

relay pertinent navigational data from other sources, such as the National Oceanic and Atmospheric Administration's Physical Oceanographic Real Time System. An AIS enhances the mariner's situational awareness, permits more effective and reliable passing arrangements as intended by the Vessel Bridge-to-Bridge Radiotelephone Act (33 U.S.C. 1201–1208) and the Inland Navigational Rules (33 U.S.C. 2001–2038), and provides the Coast Guard with a comprehensive and informative traffic image not possible with radar or video surveillance.

AIS Testing

AIS tests and trials have been conducted by national maritime safety administrations in a number of locations around the world including Germany, Sweden, Finland, Singapore, South Korea, British Columbia, the Panama Canal, the St. Lawrence Seaway, the Baltic Sea, South Africa, and the Rhine River. The Coast Guard has conducted numerous tests and simulations to identify various technical and operational issues, such as the shoreside

communications infrastructure required to support full duplex operations; unit reliability, development of operational procedures appropriate to an AIS-based VTS; and identification of user requirements for graphical display functionality.

In August 1998, the Coast Guard leased 50 early-generation (Digital Selective Calling (DSC) ITU-R M.825–3 version) transponders that were evaluated aboard a variety of platforms. The principal purpose of this testing was to evaluate the performance of a DSC-based system and identify any operational and technical problems that would have to be resolved before implementation of the latest AIS technology (ITU-R M. 1371–1 version).

Existing AIS-Like Systems

This is not the first experience with AISs for the Coast Guard and the maritime industry. Since July 1994, tankers operating in the Prince William Sound area have carried DSC transponders that report to the VTS.

The DSC transponder system used in Prince William Sound is a one-way

system of limited capability, flexibility and potential. The VTS at Prince William Sound remains dependent on radar and very high frequency voice radio communications and is, in essence, a traditional VTS augmented by a DSC system. Despite the reduced capability of this type of transponder, it has proven valuable and has demonstrated its potential as the foremost VTS surveillance sensor.

The key difference between the DSC-based identification system used in VTS Prince William Sound and the one required by this interim rule is that the former only provides ship-to-shore (VTS) transmissions of position data. The AIS technology being required ensures two-way communication, radio frequency agility, greater capacity, non-proprietary display interface standards, and a host of display possibilities, including Electronic Chart Display Information System, Automatic Radar Plotting Aid (ARPA), non-ARPA radar, Electronic Chart System, Integrated Navigation System, or other proprietary graphical user interfaces. See Technical Comparison Table 2.

TABLE 2.—TECHNICAL COMPARISON OF ITU-R M.825 VERSUS ITU-R M.1371–1 BASED AIS.

System characteristics	Digital selective calling radio transponder	Broadcast automatic identification system
Technical Standards	ITU-R M.825–3/IEC 61993–1	ITU-R M.1371–1/IEC 61993–2.
Intended Use	Ship-to-shore	Ship-to-ship; ship-to-shore; shore-to-ship.
Message Schedule	Shore synchronized	Coordinated and Synchronized. Self-organizing timeslot procedure.
Frequency Agility	Full very high frequency spectrum availability	DSC reception locked to very high frequency Ch. 70 only. DSC broadcasts and TDMA reception and broadcasts have full very high frequency spectrum availability.
Radio Channels	One DSC (Simplex or Duplex)	One DSC (Simplex). Two TDMA (Simplex or Duplex).
Permissive Channel Usage (loading)	No more than 15% on Channel 70. Up to 100% on dedicated channel.	No more than 7.5% on Channel 70. In excess of 100% on two dedicated channels (AIS1/ AIS2).
Effective Data Rate	600 bits/second	Reception: 19,200 bits/second. Broadcast: 9,600 bits/second.
System Capacity	9 polled messages/minute Ch. 70–60 polled message/minute not Ch 70–240 with special shore station control and synchronization using duplex repeater.	TDMA: 4500 messages/minute plus. DSC: 4 to 9 polled messages/minute.

The Need for Standardization

As evidenced by the number of navigation systems currently in use, there is great interest in using technology to improve navigational safety and maritime domain awareness. However, to correctly add beneficial traffic information while also meeting the user demand to avoid a multiplicity of incompatible systems, standardization was needed. Without standardization, an AIS could not operate effectively or achieve its maximum potential.

Failure to adopt international standards would create a proliferation of disparate units, with no guarantee that devices offered by various manufacturers would be interoperable. In fact, the DSC installation discussed in the *Existing AIS-Like Systems* section was based on a standard communication protocol. However, it relies upon proprietary software for data management and display. The Coast Guard has been a leader in the drafting or adoption of technical standards through its participation at IMO, ITU, and other international working groups,

including groups within the IEC; our goal being the universal interoperability of AIS.

The key differences between previous technologies and AISs are that the latter allows for reliable Self-Organizing Time-Division Multiple Access, two-way communication, radio frequency agility, greater capacity, and a host of display possibilities. For these reasons, implementing international standards for AIS was a high priority for the Coast Guard.