# S-Mode for onboard navigation displays

## An NI user-led initiative

The IMO has expressed its desire that e-Navigation should be user led and defined by user needs. For this reason, the NI has been fully engaged in the development of e-Navigation: the concept of S-Mode has been part of this work. The concept, to improve operational safety and promote more effective training through a standard display, menu system and interface device, has been created and refined through the multitude of member feedback over many years.

S-Mode was first defined in *Seaways* March 07, received tremendous industry support (*Seaways* June 07) and has been further refined in the past year.

The revised description of S-Mode, outlined here, is being submitted as an information (inf) document to the IMO's Safety of Navigation Sub-committee, (Nav 54 – July 08) with the support of the International Federation of Shipmasters' Associations (IFSMA).

**1.** For ships' navigating officers, masters and pilots to make the very best decisions concerning the safe navigation of a vessel, they need quality tools, good procedures and training that addresses how to use such tools within the context of making good decisions. Users need to be competent and confident when using information from navigation equipment such as ECDIS, Radar, AIS, and electronic position fixing systems, in order to use them as effective tools.

**2.** A challenge faced by all mariners, and particularly highlighted by members of The Nautical Institute, is to be familiar with the wide range of systems and models of navigation equipment supplied by the many manufactures that support the marine industry. Mariners often move between ships and when doing so have limited time to familiarise themselves with all aspects of the new ship's procedures and systems. These include cargo handling, moorings, safety, security and management, as well as navigation. Even if a mariner has time to devote to familiarisation, it is often the case that the quality of training materials aboard is poor, or that other officers have limited skills or competency to be an effective instructor. S-Mode will make the task of familiarisation as required by the ISM Code more effective.

**3.** An even greater challenge exists for pilots boarding a vessel, particularly inbound to a port. They need to make the best use of the ship's systems for critical decisions at a high risk phase of a voyage with little or no time to familiarise themselves with systems that they may never have operated before.

**4.** Shore-based training facilities also face a great challenge, in that they must choose which specific equipment they purchase in order to best train their students. This is unlikely to reflect the actual equipment used on any specific ship. Ship managers usually have little or no control over the type of equipment that is provided by owners of ships under their management. Yet they need to ensure that their pool of officers are competent on all ships. Training colleges neither have the capability for extensive investment nor the space to ensure that many different examples of equipment are available for training.

**5.** IMO model courses are designed to ensure minimum standards for generic training on radar, AIS and ECDIS. The Organisation (IMO) also recommends performance standards for specific equipment and also for certain features of navigation display functionality, presentation and symbology. However, the diversity of designs that conform to these standards necessitates a comprehensive familiarisation training commitment, which is often not adequately performed before the equipment is used at sea. MSC/Circ.1091 (Issues to be considered when introducing new technology on board ships) addresses some of these problems.

**6.** It is recognised that much of the diversity encountered is due to innovation being applied by navigation equipment manufacturers. In many areas this has been to the great benefit of users and needs to be encouraged. S-Mode is being proposed by The Nautical Institute as a balanced solution to the problems and issues that have been highlighted. It provides standardised functionality, and is an additional mode to those supplied by the manufacturer. Switching to S-Mode would provide a standard or default presentation, a standardised default menu system and input information from peripheral devices.

**7.** The concept calls for all navigation systems in the future to have a standard 'S-Mode' switch, that when activated defaults to a standard display (for example, head-up display, relative vectors and so on) that can then be fully manipulated through a standard menu system where functions (such as for changing range, aspect, or using EBL/VRM [electrical bearing line/variable range marker], parallel indexing etc) would all be standardised, and the input interface with the systems (perhaps track ball, joystick or keyboard) would be standard. The concept for S-Mode is to create standard features. S-Mode is not envisaged as a simplified or restricted display mode, but instead would offer a high degree of functionality. However, the use of these functions would all be standard and anyone trained in the use of S-Mode would therefore be competent and confident to make the best use of navigation systems on any ship so equipped.

**8.** S-Mode may also incorporate provisions for the use of personal settings that may be stored within the system or on a personal

memory device that would allow a pilot or mariner to rapidly configure the system to their preferred settings, overlay custom display features or give access to specialist information.

**9.** It is envisaged that the Organisation would control the technical specification, guidelines and model training courses related to S-Mode. This would ensure that all training centres would instruct the use of S-Mode; that competency for operation in S-Mode would be covered in the STCW Convention and Code; and that new training requirements would be maintained as the technical specification evolved.

**10.** S-Mode would not preclude the use of other navigation features that could be provided by a manufacturer. These may be designed to take advantage of cutting edge technology, advanced programming or innovative presentation options that would be operated outside of S-Mode.

## e-Navigation

**11.** e-Navigation has been provisionally defined as 'the harmonised collection, integration, exchange, presentation and analysis of maritime information on board and ashore by electronic means to enhance berth-to-berth navigation and related services, for safety and security at sea and protection of the marine environment'. S-Mode specifically addresses the requirement for a 'harmonised presentation' to enhance safety, and thus the protection of the marine environment. S-Mode would comply with the requirements of resolution MSC.191(79) Performance Standards for the Presentation of Navigation-Related Information on Shipborne Navigational Displays.

**12.** S-Mode also specifically supports two of the major core objectives of e-Navigation as provisionally defined by NAV 53 (NAV 53/WP.8):

**.1** integrate and present information on board and ashore through a human interface which maximises navigational safety benefits and minimises any risks of confusion or misinterpretation on the part of the user;

and

**.2** integrate and present information on board and ashore to manage the workload of users, while also motivating and engaging users and supporting decision making.

**13.** e-Navigation covers both ship and shore-side systems. Although shore users have a similar requirement to be familiar and competent with their systems, they do not face the same challenge of using multiple and different systems on a regular basis, and hence type-specific training can be sufficient. It is therefore proposed that S-Mode, as described here, should only apply to ship-based systems.

## Innovation

**14.** Manufacturers of navigation systems currently invest significantly in developing concepts and systems to better meet the perceived mariner's requirements. It is important that this is not discouraged. It is inevitable that S-Mode will lag the development of new technology and concepts, but users should still benefit from these in the shortest possible time. The S-Mode concept seeks to balance the need for innovation with the needs of the mariner in certain circumstances.

**15.** S-Mode is also pertinent to multi-function displays (MFDs), where information derived from technologies such as radar, electronic charts, position fixing and AIS is simply treated as component inputs and can easily be arranged or re-arranged on one or more displays.

## Development of S-Mode

**16.** In order to be effective, the display and functionality of S-Mode will have to be developed according to user needs and possible solutions should be assessed through simulation and other trials.

**17.** It is the intention of The Nautical Institute to secure funding to implement a phased project approach to the development of S-Mode. The Nautical Institute considers it will be necessary for: the user needs of mariners to be defined; to work with industry to create mock-up variations; and then to test these variations using simulation and other techniques with representative bridge teams. After thorough testing and evaluation, the system and training requirements would be put forward to the Organisation for consideration.

**18.** The development of S-Mode will require a number of phases:

**19. User needs capture.** This phase will entail creating or adopting a methodology for systematically capturing the needs of mariners for a standardised navigation display, functionality and user interface. Such a methodology may make use of interviews, workshops, and CBT/Internet questionnaires, conducted on an international basis. The feedback from this exercise will be analysed and documented in a format that allows the technical development of test models. Some preliminary work in this area is ongoing at Chalmers University, Sweden as part of the Baltic Sea Safety project (BaSSy).

**20. Model testing.** This phase will require the building of a number of models that can be tested on bridge simulators. These can either be tested at a small number of international maritime simulation centres or centrally, using a sample of international mariners. The methodology for assessing the performance of the models will consider the measured effectiveness of the navigation display in addition to capturing the preference of the user. The marine equipment manufacturers will have a significant input into this exercise.

## S-Mode implementation

**21.** The results of the test phase, including a system description, procedures for best practice and training proposals, will be presented to the Organisation through the e-Navigation agenda.

## Conclusions

**22.** Because of the increasing complexity and functionality of navigation equipment, a need has arisen for navigation displays to have the facility to present information in a standardised format to enable good decision making, and for there to be a standardised user interface. This will result from system specific competency gained through standard international training.

**23.** S-Mode is a proposal to balance the need for standardisation with the need to promote innovation in the development and manufacture of navigation systems. In order to produce an internationally acceptable standardised display that will satisfy mariners on all ship types and trades, a thorough investigation of user needs followed by a comprehensive testing process needs to be followed.

**24.** The Nautical Institute is currently seeking funding to develop on an international basis the S-Mode concept as a user-led initiative, in full cooperation with all stakeholders.

**25.** Once developed, the technical description of S-Mode, high-level procedures and the training requirements will be offered for consideration by the Organisation.