



SUB-COMMITTEE ON SAFETY OF
NAVIGATION
55th session
Agenda item 20

NAV 55/INF.7
21 May 2009
ENGLISH ONLY

ANY OTHER BUSINESS

AIS-based Aids to Navigation

Information document on usability, potential role, technological potentials and limitations

Submitted by Denmark

SUMMARY

<i>Executive summary:</i>	This document contains predominantly an informative summary of experiences gained from test studies of AIS-based Aids to Navigation (AIS AtoN) in Denmark. The role of AIS AtoN together with the relevant symbology and their recognition by mariners must be developed before AIS AtoN can be utilized to the benefit of safety of navigation.
<i>Strategic direction:</i>	5.2
<i>High-level action:</i>	5.2.1
<i>Planned output:</i>	-
<i>Action to be taken:</i>	Paragraph 22
<i>Related documents:</i>	Resolutions MSC.232(82); MSC.192(79); MSC.191(79); MSC.74(69), annex 3 and SN/Circ.243

Background

1 This submission predominantly provides information about a study in Denmark on experiences gathered from AIS AtoN trials. The intention is to summarize the most important experiences gained and issues raised, also with reference to a proposed new work programme item (MSC 86/23/7) for the Sub-Committee on Safety of Navigation to develop new symbols for AIS-AtoN.

Project activities

2 The study¹ has been based on trials in Danish waters in relation to situations with new wrecks and obstacles, several groundings in the same location, an area with a difficult approach

¹ A full report "Experience with AIS AtoNs – Is there a future for electronic AtoNs within e-Navigation" can be downloaded at <http://www.frv.dk/publikationer/FRV-Rapport-2009-01-v2.0.pdf>.

For reasons of economy, this document is printed in a limited number. Delegates are kindly asked to bring their copies to meetings and not to request additional copies.



to a channel and supplementary marking of offshore installations. Tools such as virtual or synthetic AIS AtoN, the symbology in IMO SN.1/Circ.243, a diamond with crosshair symbol (SN 243), have been evaluated together with AIS safety-related text message services.

Examples of operational use of AIS AtoN

3 *Emergency wreck and obstacle marking.* Virtual AIS AtoN have been used to mark new wrecks (SN 243 symbols) or other new dangerous obstacles promptly after an incident. AIS AtoN were deployed before physical AtoN could be established. Rapid marking of new dangers and alerting mariners of new dangers constitute some of the most obvious operational cases for the beneficial use of AIS AtoN. However, the lack of display capabilities on board ships, a relevant and clearly defined symbology and the recognition by mariners prevent the technology from being effective at present. Supplementing emergency wreck marks with an AIS-based text message service, using safety-related text messages automatically addressed to vessels heading towards the new danger, proved to be a more efficient tool, documented to influence the behaviour of some vessels close to the wreck. Some vessels actually changed their course after having received a text message to keep clear of the wreck area. Some vessels even responded to the text message.

4 *Marking of virtual waypoints.* As a result of four groundings, where vessels failed to alter course in a traffic separation scheme, virtual AIS AtoN were used in a trial to highlight waypoints (SN 243 symbols) where vessels should alter course without creating an obstacle in the fairway. In another trial, four virtual AIS AtoN were deployed to guide ships through an indicated recommended cone-shaped approach into a dredged channel, in an area where the approach to the channel has caused numerous collisions with a particular physical AtoN buoy. In these trials it became particularly evident that the presentations of such virtual AIS AtoN symbols on board ships were very limited. Two trials were conducted to evaluate how many vessels could actually detect such virtual AIS AtoN objects. The two trials included a total of 157 ships, and it was observed that:

- 70% of the vessels reported that they could detect an AIS AtoN on the AIS Minimum Keyboard and Display (MKD), radar or electronic chart display – when they knew what kind of symbols or MKD information to look for;
- 60% of the vessels carried a chart display capable of displaying AIS vessel targets, but less than half of these (25-30% of all vessels) could display AIS AtoN targets graphically; and
- display manufacturers have different interpretations of when to display an AIS AtoN. Not all AIS class A MKD can list AIS AtoN information on their target list.

5 *Supplementary marking of offshore installations.* More than thirty offshore installations in the Danish EEZ of the North Sea have been marked with synthetic AIS AtoN as a supplement. This raised further awareness that not only the question of recognition of AIS AtoN symbology, but also the information content at different zoom levels as well as the lack of relations to IHO charted objects are problematic when displayed on an ECDIS.

6 *Enhancement, monitoring and control of physical AtoN.* DaMSA, as well as other AtoN Administrations, are currently in the process of enhancing existing AtoN with AIS that will enable broadcasting and monitoring of health status and control of the safe functioning of such physical AtoN. This will enable the AtoN authority to monitor its marking actively.

AIS AtoN symbology issues

7 The current AIS AtoN symbols (SN 243), diamond with crosshair symbol, do not convey which type of AtoN is represented by the AIS AtoN and are considered less useful. For mariners to consider objects on their display to be useful, the symbols should convey the nature of the AtoN object. Furthermore, there is a compelling need for a policy direction for mariners on when and how AIS AtoN should be displayed and how they should operate their vessels in relation with this symbology and other possible virtual AtoN techniques.

AIS AtoN objects in relation to charted objects

8 When displaying AIS AtoN symbols, it would be useful to be able to relate the AIS AtoN to the relevant charted AtoN symbol if such a marking exists. Where a physical AtoN does exist in the charted position, consideration should be paid to a policy direction on presented elements on ECDIS displays in relation with IHO standards, defining what to present when. It would also be useful to consider at which zoom level an AIS AtoN symbol is relevant to display, just as objects in an ECDIS, in order not to obscure displays with too detailed information. When displaying related metadata, it would be useful to have the capability to determine the relative position of the object informed about, just as information related to static charted objects, in order not to obscure the display of other charted objects or information. No mechanisms exist, however, to support these issues.

Potential role of AIS AtoN

9 *The role of AIS AtoN*, or similar electronic AtoN technologies that may evolve as a result of the e-Navigation implementation process, needs to be defined. In our experience, AIS AtoN could be developed as a useful technology in several cases.

10 *Supporting existing physical AtoN.* Similar to Racon, AIS AtoN may be used to highlight physical AtoN specifically at cardinal positions. However, a policy of guidance for mariners should be developed. Consideration must also be paid to ships carrying equipment of earlier standards not capable of displaying AIS AtoN symbology. AIS AtoN could also be used at cardinal positions to broadcast, e.g., weather and tidal data and convey real-time health status information of a physical marking.

11 *Marking of new, temporary or dynamic dangerous objects.* As realized in situations of emergency wreck-marking and other incidents, virtual or synthetic AIS AtoN are particularly useful for rapid deployment of new, temporary or dynamic objects.

12 *Providing AtoN without creating obstacles.* In a number of cases, it would be desirable to provide AtoN without creating an obstacle.

13 *Providing AtoN where physical markings are difficult or particularly expensive to position.* In certain cases, the provision of physical AtoN may be desirable, but difficult or particularly expensive, due to physical or meteorological conditions. In particular in polar regions, providing AIS AtoN might be a possible and cost-effective alternative to not providing AtoN at all.

14 In all the examples provided, the issue of the status of ships not able to display AIS symbols, except possibly on their MKD, must be thoroughly evaluated.

Related reports from other sources

15 IALA is currently drafting a guideline on the establishment of AIS as an AtoN in its Aids to Navigation Management committee. The experiences gained indicate that the role of AIS as an AtoN need not only be developed as an AtoN service that can be provided, but the role must be recognized by mariners and the ability to display AIS AtoN on shipborne equipment is essential if the AIS AtoN service is to have any significant effect.

16 Through the Nordic Hydrographic Committee, it has been noted that, while currently proposed symbology is not mature, the AIS AtoN symbology issues could come under the work programme of IHO HSSC, but at present no work item exists. The Secretariats of IHO and IALA have recently discussed this issue and are preparing input for IMO MSC 86 highlighting the need to identify and confirm real user requirements for virtual AIS symbols before any practical work is undertaken.

17 Through IALA it has been noted that general lighthouse authorities are developing plans for AIS AtoN services. The risks of new AIS AtoN technology must be identified and managed. The advantages of rapid response to new dangers is noted, but also a future possibility of replacing deep-water AtoNs intended to guide SOLAS vessels only is debated, as well as marking safe water or dangers without creating obstructions. They also note constraints that prevent the technology from being mature, such as a lack of reliable on board display equipment and standards, and the need for defining reliable service areas for AIS infrastructure coverage.

18 It has been noted that an AtoN Administration proposes the important development of an AtoN Attribute and Metadata Information Standard by IALA to ensure compatibility with IHO's S-57 and S-100 standards for electronic charts.

Conclusions

19 The document concludes that AIS AtoN has the possibility of playing an innovative role in future AtoN developments. The role of AIS AtoN needs to be coherently developed and understood by shore side AtoN providers and shipside equipment manufacturers as well as mariners before ambitious implementations are carried out. It would be beneficial to include this process in the e-navigation project.

20 Display capabilities and symbology logic must be developed, promulgated and recognized by mariners for an AIS AtoN service to be useful.

21 At the technical level, there is a compelling need for a formal link between AIS AtoN and associated IHO Electronic Navigational Chart standards. At the moment, there seems to be a gap between the relatively new AIS AtoN concept and IHO standards for displaying nautical information to mariners, including defined presentations on ECDIS displays on the basis of ENC. A policy direction should require correlated work between IHO and IALA for later approval by the Organization.

Action requested of the Sub-Committee

22 The Sub-Committee is invited to note the information provided.