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On

The establishment of AIS as an Aid to Navigation

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1 General

IALA Recommendation A-126 on the Use of the Automatic Identification System (AIS) in Marine Aids to Navigation provides detailed information on the type of AIS AtoN services that may be provided. The Recommendation states that an AIS transponder could provide information and data that could:

- *Be used as an aid to navigation;*
- *Complement existing aids to navigation;*
- *Monitor the performance of aids to navigation;*
- *Monitor the 'on station' position of floating aids to navigation;*
- *Provide identity, state of 'health' and other navigational information such as meteorological and hydrological data, if available, to ships and shore authorities; and*
- *Be used to assess traffic type and patterns to assist in providing the appropriate level of service and mix of aids to navigation.*

Further, IALA A-126 recommends that *'National Members and other appropriate authorities providing marine aids to navigation services, use appropriate AIS units as part of their marine aid to navigation services for the provision of information data to shipping and monitoring purposes.*

In this manner, IALA has recognised that AIS can be applied to AtoN to further improve and enhance services to mariners as well as assisting AtoN authorities in ensuring that the provision of such aids to navigation as the volume of traffic justifies and the degree of risk requires, as stated in SOLAS, Chapter V, Reg13 *'Establishment and operation of aids to navigation'*.

The Contracting Government is to '*undertake to arrange for information relating to aids to navigation to be made available to all concerned, and AIS provides a means of promulgating near-real time information on aids to navigation*' (SOLAS, Chapter V, Reg13, clause 3).

It needs to be noted that as of the date of issue of this Guideline, the International Maritime Organization (IMO) is continuing development work on the application of AIS binary messages. The outcomes of this continuing development may require this Guideline to be reviewed and updated in the future.

2 Objective

When deploying AIS AtoN it is important to bear in mind that not all vessels are equipped with AIS. In addition, for those vessels that are AIS equipped, the display of AIS data can range from no display, or limited display on some AIS Class B units, to the use of minimum keyboard display (MKD) on some AIS Class A units to full ECDIS and Radar overlay. In the absence of ECDIS or Radar overlay users will not be able to fully use AIS AtoN functionality. The potential to display AIS AtoN data will increase in the future, as all Radars for SOLAS vessels fitted from 1 July 2008 must be able to display AIS data.

It is also very important when considering deploying AIS AtoN to bear in mind the mariner's need of for appropriate, relevant, accurate and unambiguous information.

Particular care must be exercised with the activation and promulgation of virtual AIS AtoN so as to avoid errors, particularly errors in position, and to avoid the unintentional creation of situations where mariners could be faced with too much information, irrelevant information, or information that results in confusion or distraction.

The criteria for the use of AIS as an AtoN should be based on the navigational requirement derived from the assessment of risk.

There is a distinction between the application of AIS as an AtoN to assist in safe navigation and other applications of interest to the AtoN authority, such as AtoN performance monitoring.

3 Scope

This guideline identifies general criteria to assist AtoN authorities in determining whether AIS AtoN functionality should be provided and, if so, what approach should be taken to establish the AIS AtoN. This guideline should be read in conjunction with IALA Recommendation A-126, ITU Recommendation M.1371 and the relevant references as provided in Section 12.

This document does not provide advice to the mariner on the use of AIS nor should it be considered a comprehensive source of information on AIS regulations and specifications.

4 Function of AIS AtoN

The use of AIS as an AtoN can provide the following services to AIS equipped vessels: (this is not priority list)

- Provide identification of the AtoN in all weather conditions;
- Complement existing signals from AtoN (e.g. Racon);
- Transmit accurate positions of floating AtoN;
- Indicate if a floating AtoN is off position;
- Mark or delineate tracks, routes, areas, and limits (for example, areas to be avoided and Traffic Separation Schemes (TSS));
- Mark offshore structures (for example, wind turbines, wave and tidal energy devices, oil and gas platforms); and
- Provide weather, tidal, and sea state data.
- Provide additional AtoN capability through use of virtual AIS AtoN where installation of physical AtoN is technically or economically difficult;
- Indicate AtoN status; and
- Provide an accurate position for fixed AtoN which act as reference targets for verifying radar.

In addition, the use of AIS as an AtoN can provide a number of benefits to the AtoN authority:

- Monitor the status of an AtoN
- Track AtoNs that are off position;

- Assist in the identification of ships involved in collisions with AtoN through provision of exact AtoN position data
- Gather real-time (or near real-time) information on the 'state of health' of an AtoN;
- Remotely control changes in AtoN parameters (if so equipped);
- Provide statistics on reliability of AtoNs
- Extend the coverage (range) of AIS monitoring
- Enable timely marking of new wrecks and dangers and identify temporary recommended routes through the use of virtual AIS AtoNs
- Monitor the status of other support equipment at the site;

5 VDL Considerations

As noted in A-126, an authority planning the application of AIS for AtoN should bear in mind the message capacity of the VHF data link (VDL).

In areas of high VDL activity, for example crowded shipping areas, transmission of AIS information from non-shipborne units should be kept to a level that will avoid overloading the VDL. The Competent Authority should consider increasing the reporting interval of AtoN AIS messages to reduce congestion while ensuring that the effectiveness of the transmission is not decreased.

6 Definitions of AIS AtoN and examples of use

The use of AIS AtoN can vary from the provision of an actual unit on a physical AtoN to the transmission of a 'synthetic' or 'virtual' AtoN by an AIS base station, where they fall within the footprint of the base station.

As with all AIS AtoN, these units should be established taking into account the needs of all waterway users – SOLAS and non-SOLAS.

Whenever considering the use of virtual AIS AtoN extreme care must be taken to avoid errors, particularly errors in position, and to avoid the creation of situations where mariners may be faced with too much information, irrelevant information, or information that results in confusion or distraction. Exercising such care will require the development and use of strict procedures and protocols that include verification of the appropriateness of the selected AIS AtoN and its accuracy.

6.1 Real (Physical) AIS AtoN

A 'real' AIS AtoN is one that is physically located on the AtoN. This unit transmits:

- Message 21 – identification of AtoN and current geographical position status;
- Message 8 – meteorological and hydrological-data or other IMO message;
- Message 21 and 14 – hazards to navigation
- Message 6 – AtoN monitoring message

There are three types of real AIS AtoN:

- Type 1 – transmit only station
- Type 2 – similar to type 1, includes a receiver for remote configuration

- Type 3 – full transmit and receive station.

All three station types are capable of switching off and 'sleeping' between transmissions to conserve power use.

It may be appropriate to use real AIS AtoN on existing aids to navigation to realize benefits as identified in Section 3. The power requirements for AIS AtoN need to be taken into account when looking to install on floating AtoN or on fixed AtoN in remote areas.

IEC 62320-2 provides the various capabilities of real AIS AtoN.

6.2 Synthetic AIS AtoN

There may be times when, for practical and/or economic reasons it is not appropriate to fit a real AIS to an AtoN. In these instances, consideration should be given to the use of 'Synthetic' AIS AtoN. There are 2 types of Synthetic AIS AtoN – 'Monitored Synthetic AIS AtoN' and 'Predicted Synthetic AIS AtoN'.

6.2.1 Monitored

A 'monitored' synthetic AIS AtoN is transmitted as a Message 21 from an AIS Base Station located in the vicinity of the AIS AtoN. In this instance, the AtoN physically exists, however there does not have to be a real AIS AtoN unit. The communication between the AtoN and the AIS shall confirm the location and status of the AtoN.

Possible areas where it may be appropriate to use 'Monitored Synthetic AIS AtoN' may include:

- on an existing monitoring system to transmit the AtoNs status via a base station;
- to feed meteorological / hydrological data via a base station.

6.2.2 Predicted

A 'predicted' synthetic AIS AtoN is transmitted as a Message 21 from an AIS Station located remotely from the AtoN. The AtoN exists, but there is no monitoring to confirm either location or status. Only a monitored synthetic AIS AtoN can ensure the integrity of the floating AtoN, therefore **the use of predicted synthetic AIS AtoN is not recommended for use on floating AtoN.**

Possible areas where it may be appropriate to use 'Predicted Synthetic AIS AtoN' may include:

- On fixed AtoN (i.e. lighthouses, beacons, etc.);
- On fixed hazards to navigation (i.e. fish farms, windturbines, plantforms, etc.)

6.3 Virtual

A 'virtual AIS AtoN' is transmitted as a message 21 for an AtoN that does not physically exist.

Virtual AIS AtoN are used where it is not physically possible or feasible to put the real AtoN on station, examples include ice conditions, new wrecks and dangers, etc. Possible areas where it may be appropriate to use 'Virtual AIS AtoN' are provided in more detail in Annex 1 and may include:

- Replace existing buoys or augment existing buoyage to increase safety of navigation;
- provide an AtoN when a physical AtoN is temporarily removed;

- Mark new danger or obstruction;
- Indicate deep water channels;
- Indicate a temporary recommended fairway;
- Indicate landfall or some other key point of interest;
- Identify hydrographic survey areas;
- Delineate exclusion zones / SAR or pollution zones.

6.4 Chained AIS AtoN

A chain of AIS AtoN Stations allows for communication from an AIS Base Station to AIS AtoN Stations that are remotely located and unable to communicate directly with the base station. Messages are passed from station to station until the intended recipient is reached.

The concept requires an AIS AtoN Station to have knowledge of other AIS AtoN Stations in the chain, namely its parent and all children below it in the chain.

A "parent station" is a station that is in the direction of the base station. A "child station" is a station that is directed away from a base station. In order to prevent unnecessary retransmission of the messages, each AIS AtoN Station in a chain may have only one parent, but may have multiple children (this includes all synthetic and virtual AIS AtoN).

7 Accessing the VDL

As with all AIS units, AIS AtoN require MMSI numbers to access the VDL.

The numbering format for AIS AtoN is as per ITU-R M585-4, Annex 4. This number is a nine-digit unique number using the format $9_1 9_2 M_3 I_4 D_5 X_6 X_7 X_8 X_9$ where the digits 3, 4 and 5 represent the MID and X is any figure from 0 to 9. In this format, the MID represents the territory or geographical area of the administration assigning the call identity for the navigational aid.

The administration may use the sixth digit to differentiate between certain specific uses of the MMSI, as shown in the example applications below:

a) 99MID1XXX Physical AIS AtoN

b) 99MID6XXX Virtual AIS AtoN

Synthetic AIS AtoN are identified through a flagged element of the MMSI configuration command.

8 Criteria for providing AIS AtoN to assist navigation

The criteria for fitting AIS to any AtoN should be based on the navigational requirement derived from the assessment of risk. AIS messages for an AtoN may be generated from information derived from the AtoN itself and broadcast directly from the AtoN, or broadcast from an AIS unit not located on the AtoN – i.e. a transmitting AIS base station.

8.1 Real AIS AtoN

8.1.1 Lighthouses and Beacons

The primary purpose of providing AIS AtoN functionality to lighthouses and beacons is to provide the mariner with a fixed point of reference on the shore, and to confirm the functionality of other AtoN provided on the station. Such a point of reference is the e-Navigation equivalent of the physical station and is of assistance to the mariner in identifying a particular point of land, for spatial awareness, in taking bearings or distances for position confirmation, or in laying off parallel index lines. The provision of AtoN functionality information gives advance information to the mariner on whether key AtoN are performing correctly and allows for revision of the passage plan if required.

Criteria

AIS AtoN functionality should be provided on Lighthouses and Beacons where a navigational assessment identifies the requirement set out above. Typical locations for consideration would include offshore stations, headland stations, landfall stations, stations that are commonly used as waypoints, stations that mark points on featureless coastlines, or isolated dangers.

8.1.2 Buoys and Major Floating Aids

In addition to the point of reference and AtoN information purposes described above for fixed AtoN the provision of AIS AtoN functionality on floating AtoN such as buoys and Major Floating Aids (MFA) provides confirmation of the floating AtoN position. Confirmation of position provides the mariner with an assurance that the AtoN can be used, improves spatial awareness, enables bearings and distances for position confirmation, or in laying off parallel index lines. Advance confirmation of the position of floating AtoN is a significant improvement in the service available to the mariner.

Criteria

An important consideration is to identify high risk areas where, in poor conditions, AIS can improve the conspicuity of AtoNs. The importance of the floating AtoN in the navigational solution is the key to assessing need for provision of AIS AtoN functionality. Therefore, it is likely that all Major Floating Aids (MFA) and Buoys of Primary Navigation Significance (BPNS) will be AIS equipped. Of the remaining floating AtoN, typical locations for consideration would include gateway buoys at the approach to narrow channels, buoys that are commonly used as waypoints, buoys marking isolated dangers, buoys marking the extremities of shoal areas and buoys that are critical to the mariner's spatial awareness.

8.2 Virtual AIS AtoN

Virtual AIS AtoN are used where it is not physically possible to put the real AtoN on station, examples include ice conditions, new wrecks and dangers, etc. or where additional AtoN can be provided to enhance safety of navigation. Virtual AtoN may also have a future role in replacing some MFA or buoys and in providing AtoN to meet the needs of special craft such as Wing-In-Ground (WIG) vessels.

Criteria

The criteria for use of virtual AIS will be influenced by the practicality of providing a physical AtoN and Real or Synthetic AIS. Where physical AtoN cannot be provided, for example in ice conditions, virtual AIS AtoN can contribute to reducing the risk and provide

additional information for the user. The need to rapidly mark wrecks and other new dangers with virtual AIS AtoN, often in advance of laying physical AtoN, will be based on an assessment of the danger posed to shipping in the area. The criteria for replacement of existing AtoN with virtual AtoN will involve an assessment of the navigational value of the physical characteristics. Typical locations would include deepwater AtoN intended primarily for SOLAS Convention vessels.

9 Additional applications of AIS AtoN

An AtoN Authority can gain benefit from the provision of AIS AtoN with regards to monitoring of aids to navigation, data collection and networking.

In establishing an AIS station, consideration should be given to future as well as present requirements

When deciding to implement AIS AtoN there are a series of steps / elements to be considered, as outlined in Figure 1. Each stage has a number of options and some key points to keep in mind in the process are also indicated.

9.1 Monitoring

There is a wide range of possible means of monitoring AtoNs. These range from physical observation, radar coverage, and electronic reporting through to full telemetry control systems. Whether an AIS AtoN Station is required for navigational purposes or not, AIS may still be used as an AtoN monitoring and networking tool.

Where AIS equipment at the AtoN is used for monitoring, consideration must be given to the possibility of the failure or the AIS itself while the AtoN continues to function. If a secondary monitoring system is available, any AIS messages being transmitted to the mariner may still be transmitted from an adjacent station as synthesised messages.

Where there is no AtoN requirement, the criteria for using AIS as an alternative means of monitoring will centre on cost, reliability and the value attached to the additional functionality available from the various systems.

9.2 Data Collection

AIS AtoN can collect and store data regarding the activity on the VDL. AIS AtoN can also be chained in a parent / child system to extend coverage range and enable data collection throughout a navigational area.

9.3 Networking

Networks of AIS Base Stations can provide a useful means of monitoring the integrity of transmitted AIS messages and for local storage of data.

The availability of detailed AIS vessel track information will contribute significantly to the navigational review process.

Where an AIS Base Station is being provided as part of the AtoN requirement, consideration should be given to utilisation of the station for monitoring of other AtoN in the area and for network, data storage and forwarding purposes as outlined in IALA Guideline 1050 on the Management and Monitoring of AIS Information. The criteria in this case are likely to centre on communications costs and reliability. While AIS data can be secured using time or event generated polling on dial-up lines, live streaming over broadband or similar high speed lines is preferred.

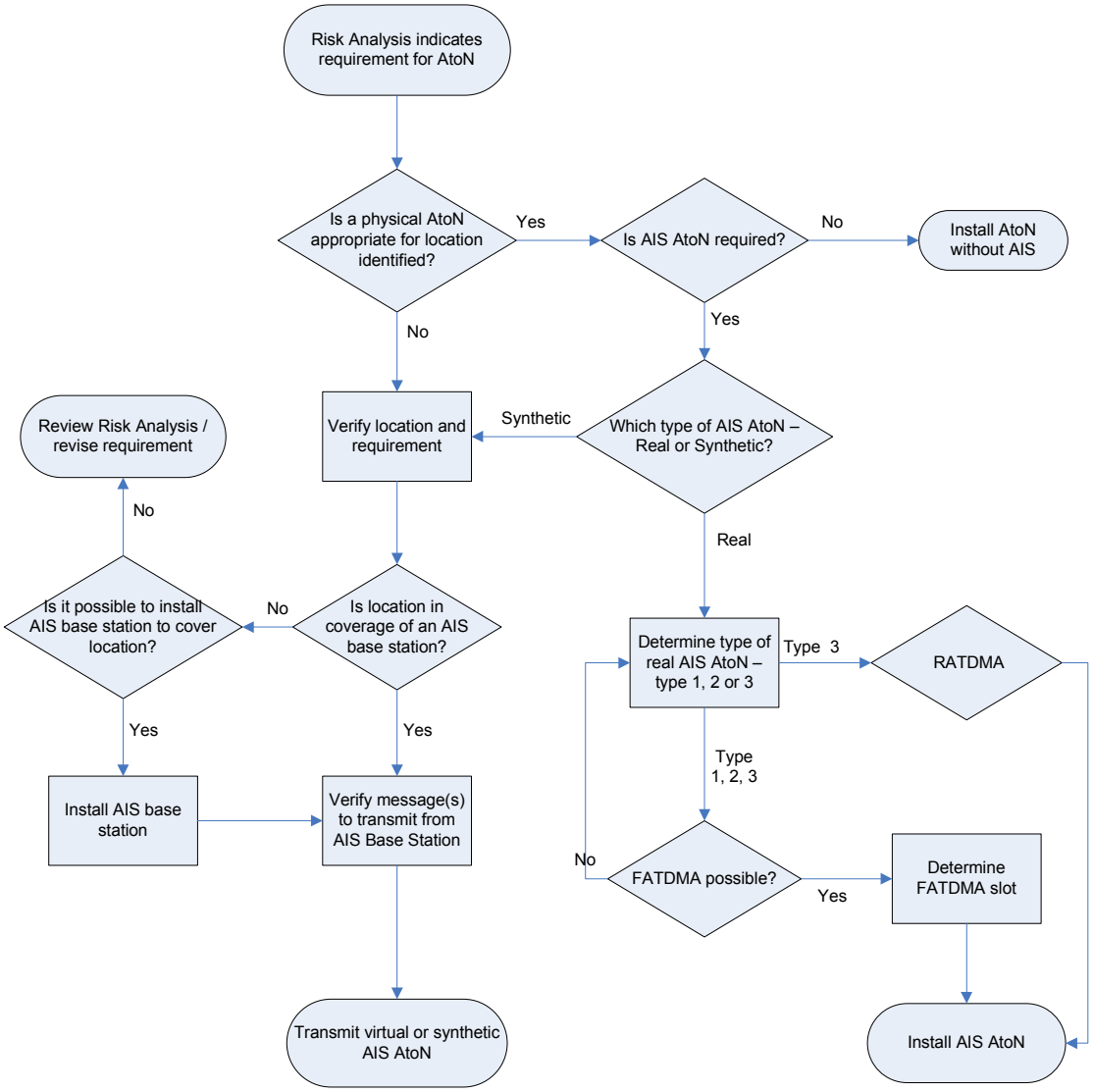

Figure 1 – Flow Chart for decision process, AIS AtoN

9.4 General considerations

A number of elements to consider when determining if an AIS AtoN is required include:

- Present use of the VHF data link (VDL) and possible impact on the VDL by the use of an AIS AtoN;
- Category of AtoN / criticality for navigation;
- Use of AIS AtoN for way points, identifying isolated danger or delineating TSS;
- User requirements (i.e. High Speed Craft);
- Additional functionality (Met / Hydro; DGNSS; other).

There are different options for the use of AIS AtoN. Table 1 – Overview of elements to consider for AIS AtoN – provides an overview of possible uses for real, synthetic or virtual AIS AtoN.

Table 1 – Overview of elements to consider for AIS AtoN

Element to be addressed	Real	Synthetic	Virtual	Chained
Low power availability at site		X	X	
Difficult to access site		X	X	X
Space limitations on site		X	X	
Requirement for remote monitoring	X			X
Additional functionality – met/hydro data; DGNSS; etc.	X			X
Location – difficult Environmental conditions (including tide / current; cyclone /hurricane; extreme temperature)		X	X	
Need for spatial awareness	X	X	X	X
Waterway use for SOLAS vessels only			X	
Waterway use mixed vessels	X	X		
Temporary marking of new danger / wreck			X	
Extend range of AIS system				X

10 AIS AtoN message use

AIS Message 21 is the primary AIS AtoN information message. This message provides details of the identity, position and status of the AtoN and will warn the mariner if any of the AtoN functions are not performing correctly. In addition, there are a number of other messages that can be used with AIS AtoN, enabling additional information to be transmitted to the mariner and also providing the AtoN authority with status and monitoring capabilities.

ITU-R M.1371 defines the AIS messages used, and IEC 62320 provides a summary of the AIS AtoN station messages. A summary of Message Types (current at date of publication) is available at Annex 3

11 Display of AIS AtoN and Symbology

Guidelines for display of AIS AtoN are provided by IMO in IMO SN/Circ.243 Guideline on AIS Symbology. This symbology relates to display on Radar, ECDIS or other similar systems and is based on the use of a diamond symbol.

IEC 62288 also sets out similar AIS Display System symbology and provides for the use of a ‘V’ symbol for virtual AIS in addition to the basic diamond symbol.

AIS symbology on navigational charts is governed by IHO standards.

Particular issues arise in relation to virtual AIS. Effective utilization of virtual AIS needs an internationally accepted standard on symbols defined by type so that the user can clearly identify the AtoN area of interest.

12 REFERENCES

1. *IALA Aids to Navigation Guide (NAVGUIDE) 5th Edition*
2. IALA Recommendation A-126.
3. IALA Guideline 1050
4. ITU-R M.1371
5. ITU-R M.585-4
6. IMO SOLAS Chapter V, Reg. 13
7. IEC 62320-2 AIS AtoN
8. IEC 62288-ECDIS
9. IEC 62388-New Radar

ANNEX 1 – Function of Virtual AtoN AIS

Application Mode	Function	Description	Type of Virtual AtoN AIS
Permanent Marking of Obstacles	Marking of Shoals and Reefs	Virtual AtoN can be effectively utilized where it is difficult to place a physical AtoN due to sea state, winds, or other environmental or ecological conditions. A clear marking of the shoals and/or reefs will improve safety of navigation.	Isolated Danger Marks
Permanent Marking (navigation support	Marking of Fairway Limits	Virtual AtoN can be effectively utilized where lighted buoys cannot be installed for some reason (i.e. sharing of waterway). A clear marking of the fairway limits will serve for orderly flow of marine traffic and improved safety of navigation.	Lateral Marks
	Marking of Fairways	Virtual AtoN can be effectively utilized where a physical AtoN placement is difficult due to the water depth, seabed, etc. A clear marking of the fairway will improve safety of navigation.	Lateral Marks, & Safe Water Marks
		Virtual AtoN can be effectively utilized in approaches to a harbour entrance where a ship changes its course and where it is difficult to install a physical AtoN. A clear marking of the point of approach will serve for an orderly flow of ships at a entrance and improve safety and efficiency of shipping.	Safe Water Marks
	Marking of Fairways & Marking of the Limits of Safe Water	Virtual AtoN can be effectively utilized where navigation becomes difficult due to a thick fog, heavy rain, etc. (This application can also be adapted as a temporary marking during a limited visibility.) Marking of a recommendable fairway during times of limited visibility will serve to improve safety of navigation and efficiency of shipping.	Lateral Marks, & Safe Water Marks
Temporary Marking	Marking of a Navigation Restricted Areas	Virtual AtoN can be effectively utilized when navigation restriction is required due to e.g., marine accidents or when marking of a wreck. A temporary navigation restriction can prevent subsequent incidents from developing.	Cardinal Marks, & Special Marks
	Designation of Temporarily Recommendable Fairways	Virtual AtoN AIS can be effectively utilized for indication of fairways when a large scale disaster hits the area. A clear marking of temporarily recommendable fairways will be expected to serve for the relief ships dispatched to the site and to support safe and effective relief activities.	Lateral Marks & Safe Water Marks
	Marking of Aids to Navigation that are malfunctioning or off position	Virtual AtoN AIS can be effectively utilized when a physical AtoN has lost ability to perform regular functions due to a natural disaster. When a physical AtoN lost ability to perform regular functions due to natural disasters, recovery actions are required at the earliest opportunity. Virtual AtoN can respond to the circumstance even if the actions by personnel cannot be achieved due to meteorological and/or hydrological conditions, and keep the influence of the trouble reach to ships in navigation at a minimum level.	Cardinal Marks, Lateral Marks, Isolated Danger Marks, Safe Water Marks, Special Marks, & Other Position Marks

Annex 2 – Description of AIS AtoN Stations

Reference IEC 62320-2

Requirements	Type 1 AIS AtoN Station	Type 2 AIS AtoN Station	Type 3 AIS AtoN Station	Alternatives
VDL Receiver	No Receiver	Receiver for control functions only	2 Receiving processes for autonomous mode	
Transmitted Messages	21			21 plus one or more of 6, 8, 12, 14, 25 and other appropriate messages (Types 1, 2 and 3) Plus 7, 13 (Type 3 only)
Access Mode for Message 21	FATDMA			FATDMA and RATDMA (Type 3 only)
Access Mode for Messages other than 21, if implemented				FATDMA (Type 1 and 2) One or more of FATDMA, RATDMA or CSTDMA (Type 3)
Configuration / Communication method	Defined by manufacturer			Defined by manufacturer with Standard Sentences (Type 1, 2 and 3)
Physical Communication Interface	None			The electrical and physical characteristics shall be defined by manufacturer. (Type 1, 2 and 3)
Transmit Power	12,5 W			As defined by manufacturer (Type 1, 2 and 3)
Transmitter capability	Dual channel			Single channel (Type 1 and 2)
Synthetic and Virtual AtoN	No			Yes (Type 1, 2 and 3)
Positioning Device	EPFS and Surveyed Position			Surveyed Position Only (no EPFS) (Type 1, 2 and 3)
UTC synchronisation	Direct Only			Direct, Indirect or semaphore (Types 3)
Assignment	Shall not respond to assignment Messages 16 and 23			
Interrogation	Shall not respond to interrogation Message 15			

Annex 3 – Summary of Current Message Types

Reference ITU-R M.1371

Message ID	Name	Description
1	Position report	Scheduled position report; (Class A shipborne mobile equipment)
2	Position report	Assigned scheduled position report; (Class A shipborne mobile equipment)
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	Addressed safety related message	Safety related data for addressed communication
13	Safety related acknowledgement	Acknowledgement of received addressed safety related message
14	Safety related broadcast 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)(4)
16	Assignment mode command	Assignment of a specific report behaviour by competent authority using a Base 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(8)
19	Extended Class B equipment position report	Extended position report for class B shipborne mobile equipment; contains additional static information(8)
20	Data link management message	Reserve slots for Base station(s)
21	Aids-to-navigation report	Position and status report for aids-to-navigation
22	Channel management(6)	Management of channels and transceiver modes by a Base station
23	Group assignment command	Assignment of a specific report 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 Part B: Static Data
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)

Annex 4 – LIST OF ACRONYMS

Acronyms	Explanation
AIS	Automatic Identification System
AtoN	Aids to Navigation
BPNS	Buoys of Primary Navigation Significance
CSTDMA	Carrier Sense Time Division Management
DGNSS	Differential Global Navigation Satellite System
ECDIS	Electronic Chart Display Information System
EPFS	Electronic Position Fixing Device
FATDMA	Fixed Access Time Division Multiple Access
IALA	The International Association of Marine Aids to Navigation and Lighthouse Authorities
IEC	International Electrotechnical Commission
IMO	International Maritime Organisation
ITU	International Telecommunications Union
MFA	Major Floating Aids
MID	Maritime Identification Digit (first three digits of the MMSI)
MKD	Minimum Keyboard Display
MMSI	Maritime Mobile Service Identity
RATDMA	Random Access Time Division Management
SOLAS	IMO Safety of Life at Sea Convention, 1974 as amended,
TSS	Traffic Separation Schemes
UTC	Universal time co-ordinated/ Universal Co-ordinated Time
VDL	VHF Data Link
VHF	Very High Frequency
WIG	Wing-in-Ground