			
Class B Msg 22 Flag	0 = No frequency management via Message 22 , operating on AIS1, AIS2 only; 1 = Frequency management via Message 22		X	X		X			
Class B DSC Flag	0 = Not equipped with DSC function 1 = Equipped with DSC function (dedicated or time-shared)		X	X		X			
Class B Display Flag	0 = No display available; not capable of displaying Message 12 and 14; 1 = Equipped with integrated display displaying Message 12 and 14		X	X		X			
Class B Band Flag	0 = Capable of operating over the upper 525 kHz band of the marine band; 1 = Capable of operating over the whole marine band (irrelevant if 'Class B Message 22 flag' is 0)		X	X		X			
Type of Electronic Position Fixing Device	0 = undefined (default); 1 = global positioning system (GPS); 2 = GLONASS; 3 = combined GPS/GLONASS; 4 = Loran-C; 5 = Chayka; 6 = integrated navigation system; 7 = surveyed; 8 = Galileo; 9 -14 = not used; 15 = internal GNSS	X	X		X	X		X	X
Overall Dimension / Reference for Position	Reference point for reported position. Also indicates the dimension of ship (m) (see Figure 41 and § 3.3.3, Annex 8 in ITU-R M.1371-5) For SAR aircraft, the use of this field may be decided by the responsible administration. If used it should indicate the maximum dimensions of the craft. As default should A = B = C = D be set to '0'	X	X	X		X		X	X

EXACT DATA BROADCASTED VIA AIS BY STATION TYPE (Messages Used) Note: Not all data may be portrayed on shipboard or shore-side display systems		Class A (1,5,27)	Class B/SO (18,19, 24B)	Class B/CS (18,24A,24B)	Base Station (4,24A)	Repeater Station	AIS-SART/MOB/EPIRB (1)	SAR A/C (9,5)	AtoN (21)
Vendor ID	Unique identification of the Unit by a number as defined by the manufacturer (option; '@@@@@@@' = not available = default) See Table 79A in ITU-R M.1371-5.		X	X		X			
Maximum Present Static Draught	In 1/10 m, 255 = draught 25.5 m or greater, 0 = not available = default; in accordance with IMO Resolution A.851. Not applicable to SAR aircraft, should be set to 0	X				X			
IMO Number	1-999999999; 0 = not available = default – Not applicable to SAR aircraft. 0000000001 – 0000999999 not used 0001000000 – 0009999999 = valid IMO number 0010000000 – 1073741823 = official Flag State number.	X				X		X	
ETA	Estimated time of arrival; MMDDHHMM UTC Bits 19-16: month; 1-12; 0 = not available = default Bits 15-11: day; 1-31; 0 = not available = default Bits 10-6: hour; 0-23; 24 = not available = default Bits 5-0: minute; 0-59; 60 = not available = default For SAR aircraft, the use of this field may be decided by the responsible administration	X				X		X	
Destination	Maximum 20 characters using 6-bit ASCII; @@@@@@@@@@@@@@@@@@@@ = not available For SAR aircraft, the use of this field may be decided by the responsible administration	X				X		X	
AIS Version Indicator	0 = station compliant with Recommendation ITU-R M.1371-1; 1 = station compliant with Recommendation ITU-R M.1371-3 (or later); 2 = station compliant with Recommendation ITU-R M.1371-5 (or later); 3 = station compliant with future editions	X				X		X	
UTC Year	1-9999; 0 = UTC year not available = default				X				
UTC Month	1-12; 0 = UTC month not available = default; 13-15 not used				X				
UTC Day	1-31; 0 = UTC day not available = default				X				
UTC Hour	0-23; 24 = UTC hour not available = default; 25-31 not used				X				
UTC Minute	0-59; 60 = UTC minute not available = default; 61-63 not used				X				

EXACT DATA BROADCASTED VIA AIS BY STATION TYPE (Messages Used) Note: Not all data may be portrayed on shipboard or shore-side display systems		Class A (1,5,27)	Class B/SO (18,19, 24B)	Class B/CS (18,24A,24B)	Base Station (4,24A)	Repeater Station	AIS-SART/MOB/EPIRB (1)	SAR A/C (9,5)	AtoN (21)
UTC Second	0-59; 60 = UTC second not available = default; 61-63 not used				X				
Altitude Sensor	0 = GNSS; 1 = barometric source							X	
Altitude (GNSS)	Altitude (derived from GNSS or barometric (see altitude sensor parameter below)) (m) (0-4 094 m) 4 095 = not available, 4 094 = 4 094 m or higher							X	
Position Latency	0 = Reported position latency is less than 5 seconds; 1 = Reported position latency is greater than 5 seconds = default	X							
Type of aids-to-navigation	0 = not available = default; refer to appropriate definition set up by IALA. See table 74 in ITU-R M.1371-5					X			X
Off-position indicator	For floating AtoN, only: 0 = on position; 1 = off position					X			X
AtoN status	Reserved for the indication of the AtoN status; 00000000 = default. IALA Rec. A126 provides guidance on its use.					X			X
Virtual AtoN flag	0 = default = real AtoN at indicated position; 1 = virtual AtoN, does not physically exist					X			X
Communication State	The communication state provides the following functions: (1) it contains information used by the slot allocation algorithm in the SOTDMA concept; and, (2) it also indicates the synchronisation state. See 3.3.7.2.2 SOTDMA communication state in ITU-R M.1371-5.	X				X	X		

ANNEX D AIS FUNCTIONALITY BY LAYER AND STATION TYPE

Table 7 AIS Functionality By Layer and Station Type

	AIS Station Types / Functionality	Class A	Class B 'SO'	Class B 'CS'	AtoN	Base Station	AIS-SART MOB-AIS EPIRB-AIS	Repeater	SAR Aircraft	Limited Base Station
PHYSICAL LAYER	Dual Channel	C	C	C	R, C[3]	C	C	C	C	O
	Single Channel	N	N	N	O, N[3]	N	N	N	N	O
	Full Frequency Range Capability	C	O	O	O	C	N	O	O	O
	Receive / Transmit	C	C	C	N, C[3]	C	N	C	C	C
	Transmit Only	N	N	N	C, N[3]	N	C	N	N	N
	DSC Functionality	R	R	R	N	O	N	N	R	R
	Operating Frequency Assignment Capability	C	O	O	N	N	N	N	C	O
	Transmit Power in Watts: High (Nominal) Setting	12.5	5	2	M	M	M	12.5	M	12.5
	Transmit Power in Watts: Low Power Setting	1	1	N	M	M	M	2	M	1
NETWORK LAYER	*Channel Operation & Management*									
	Default Channel Operation AIS 1 & AIS 2	C	C	C	C	C	C	C	C	C
	Channel Management Message 22	C	C	C	N	N	N	N	C	C
	DSC Telecommand	C	O	O	N	N	N	N	C	N
	Manual Input	C	N	N	N	N	N	N	N	N
	Presentation Interface	C	N	N	N	C	N	N	C	C
	Reporting Modes A, B or C	N	N	N	C	N	C [B Mode]	N	N	N
	Frequency Agile	C	O	O	O	C	N	O	O	O
	Slot Re-Use Data Link Congestion.	C	C	N	N, C[3]	C	N	C	C	N
	Long Range	C	N	N	N	N	N	N	N	N

	Functionality \ AIS Station Types	Class A	Class B 'SO'	Class B 'CS'	AtoN	Base Station	AIS-SART MOB-AIS EPIRB-AIS	Repeater	SAR Aircraft	Limited Base Station
LINK LAYER	*TDMA Synchronisation*									
	UTC Indirect	C	O	O	N	C	N	C	C	O
	Use Semaphore Synchronisation	C	O	N	N	C	N	C	C	N
	Act as Semaphore	C	O	N	N	C	N	N	C	N
	Tiiming									
	Long Transmission Packets. No. of Slots	3	3	12	3	5	1	3	3	R
	Mode Of Operation									
	Autonomous	C	C	C	C	C	C	C	C	C
	Assigned	C	C	C	N	N	N	N	C	C
	Polled	C	C	C	N	C	N	N	C	C
	Limitation Maximum Permissible Number of Slots Per Frame.	20	31	31	20	None	10	None	20	20
	VDL Access Schemes									
	SOTDMA	C	C	N	N	N	N	N	C	N
	RATDMA	C	C	N	N, C[3]	O	N	C	C	C
	ITDMA	C	C	N	N	N	N	N	C	C
	FATDMA	N	N	N	C	C	N	O	N	N
	CSTDMA	N	N	C	N, O[3]	N	N	N	N	N

Notes

[1] The limitation is for messages 6, 8, 12 & 14.
[2] Only if the Class B has a presentation port
[3] Only for AIS ATON Type III stations.

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C - Compulsory in any configuration
O - Optional
R - Receive only
M - Manufacturer to determine
N - Not allowed

This table supersedes the information in IALA Guideline 1059 on the Comparison of AIS Stations. Specifications or behaviour in the tables are subject to changes that may arise during further development. These will be incorporated in future revisions of this guideline.

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ANNEX E AIS DOCUMENTATION OVERVIEW

Table 8 AIS documentation matrix

Organisation	Doc Number	Doc Name	Status	Key points	Comments
IMO	Res. MSC.74(69) 12 May 1998	Adoption Of New And Amended Performance Standards	In Force	Annex 3 – performance standards for AIS.	Provides the basic elements of what AIS should do. Introduces key terms – autonomous and continuous, static, dynamic and voyage related information.
IMO	Res. A.917(22) 29 Nov 2001	Guidelines For The Onboard Operational Use Of Shipborne Automatic Identification Systems (AIS)	In Force (amends Res. A.956(23))	Provides the objectives of AIS, Description of shipborne AIS, data sets, reporting rates, operation, limitations, use of AIS for collision avoidance, AIS in VTS / SAR and AtoN.	Reporting rates identified – from 2 sec to 3 min, depending on speed and activity for dynamic info; every 6 min for static info (or on demand)
IMO	Res. A.956(23) 26 Feb 2004	Amendments To The Guidelines For The Onboard Operational Use Of Shipborne AIS (Res. A.917(22))	In Force (amends Res. A.917(22))	Operation of Transceiver Unit – (para 21) Change includes security aspects – including option to turn off the AIS 'or where security incidents are imminent'.	Notes that when a ship is in a Ship Reporting System (SRS) there is a requirement for the master to report the reason for turning off the AIS.
IMO	Res. MSC.99(73) 5 Dec 2000 Regulation 19, SOLAS	Adoption Of Amendments To The International Convention For The Safety Of Life At Sea, 1974, As Amended	In Force (amended by Diplomatic Conference)	Original implementation dates for AIS with incremental implementation starting 1 July 2002 and ending 1 July 2008.	Amended by Diplomatic Conference on Maritime Security, 2002 - Original phased in implementation brought forward to completion by 1 July 2004.

Organisation	Doc Number	Doc Name	Status	Key points	Comments
IMO	Res. MSC.140(76) 5 Dec 2002	Recommendation For The Protection Of The AIS VHF Data Link (VDL)	Superseded by Res. MSC.347(91)	Related to the introduction of AIS Class B. Recognises the 'compelling need to ensure the integrity of the VHF Data Link (VDL)' and puts onus on administrations	To Note: .1 Class B AIS devices, as well as any device which transmits on the radio channels AIS 1 or AIS 2, should meet the appropriate requirements of Recommendation ITU-R M.1371 (series); .2 Class B AIS devices should be approved by the Administration; .3 Administrations should take steps necessary to ensure the integrity of the radio channels used for AIS in their waters.
IMO	MSC Circ.1062 16 Dec 2002	Maintenance And Administration Of AIS Binary Messages	Superseded Led to SN/Circ.236 then to SN.1 /Circ.289	Notes the process for handing over responsibility for Binary Messages	Initially, IALA dealt with Binary Messages, in conjunction with ITU. The capability of binary messages has continued to evolve.
IMO	Res. MSC.246(83) 8 Oct 2007	Adoption Of Performance Standards For Survival Craft AIS Search And Rescue Transmitters (AIS-SART) For Us In Search And Rescue Operations.	In Force	Provides performance standards for the AIS-SARTS.	Indicates that AIS-SARTs fitted on vessels conform to the identified performance standards.
IMO	MSC. Circ.1252 20 Oct. 2007	Guidelines On Annual Testing Of The Automatic Identification System (AIS)	In Force	Provides guidance and a checklist to perform the annual test as required by SOLAS V/Reg.18.9 (Res. MSC.308(88))	-

Organisation	Doc Number	Doc Name	Status	Key points	Comments
IMO	Res. MSC.347(91) 30 Nov. 2012	Recommendation For The Protection Of The AIS VHF Data Link (VDL)	In Force (supersedes MSC.140(76)).	Related to the introduction of AIS Class B, AIS-SART and other AIS devices. Recognises the 'compelling need to ensure the integrity of the VHF Data Link (VDL)' and puts onus on administrations.	Recommends that: any device which transmits on the radio channels allocated for AIS, should meet the appropriate requirements of Recommendation ITU-R M.1371; that all such transmitting devices should be approved by the Administration; and, that Administrations should take the steps necessary to ensure the integrity of the radio channels used for AIS in their waters.
IMO	MSC. Circ.1473 23 May 2014	Policy On Use Of AIS Aids To Navigation	In Force		IMO opted not to use the term synthetic AIS AtoN, but, did not prohibit their use.
IMO	SN/Circ.217 11 July 2001	Interim Guidelines For The Presentation And Display Of AIS Target Information	In Force	Presents the symbol - triangle – for AIS targets	For symbology, also note IHO S57, IALA Rec. V-125 (2003), ISO 19018 (2004) and IEC 62288 (2008)
IMO	SN/Circ.227 6 January 2003	Guidelines For The Installation Of A Shipborne Automatic Identification System (AIS)	In Force (amended by SN/Circ.245)	Details on installation of AIS on board vessels, including interference with VHF, antenna installation, GNSS installation, installation of the unit on the bridge, static and dynamic data input, long range function,.	Issues have arisen with regards to the positioning of the antenna (interference); the quality of the GNSS feed; input of data.

Organisation	Doc Number	Doc Name	Status	Key points	Comments
IMO	SN/Circ.244 15 Dec 2004	Guidance on the use of the UN/LOCODE in the destination field in AIS messages	In Force	Adopts the use of UN LOCODE to express the origination and destination of a voyage	
IMO	SN/Circ.227 corr.1 10 Dec 2008	Corrigenda To SN/Circ.227 On Guidelines For The Installation Of A Shipborne Automatic Identification System (AIS)	In Force (correction to SN/Circ.227)	Contains changes to ship type, second digit, dangerous cargo.	Developed to reflect the entry into force of resolution MEPC.118(52), concerning the change in the categorization and listing of Noxious Liquid Substances and other substances.
IMO	SN/Circ.245 15 Dec 2004	Amendments To The Guidelines For The Installation Of A Shipborne AIS (SN/Circ.227)	In force (amends SN/Circ.227)	Only change is the inclusion of an uninterrupted power source (UPS) for the AIS.	
IMO	SN/Circ.236 28 May 2004	Guidance On The Application Of AIS Binary Messages	Superceded	Provides information on the use of the 7 agreed AIS Binary Messages. Met/Hydro; Dangerous Cargo; Fairway closed; Tidal Window; Extended ship / voyage related data; Number of people on board; Pseudo AIS targets.	The display capability of AIS binary messages is not part of the mandatory functions of the MKD (Minimum Keyboard and Display). The display may require hardware additional to the AIS and dedicated software. After 1 Jan 2013 IMO SN.1/Circ.289 is applied.
IMO	SN/Circ.243 15 Dec 2004	Guidelines For The Presentation Of Navigation-Related Symbols, Terms And Abbreviations	In Force	Provides guidance on the appropriate use of navigation-related symbols to achieve a harmonized and consistent presentation.	Includes presentation of AIS. This circular is references in IEC 62288.

Organisation	Doc Number	Doc Name	Status	Key points	Comments
IMO	SN.1/Circ.289 2 June 2010	Guidance On The Use Of AIS Application Specific Messages	In Force	Supersede SN/Circ.236.	There will be significant functionality available for the use of these messages.
IMO	SN.1/Circ.290 2 June 2010	Guidance For The Presentation And Display Of AIS Application-Specific Messages (ASM) Information.	In Force	Provides guidelines on how to present ASM in various formats.	Critical in effectively providing ASM information.
IMO	SN/Circ.243 / Rev.1 23 May 2014	Amended Guidelines For The Presentation Of Navigation-Related Symbols, Terms And Abbreviations	In Force	Provides guidance on the appropriate use of navigation-related symbols to achieve a harmonized and consistent presentation.	Includes presentation of AIS. This circular is references in IEC 62288.
IMO	SN/Circ.1473 23 May 2014	Policy on use of AIS Aids to Navigation	In Force	Defines AIS AtoNs as either Physical or Virtual	Omits the use of synthetic as defined in IALA documents
IMO	COMSAR.1/Circ.46 4 Feb. 2009	AIS Safety-Related Messaging	In Force	Notes issue of using pre-fabricated messages in AIS.	While some units can use pre-set safety related messages (such as can be used in GMDSS, DSC) the system was not designed for such use.

Organisation	Doc Number	Doc Name	Status	Key points	Comments
	From IMO web site (www.imo.org)	**Maritime security - AIS ship data** At its79th session in December 2004, the Maritime Safety Committee (MSC) agreed that, in relation to the issue of freely available automatic information system (AIS)-generated ship data on the world-wide web, the publication on the world-wide web or elsewhere of AIS data transmitted by ships could be detrimental to the safety and security of ships and port facilities and was undermining the efforts of the Organization and its Member States to enhance the safety of navigation and security in the international maritime transport sector. The Committee condemned the regrettable publication on the world-wide web, or elsewhere, of AIS data transmitted by ships and urged Member Governments, subject to the provisions of their national laws, to discourage those who make available AIS data to others for publication on the world-wide web, or elsewhere from doing so. In addition, the Committee condemned those who irresponsibly publish AIS data transmitted by ships on the world-wide web, or elsewhere, particularly if they offer services to the shipping and port industries.			
ITU	ITU-R M.1371-5 2014/02	Technical Characteristics For An Automatic Identification System Using Time Division Multiple Access In The VHF Maritime Mobile Band	Version 5 In Force	Provides the overall technical basis for the working of AIS, including SOTDMA, RATDMA, FATDMA, ITDMA and CSTDMA	ITU recommends that that the AIS design should take into account technical guidelines maintained and published by IALA.
ITU	ITU-R M.585-6 2012/01	Assignment And Use Of Maritime Mobile Service Identities	Version 6 In Force Note: version 7 will be published in 2015	Identifies numbering system for MMSIs,	Includes numbering process for ship stations, shore stations, AIS-SART/MOD-AIS/EPIRB-AIS and AIS aids to navigation.
ITU	ITU-R M.1842				
ITU	ITU-R M.2092				
ITU Documents Are Available For Download From ITU Website www.ltu.lnt					

Organisation	Doc Number	Doc Name	Status	Key points	Comments
IEC	61097-14, Ed.1 2010/02	Global Maritime Distress And Safety System (GMDSS) - Part 14: AIS-SART	In Force	Global maritime distress and safety system (GMDSS) – Part 14: AIS search and rescue transmitter (AIS-SART)	AIS-SART is acceptable for carriage by SOLAS vessels from 1 January 2010
IEC	61162-1, Ed.4 Ed 4.0 2010/11	Maritime Navigation And Radiocommunication Equipment And Systems – Digital Interfaces – Part 1: Single Talker And Multiple Listeners	In Force	Contains the requirements for data communication between maritime electronic instruments, navigation and radiocommunication equipment when interconnected via an appropriate system.	Includes AIS presentation interface sentences. (in addition, refer to NMEA 0183)
IEC	61993-2, Ed.2 2012/10	Part 2: Class A Shipborne Equipment Of The Universal Automatic Identification System (AIS) – Operational And Performance Requirements	In Force	Provides the actual testing standard for the equipment. Equipment bought should note compliance with this standard. As part of maintenance cycle, this document is being updated by the IEC AIS Working Group.	Note – 61993-1 is for Shipborne automatic transponder system installation using VHF digital selective calling (DSC) Techniques.
IEC	62287-1, Ed.2.1 2013/04	Class B Shipborne Equipment Of The Automatic Identification System (AIS) –Part 1: Carrier-Sense Time Division Multiple Access (CSTDMA) Techniques	In Force	Provides the actual testing standard for equipment – equipment bought should note compliance with this standard. Note Politeness factor to accommodate activity on the VDL.	For CSTDMA only. .

Organisation	Doc Number	Doc Name	Status	Key points	Comments
IEC	62287-2, Ed.1.0 2013/04	Class B Shipborne Equipment Of The Automatic Identification System (AIS) –Part 2: Self-Organising Time Division Multiple Access (SOTDMA) Techniques	In Force	Testing standard for the equipment. SOTDMA AIS Class B that continues to reflect politeness factor to accommodate activity on the VDL.	
IEC	62288, Ed.2.0 2015/01	Presentation Of Navigation-Related Information On Shipborne Navigational Displays	In Force	Specifies presentation of navigational information, including navigational terms, abbreviations, colours and symbols.	Addresses the presentation of information, including the display of AIS units.
IEC	62320-1, Ed.2.0 2015/01	Part 1: AIS Base Stations - Minimum Operational And Performance Requirements, Methods Of Test And Required Test Results	In Force	Provides the actual testing standard for equipment – equipment bought should note compliance with this standard. Through implementation of the standard, some corrections have been identified, and a PAS (Publically available standard) is being developed.	Some presentation interface sentences were created for the AIS Base Station, which are being reviewed in the IEC process for inclusion into IEC 61162. Liaison work is underway to resolve PI sentence issues.
IEC	62320-2, Ed.1.0 (2008)	Part 2: AIS Fitted To Aids To Navigation (Aton)	In Force	Introduces concept of three types of AIS, with different functionality. When completed, equipment purchased should note compliance with the standard.	Main difference between types of AIS AtoNs: Type 1 – no receiver Type 2 – receiver for control functions only Type 3 – 2 receiving processes for autonomous mode

Organisation	Doc Number	Doc Name	Status	Key points	Comments
IEC	62320-3, Ed. 1.0 (2015)	Part 3: Repeater stations	In Force	specifies the minimum operational and performance requirements, methods of testing and required test results for AIS repeater stations	
IEC Documents are available for purchase from IEC website http://webstore.iec.ch/webstore/webstore.nsf/artnum/028339					
IALA	Rec. A-123 June 2007	On the Provision of Shore Based Automatic Identification Systems (AIS)	In Force – Previous edition Dec. 2003	A-123 provides high level indication of the need for AIS Base Stations.	This has recently been updated and continues to reflects the overall vision of AIS as presented in SOLAS, Chapter V. Additional reference for Symbology ISO 19018 (2004)
IALA	Rec. A-124 Ed. 1.2 Dec. 2003	On Automatic Identification System (AIS) Shore Station and Networking Aspects relating to the AIS Service	In Force – under review	The initial concepts of AIS Base Stations, Repeaters and Limited Base Stations. Requires significant revision.	During the process of developing IEC 62320-1 many areas of A-124 were identified for change and a substantial revision is being carried out.
IALA	Rec. V-125 Ed. 2 Dec. 2004	The Use And Presentation Of Symbology At A VTS Centre (Include AIS)	In Force	Provides information on symbology for use at VTS Centres.	Ed. 1 covered AIS aspects only, while Ed. 2 provides a broader view for symbology.

Organisation	Doc Number	Doc Name	Status	Key points	Comments
IALA	Rec. A-126 June 2007	The Use Of Automatic Identification Systems (AIS) In Aids To Navigation	In Force / Previous edition Dec. 2003	Initial information for using AIS as an AtoN	In developing IEC 62320-2 many areas of A-126 were identified for change, and this document represents substantial changes to the initial edition. A-126 is currently under review.
IALA	Rec. V-128 Ed. 3 June 2007	Operational And Technical performance Requirements For VTS Equipment	In Force	Annex 3 identifies technical requirements for AIS in a VTS centre.	Notes that AIS is a sensor that can be used in VTS.
IALA	Rec. O-143 March 2010	Virtual Aids To Navigation	In Force	Notes application, risks and benefits of virtual aids to navigation.	AIS can be used to transmit virtual aids to navigation. IALA Guideline 1081 provides amplification on the use of virtual aids to navigation.
IALA	Guideline 1026 Dec. 2001	On AIS As A VTS Tool	In Force	Notes how AIS can assist in VTS.	The introduction of AIS in VTS is under review at IALA – an IALA questionnaire is being circulated to gather status of AIS in VTS and to update relevant documents.
IALA	Guideline 1028 ed.1.3 Dec. 2004	On Automatic Identification (AIS) – Volume 1, Part 1 – Operational Issues	In Force / Replaced Guideline 1019 on AIS	Provides information on the actual operation of AIS.	Provides detailed information on how AIS works. (note – this guideline is no longer being maintained)

Organisation	Doc Number	Doc Name	Status	Key points	Comments
IALA	Guideline 1029 ed.1.1 Dec 2002	On Automatic Identification System (AIS) – Volume 1, Part 2 – Technical Issues	In Force / Replaced Guideline 1019 on AIS	Provides information on the technical aspects of AIS Range formula provided.	Provides detailed technical information, very in-depth on the provision of shore based AIS. (note – this guideline is no longer being maintained)
IALA	Guideline 1032 June 2003	Aspects Of Training Of VTS Personnel Relevant To The Introduction Of The Automatic Identification System	In Force	Notes the required training for VTS Personnel when AIS is introduced.	
IALA	Guideline 1050 Dec. 2005	Management And Monitoring Of AIS Information	In Force	Notes the benefits to using AIS in planning and managing aids to navigation systems.	AIS can provide many organisational benefits, both in short term / real time and in long term analysis of data.
IALA	Guideline 1059 June 2008	Comparison Of AIS Stations	In Force	Compares and presents each of the AIS stations.	Will be withdrawn on completion of this document
IALA	Guideline 1062 Dec. 2008	Establishment Of AIS As An Aton	In Force	Identifies possible functions of AIS as an AtoN.	There are benefits to the use of AIS as an AtoN. The impact on the VDL needs to be taken into account.
IALA	Guideline 1081 March 2010	Virtual Aids To Navigation	In Force	Introduces concepts of virtual aids to navigation; user needs; benefits and risks.	Amplifies information presented in Rec. O-143

Organisation	Doc Number	Doc Name	Status	Key points	Comments
IALA	Technical Clarifications	Clarifications To ITU-R M.1371 Series	In Force	Created and maintained at the request of ITU.	Technical clarifications to ITU-R M.1371-4 have been developed and liaison between IALA / ITU is underway prior to publishing.
IALA	Plan Dec 2009	Radio Communications Plan	In Force		
IALA	1095 May 2013	Implementation of Application–Specific messages	In Force	Intends to aid in harmonisation and establishes the IALA ASM collection	Currently resides at http://www.e-navigation.nl/asm
IALA	1098 May 2013	Application of AIS AtoN on buoys	In Force	Provides guidance regarding, specification, installation and maintenance of AIS AtoN on buoys and fixed structures	
IALA Documents available for free download from IALA website www.iala-aism.org under 'publications'					