

AIS Implementation: a news round-up

Fred Pot, Principal of Marine Management Consulting, gives us the latest news and developments about Automatic Identification Systems on vessels



THE REMOTE Automatic Identification System (AIS) which the International Maritime Organisation (IMO) has embraced in principal and will require ships to carry in future, is currently being defined by government entities and by commercial interests. AIS consists of a shipboard transmitter that digitally broadcasts its name, position, speed and course along with other details via VHF to nearby ships and coastal authorities.

An AIS 'transponder' also has two VHF radios that receive this information from other ships. Although a transponder has a small, 3-line display to display the information it receives, it is typically connected to a ship's electronic chart or radar to provide a more practical display of AIS information.

IMO will likely require new ships constructed after July 1, 2002 to carry a transponder. Existing passenger ships and tankers will need to carry a transponder a year later, with other existing ships over 30,000 GRT, to follow a year after that. By 2008 even small (>300 GRT) ships that are not involved in international voyages will be required to carry one and many countries are likely to require domestic tonnage to carry transponders well beyond IMO's requirements both in starting date and in minimum ship size.

But first AIS standards have to be defined.

To make sure that transponders from different manufacturers can understand each other, the International Electrotechnical Commission is in the process of defining performance criteria for type approval of transponders (Future Publication IEC 61993-2). International agreement on these criteria is expected to be reached by December of this year.

In the meantime, two of the transponder manufacturers that are actively involved in defining these criteria, are working out the detailed issues that, so far, have prevented actual inter-operability. "Marine Data Systems (of South Africa) and Saab Transpondertech (of Sweden) have in the last two weeks conducted an e-mail dialogue regarding the schedule for interoperability testing and are at the point of preparing proposed schedules for this to happen", says Ernie Batty of Marine Data Systems.

To allow connection of any transponder to any electronic chart or radar, AIS 'sentences' are added to the current standard communication protocol for navigation instruments. This protocol allows ship's instruments, like differential GPS, auto pilot, radar, ECDIS, gyro compass, depth sounder, etc., to communicate with each other over serial cables. Because its throughput capacity is limited to 4.8 kb per second, which is too limited to be able

to process AIS information in a timely fashion, a high-speed, 38.4 kb per second version of the same protocol has also been developed (NMEA 0183-HS / IEC 61162-2). This new version was published on July 1, 2000.

This means that producers of ECDIS, radars and integrated bridge systems can now start to develop and test a single standard interface that allows their equipment to be connected to any type-approved transponder.

Writing software for an interface between ECDIS/radar and an AIS transponder is one thing; displaying AIS information on screen is quite another. AIS provides much more information than radar, so new symbols and rules will be needed in order to display the many and varied things which AIS can provide, such as actual current velocity observations.

Singapore is planning to test display alternatives on three Marine and Port Authority (MPA) vessels starting this fall. An international committee will direct the test. Unfortunately this committee lacks representation from ship operators, and MPA vessel crews are not necessarily representative of important future AIS users: bridge teams sailing on large ships with sophisticated integrated bridge systems. Hopefully, ship operators will involve themselves in the process soon to make sure the standard will work for their bridge teams.

Because there is much testing to be done, AIS symbols and display rules will probably not be complete until the fall of 2001.

Bridge teams of the cruise ships *Regal Princess*, *Sea Princess* and *Volendam* have just completed testing AIS in British Columbia/Alaska under the auspices of an association of private and government maritime interests (PACMAR). Because this test preceded availability of standards for interoperability between transponders and standards for interfacing transponders with other navigational instruments, the transponders of a single manufacturer (Tideland Signal/MDS) were used and special software was written to interface *Regal's* transponder to its electronic chart (Transas Marine's NaviSailor 2500) and *Sea's* and *Volendam's* transponders to their integrated bridge systems (STN Atlas' ChartPilot/MultiPilot II). Once these interfaces were available, installation of transponders proved relatively simple with short cable runs.

Bridge teams were generally pleased with AIS performance. *Sea's* navigator, for instance, reported that he was able to discuss sailing through separate channels between Skagway and Juneau in Alaska with *Regal*, because *Regal* identified itself as an AIS target about 1 hour 40 minutes (39.8 nm) before the two ships passed each other. *Regal's* unidentified radar target

showed just 30 minutes (12.1 nm) before passing, which was well after each ship had selected its channel. See <http://www.bcmarine.org/wmc/uais/cruise.htm> for *Sea Princess'* ECDIS screen prints of this encounter.

Although formal analysis of the test data has yet to be completed, bridge teams reported noticeable differences in range and bearing between AIS and ARPA targets of the same ship, thus reinforcing the need for consolidation and avoidance of screen clutter. (Since AIS position information was updated every 2 seconds for this trial, latency cannot explain the differences).

AIS really shone, however, when it came to filling in the many radar blind spots in Alaskan and British Columbian fjords. In one instance, the range between *Regal* and *Sea* was only 6.3 nm, but there was a 762 m high island in between them. AIS was able to show a complete picture of the traffic situation to the officer on watch almost irrespective of coastal geography.

To assist in optimally spotting future AIS base and repeater stations along a rocky coast, an analyst will use the AIS test data to attempt to fashion a model that predicts AIS range given the characteristics of the surrounding terrain. This will not be easy because AIS' range, just like VHF's range, turns out to be affected by characteristics beyond those that are easily measurable, like terrain height between transponder antennas. In the test, so far, AIS range peaked at about 71 nm but also was as short as 12 nm, although the latter may have been caused by a combination of terrain characteristics and temporary 'technical challenges'.

In the US, MariTEL acquired VHF Channel 87B, which has been reserved for AIS in the rest of the world, from the government along with many other marine VHF channels. USCG is currently negotiating with MariTEL to free up 87B for AIS.

According to both USCG Capt. Robert Ross and Thom Belesky, vice president of MariTEL, the negotiations are going well and it now seems likely that 87B will become available for most approaches to US ports. Similarly, VHF Channel 88B, which has been reserved as the second channel for AIS in the rest of the world and is currently being used by Federal Government agencies, will likely be freed up for AIS in the US as well.

Hardware and software to support an older type of digital radio communication protocol (Digital Selective Calling on VHF Channel 70) was added to the standard for AIS transponders mostly because 87B and 88B were not available in the US. It is not clear what will happen to this part of the standard now that, at least for the US, DSC seems not to be required after all. Deleting

DSC from the AIS standard may be possible in the future, but type approved transponders will probably need to have DSC capability even if it will never be used.

In heavy traffic areas USCG feels that the throughput capacity that AIS provides with channels 88B and 87B (19.2 KB per Second) will prove to be insufficient and that a third AIS channel will be needed for base stations to interrogate ships, to broadcast safety messages and to re-broadcast AIS information it receives. For these purposes USCG intends to remotely switch one of a ship's transponder's two radios temporarily from 87B or 88B to this third channel.

While this solution increases the capacity available for AIS traffic in an area by 50 per cent, it does not increase the capacity of an individual ship's transponder.

In addition to 87B, MariTEL (www.maritelusa.com) also owns many more marine VHF frequencies in the US. In alliance with several partners, it intends to build 286 330ft high towers, each with a minimum range of 50 nm to serve the marine industry, with analog voice as well as 14.4 kb per second data transmission services. All base stations will be connected to a central control centre that will route voice calls and data transmissions, verify and charge credit cards and provide customer service 24x7.

The network has been dubbed MariNET (a name that is already used by a British company that is in a similar business). The base stations have been designed to support multiple protocols and modulation methods, including the Time Division Multiple Access (TDMA) protocol which could be used to communicate with ships that are equipped with AIS transponders. With such an extensive infrastructure, MariTEL may be able to entice USCG to use its infrastructure instead of building its own with tax dollars.

To achieve 14.4 kb per second, MariNET may use a combination of TDMA and Frequency Division Multiple Access (FDMA). MariTEL hopes to persuade VHF radio manufacturers to produce and sell low cost radio modems that boat owners can use on the network for e-mail, internet access and receipt of AIS position updates from SOLAS ships.

This venture is worth watching as it has the potential to drive the implementation of AIS well beyond the boundaries of IMO or USCG carriage requirements, a development which would be to the benefit of the maritime industry at large. **DS**

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