

Paper for Consideration by NCWG

Requirement for an Indication of Synthetic AIS Aids to Navigation on Charts

Submitted by:	IHO Secretariat
Executive Summary:	A request has been received by the S-101PT from IALA to include new symbology to provide a clear distinction between Real and Synthetic AIS AtoNs in ENC's.
Related Documents:	S-4 – clause B-489.1; INT1 – S17.2 IALA Publication G1062 – <i>Guideline on the Establishment of AIS as an Aid to Navigation</i> IMO MSC.1/Circ.1473 (May 2014) – <i>Policy on Use of AIS Aids to Navigation</i>
Related Projects:	S-101; S-57; S-52

Introduction/Background

1. The S-101 Project Team (S-101PT) has recently received a request from IALA for synthetic AIS Aids to Navigation to be able to be distinguished from real (physical) AIS Aids to Navigation on charts, particularly in ENC. Current guidance for the depiction of AIS Aids to Navigation included at S-4 clause B-489.1 (and corresponding INT1 symbols at S17.2 and S-52/S-101 portrayal) does not make any distinction between the way that real (physical) and synthetic AIS Aids to Navigation are portrayed on charts.

Analysis/Discussion

2. The current S-4 guidance for the portrayal of AIS Aids to Navigation (AtoNs) associated with an established physical Aid to Navigation on charts is as follows:

B-489.1 An AIS-equipped Aid to Navigation (AtoN) may provide a positive identification of the aid. It may also transmit an accurate position, and provide additional information such as actual tidal height or local weather; details of these functions, which cannot be charted, should be provided in associated publications as appropriate. AIS transmissions must normally be charted using the magenta radio circle and international abbreviation 'AIS', see B-480:



S17.1 (with the letters in upright text) must be used for fixed AtoN and **S17.2** (with the letters in sloping text) must be used for floating AtoN.

In areas where the local authority has decided to transmit AIS signals from most aids to navigation such that individual depiction of all relevant aids as AIS-equipped will result in excessive chart clutter, the relevant hydrographic office should issue a statement to this effect and insert a note on charts (or in an associated publication) stating that AIS transmitters (except virtual AIS aids to navigation) will not be shown on charts.

Note: the signal may:

- actually be transmitted from a physical AtoN
 - apparently be transmitted from a physical AtoN (formerly referred to as a synthetic signal);
- or
- be transmitted to represent a non-existent AtoN (that is, a 'virtual' AtoN).

For signals actually or apparently transmitted from a physical AtoN, the centre position circle should be replaced by the symbol for the actual AtoN, for example a light star or buoy symbol. For charting a 'virtual' AIS AtoN, where no physical AtoN exists, see B-489.2.

It must be noted that this guidance does not distinguish, in regard to presentation, between an AIS AtoN where the AIS signal is generated from the physical aid itself (Real (Physical)) or from a remote AIS base station to simulate the position of the physical aid (Synthetic) as specified in the last paragraph of clause B-489.1 – “For signals actually or apparently transmitted from a physical AtoN, ...”. The only distinction on charts is between “Real” (comprising Real (Physical) and Synthetic) and Virtual AtoNs. This guidance was developed initially with input from IALA and IMO, with the final agreed on entry for Real AIS AtoNs included in INT1 as follows:

17.2		Automatic Identification System transmitters on floating marks (examples)	489.1
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3. The IALA specifications related to defining “Real (Physical)” and “Synthetic” AIS Aids to Navigation as included in IALA Publication G1062 – *Guideline on the Establishment of AIS as an Aid to Navigation* is as follows:

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 (e.g. lighthouses, beacons);
- On fixed hazards to navigation (e.g. fish farms, wind turbines, platforms)

A clear distinction is specified in this document between “Real (Physical)” and “Synthetic” AIS Aids to Navigation. [NOTE: There has never been any discussion in regard to IHO charting specifications for distinguishing “Monitored” Synthetic AtoNs and “Predicted” Synthetic AtoNs.]

4. However, IMO MSC.1/Circ.1473 (May 2014) – *Policy on Use of AIS Aids to Navigation* defines only “Physical” and “Virtual” AIS AtoNs:

3 Definition

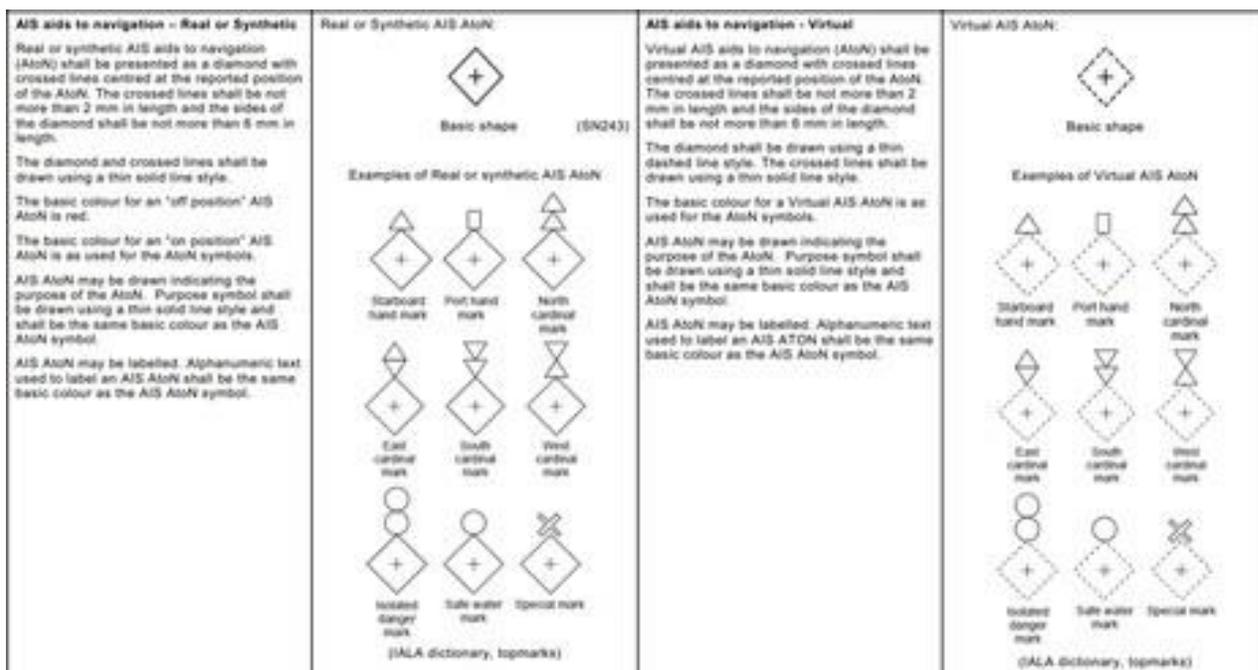
3.1 AIS Aids to Navigation

An AIS AtoN is a digital aid to navigation (AtoN) promulgated by an authorized service provider using AIS Message 21 "Aids to navigation report" that is portrayed on devices or systems (e.g. Electronic Chart Display and Information System (ECDIS), radar or Integrated Navigation System (INS)). An AIS AtoN can be implemented in two ways:

- .1 **Physical AIS AtoN:**
a Physical AIS AtoN is an AIS Message 21 representing an AtoN that physically exists; and
- .2 **Virtual AIS AtoN**
a Virtual AIS AtoN is transmitted as a Message 21 representing an AtoN that does not physically exist.

Discussion with IMO on the current specifications for charting AIS AtoNs confirmed that the definition for “Physical AIS AtoN” was intended to include both the IALA defined “Real (Physical)” and “Synthetic” AIS AtoNs. Corresponding symbols developed by IMO for implementation in ECDIS to display the broadcast AIS AtoN when the vessel is in range of the AIS signal included only 2 variants of a standard AIS AtoN symbol to satisfy these definitions with no indication for the “Physical AIS AtoN” as to whether the nature of the aid was Real or Synthetic.

5. The portrayal of AIS AtoNs as defined in IMO MSC.1/Circ.1473 is defined in IEC Publication 62288 - *Maritime navigation and radiocommunication equipment and systems – Presentation of navigation-related information on shipborne navigational displays – General requirements, methods of testing and required test results:*



6. When developing the current guidance for S-4 and corresponding symbology, the NCWG determined that, for the purposes of charting, this information was required by the mariner:

- a. For paper charts – for information purposes only as paper charts are not designed to be used directly with AIS, taking into account that vessels using the paper chart as their primary navigation tool are unlikely to be equipped with an AIS receiver; and for route planning purposes for ECDIS-equipped vessels where the paper chart is utilized as a planning tool.
- b. For ENC/ECDIS – for route planning purposes only so as to provide information that AIS AtoNs exist, given that for route monitoring the vessel should be navigating on the AIS signal-generated ECDIS portrayal (IMO symbols) when in range of the signal.

7. When discussing the desired portrayal of a distinction between Real (Physical) AIS AtoN and Synthetic AIS AtoN on charts, mainly within the S-101 Portrayal Sub-Group, the justification from IALA is principally to provide an indication that the actual physical AtoN may be off station (has been deliberately moved/dragged/removed temporarily) from the position of the broadcast position (noting also that for floating AtoN the actual physical location of the buoy will rarely be in the same location of the broadcast synthetic AIS AtoN symbol due to weather and tides/currents). Additionally, feedback from mariners resulting from discussions within the S-101 Portrayal Sub-Group appears to support the inclusion of new symbology to distinguish between Real and Synthetic AIS AtoNs on charts.

8. In order to be consistent with existing symbology for AIS AtoNs on charts, the S-101 Portrayal Sub-Group is recommending the use of the acronym “S-AIS” to identify the synthetic nature of the AIS signal. The corresponding ENC derived ECDIS symbol would be similar to:



9. Some questions to be discussed when considering the merits of introducing new chart symbology to distinguish Synthetic from Real AIS AtoNs include, but may not be restricted to:

- a. Is there merit in the argument that the physical AtoN may be off station sufficient to justify the indication of the distinction between Real and Synthetic AIS AtoNs, given the principal use for the charted information to be for route planning?
- b. If an AtoN that is also a Synthetic AtoN is temporarily moved deliberately, how does this impact on chart updating (for example, S-57 ENCs)?
- c. Should the fact that IMO have chosen to deliberately include only two symbols to reflect an AIS AtoN as either Real/Synthetic or Virtual be taken into account in deliberations?

Recommendations

10. The following recommendations result from the issues raised in this paper.

- A. It is recommended that the NCWG discuss the merits of providing an indication on charts of the distinction between real and synthetic AIS aids to navigation. If it is decided that such a distinction is required, consideration should be made to applying changes to S-4, clause 489.1 as included at Annex A. Amendments will also be required to INT1 to include the new symbology required to provide the distinction in line with the guidance in the Annex. If it is decided that no such distinction is required, it is recommended that no further action is required; and feedback to this effect is reported to IALA and the S-101PT.

Justification and Impacts

11. A requirement has been submitted for changes to be made in S-101 to distinguish between real and synthetic AIS AtoNs on S-101 ENCs. This requirement is inconsistent with the current guidance included in S-4, so before such a requirement can be included in S-101, confirmation by NCWG and amended S-4 specification is required for S-4.

Action Required of NCWG

- i. NCWG is invited to **discuss** the request for a clear distinction should be included on charts between real and synthetic AIS AtoNs as described in paragraphs 2-9.
- ii. NCWG is invited to **agree** on a way forward based on the recommendation in paragraph 10, taking into consideration the revised draft text for S-4 clause B-489.1 as included in Annex A.
- iii. NCWG is invited to **inform** the S-101PT (and possibly ENCWG) of any decision made for the appropriate action.

Alternate Proposed Text for S-4 – Clause B-489.1

B-489.1 An AIS-equipped Aid to Navigation (AtoN) may provide a positive identification of the aid. It may also transmit an accurate position, and provide additional information such as actual tidal height or local weather; details of these functions, which cannot be charted, should be provided in associated publications as appropriate. ~~AIS transmissions must be charted using the magenta radio circle and international abbreviation ‘AIS’, see B-480:~~



S17.1



S17.2

~~S17.1 (with the letters in upright text) must be used for fixed AtoN and S17.2 (with the letters in sloping text) must be used for floating AtoN.~~

~~In areas where the local authority has decided to transmit AIS signals from most aids to navigation such that individual depiction of all relevant aids as AIS-equipped will result in excessive chart clutter, the relevant hydrographic office should issue a statement to this effect and insert a note on charts (or in an associated publication) stating that AIS transmitters (except virtual AIS aids to navigation) will not be shown on charts.~~

Note: the signal may:

- actually be transmitted from a physical (real) AtoN;
- apparently be transmitted from a physical AtoN (formerly referred to as a synthetic signal); or
- be transmitted to represent a non-existent AtoN (that is, a virtual AtoN).

~~AIS transmissions must normally be charted using the magenta radio circle and international abbreviation ‘AIS’ for “real” AIS AtoN or ‘S-AIS’ for “synthetic” AtoN, see B-480:~~

~~AIS transmitter (base station):~~



S17.1

~~Real AIS AtoN:~~



S17.2



S17.3

~~Synthetic AIS AtoN:~~



S17.2



S17.3

~~S17.2 (with the letters in sloping text) must be used for floating AtoN and S17.3 (with the letters in upright text) must be used for fixed AtoN.~~

~~In areas where the local authority has decided to transmit AIS signals from most aids to navigation such that individual depiction of all relevant aids as AIS-equipped will result in excessive chart clutter, the relevant hydrographic office should issue a statement to this effect and insert a note on charts (or in an associated publication) stating that AIS transmitters (except virtual AIS aids to navigation) will not be shown on charts.~~

For signals transmitted from a physical AtoN and also for synthetic signals associated with a physical AtoN, the centre position circle should be replaced by the symbol for the actual AtoN, for example a light star or buoy symbol.

For charting a ‘virtual’ AIS AtoN, where no physical AtoN exists, see B-489.

NOTE: The above draft amendments to S-4 will require a new entry in INT1 (S17.3) to show examples of fixed aids to navigation (beacon symbols to replace the small position circle) associated with real and synthetic AIS.