e-NAV13 Input

Agenda item 9.6

Task Number 32

Author(s) / Submitter(s) e-Nav Committee WG3/WG4

Liaison note on reliability of AIS data

# Summary

The combined WG3/WG4 of the e-Navigation Committee, at its intersessional meeting in Sarasota, 25 February - 1st March 2013, studied and discussed the input document e-NAV13-28 on the reliability of data and information gained through AIS to be used as potential evidence in court.

This document reflects the results of the discussions and considerations.

It was recognized that juridical organization and systems for the acceptance of specific data or information as evidence or subsidiary evidence will differ in each individual country and/or region.

However, it was also concluded that also other causes could constrain the use of AIS data and information for the mentioned juridical purposes. At the other hand a variety of measures were identified that could be put in place by competent administrations or organizations to assure that AIS properly operates in a technical and functional sense and therefore potential risks for the use of AIS data or information can be limited or could be avoided.

Chapter 3.1 of this document reflects comments on doc. e-NAV13-28 (paragraphs 3.1-3.4, 3.6 and 3.8-3.9). Chapter 3.2 comments on the conclusions of doc. e-NAV13-28. Chapter 3.3 refers to an eventual checklist of measures providing guidance to competent administrations and organizations. Chapter 3.4 lists the recognitions, conclusions and recommendations by WG3/WG4 and chapter 4 shows the actions requested by the Committee.

## Purpose of the document

To provide comments to the Committee on the document e-NAV13-28, also to provide additional information from another perspective in how to properly use AIS data and information as evidence in court.

Furthermore the Committee is invited to discuss the development of a provisional checklist of measures to be used by competent administrations or authorities to provide guidance concerning the validation on the suitability of AIS data and information as evidence in court cases.

## Related documents

Input document e-NAV13-28.

# Background

Doc. eNAV13-28 reflects a technical analysis on the reliability of AIS data arises from a request by the IALA Legal Advisory Panel to the e-Navigation Committee. This in turn arose from the increasing use or request for use of AIS data in court cases.

# Discussion

**3.1 Substantial comments on the technical analysis reflected in e-NAV13-28**

*para 3.1 Causes of failure*

After discussion it was concluded that the used methodology (Failure Mode and Effect Analysis carried out on AIS AtoNs in 2011) may not fully cover all issues for identification of potential causes of failure. The term “Causes of Failure” does not properly reflect the scope of the problem, which includes many aspects.

When talking about AIS data the scope of data and the perception of causes of failure needs to be clearly defined.The methodology should include general areas of failure, such as

* Physical Installation
* Configuration
  + Not compliant with standards
* Environmental
  + Loading of the VHF Data Link
  + Sensor failure (including GNSS)
  + Data Transport (including VHF and network failures)
  + Behaviour on the VDL
* Data input (during operation)
* Equipment failure (AIS unit)
* Presentation configuration
* Data Portrayal
* Data interpretation

These general areas of failure should be further analysed and specific failures identified.

*para 3.2 Data Input*

Data input to an AIS device is either manually configured or autonomously acquired. This data is usually categorized into Static, Dynamic and Voyage related.

Static information is input at installation, and should be updated when any change is made, such as during a refit. This information would generally be correct, subject to (deliberate/unintentional) user input error, or lack of updates due to inability to make those changes or neglect.

Dynamic information is derived from onboard sensors, such as a GNSS receiver or EPFS, compass or log. There are several ways in which this information can become erroneous, including sensor failure, deliberate manipulation (e.g. jamming), *calibration errors, environmental effects* and incorrect interfacing.

Most voyage related information is input at the masters discretion*.* Therefore, not all voyage related information may be available or updated.

*para 3.3 Failure of AIS unit*

It should be noted that there is certified and non-certified equipment. There is no way of determining from the AIS data whether equipment is certified or not. Statistics show that there are more problems with non-certified equipment.

*para 3.4 Disruption to GNSS*

The mentioned amount of errors (a quarter of the total) may be true for AtoN, however this may not apply for AIS data in general. Circumstances may differ (e.g. in ports). Further clarification on this issue is requested.

*para 3.6 Effects of VHF propagation*

In general the statement is correct. The VHF propagation may cause interference which results in a partial loss of data. More details on the effect of VHF propagation on the use of AIS data should be included.

*para 3.8 Control system malfunction*

In general national AIS networks do not have mandatory backup systems (the choice for the establishment of backup systems is up to the relevant competent authority, subject to their requirements).

*para 3.9 Malicious interference*

In general it is recognized that manipulation of data in AIS messages (e.g. overwriting of the substance) is difficult to realize. Adding false data to AIS data (e.g. spoofing) is possible, the deliberate interference of AIS data with the objective to incompletion is also possible (jamming).   
  
It is recommended that measures have to be further identified in order to facilitate future corroboration of AIS information to avoid manipulation of data, spoofing and jamming.

**3.2. Substantial comments on the conclusions reflected in e-NAV13-28**

* In general the conclusions as reflected in doc. e-NAV13-28 may be true for AIS AtoN but may not reflect the overall reliability of AIS data in its full scope.
* Other causes, as reflected in the comments provided on para 3.1 however may be significant for other types of AIS data.
* WG3/WG4 concurs that further work would be required to establish an overall probability of erroneous data, probably drawing on records collected over long periods.
* Further measures and the development of the proper tools may detect and mitigate this disruption to some extent, but cannot eliminate it.
* The correctness of AIS data in its own right could be relied upon in conjunction with competent monitoring, corroborative information and proper interpretation of the data. The reliability of the AIS data is high, but the accuracy of data is not guaranteed.

**3.3 Checklist of measures providing guidance to competent administrations and organizations**

In general competent authorities and administrations already put various necessary measures in place in order to secure the proper technical and functional operation of AIS both aboard and ashore. These measures, eventually complemented with other measures or issues to be considered, may be reflected in a list that could be used as guidance for juridical parties involved in court cases in order to identify the juridical acceptance of AIS data and information as (subsidiary) evidence.

It is recommended that a survey will be done with the aim to categorize measures to secure the proper technical and functional operation of AIS both aboard and ashore, resulting in a Guideline for competent authorities and administrations. This survey and the development of the Guideline can be done by e-NAV Committee in conjunction with the Legal Advisory Panel where appropriate.

**3.4 Conclusions and recommendations**

It was recognized that

* juridical organization and systems for the acceptance of specific data or information as evidence or subsidiary evidence will differ in each individual country and/or region;
* there is a difference between operational/technical processes and the proper interpretation of data afterwards (e.g. in court);

It was concluded that

* the used methodology (Failure Mode and Effect Analysis carried out on AIS AtoNs in 2011) may not fully cover all issues for identification of potential causes of failure. The term “Causes of Failure” does not properly reflect the scope of the problem, which includes many aspects;
* the perspective of the conclusions as reflected in doc. e-NAV13-28, being a technical analysis, in general focuses on the technical vulnerabilities of GNSS and communication networks;
* also other causes, as reflected in paragraph 3 (comments on para 3.1 of doc. e-NAV13-28) could constrain the use of AIS data and information for the mentioned juridical purposes;
* The correctness of AIS data in its own right could be relied upon in conjunction with competent monitoring, corroborative information and proper interpretation of the data. The reliability of the AIS data is high, but the accuracy of data is not guaranteed.

It is recommended that

* general areas of failure (see comments on para 3.1 of doc. e-NAV13-28) should be further analysed and specific failures identified;
* measures have to be further identified in order to facilitate future corroboration of AIS information to avoid manipulation of data, spoofing and jamming;
* a survey will be done with the aim to categorize measures to secure the proper technical and functional operation of AIS both aboard and ashore, resulting in a Guideline for competent authorities and administrations. This survey and the development of the Guideline can be done by e-NAV Committee in conjunction with the Legal Advisory Panel where appropriate.

# Actions requested of the Committee

The Committee is requested to

1. note the comments as provided
2. discuss these comments in conjunction with doc. eNAV13-28
3. discuss the conclusions and recommendations as provided
4. inform the Policy Advisory Panel and the Legal Advisory Panel where appropriate.