E-navigation and S-Mode displays

Feedback from Institute members

David Patraiko MBA, FNI
Director of Projects

In the March 2007 issue of Seaways *we published an article on the concept of e-navigation and S-Mode.*

We are very pleased at the volume of feedback we have received from a wide range of disciplines but specifically from our active seagoing members.

Many of these comments came through the Institute's SeaGoing Correspondence Group (SGCG): see p 21 for information about how to join.

Although space is limited, we have tried to represent most comments here.

Generally, there has been overwhelming support for the concept of S-Mode (a standard mode of presentation and operation for navigation displays, triggered by a single button). There has also been a clear indication that the management of alarms on the bridge must be a crucial aspect of the overall e-navigation concept.

The Nautical Institute will continue to develop the concept of S-Mode and represent our members' views as e-navigation develops, in close liaison with all major stakeholders and industry forum. This will include representation at the IMO and IALA, close working relationships with the International Federation of Shipmasters' Associations (IFSMA), CIRM (the International Association of Marine Electronic Manufacturers), the International Maritime Pilots' Associations (IMPA), International Shipowners Organisations, and others. We are also pleased that the Baltic Sea Safety (BaSSy) project has committed considerable resources to S-Mode and to cooperate with the Institute as a means towards achieving their goals of improving the safety of navigation in Baltic waters.

It is envisioned that the development of S-Mode will entail extensive user need identification, industry cooperation, rigorous modelling and simulator testing and the establishment of procedures and training requirements. Regular updates on our progress will be published in Seaways and all members or interested parties are encouraged to contact the Institute.

Seaways is posted to all Institute members. The subscription rate to others is £65 p.a. Opinions expressed in articles and letters are those of the authors only.

The Nautical Institute is a company limited by guarantee No. 2570030 and a registered charity in the UK No 1004265.

Printed in England by O'Sullivan Printing Corporation, Southall.
Typeset by Tradeset Ltd, Eastcote, Pinner

The comments

The idea sounds fantastic, in fact it's so simple it might just work! You know what they say, simple things for simple sailors.

In a world where technology advances quicker than the average seafarer can keep up, it's refreshing to read that a practical view of the best methods of using the equipment in differing situations is being considered.

To draw a comparison within the RNLI, we have identical navigational equipment on each class of lifeboat. For example, on Fleetwood's Tyne class lifeboat we have a Northstar DGPS and Magnavox DGPS. If we were to be provided with a Tyne class lifeboat from the relief fleet, for example while ours was in refit, we would find the same Northstar and Magellan DGPS sets onboard. Onboard the inshore lifeboats Northstar DGPS sets are fitted. From a station training coordinator's perspective, this helps enormously with crew navigational training. Mobile training units which carry out navigational training also use the equipment relevant to the class of lifeboat.

On station we have decided, though trial and error, which screen each machine is to display. The Magnavox displaying route information and the Northstar displaying current position, speed etc. This leads to effective bridge resource management.

In my commercial fleet, we have two Litton Marine DGPS systems on the three ships. We have the same electrical officer for the ships and he has placed the DGPS in the same position on all of them. The senior master's have agreed on the modes of use, waypoints etc, so if I was to transfer to one of the sister ships, the main navigational aid for channel navigation would be the same.

I would say that the possibilities should definitely be investigated as I think the S-Mode function would enhance safety of navigation through standardisation.

Serving Master

When going from ship to ship, I am faced with the prospect of learning all the new bridge equipment available for that specific ship. I spend many hours trying to understand all the functions, all the possibilities and the location and use of all buttons. This has two components:

1. Learning the different technology used. This includes, for different radars, the best setting, the limitations, how well a certain filter works. A difference of one year sometimes accounts for a completely different approach.
2. Learning where all the buttons are. Where do I switch on this thing? At night, how do I operate this with no light? Is the provided panel light enough?

A regulation, requiring some standard settings to be used, could reduce the time spent with the learning process and as a consequence, would shorten the time that an officer needs before being apt to be left alone on the bridge with all that equipment. Such a regulation should leave enough space for technical competition between makers of any equipment. The cost of research should be rewarded. The best should profit more.

On the other hand, I would love to have all the 'switch on' buttons located on the same side of the panel, with a shape recognised in the dark. My actual chart display equipment has the on/off button located on a lower level, under the operating panel and not easily accessible and/or visible. On either side of this switch, the manufacturer installed the buttons to reduce light and contrast. During the hours of light adjustment, when reducing or increasing the light/contrast, if we touch the middle button, the equipment goes off and must be re-initialised. And, believe me, it happens...

The equipment should indeed have some common features, standards, settings, allowing for an easier learning process and a recognisable location for the fundamental buttons, with some basic design rules. But I am strongly in favour of allowing technology to continue developing and I am ready to accept that the equipment will change in order to achieve that. After all, the new kids of today, officers of tomorrow, are used to having new features in each new Gameboy, computer and mobile phone. It is the main reason why they change equipment... Bottom line, I am in favour of the S-Mode, but care should be exercised not to put too many limitations on creativity.

Serving Master

An excellent idea. Most pilots are pretty adept at quickly finding the features they need from any radar (display mode/range/VRM/EBL and then clutter if required) or an ECDIS (change scale or chart).

Having spent hours as second officer creating radar maps for ports the ship went to, I used to get pretty miffed when the pilot asked for maps and nav-lines to be turned off. However, I now find myself asking for all this extraneous clutter to be taken off, because its accuracy cannot be guaranteed and too much computer generated information masks the radar picture.

On dual-position full ECDIS bridges, I would suggest the following makes for a fairly well organized bridge team in pilotage waters:

RH seat: e-chart display controlled by captain or designate. Ship's position can be monitored independently of pilot's visual picture and the radar. AIS targets to be displayed on the e-chart and used for anti-collision (this helps crew understand where other vessels are heading if there are multiple channels). It would be appropriate for any maps or fairways created by the ship to be displayed at this position.

LH seat: radar display controlled by the pilot (normally relative motion (RM) and without chart-overlay). Pilot can monitor relative trails of fixed objects (for leeway/set appreciation) and moving objects (for rapid assessment of collision avoidance).

So, a default S-Mode needs to cover two quite different requirements. I would say keep the S-Mode to the minimum required, and being biased towards the pilotage water situation, I would advocate a north up RM motion display. Further 'menu trees' can turn on more features as required such as e-chart and AIS targets.

Too little attention is given to the nearest danger in pilotage waters, normally the seabed. The echo-sounder is often off or tucked away somewhere. The readout needs to be shown on all ECDIS displays and the S-Mode should bring this up, together with the current alarm setting. Another S-Mode feature which comes to mind is a link with LM time via GPS clock; when the system is powered-up, appropriate levels of lighting can be set automatically. Often dimming controls are hard to find.

This is one of the most common-sense ideas about e-navigation I have seen in a while and it deserves the attention and participation with the many stakeholders. I would be pleased to work with the NI further on this if you need further input.

Pilot

My thoughts are based on my personal use of various chart/radar systems and not the multi-function displays (MFDs) specifically, which I have only seen in demonstrations. However, from what I have seen they are essentially similar and just a bit more flexible.

I think the idea of some standard displays selectable appropriate to the main situations when you would need it is clearly needed and would be a great function for those new to a ship, or a pilot.

If the purpose of the S-Mode is to standardise different manufacturers to reach a common menu set-up mode with a couple of basic screen setups at a push of a button, I would support it. Also, standardising the names for functions which do the same thing would be very useful, specifically between Asian and western markets.

I worry only a little about it becoming a 'dumbing down/lowest common denominator' method of glossing over better training. I think it would be useful for those new onboard and for pilots, but for general use a reasonable well trained person, after just a little familiarisation, effort on their part, and help from other bridge team members, should be able to determine how to use the displays properly, regardless of manufacturer, based on the existing equipment standards.

The problem we have is that the training and/or personnel are not up to standard and many operators often are still working at a very basic level. I see this on my current ship. I explained to the

SGCG

The Institute's Papers and Technical Committee operates an email correspondence group, the SeaGoing Correspondence Group (SGCG). Members who are currently active officers, and who would like to make a difference by offering their professional views, are asked to give feedback on a variety of technical and operational issues, typically between five and 10 times a year. If you think can contribute to this professional forum, please contact David Patraiko for more details at djp@nautinst.org

Past topics have included operational aspects of navigation technology, routeing, moorings, Colregs, training and fatigue.

second officer how to do passage planning on the ECS and set certain parameters before I left the ship last time, but he still does not really understand, for example, how the turn radius setting for planning routes affects the display and route calculation (and he's not such a bad officer generally).

So must we go for the lowest common denominator? Do we make him do a video or a CBT course? Will that make any difference? No, because he has already done them. Of course we must look to the future and to some extent assume that newly trained officers have the requisite training in bridge equipment and computers generally from college. A person who understands the principles should be able to go to any piece of equipment and ask what they wish from it rather than being told what is right by it and then deciphering it.

More than 95 per cent of the people I have sailed with, from masters to cadets, have their own familiar mode of operating the radar which they tend to use in all situations. I have tried to get my cadets away from this and show them how to set-up and use them according to the situation and thus get more information out of them; but it is rare to see others using two radars in different modes in the trades I have been on.

My point is that if this idea moves forward I would imagine the people who would develop the best standard display set-ups would be those who are interested and knowledgeable on the subject. It will take a long time for the requisite training and planning for the idea to be fully realised so, as stated in your brief, a very important element of this would be to have this training enforced at the colleges backed up as manadatory from IMO.

To my mind there are just two simple display set-ups really that would be needed for such an idea: a navigation mode and a collision avoidance mode. Both would start up in north-up but if a pilot wanted head-up, this would be very simple to change.

'Nav mode' would be in true motion GPS stabilised for overlaying with ECS, displaying basic chart features similar to that of traditional charts and radar target overlays only. Range should be easy to change as well. Collision avoidance mode of course would be primarily radar with relative motion, sea stabilised with log input, true trails and relative vectors.

This way one of the two MFDs can be used for either purpose simultaneously in areas where the most and clearest information is need. When in open sea it is not so critical and individuals may tweak the setup as required.

So – is the S-Mode to be the core mode around which all MFDs are to be based or a mandatory option allowing an immediately familiar state for first time users? I think the latter is perhaps more realistic and easier to achieve and would be more favourable with manufacturers who of course will still want as much of a free rein as possible to develop ideas.

Serving Chief Officer

⚓ ⚓ ⚓

From the pilotage aspect this is an excellent concept. Personally I would like to see the VRM and EBL controls (with their own basic on/off button) fitted as separate controls as standard to facilitate ease of operation. Currently the plethora of different operating systems results in even these basic functions being accessed in many different manners, and trying to align an electronic bearing line using a rollerball and buttons can be a most frustratingly inefficient process on some radars.

Another feature that I would find of great value to permit basic parallel indexing would be an electronic version of the old mechanical rotating cursor. This was a simple but most efficient feature which has totally disappeared from modern radars.

I anticipate great resistance from the manufacturers because the average shipowner will just opt for the minimum S-Mode specification. Already it is quite astounding how many new vessels of less than 1000gt are still fitted with radars that don't have an ARPA facility and even on the larger ones the carriage requirements are for 1 ARPA so the second set frequently isn't ARPA enabled.

Pilot

⚓ ⚓ ⚓

My team and I are very much in favor of this idea. Highlights from our feedback:

This should have been done a long time ago.

Cost saving to companies, as officers will know the system and a reduced need for special courses. Standardised training for all nautical schools, cost savings for schools.

Confident officers from day 1; improved safety, with a new ship or company: more user-friendly equipment on the bridge.

Multi-function displays have already been used on airlines for a long time, and have proven their efficiency, so why should this not work on ships.

Some questions and concerns: How long will it take to implement? Will each flag state govern? Will all flag states approve?

Serving Master

⚓ ⚓ ⚓

I like the idea. I am not a young technocrat and I struggle a bit with new technology. My present command is brand new with all sorts of fancy new stuff including ECDIS, VDR etc etc: this after a long time on ships of 25 years old and more.

Always, when taking over a new command, I get familiar with the basics first and then progress up as far as I need to use the equipment safely – and this does not mean learning about every single function. Often equipment has too many added extras, which are not needed by everyone; the secret is to pick out the bones of what you actually need to use. The idea of an S-Mode control has a lot of merit. I guess pilots in particular would welcome this, especially as some have not come to grips with anything more technical than 'head up, relative motion' for radars, or so it seems to me.

I think the S-Mode concept will be difficult to get started as finding common ground about what it will involve could be difficult. I hope IMO consults seagoing mariners about this, should it come to fruition.

My present vessel has JRC radars and, although not a great lover of JRC equipment, I find these very user-friendly, a pleasant surprise to one who had been used to KH radars for a number of years. My biggest gripe these days is the sheer number of alarms we have going off all the time. A standard button to silence the lot would be great.

I think 'keep it simple' is the phrase everyone must bear in mind with any modern technology.

Serving Master

⚓ ⚓ ⚓

I very much enjoyed the article in Seaways. The S-Mode concept is fully in principle with the format being kept as simple as possible (real-time safe water out to 12nm etc). My concern remains that there must be a safeguard to avoid the natural instinct for all bridge members to focus on the display and forget to look out of the window. A move towards an S-Mode head's-up/bridge window display should be considered in your ongoing discussions.

Operations and Development Manager

⚓ ⚓ ⚓

I have a few comments on S-Mode, restricted to my area of expertise, which is ECDIS.

I can see the training benefit. There is no doubt that ECDIS is among the most complex pieces of equipment that the navigator has to master. However ECDIS has developed over more than 10 years and each manufacturer has developed its own way of providing access to the many functions required by the performance standard. Agreeing S-Mode among them without involving excessively costly redesign will not be easy.

The ECDIS performance standard clearly defines the functions that are required. It does not allow for a reduced mode of operation. If an ECDIS were locked down to a minimal set of features it would no longer be an ECDIS and would not meet carriage requirements. And it is difficult to ignore the fact that ECDIS requires a lot of functionality even before you add manufacturers' enhancements or overlaid environmental data such as tide and weather, which are useful to the navigator but not required by the performance standard.

One possibility is to build on a part of ECDIS that is already standardised. The electronic navigational chart (ENC) is 'standardised as to content, structure and format'. All ENCs use the same colours and symbols regardless of the ECDIS that they are displayed on. Allied to this is the standard display, which specifies minimum levels of information that must be displayed when an ENC is first loaded. The regulations require that an ECDIS be capable of presenting the standard display by a single operator action.

Perhaps standard display could be enhanced to include, for example, a default scale, an S-Mode toolbar with standardised icons (zoom in, zoom out, look ahead, chart settings (safety contour etc), day/night settings to name a few), whilst still leaving all other controls intact for trained operators.

Training is at the heart of the problem that S-Mode is trying to address and few ECDIS operators are formally or fully trained. They are learning to use the equipment on the job and appreciating what ECDIS can do for them as they go. The core strategies should not be that difficult to develop (setting up the chart, preparing the route and monitoring position against chart hazards and other targets) and could, in a nutshell, be taught better.

Manufacturer

The S-Mode reset to standard controls has real merit for new bridge design. May I suggest also that all electronic and electrical systems on the bridge be monitored by a single central alarm system with a couple of strategic 'accept' buttons placed around the bridge. Pushing the button would immediately mute any or all alarms. The buttons would continue to indicate an alarm condition by remaining illuminated, preferably by showing a slow flash. These could be the same buttons used by the watch alarm.

A display could be mounted at the chart table that would show the status of all alarm conditions until each was cleared.

Cutting the noise immediately without losing awareness would greatly assist the command team with clear communications instead of the present bedlam. Being able to immediately give clear instructions to others in the bridge team or over other communications systems can be vital in the event of a blackout in pilotage waters.

It would also help prioritise which systems had to be restored. Does the master need to know that the hospital call system has failed in a narrow channel?

Much equipment has the same sounding alarm and operates at quite a high frequency. For anyone over 22, a milestone I left behind many years ago, it becomes more difficult to determine the precise location of an alarm. Bright sunlight can make it hard to establish which equipment is malfunctioning because the indicator lights can be difficult to see.

The system would require positive action on the part of the operator to clear the fault on the equipment before the fault cleared from the display screen. Such a system may well have prevented the grounding of a passenger ship some years ago. There could also be provision for inhibiting an individual alarm if necessary by the master. The inhibited alarm would remain displayed. Such a system has been fitted in ships' engine control rooms for many years and it is time for the same treatment to be given to bridge equipment.

On one almost new vessel I sailed in, the magnetic compass was situated in such a position that it defeated all attempts by at least four compass adjusters to adjust it for heeling error. When the vessel was rolling the autopilot alarm, which was integrated with other alarms, sounded continuously. The only way to silence it was to jam the accept button down with a toothpick. Fortunately the vessel did us all a favour some years after she had gone to new owners by rolling over and sinking, happily without loss of life, after she suffered a machinery breakdown.

Next on my hit list are the 'T' shaped instrument layout where one has to walk around the helmsman, bridge consoles placed hard up against the bridge windows and windscreen wiper switches placed 20 metres from the wiper.

Serving Master

The IALA E-navigation Committee has had the opportunity to review the concept of S-Mode as submitted by The Nautical Institute.

The concept of a bridge display that has the ability to revert to a standardised and simplified mode of operation for display, functionality and interface was overwhelmingly supported by the Committee.

The Committee considered that such a mode would fit neatly and contribute positively to the concept of e-navigation. It would encourage the development of such a mode and offers the following feedback:

- **As the particulars of S-Mode would ultimately be controlled by the IMO, the IMO should be integral in the development of such a mode.**
- **Affordability is important.**
- **Even though the functionality of such a mode may be kept to a limited capability, that capability should be complete and at least enable a vessel to proceed safely.**
- **Due consideration should be given to the minimum requirement as this may differ from ship type to ship type (the needs of a HSC may be different to those of slow coastal vessels, for example).**
- **Due consideration should be given to the possibility of S-Mode being scalable to a variety of non-Solas vessels.**
- **S-Mode should be developed and trailed with the widest possible input from mariners.**
- **Comprehensive procedures and training should be developed as a part of S-Mode.**

The Committee hopes The Nautical Institute finds these comments useful and any other further support that IALA may be able to provide.

IALA E-navigation Committee