IALA RECOMMENDATION (INFORMATIVE)

R0143
PROVISION OF VIRTUAL AIDS TO NAVIGATION (O-143)

Edition 2.0

June 2021

urn:mrn:iala:pub:r0143:ed2.0

10, rue des Gaudines – 78100 Saint Germain en Laye, France
Tél. +33 (0)1 34 51 70 01 – contact@iala-aism.org

www.iala-aism.org

International Association of Marine Aids to Navigation and Lighthouse Authorities
Association Internationale de Signalisation Maritime

DOCUMENT REVISION

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

Date	Details	Approval
June 2010	1st issue	Council 47
May 2013	Edition 1.1 Minor amendments throughout the document. To reflect developments at IMO NAV discussion on AIS AtoN.	
September 2020	Edition 1.2 Editorial corrections.	
June 2021	Edition 2.0 Amendments throughout the document to reflect better knowledge of the National Authorities on Virtual AIS AtoN and to align with the revised Virtual Guidelines.	Council 73

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;

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

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

RECOGNIZING 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 *R0123 The Provision of Shore Based Automatic Identification Systems (AIS)(A-123)*;

Recommendation *R0124 The AIS Service (A-124)*;

Recommendation *R0126 The Use of the Automatic Identification System (AIS) in Marine Aids to Navigation Service s(A-126)*;

Guideline *G1062 Establishment of AIS as an Aid to Navigation*;

The *IALA NAVGUIDE (8th Edition)*, which includes a section on the use of AIS as an Aid to Navigation; and

Guideline *G1081 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 – Physical (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.

ANNEX CONTENTS

PROVISION OF VIRTUAL AIDS TO NAVIGATION

1. INTRODUCTION

IALA recognises that there are various aids to navigation signals available for use by competent authorities to improve and enhance AtoN services to mariners. Among these are visual (colour, shape and lights), audible (horn, bell and whistle) and electronic (radio) signals to include radionavigation, racon and AIS AtoN (Physical, Synthetic and Virtual).

This Recommendation offers guidance on the provision of Virtual Aids to Navigation (Virtual AtoN) and more specifically Virtual AIS AtoN.

2. DEFINITION

2.1. DEFINITION

A Virtual AtoN does not physically exist but is a digital information object[1] promulgated by an authorised service provider that may be presented on navigational systems.

2.2. AMPLIFICATION

Virtual AtoNs should only be used after approval by a national competent authority, as stipulated in IALA Guideline *G1084*[28].

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 textually and/or graphically.

The information, including geographic position, carried by Virtual AtoN 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 in other relevant nautical publications in due course.

3. BACKGROUND

Automatic Identification System (AIS) is being used as an Aid to Navigation to improve and enhance services to mariners. IALA Recommendation *R0126 (A-126)* [24] and IALA Guideline *G1062* [26] provide technical details on the use of Physical (Real), Synthetic and Virtual AIS AtoN.

AIS AtoN can currently be implemented in three ways, Physical (Real), Synthetic and Virtual.

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 but the IALA, having assessed the possibilities of AIS technology according to AtoN

1 A digital item, or group of items, represents information that is transmitted or received in a series of pulses, using digits 0 and 1. In the context of Virtual AtoN, they will convey symbol and text information to the user.

service providers (national competent authorities), has proposed the addition of a third type - the Synthetic AIS AtoN. Physical (Real) and Synthetic AtoN have the same symbol but the Physical (Real) can broadcast dynamic position and AtoN status whereas the Synthetic Predicted broadcasts static position and no AtoN status. The AIS AtoN service providers and authorities should know the difference between the three AIS AtoN types and refer to all pertinent associated IALA and other documentation (refer to the last section).

3.1. PHYSICAL AND SYNTHETIC AIS ATON

A Physical AIS AtoN station is a Physical AtoN fitted with an AIS AtoN device. AtoN information associated with an AtoN that physically exists but which is transmitted from a remote AIS AtoN station (base or mobile) is a Synthetic Predicted AIS AtoN. The Synthetic Monitored is another type of Synthetic that exists and can be considered as an alternative to a Physical AIS AtoN because it can provide some position and/or AtoN status information.

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 consideration of the value and uses of Virtual AIS AtoN.

5. APPLICATION OF VIRTUAL AIS ATON

There are numerous potential applications of Virtual AIS AtoN. They may be used as a primary or supplemental navigational mark such as a turning mark, hazard or boundary marker, etc.

They may be used to mark an artificial or natural object or at a single location or to define an area. They can be used for time-critical situations (oil spills, channel obstruction, etc.), temporary events, hydrographical or meteorological situations (shifting bathymetry, hurricanes, etc.) and for permanent usage (under specific conditions).

Virtual AIS AtoN are 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 a stationary or drifting hazard to navigation on a temporary basis until a more permanent AtoN can be established, see IALA Recommendations *R1015 The Marking of Hazardous wrecks* [20] and *R1016 Mobile Marine Aids to Navigation (MAtoN)* [21]. Alternatively, Virtual AIS 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.

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

5.1. TEMPORARY AND PERMANENT USAGE

Temporary Virtual AIS AtoN are used primarily where there are time critical considerations such as marine incidents, large scale disasters, the need for an alternative fairway or area to be avoided, military and offshore operations,

etc. Temporary Virtual AIS AtoN can also prove to be effective when a physical AtoN is gone missing or unavailable for a short time.

The permanent usage of Virtual AIS AtoN was initially restricted when this technology was introduced and was primarily utilized where it was very difficult to place or to maintain a physical AtoN due to water depth, sea state or other environmental conditions. Other beneficial applications for the mariners have been demonstrated over the years. It is suggested to use caution to avoid inappropriate application of their use. A comprehensive risk assessment of the situation and consultation with mariners is strongly suggested before deciding on their establishment.

The temporary and permanent usage of Virtual AIS AtoN should be reflected in Maritime Safety Information (MSI) as well as all relevant nautical publications and systems.

The annex A of the IALA Guideline *G1081* [27] provides specific usage for temporary and permanent usage.

6. RISKS, LIMITATIONS AND BENEFITS

6.1. RISKS AND LIMITATIONS

Virtual AIS AtoN are increasingly portrayed on the displays of many ships, but some challenges still exist. There may be confusion from a lack of consistent symbology (especially in older equipment), equipment may not be properly configured to show data, information may create overload or be absent (non-SOLAS vessels) and some may even display a position offset. International standards and specifications strongly encourage ship-owners and shipborne equipment manufacturers to ensure vessels are carrying the proper equipment and interface, but mandatory requirements are still not in place.

Some other risks or limitations may exist, such as GNSS or radio wave vulnerability, jamming and spoofing or overloading of the VHF datalink. In the near future, cybersecurity and system redundancy might alleviate these problems.

IALA Guideline *G1081* [27] provides some potential mitigation measures for the different risks and limitations. For mariners, best practices and a better understanding of this technology through proper instruction and training are a few of the proposed solutions.

6.2. BENEFITS

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

- Timely notification (after a sudden event such as a new hazard, wreck, avoidance area, etc.).
- Easily and rapidly deployed and modified.
- With proper interface, direct delivery to navigational systems.
- Information readily apparent to the user.
- Avoidance of misinterpretation through use of standardized symbology and IMO phraseology.
- Low cost to install and maintain but should not be solely driven by economic reasons.
- Marking where physical AtoN and Physical (Real) AIS AtoN are 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 tool available to AtoN authorities to supplement, compensate and enhance new and existing systems. When properly administered and applied by a competent authority, Virtual AtoN can deliver improved services to users.

Virtual AtoN can be used as either temporary or permanent, but authorities or users should always be aware of its risks and limitations, especially when some ships may not have the capability or the obligation to display 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 and efficiency of navigation.

8. REFERENCES

Reference documents are the latest from the date of issuance of this Recommendation. Readers must consider that some will be amended or revoked, and care should be taken to follow up with the most up to date information.

[1] IMO. Res. A.1106(29) 2015 Revised Guidelines for the onboard use of shipborne automatic identification systems AIS

[2] IMO. MSC 232(82) Performance Standards for ECDIS

[3] IMO. MSC.192(79) Performance standards for radar equipment

[4] IMO. MSC.191(79) as amended, Performance Standards for the Presentation of Navigation-Related Information

[5] IMO. MSC SN.1/Circ.243/Rev.1 Amended Guidelines for the Presentation of Navigation-Related Symbols, Terms and Abbreviations

[6] IMO. MSC.1/Circ. 1503/Rev.1 ECDIS – Guidance for good practice

[7] IMO. SN.1/Circ. 289 Guidance of the Use of AIS Application Specific Messages

[8] IMO. SN.1/Circ. 290 Guidance for the presentation and display of AIS Application Specific Messages information

[9] IMO. MSC.1/Circ. 1473 Policy on use of AIS Aids to Navigation

[10] ITU-R M.1371 Technical Characteristics for an Automatic Identification System using Time Division Multiple Access in the VHF Maritime Mobile Band

[11] IHO. S-4 Regulations of the IHO for International (INT) charts and charts specifications of the IHO

[12] IHO. S-52 Specifications for Chart Content and Display Aspects of ECDIS

[13] IHO. S-52 Chart Presentation Bulletin No. 10 (S-52-CPB-No 10): Portrayal of Virtual AIS aids to navigation

[14] IHO. S-57 Transfer Standard for Digital Hydrographic Data

[15] IHO. S-57 Appendix B.1 ENC Product Specification

[16] IHO. S-57 Edition 3.1 Encoding Bulletin 54: UOC Clause 12.14.1 AIS equipped aids to navigation

[17] IHO. S-100 Universal Hydrographic Data Model

[18] IHO. S-101 ENC Product Specification

[19] IHO. S-101 Feature and Portrayal Catalogues

[20] IALA. (2017) Recommendation R1015 The Marking of Hazardous Wrecks, Ed. 1.0

[21] IALA. (2017) Recommendation R1016 Mobile Marine Aids to Navigation (MAtoN), Ed. 1.0

[22] IALA. (2015) Recommendation R-121 For the performance and monitoring of a DGNSS Service in the band 283.5 – 325 kHz, Ed. 2.0

[23] IALA. (2012) Recommendation R0124 The AIS Service (A-124), Ed 2..1

[24] IALA. (2011) Recommendation R0126 The Use of the Automatic Identification System (AIS) in Marine Aids to Navigation Services (A-126), Ed. 1.5

[25] IALA. (2017) Recommendation R0130 Categorization and Availability Objectives for Short Range Aids to Navigation (O-130), Ed 1.5

[26] IALA. (2008) Guideline G1062 The Establishment of AIS as an AtoN, Ed. 1.0

[27] IALA. (2013) Guideline G1081 The Provision of Virtual Aids to Navigation, Ed. 1.1

[28] IALA. (2011) Guideline G1084 Authorization of AIS AtoN, Ed. 1.0

[29] IALA. (2019) Guideline G1143 Unique Identifiers for Maritime Resources, Ed 1.0

[30] IALA. (2011) Recommendation R0125 The Use and Presentation of Symbology at a VTS Centre (including AIS) (V-125)

[31] IEC. 61174 ECDIS – Operational and Performance Requirements, Methods of Testing and Required Test Results

[32] 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

[33] IEC. 62288 Presentation of navigation-related information on shipborne navigational displays

[34] IEC. 62320-2 AIS AtoN stations - Minimum operational and performance requirements -methods of test and required test results

[35] IEC. 62388 Maritime navigation and radio-communication equipment and systems – Shipborne radar - Performance requirements, methods of testing and required test results