

IALA Recommendation O - 143

On

Provision of

Virtual Aids to Navigation

Edition 1.1

May 2013



10 rue des Gaudines
78100 Saint Germain en Laye, France
Telephone: +33 1 34 51 70 01 Fax: +33 1 34 51 82 05
e-mail: contact@iala-aism.org Internet: www.iala-aism.org

Document Revisions

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

Date	Page / Section Revised	Requirement for Revision
May 2013	Minor amendments throughout the document	To reflect developments at IMO NAV discussion on AIS AtoN.

**IALA Recommendation on Virtual Aids to
Navigation
(Recommendation O - 143)**

THE COUNCIL

RECALLING that one of the aims of the association is to foster the safe, economic and efficient movement of vessels and the protection of the environment through the improvement and harmonisation of aids to navigation and Vessel Traffic Services;

RECOGNISING Regulation 13 of Chapter V of the SOLAS Convention 1974, as amended, on the establishment and operation of aids to navigation;

RECOGNISING ALSO Regulation 10 of Chapter V of the SOLAS Convention 1974, as amended, on ships routing measures;

RECOGNISING FURTHER Regulation 4 of Chapter V of the SOLAS Convention 1974, as amended, on navigational warnings;

NOTING that work carried out by IALA on shipborne automatic identification systems has facilitated the development and adoption of a suite of technical and operational publications by other bodies such as IMO, ITU, IHO and IEC;

NOTING ALSO that IALA has adopted:

- Recommendation A-123 on the Provision of Shore Based Automatic Identification Systems (AIS);
- Recommendation A-124 on the AIS Service;
- Recommendation A-126 on the Use of the Automatic Identification System (AIS) in Marine Aids to Navigation Services;
- Guideline 1062 on Establishment of AIS as an Aid to Navigation; and
- The IALA NAVGUIDE (5th Edition), which includes a section on the use of AIS as an Aid to Navigation.
- Guideline 1081 on Virtual Aids to Navigation

CONSIDERING that various applications of AIS have been identified by IMO, ITU, IHO, IEC and IALA;

CONSIDERING FURTHER that AIS as an aid to navigation can be implemented in three separate ways – real, synthetic and virtual;

RECOMMENDS that:

- 1 National Members and other authorities providing marine aids to navigation consider deploying virtual aids to navigation (Virtual AtoN) as deemed practical and necessary and as the volume of traffic justifies and degree of risk requires;
- 2 National Members and other authorities providing marine aids to navigation take into account the provisions set forth in the Annex to this Recommendation when considering the use of virtual aids to navigation.
- 3 National Members and other authorities providing marine aids to navigation consider measures to raise awareness of the use and limitations associated with Virtual AtoN.

Table of Contents

1	Introduction	5
2	Definition	5
2.1	Definition	5
2.2	Amplification	5
3	Background	5
3.1	Real and Synthetic AIS AtoNs	6
3.2	Virtual AIS AtoN	6
4	Purpose	6
5	Application of virtual aids to navigation	6
5.1	Temporary	6
5.2	Permanent	7
6	Risks, Limitations and Benefits	7
6.1	Risks	7
6.2	Limitations	7
6.3	Benefits	7
7	Summary	8
8	Further Information sources	8

ANNEX

Virtual Aids to Navigation

1 INTRODUCTION

IALA recognises that there are various tools available for use by aids to navigation authorities to improve and enhance services to mariners. Among these are visual aids, radio aids and now, virtual aids to navigation.

This Recommendation offers national members and other authorities guidance on the provision of virtual aids to navigation (virtual AtoN).

2 DEFINITION

2.1 Definition

A virtual AtoN does not physically exist but is a digital information object¹ promulgated by an authorised service provider that may be presented on navigational systems.

2.2 Amplification

Virtual AtoN should only be used after approval by a Competent Authority.

Virtual AtoN can be used to inform the mariner about dangers to navigation as well as safe waterways, areas in which extra caution may be necessary and areas to be avoided.

They may be used to represent a line, area, position or other form that may be displayed graphically.

The information, including geographic position, carried by virtual aids to navigation may be fixed or may be changed over time (dynamic), depending on the intended purpose. There are two applications of virtual AtoN, temporary and permanent. They should be reflected in Maritime Safety Information (MSI) and be shown on the relevant nautical paper chart, Electronic Nautical Chart (ENC) and other relevant nautical publications in due course.

The information from virtual AtoN should be considered as the same as real AtoN.

3 BACKGROUND

Automatic Identification System (AIS) is being used as an Aid to Navigation to improve and enhance services to mariners. IALA Recommendation A-126 'On The Use of the Automatic Identification System (AIS) in Marine Aids to Navigation Services' and IALA Guideline No. 1062 'On the establishment of AIS as an Aid to Navigation' provide technical details on the use of real, synthetic and virtual AIS AtoN.

AIS AtoN can currently be implemented in three ways - real, synthetic and virtual. In the future, methods other than AIS will also be available to generate virtual Aids to Navigation.

However, the 58th session of IMO NAV Sub-Committee (2012) decided that the definition of AIS AtoN classified only physical AIS AtoN and virtual AIS AtoN because from the mariner's view point, there is no difference between real AIS AtoN and synthetic AIS AtoN, both are associated with a physical AtoN on the sea. This Recommendation is for the use of AtoN service providers or authorities and the authorities should know the difference of real AIS AtoN and synthetic AIS AtoN and therefore this Recommendation and associated Guideline retains the use of three types of AIS AtoN, real, synthetic and virtual.

¹ A digital item, or group of items, regardless of type or format that a computer can address or manipulate. In the context of virtual AtoN they will convey information to the user.

3.1 Real and Synthetic AIS AtoN

A real AIS AtoN station is a physical AtoN fitted with an AIS device. When it is not appropriate to fit AIS on an AtoN, the 'synthetic' approach may be taken. A synthetic AIS AtoN is where the AtoN information is transmitted from an AIS station located remotely from the AtoN.

3.2 Virtual AIS AtoN

A virtual AIS AtoN is transmitted from an AIS station to establish an AtoN that does not physically exist. In this case, a digital information object will appear on the navigational system for a specified location, even though there is no physical AtoN. A nearby base station or AtoN station could broadcast this message. The AIS message will clearly identify this as a virtual AIS AtoN.

4 PURPOSE

The purpose of this Recommendation is to encourage National Members and Administrations to consider the value and uses of virtual AtoN.

5 APPLICATION OF VIRTUAL AIDS TO NAVIGATION

There are numerous potential applications of virtual AtoN. They can be used not only to mark specific locations such as beacons or buoys, but also to mark lines, areas and other forms. They are not intended to replace physical AtoN. However, they may be used to complement or supplement existing marks to improve the safety of navigation.

Virtual AtoN is particularly useful in time-critical situations and in marking/delineating dynamic areas where navigational conditions change frequently or in applications where the use of physical aids is not practical or possible. For example, it may be appropriate to create a virtual AtoN to mark hazards to navigation on a temporary basis (see IALA Recommendation O-133 Emergency Wreck Marking), until a more permanent AtoN can be established. Alternatively, virtual AtoN may be established to mark areas where navigation conditions (for example; channel boundaries, overhead clearance, ice, water levels) change frequently and would require dynamic marking.

Concerning the permanent use of virtual AIS AtoN, the discussion of the 58th session of IMO NAV Sub-Committee (2012) concluded that the permanent usage is not recommended. However, if an authority intends to use AIS AtoN for permanently marking where the risk requires, the authority should conduct at least the following procedures:

- comprehensive risk assessment of that area;
- study of the possibilities on establishing a physical AtoN;
- investigation of the traffic in such area;
- equipment carried on the vessels navigating in the area;
- consultation with users and consensus from the users.

The use of virtual AtoN should be overseen by the appropriate authority. Notifications to mariners of the presence of virtual AtoN, integrity monitoring and verification of the effectiveness of the virtual AtoN are essential elements of such oversight.

5.1 Temporary

Temporary virtual AtoN are used primarily where there is a time critical consideration. It is generally considered that if the temporary use of virtual AtoN become more than 6 months (according to the IHO, if any temporary change continues to more than 6 months, it should be charted accordingly), it will be treated as permanent. For example, marking of Navigational Restricted Areas, marking of AtoN that are malfunctioning or off position are usage of temporary virtual AtoN. The specific usage is referred in Annex 1 of IALA Guideline 1081.

5.2 Permanent

Permanent virtual AtoN are not intended to replace physical AtoN except in specific cases after a risk assessment shows it to be appropriate and after approval of a national competent authority. For example, permanent virtual AtoN can be effectively utilized where it is very difficult to place or to maintain a physical AtoN due to water depth, sea state or other environmental conditions. The specific usage is referred to in Annex 1 of IALA Guideline 1081.

6 RISKS, LIMITATIONS AND BENEFITS

6.1 Risks

Virtual AtoN may not be visible on the displays of some ships and, if visible, the symbols may differ from one display to another. The consequences may be confusion, lack of information for the user and the undermining confidence in ECDIS, the chart and other systems. It is likely to be 2020 before the display of virtual AtoN is harmonised as a result of the 'grand-fathering' clauses in the carriage requirement programme for Electronic Chart Display Information System (ECDIS).

Radar that complies with the IMO Resolution MSC.191(79) will only display the AIS AtoN symbol approved by IMO SN/Circ.243 (a diamond with crosshair centred).

ECDIS equipment fitted prior to 2009 will not show virtual AIS AtoN until the equipment is upgraded or replaced, which is unlikely under the current 'grand-fathering' arrangements. There is currently no provision for virtual AtoN in S-57, or a symbol in S-52, but this is capable of implementation. However, even when virtual AtoN are reflected in S-57 and S-52, existing ECDIS will only show an orange '?' upon encountering a virtual AtoN object in the ENC database. The orange '?' can be interrogated for further detail.

The Minimum Keyboard Display (MKD) should display AIS AtoN, including the virtual flag, but it is known that some MKDs do not meet this requirement.

One of the risks associated with Virtual AtoN, when it is used to replace a physical AtoN, is that the mariner ignores Virtual AtoN information as it does not physically exist.

Although virtual AtoN are not intended to replace physical AtoN in most cases, there is a risk that some service providers may take advantage of the relatively low cost of virtual AtoN to replace physical ones. This should only occur when the decision is taken by a competent authority based upon a proper risk assessment.

One consideration to be taken into account when using virtual AtoN is how much information is presented to the mariners, for example, if a waterway is properly marked on the radar and ECDIS, adding virtual AtoN to mark the limits can be considered 'too much' information presented to the mariners for the same object.

6.2 Limitations

Limitations include:

- 1 Global Navigation Satellite System (GNSS) vulnerability.
- 2 Susceptibility to spoofing and jamming.
- 3 AIS VHF Data Link (VDL) capacity and Fixed Access Timed Division Multiple Access (FATDMA) planning.
- 4 Not all ships can display the AIS AtoN symbol at present.

6.3 Benefits

Some of the potential benefits of virtual AtoN in enhancing safety, environment and security are:

- timely notification;
- ease and accuracy of presentation, where displayed graphically;

- ease and speed of deployment;
- direct delivery to navigational systems; limited to relevant area;
- information readily apparent to the user;
- avoidance of misinterpretation through use of standardised symbology and IMO phraseology;
- easily changed / amended;
- low cost to install and maintain;
- marking where physical AtoN is not practical.

7 SUMMARY

Regulation 13 of Chapter V of SOLAS on the establishment and operation of aids to navigation allows authorities latitude in determining the appropriate mix of aids to navigation in order to deliver this essential service, taking into account IALA Recommendations and Guidelines.

Virtual AtoN is a new tool available to authorities to supplement and enhance existing systems. When properly administered and applied, virtual AtoN can deliver improved services to users.

Virtual AtoN can be used as both temporary and permanent, but authorities or users should always be aware of its risks and limitations, especially at this time when not all ships have the capability of displaying virtual AtoN on their navigational equipment.

IALA encourages authorities, after carrying out a proper risk assessment of the situation and after taking into account various factors, to consider the use of virtual AtoN in the design and delivery of future AtoN services in accordance with this recommendation and its associated guideline as it will enhance the safety of navigation.

8 FURTHER INFORMATION SOURCES

- [1] IMO Res. A.917(22) 2001 Guidelines for the Onboard Operational Use of Shipborne AIS
- [2] IMO Res. A.956(23) 2003 Amendments to the Guidelines for the Onboard Operational Use of Shipborne AIS
- [3] MSC 232(82) Performance Standards for ECDIS
- [4] MSC.192(79) Performance standards for radar equipment
- [5] MSC.191(79) Performance Standards for the Presentation of Navigation-Related Information on Shipborne Navigational displays
- [6] MSC 86/23/7 New symbols for AIS-AtoN - Submitted by Japan
- [7] IMO SN/Circ 243 – Amendments to Guidelines for the Presentation of Navigation-Related Symbols, Terms and Abbreviations
- [8] IMO SN/Circ 266 Maintenance of ECDIS Software
- [9] IMO SN/Circ 289 Guidance of the Use of AIS Application Specific Messages
- [10] IMO SN/Circ 290 Guidance for the presentation and display of AIS Application Specific Messages Information
- [11] ITU-R M.1371 Technical Characteristics for Automatic identification System using Time Division Multiple Access in the VHF Maritime Mobile Band
- [12] IHO S-4 Chart Specifications of the IHO and Regulations for International (INT) Charts
- [13] IHO S-52 Specifications for Chart Content and Display Aspects of ECDIS
- [14] IHO S-57 Transfer Standard for Digital Hydrographic Data
- [15] IHO S-57 Appendix B.1 ENC Product Specification

- [16] IHO S-100 Universal Hydrographic Data Model
- [17] IHO S-101 ENC Product Specification (ENC Product Specification based on S-100 (not to be adopted before 2012 at the earliest))
- [18] IALA Recommendation R-121 For the performance and monitoring of a DGNSS Service in the band 283.5 – 325 kHz
- [19] IALA Recommendation A-124 on the AIS Service
- [20] IALA Recommendation A-126, on the Use of the Automatic Identification System (AIS) in Marine Aids to Navigation Services, Edition 1.5, Jun. 2011
- [21] IALA Recommendation O-130 on Categorisation and Availability Objectives for Short Range Aids to Navigation
- [22] IALA Guideline 1062 on the establishment of AIS as an Aid to Navigation
- [23] IALA Recommendation V-125 on the Use and Presentation of Symbology at a VTS Centre (including AIS)
- [24] IEC 61174 ECDIS – Operational and Performance Requirements, Methods of Testing and Required Test Results
- [25] IEC 61193-2 Class A shipborne equipment of the universal automatic identification system (AIS) - Operational and performance requirements, methods of test and required test results AIS Class A
- [26] IEC 62288 Presentation of navigation-related information on shipborne navigational displays
- [27] IEC 62320-2 AIS AtoN stations - Minimum operational and performance requirements - methods of test and required test results
- [28] IEC 62388 Maritime navigation and radio-communication equipment and systems – Shipborne radar - Performance requirements, methods of testing and required test results