

## **AIS as a tool for Safety of Navigation and Security - Improvement or not?**

**The introduction of AIS (Automatic Identification System) surely has a potential for aiding the navigators onboard ships, and will in the future play an important role in safety of navigation. BUT, navigators should be informed about the limitations in the system.**

Most of the maritime industry is aware of the AIS system that will be required onboard most SOLAS vessels of 300 gross tonnages and upwards from year end 2004. The system will, among other data, broadcast information from the ship sensors of its position, heading, speed over ground and course over ground automatically.

BUT, in the transition period before all vessels are equipped with known and trustworthy sensors, there may be accidents caused by the navigators' trust in the AIS. We will then have the "AIS assisted accidents" as we previous have had with radar, ARPA and GPS assisted accidents.

Therefore, governmental bodies, classification societies, owners, navigators' organisations and others should make sure that the crew receiving the new AIS onboard their ship is oriented about the system and its limitations, and not only introduced to the system as the new tool for safety of navigation.

### **Collecting information**

The heading sensor for AIS will normally be the onboard gyro compass, which will give quite trustworthy information with small deviations from the real situation during normal operation. However, there will be vessels that use other sensors, as for instance magnetic compass, or do not transmit heading at all.

Position, course and speed over ground will normally be provided solely by the Global Positioning System (GPS). Later on Galileo or Global Orbiting Navigation Satellite System (GLONASS) based Global Navigation Satellite System (GNSS) services and receivers will be available.

Few ships have a speed log installation capable of providing speed over ground information to the AIS. It should be noted that course and speed from GPS are not defined at all for pre 2003 GPS'es and therefore it may be great differences in the filters (time constants) and accuracy which will be unknown to the navigators.

For post 2003 GPS'es the accuracy will be defined, but the filters remain undefined. As a consequence, Automatic Radar Plotting Aid (ARPA) information or information from other radar plotting aids and AIS information will not be the same, i.e. navigators will experience two information sources with different data for the same target vessel.

Bundesamt für Seeschifffahrt und Hydrographie (BSH) and Det Norske Veritas (DNV) are now preparing guidelines for the filters in connection with type approval of GPS, and will work for implementation of these guidelines through international instruments.

## **Safety issues**

The navigator's assessment of collision risk depends upon his/her knowledge about own ship's motion and other ships' motion.

The available means for assessing the other ships' motion are:

- Visual sighting
- Radar
- ARPA (or other radar plotting aids)
- AIS
- Voice communication with other ships

Visual sighting, radar and communication are real time information, but it is difficult for the navigator to predict the situation some time ahead if the safety margins are small, as in congested waters. The same applies for AIS if only the text display (Minimum Keyboard and Display unit (MKD)) is provided.

ARPA and AIS vectors, if displayed on a graphical display, have the advantage that they are easy to interpret and it is easy to predict the other ships' motion based on the information available at the moment, prolonging the vectors.

The AIS is today known as a system providing other ships' heading, course and speed in real time, as opposed to the ARPA system which calculates the course and speed from historic radar data. As the origin of the heading, course and speed are questionable for AIS, we may suspect that the AIS information will in many cases be less reliable than the ARPA information.

For instance, the course and speed over ground may be provided from a GPS with very slow filters. This may cause the AIS course and speed information to be more delayed and less accurate than the ARPA calculated information.

The navigator is also trained in the ARPA technology, its pros and cons, through the required International Maritime Organization (IMO) ARPA model course.

And that is a main part of the problem; most navigators are today not familiar with the AIS technology and its pros and cons partly mentioned above, and may use the AIS information uncritically and trust the AIS information in disfavour of the ARPA/ Radar information.

We may also foresee situations where the position of the AIS target and the ARPA target for the same vessel are different due to position error from the AIS or that the position used in the radar or in other graphical displays as for instance ECDIS is wrong or delayed. The navigator may then perceive the situation as there are two vessels and react wrong if he/ she should do in the actual situation.

In addition, there will be vessels with the AIS switched off or the AIS is out of order. It should also be mentioned that most of the world fleet vessels with size below 300 GRT will not have installed AIS albeit that International Electrotechnical Commission is working with

specification of a “light” version of the AIS called AIS Class B, which in most countries will be a volunteer installation.

However, this last issue will most probably be of minor significance if as the navigators are sufficiently trained and informed about the pros and cons will be aware of this issue through information bulletins and the fact that the vessels are not visible at all on AIS displays.

## **Security issues**

AIS has been identified as a tool for increased security. As the output from the AIS is depending on the sensors and open settings in the AIS, it will be very easy to falsify AIS data for onboard people. We may also note that it's possible to set up a “ghost AIS” sending false data. Is it a possibility that these data can be used by unauthorized personnel?

We may also note that the AIS information is public available for pirates, terrorists and all other with an AIS receiver. Will AIS be used as a screening tool for pirates to select the best targets? The future will show.

With regards to security, IMO, which set the requirements for the new Long Range AIS (LR-AIS), should bear in mind the security limitations in the AIS and evaluate the need for improvement for the LR-AIS.

A very interesting project about use of satellite for receiving AIS signals is performed in Norway and this may be used as example of the availability of AIS information. See <http://128.39.102.180/> for more information about the NCUBE -Norwegian Student Satellite project.

## **End comment**

AIS will be an improvement, but it might take some time, and I am sorry to say maybe some accidents too, before we see the effect.

DNV is actively involved in both IMO Correspondence Group on Navigational Displays and International Electrotechnical Commission (IEC) TC80 WG13 - Displays for the presentation of navigation related information - General requirements, methods of test and required test results for setting the standards for presentation of navigational information and AIS is of course one of the important issues there.

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