

Putting e-navigation into practice will entail challenges

There was evidence of strong commitment to make e-navigation work for the user at the e-Navigation Underway 2015 international conference

by Aline De Bièvre*

The challenges and opportunities involved in implementing IMO's e-navigation strategy were thoroughly discussed at the e-Navigation Underway 2015 conference on board DFDS ro-ro passenger ferry *Pearl Seaways*, held from 27-29 January this year. Over 160 participants from 26 countries and 112 organisations discussed the conference's main theme, *e-Navigation: The Implementation Phase?*

Omar Frits Eriksson, director for maritime technology and business development at the Danish Maritime Authority (DMA) and chairman of the International Association of Lighthouse Authorities' (IALA's) e-Navigation Committee, effectively threw down the gauntlet. "Each year we believe we make progress. But the question is, how much?" he asked. This question exercised the minds of delegates for the entire two days of the otherwise smooth round trip between Copenhagen and Oslo.

The concept of e-navigation** has come a long way since the UK first introduced it to IMO's Maritime Safety Committee (MSC) in 2005. This was followed a year later by a formal proposal to develop a global e-navigation strategy that was co-sponsored by six other countries – Japan, the Marshall Islands, The Netherlands, Norway, Singapore, and the USA.

In his welcome address, DMA director general Andreas Nordseth explained that the initial vision of the e-navigation pioneers – to integrate marine information by electronic means, to make navigation safer and the conduct of maritime business more efficient – had resulted in IMO's strategy implementation plan (SIP).

He said that now that the SIP had been approved by the MSC in November 2014, it was up to the new generation in the maritime industry to make the vision a reality. Work on e-navigation should continue and practical implementation should be a high priority on the international maritime agenda. Meeting the

needs of future users had to be the focus and was the key to success. "Without users, there will be no user-driven demand for e-navigation," Mr Nordseth said.

He highlighted the importance of the global testbed agreement signed by Denmark, South Korea and Sweden at last year's e-Navigation Underway conference (*Marine Electronics & Communications*, February/March 2015). Significantly the MSC had, in November 2014, approved guidelines for the harmonised reporting of testbed results. In the spirit of a memorandum of understanding, the agreement was open to all interested parties. It aimed to establish a framework for co-operation and co-ordination in the testing and demonstration of selected e-navigation solutions in specific situations or locations.

Jin Hyoung Park of the Korea Research Institute of Ships and Ocean Engineering stressed the value of the testbed approach for measuring the enhancement of berth-to-berth navigation. Testing on a global scale was needed not only to obtain proof of concept but also to co-ordinate local, national and regional testbed results, allowing harmonisation based on internationally agreed standards. This was important because of the global nature of marine navigation.

The conference was told that the IALA e-Navigation Committee had established a working group to share information

about e-navigation testbeds, advise on implementation issues and contribute to the global testbed initiative. The question of how best to expedite the execution of the SIP with the appropriate IMO co-ordination and leadership was addressed by Norwegian Coastal Administration director John Erik Hagen, who chairs the IMO correspondence group that will present a high-priority task list to the June meeting of the MSC (MSC 95).

The group has identified six tasks for inclusion in IMO's biennial work programmes, up to 2019, with the recommendation that three should be fast-tracked. These three are:

- updating, by adding new modules, the existing performance standards for integrated navigation systems relating to the harmonisation of bridge design and display of information;
- revising the existing guidelines and criteria for ship reporting systems relating to standardised and harmonised electronic ship reporting and automated collection of onboard data; and
- developing new guidelines on harmonised display of navigation information received via communications equipment.

Mr Hagen acknowledged that "it is a question of attitude and willingness" whether IMO member states, international organisations and industry stakeholders would come forward to do the work. But he made it clear that participation of this kind was essential. At stake was the delivery of global standards to bring maritime information exchange into the 21st century. The dividend of the e-navigation process was harmonisation and this would benefit users, he said.

International Chamber of Shipping marine director John Murray agreed that the MSC 95 session would be crucial as a means of locking IMO into the ongoing development of e-navigation. Anything short of the genuine commitment of the IMO membership to the delivery of practical e-navigation solutions for worldwide application would open the door for regional and national solutions with differing standards, to the detriment of efficient shipping.

Mr Murray said that it was essential that e-navigation brought about a reduction in the administrative burden carried by ships' crews. IMO should urgently adopt a new requirement for the mandatory electronic exchange of



Aline De Bièvre attended the e-Navigation Underway 2015 conference on board DFDS passenger ferry *Pearl Seaways*

information – based on IMO-standardised forms, in particular those of the Convention on Facilitation of International Maritime Traffic – to support automatic reporting, so that bridge officers were free to fully engage with navigational tasks.

Voicing similar concerns, Simon Pelletier, a senior Canadian pilot and president of the International Maritime Pilots' Association (IMPA), insisted that "very little or nothing at all" had been accomplished so far for the mariner. He saw as the root of the problem the relentless introduction of new technology and of new information that was not needed. Integration of new equipment designs and harmonisation of information displays were lacking. He warned against the erosion of active navigational skills, which was endangering safety. This had never been the intention of the e-navigation pioneers.

Common data structure and the maritime cloud

Addressing the technical aspect of e-navigation, International Hydrographic Organization (IHO) president Robert Ward called for the urgent establishment of a common data structure in order to ensure that digital data was interoperable. Mariners, ship operators and all those involved in commercial maritime activities would need to provide digital information only once and would obtain information that was both relevant and authoritative in return. Information would be available to the user when it was needed. It would also be possible to combine and analyse it with other information, such as nautical chart data, making the latter more relevant and thus demonstrating the added value that e-navigation could offer the user.

He emphasised the critical, underpinning role of the IHO S-100 data exchange standard in the e-navigation digital information environment. As a baseline standard, it had an inherent flexibility to support a wide variety of digital data sources, products and services. Capt Ward expected the second edition of the standard to become available within the next year. Mr Eriksson commented that the IALA e-Navigation Committee was working to ensure that shore-based product specifications were aligned as closely as possible to the S-100 standard.

A key topic of discussion concerned communication channels for the transfer of digital data. Several speakers described e-navigation as the maritime Internet. Interest is clearly growing in the concept of the maritime cloud, as the enabler of a secure, reliable and standardised way for mariners, bridge systems and shore-based data centres to access accurate, relevant and timely information.

The DMA has secured European funding for the new EfficienSea 2 project. It will lead this project with 31 other partners from 10



Delegates on board Pearl Seaways had lively exchanges on many e-navigation implementation issues

European countries and with the support of a high-level user group. Starting on 1 May, with a timeframe of 36 months, the project has a budget of €11.5 million. Thomas Christensen of the DMA said that a major objective was to create a logical communications infrastructure for e-navigation, based on available communications systems. A prototype maritime cloud had already been developed and had been used successfully for exchanging basic text messages in the two regional testbed projects, Monalisa 2 in the Baltic Sea and AccSeas in the North Sea.

A number of presentations on board *Pearl Seaways* demonstrated how the maritime cloud is moving from the conceptual to the development phase in various parts of the world. Geir Lyngheim Olsen of Jeppesen, Norway introduced the 'maritime Android' and explained that it was a simple way to make local maritime cloud information work in the shipboard digital environment with limited connectivity.

Local information could, for example, include navigational notices, vessel traffic services contact details, and maritime rescue co-ordination centre emergency contacts. It could be made available as part of the digital voyage planning function of the ship's electronic chart system. There could be the option of providing the information automatically by means of a single-window application.

Using the maritime cloud to send and receive information about local and passing ships via smart phone was part of a prototype small area information system developed for the narrow and twisting, L-shaped Onda Strait in the Seto

Inland Sea in Japan. Junji Fukuto of Japan's National Maritime Research Institute said that the heavy traffic in this dangerously confined area – characterised by strong currents and blind corners – explained why small ships without an automatic identification system (AIS) were particularly keen to receive position data and other relevant information.

Jung Sung Heon of South Korea's Dong Kang Marine-Technology Co reported on a promising study into the use of a navigation cloud server, to be installed in a shore-based traffic control centre or on board a mother ship. The server was used to process, analyse, relay and display ship-specific radar, electronic chart and AIS data directly onto a single Android tablet, which had a GPS connection, that was located on the bridge of any vessel lacking physical installation capacity (such as high speed craft, and small coastguard and fishing vessels). The results from the successful development phase will be evaluated on a testbed in the port of Gusan in the Yellow Sea.

Emerging new concerns

With IMO's work gathering pace on the review and modernisation of the Global Maritime Distress and Safety System (GMDSS), there is an opportunity to co-ordinate this project with IMO's e-navigation work. Jean-Charles Cornillou, technical adviser to Cerema, France suggested that co-ordination would make a lot of sense and that there were benefits to be derived for e-navigation.

He also suggested the possibility of backing up e-navigation communications via the

GMDSS and vice versa.

Cyber security in the implementation of e-navigation and in development work on the maritime cloud was widely felt to be a matter for urgent consideration. Kwangil Lee of South Korea's Electronics and Telecommunications Research Institute pointed out that the interconnectivity that e-navigation enabled in the interests of enhanced navigational safety also increased the threat of security attacks.

There is as yet no standard for e-navigation governance. This will be addressed under EfficienSea 2 and by IALA's e-Navigation Committee. The issue is politically sensitive and is bound to raise broader legal questions about the allocation of responsibilities for risk control and possible liability implications.

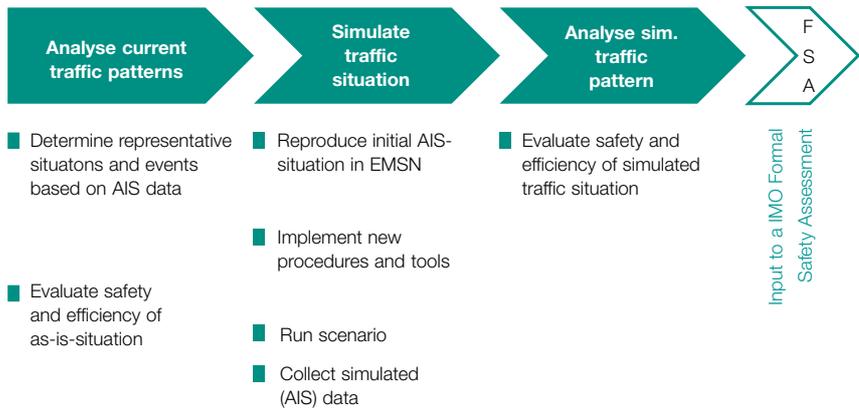
Many delegates were concerned about the impact of e-navigation on masters and bridge crews and how to address changing training needs. There was wide agreement that basic computer literacy should be included in training modules.

It was a good decision on the part of the conference organisers to devote the last session to human-centred design of ship bridge equipment. The merciless exposure of persisting bad practices in system design failing people, presented by academic researchers Margareta Lützhöft and Benjamin Brooks, was entertaining and depressing in equal measure.

Nick Lemon of the Australian Maritime Safety

Test set-up within MONALISA 2.0

STM operational tests require large-scale test-environments



The Monalisa 2 Sea Traffic Management (STM) test setup using large-scale interactive simulation to test e-navigation concepts

Authority suggested that Solas regulation V/15 on bridge design principles, although mandatory, was not working. The regulation needed to be clarified to ensure that all stakeholders involved in shipping, including shipbuilders and nautical engineers, had a sound awareness of the aims of human-centred design and understood that they had a role to play in ensuring good practices from the early stages of bridge design. He also raised the possibility of subjecting ship bridge equipment to human-centred design type approval. **MEC**

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****IMO defines e-navigation as "the harmonised collection, integration, exchange, presentation and analysis of marine 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"**

Positioning navigation and timing solutions

A topic that was much discussed at the e-Navigation Underway 2015 conference was the resilience, reliability and integrity of positioning, navigation and timing (PNT). Alwyn Williams of the General Lighthouse Authorities of the UK and Ireland showed how the AccSeas project for improving shipping

accessibility, efficiency advantages, safety and environmental sustainability in the North Sea region had been able to create and use PNT solutions.

One such innovative solution concerned the provision of route exchange services. It proved popular with both shipboard and

vessel traffic service users when it was trialled with a P&O passenger ferry, using the maritime cloud. Dr Williams said that this enabled communications about tactical, intended or suggested route alternatives to be free of any error, because graphic images of the new alternative routes could be exchanged.

New problems loom over the horizon

Many ships engaged on international voyages will still not have ecdis, even after the full implementation schedule under Solas regulation V/19.2 is completed in 2018. This is because they were not included in the Solas mandatory carriage requirement for ecdis. This will have implications for e-navigation – and its wider role in maritime risk management – because the gap in ecdis use will be large.

Existing cargo ships under 10,000gt and existing tankers under 3,000gt will not have to comply, nor will passenger ships under 500gt. This should be cause for concern on the part of those involved in implementing

e-navigation. The issue received only a cursory mention at the e-Navigation Underway 2015 conference, but the implicit understanding among participants was that it would be too difficult to rectify the situation because the Solas carriage requirement represented a sensitive IMO compromise.

Much more vocal concern was in evidence about the need for improved ecdis training, not least because of the sheer diversity of electronic chart systems that are on the market.

Meanwhile, the problem of software updating looms ever larger. IMO guidance on procedures for updating shipborne

navigation and communications equipment is available. However, there is no internationally recognised standard in place to regulate the maintenance of shipboard software. Richard Doherty, chief technical officer of the international association of marine electronics companies CIRM, said that the joint working group with Bimco on software maintenance was making progress by drafting an industry standard. The group was established last year from a wide spectrum of experts including the technical committee of the International Electrotechnical Commission and representatives of major shipowners.