

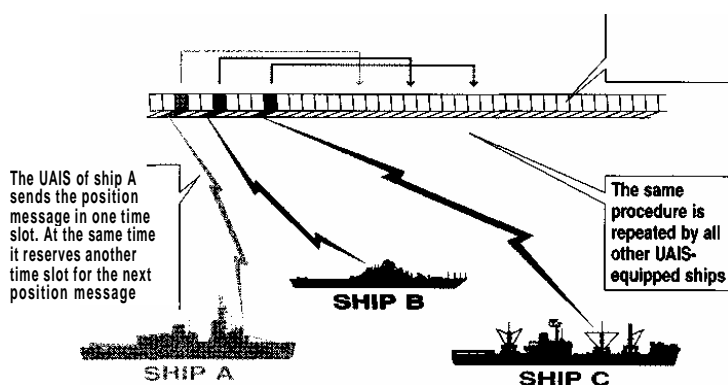
AIS - More discussion required?

**AIS: Automatic Identification of Shipping. Also known as:
UAIS: Universal Automatic Identification of Shipping.**

Those of you who are members of the Nautical Institute will have already read this article in the July issue of SEAWAYS albeit without the benefit of diagrams. I feel that since one of the "selling points" of AIS is the promise of "remote pilotage" as many pilots as possible should be aware of the forthcoming compulsory fitting of AIS units. The feature is therefore reproduced with the kind permission of SEA WAYS editor, Clare Walsh.

Considering that AIS is intended to become compulsory equipment under the new SOLAS regulations and is to be phased in between the target dates of 2002 and 2008 there has been very little published in the maritime press concerning the system and how it will work. Until recently my own knowledge of it was limited to three basic facts.

1. It is a VHF based system
2. The equipment specifications have been approved by IMO for inclusion into the forthcoming SOLAS regulations.
3. Proponents of the equipment are claiming that it will facilitate VTS operations and provide the platform for "remote pilotage"* from a VTS centre.



The principle of UAIS STDMA

At first glance 4,500 slots per minute appears more than adequate for even the busiest waterway but the industry's ambitious plans for it to relay chunks of data about each vessel will eat into that capacity.

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It was therefore with interest that on 27th March I attended a one day seminar entitled "AIS AWARENESS FOR USERS" aboard HQS WELLINGTON, co-hosted by the Royal Institute of Navigation and the Nautical Institute.

Those present consisted of a wide cross section of marine and port interests although, as is all too common at such events, serving ships' officers were in a minority.

Presentations were given by: **Marine Data Systems Ltd. (MDS)** **Marine Coastguard Agency (MCA)** **Defence Evaluation and Research Agency**

(DERA) [a section of the MOD.]

Trinity House

The above groups detailed the principles and technical details of the system and equipment involved. The following represents my own personal interpretation of the Seminar.

Equipment:

The shipboard and shore station equipment consists of a box containing two (one as a reserve back up) fully synthesised VHF transmitter and receiver units capable of operating on any frequency within the marine band (136 -174 MHz). Two VHF channels within this band have been allocated for intership transponder use by the International Telecommunications Union (ITU) namely AIS1 (161.975Mhz) and AIS2 (162.025Mhz). If these become overloaded or are allocated to alternative usage within any area then the system will be switchable to another available channel within the marine band. The unit also contains a GPS receiver and a computer.

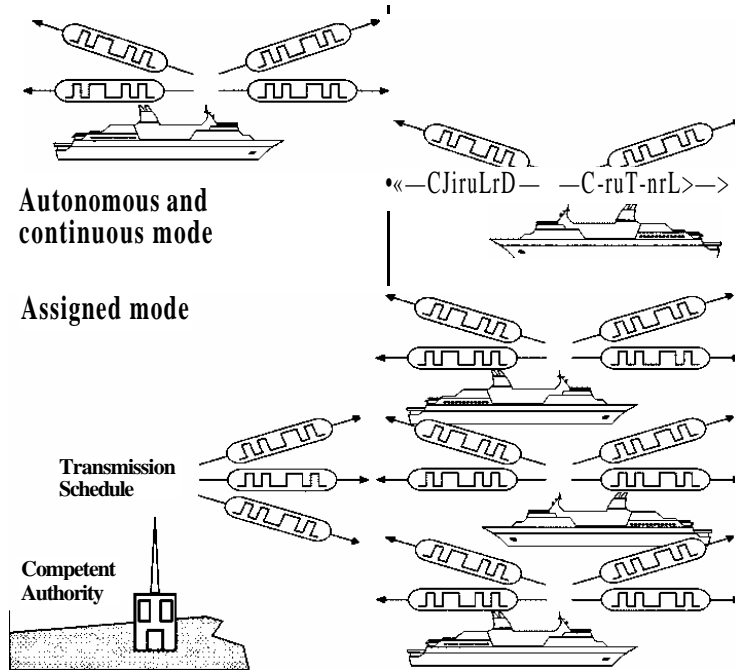
**The term "remote pilotage" has been deemed inappropriate by the DETR. However to the best of my knowledge no acceptable alternative term has yet been proposed.*

Implementation:

The specifications have been approved by IMO for inclusion into Chapter 5 of the forthcoming SOLAS regulations and the fitting of AIS is to be phased in for all SOLAS vessels over 300GRT between 2002 and 2008. (These are proposed target dates and with type approval from the International Electrotechnical Commission still to be granted they may not be achievable). Once operational it is anticipated that non-SOLAS vessels will appreciate the advantages of the system and fit basic AIS equipment on a voluntary basis once the system is fully implemented.

Basic principle of operation:

Each station transmits data in pulses on the VHF frequency and any station within



VHF range will be able to receive the information and display it either on the radar, ECDIS or a dedicated display. The system can therefore be used for ship to ship and ship to shore (4S) identification and transfer of data. Using the two channels the system is designed to provide about 4500 slots per minute for transmission of information "blocks". Depending on the information required a ship will require more than one slot to transmit the relevant information. There are four types of information "block".

Static: this will probably consist of Name, Callsign, MO & MMSI numbers, Length & Draft. The information will be repeated about every 6 minutes. **Dynamic:** GPS Position, Course and Speed made good, Gyro heading and Rate of Turn. Information is updated every time slot or on request.

Voyage related: Ship type, Cargo, Destination, ETA etc. Repeated every 6 minutes or updated as required. **Short Messages:** Safety related transmitted as required.

Note: There is currently no requirement for vessels to carry GPS or DGPS. As I understand it the GPS receiver to be incorporated into the AIS unit will be of low grade with the primary function of controlling the timer of the unit.

The system will operate in 3 different modes:

Autonomous and Continuous

When a vessel is at sea it will be operating in this mode and will transmit basic static and dynamic data, which can be displayed

and read by other stations within VHF range. The transponder monitors other transmissions and transmits when there is a clear slot between other transmissions.

Assigned mode

Upon entering a VTS area the transmissions will be automatically controlled by the shore base station and assigned a slot to link in with other traffic. Ship to shore transmissions will normally take place on a dedicated port frequency different from the AIS 1 & 2 intership frequencies. When a ship enters a port area it will be requested to switch AIS operation to that channel by the polling mode.

Polled or Controlled mode

The shore station automatically interrogates the other station and requests specific information and advises the port working frequency to be worked. Operation in this mode may possibly take place on Channel 70 in the form of a DSC short message in order not to conflict with the other modes.

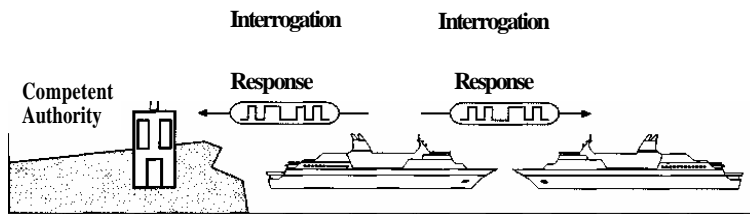
Practical Operation

Ship to Ship: The system displays the static and dynamic information of other shipping within VHF range and the advantage of the system is that it will work in heavy clutter and radar shadow sectors such as behind a headland. Interestingly, opinions of the serving officers present at the seminar differed as to the merits of positive identification of shipping. The short sea traders could see distinct advantages in being able to identify the "Port Hand

Polling or controlled mode

Telecommunications Union (ITU) have

from irrelevant transmissions outside the test area.

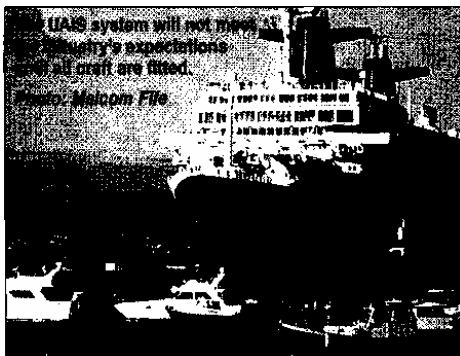


Charlie" whereas a deep sea officer was of the opinion that what was required was not more excuses for VHF conversations but for shipping to obey the COLREGS. The point was also raised that the existing COLREGS made no provision for VHF conversations! There was however a general consensus of opinion that with their identity being beamed out continuously watch-keepers would tend to be more vigilant!

Ship to Shore: The advantages here are more obvious since AIS will remove the need for vessels to report to shore stations with their details or to update their position passing reporting points. VHF conversations will thus be minimised. The promoters of the system claim that it will be able to handle around 400 ships. The dynamic information received is expected to provide sufficient information for a more positive interaction between a VTS centre and shipping and thus reduce the requirement for compulsory pilotage. The system could also be used to re-transmit VTS radar positions of vessels not fitted with AIS to shipping to enable these to be displayed on a vessel's ECDIS or pilot laptop display. (Currently it is not possible for this VTS information to be received and displayed as vectors, i.e. a moving vessel will appear as a spot that will jump each time the signal is transmitted.)

Acknowledged weaknesses of the system

Whilst the IMO have approved the performance standard and the International



approved the technical characteristics of the system there is still work to be completed by the International Electrotechnical Commission (IEC) before the equipment can be introduced. IEC is responsible for the International equipment standards, which will provide the type approval of the equipment. It includes such items as: Test specifications, data transfer standards, compatibility connections with bridge equipment and display recommendations. This standard, which will provide the precise information for manufacturers, is currently being drafted but is not expected to be completed before 2001.

There is not yet full international acceptance of the two VHF frequencies. The USA in particular has allocated one of the frequencies for other usage and is concerned about interference.

Sea trials of the equipment have been fairly limited and have not involved more than 10 vessels equipped with the system. AIS is not compatible with existing bridge equipment which will probably result in its becoming yet another stand alone PC bolted onto the end of the chart table. The ship owner will undoubtedly be reluctant to invest in new radar/ECDIS units until the system is fully operational. The carriage of GPS /DC-PS is not yet compulsory. Carriage of ECDIS is also not compulsory and at present to the best of my knowledge no ECDIS has yet been approved for navigation usage.

The exact manner in which vessels will be polled and switched to a port frequency has yet to be agreed.

Correct correlation between the radar and AIS targets can also be a problem. Trials in one port have resulted in "impossible" vector swap of the AIS vector onto an incorrect adjacent radar vector. Whilst this is probably a result of a solvable software problem within the VTS it serves to highlight the compatibility problems and confirm the fact that VTS centres will also have to be upgraded in order to achieve compatibility.

Live trials at various locations have suffered from interference

Discussion points:

The presentations were followed by a lively discussion covering many aspects of the system but of particular note were the problems associated with VHF transmissions. As one who has worked in a VTS centre, one of the major problems encountered was with interference from unwanted VHF transmissions from outside our own coverage area, sometimes from stations well over one hundred miles away. Such interference could easily obliterate transmissions from vessels within our district. Other climatic conditions can cause other reception anomalies. Concern was expressed by several of those present that the system could be overloaded by such unwanted interference. The experts acknowledged the problems associated with VHF propagation but were confident that the equipment would be capable of filtering out unwanted transmissions from remote stations in order to prevent system overloading. I questioned whether this filtering could be achieved other than by eliminating weaker signals which may not be the most remote. I remain unconvinced that any other method is achievable.

Another point raised was the fact that since the update of heading/rate of turn information is not possible to be continuously transmitted, what was the anticipated update frequency of this information? With normal conditions it was anticipated that this should be achievable approximately every 2 seconds. There was some concern as to whether or not such irregular and possibly unpredictable update rates could provide an effective basis for "remote pilotage".

The seminar ended by a general opinion of AIS being sought from those present. The response appeared to indicate that the implementation timetable was unrealistically optimistic and that more research would be needed before the effectiveness of the system could be guaranteed.

My own knowledge is far from complete and there are many aspects of the system which still leave me somewhat confused. Time for the experts to educate us I think?

More of these seminars are planned at the main Nautical colleges around the country during the next few months. Whilst the details of these seminars are still to be finalised I understand that these will be mainly for the benefit of deck officers attending courses and may not follow the open format of the HQS Wellington event. If you are interested it may be worth contacting your local college for further information.

JCB