Digital Ship
www.thedigitalship.com
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Inmarsat and Astrium agree GX MOU

Astrium Services has been a notable absentee from the confirmed list of Global Xpress reseller partners that Inmarsat has announced over the last six months – this may be set to change as the companies have confirmed the agreement of an MOU that should pave the way to a formal deal

After extensive negotiations, Inmarsat and Astrium have taken the first firm steps towards a distribution deal for the Global Xpress Ka-band service following the agreement of a Memorandum of Understanding (MOU) between the two companies.

The deal, officially an 'MOU on a Strategic Distribution Partnership Agreement for Global Xpress', was struck at the Inmarsat partner conference in Budapest, Hungary, on December 5.

The exact details of what is contained in the document have not yet been disclosed, though it has been confirmed to *Digital Ship* that the MOU does, at least, pave the way for an agreement on Global Xpress to be reached.

It has also been confirmed that both parties are currently in active negotiations to finalise a deal "in the very near future", which it is hoped could come about early in 2013.

Astrium has so far been conspicuous by its absence from the growing list of confirmed resellers for Global Xpress, despite the fact that it is currently Inmarsat's largest external distribution partner, contributing to approximately 40 per cent of Inmarsat's maritime revenues.

It is thought that a number of differences exist between the two parties with regard to how they would like to present the product to the market, particularly when it comes to the integration of value added services (VAS) to operate with the Ka-band communications network.

The MOU is expected to lead to a formal deal on GX in early 2013

Astrium is understandably keen to be able to differentiate its offering from that of other competitors providing Global Xpress as far as possible, and seems to have so far been discouraged by Inmarsat's efforts to exert greater control over the VAS ecosystem via its alliance with Cisco.

In an interview with *Digital Ship* in our October issue, Erik Ceuppens, head of the Astrium Services Business Communications division, admitted that there had been "tensions" between the parties, particularly with relation to the freedom resellers will have to create their own packages around the Global Xpress product.

"Inmarsat is looking at the Global Xpress tie-in of value added services to one connectivity technology. We have, clearly, a different view – there are connectivity technologies but the solution layer we are building should be, in a certain way, independent of the connectivity provided," said Mr Ceuppens, in that interview.

"This is probably where we have a

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Digital Ship Limited
2nd Floor,
8 Baltic Street East
London EC1Y 0UP, U.K.
www.thedigitalship.com

PUBLISHER
Stuart Fryer

EDITOR
Rob O'Dwyer: Tel: +44 (0)20 7017 3410
email: odwyer@thedigitalship.com

DEPUTY EDITOR
Julie Ann Chan: Tel: +44 (0) 20 7017 3414
email: julie@thedigitalship.com

CONFERENCE PRODUCER
Cathy Hodge: Tel +44 (0) 20 7253 2700
email: cathy@thedigitalship.com

ADVERTISING
Ria Kontogeorgou: Tel: +44 (0)20 7017 3401
email: ria@thedigitalship.com

PRODUCTION
Vivian Chee: Tel: +44 (0)20 8995 5540
email: chee@thedigitalship.com

EVENTS
Diana Leahy Engelbrecht
Tel: +44 (0)118 931 3109
email: diana@thedigitalship.com

CONSULTANT WRITER
Dr Andy Norris (navigation)
apnorris@globalnet.co.uk

DIGITAL SHIP SUBSCRIPTIONS
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different view, for example, than Inmarsat. We strongly believe in diversity. I think it's also of benefit to Inmarsat, because if there's no diversity the only differentiator will be price and I think that's not really healthy for the industry."

"What's important is that, in the Global Xpress framework, elements are there that will allow companies to compete on the difference in their value propositions to the customers, and not only to compete on price. For us, indeed, it's critical that there is a differentiation possibility based on the services that we will be able to add."

However, despite these differences Mr Ceuppens was still, even at that time, confident that a compromise could be reached.

"Clearly, what we are trying to do is establish a strategic agreement with Inmarsat on Global Xpress. To come to a strategic agreement obviously both parties need to agree, which is always a process to go through – and we are currently going through that process," he said.

"What is key for us is to be able to build a sustainable business model for Global Xpress in the future, not only for Astrium, as such, but also for our partners. A major part of our business is still through our distribution channel, so we are not only negotiating for Astrium, we are negotiating for our distribution channel."

It would seem that the companies' newly agreed MOU may now mark the first steps in reaching a compromise deal that will see the parties able to cooperate on distribution of the Ka-band service under terms that are satisfactory to both.

There is certainly an eagerness on both sides to reach a resolution - after all, Astrium does not want to be unable to offer Global Xpress to its customers as part of its portfolio, while at the same time Inmarsat can ill afford to exclude its largest maritime partner from its list of resellers as it tries to recoup its $1.2 billion investment into Global Xpress.

Further developments will be keenly awaited, to see if Astrium does indeed join Telemar, GMPCS, Navarino, SingTel, Imtech and JRC as a GX partner in 2013. **DS**

KGJS to roll out Dual iFusion

www.globewireless.com

Norwegian shipping company Kristian Gerhard Jebsen Skipsrederi AS is to implement the Dual Globe iFusion system from Globe Wireless as the communication solution for both the SKS Tankers Holding AS and KGJS Cement Holding AS fleets.

The Dual Globe iFusion system includes a two terminal FleetBroadband configuration, with one terminal acting as the primary communication system and the secondary terminal acting as a backup.

The standard Globe iFusion system will be supplemented by a second back-up antenna

All external voice and data communications are controlled by the primary antenna, however if any connection loss is detected on the primary the secondary terminal antenna is used automatically for all services.

The secondary terminal also serves as a backup and can become the primary terminal in the event of primary terminal hardware failure.

Globe Wireless already had an existing relationship with KGJS prior to this deal, and the two companies have worked together to develop and evaluate the specific requirements and communication systems needed.

"Globe Wireless has been working with us, not as a supplier, but as a partner throughout this time and has demonstrated exceptional commitment and flexibility in offering us a satellite communications solution that satisfies our evolving needs," said KGJS, in a statement.

"They were open to our ideas and had many of their own to offer. Globe Wireless' Dual Globe iFusion solution will ensure that there is reliable, high quality broadband communications between our vessels and offices ashore."

"In addition, Globe Wireless is meeting our bandwidth needs, along with providing a complete turnkey solution including logistics, equipment, service, support and applications. This level of support enables us to focus on our business at a more efficient level reducing our operational costs."

Globecomm hits 3,500

www.globecommsystems.com

Globecomm Systems has announced that it has reached the milestone of providing connectivity services to 3,500 ships globally.

"The growth of our maritime services segment is a core strategy for Globecomm and will continue to be so in coming years," said Dave Hershberg, Globecomm chairman and CEO.

"The key to our approach is being 'agnostic' about the airtime and letting our customers choose a service that is right for them, all of which can take advantage of a market-leading suite of value-added services."

Globecomm's products include communications services ranging from L-band to GSM and VSAT, as well as value-added software products.

More than half of the company's customers use Inmarsat platforms, with the remainder divided between Iridium, VSAT and GSM technology.

Globecomm has also installed 300 Wi-Fi networks on ships to enable managed internet access for crews, as well as combining hybrid VSAT and GSM services, enabling remote access to onboard IT networks and providing firewall and anti-virus products.

"2012 has been an excellent year for Globecomm Maritime," said Malcom McMaster, president of Globecomm Maritime.

"We have remained focused on core technologies such as Inmarsat FleetBroadband, but have also expanded our range of services, with emphasis on extended Ku-band coverage and our combined Ku-band/L-band service se@FLEX."

"Reaching 1,800 active Inmarsat terminals demonstrates the success of continuing to support core maritime technology while at the same time providing cost-effective services that our customers have come to know and trust."

Beam Communications has celebrated its 10th anniversary, having been founded in 2002 in Melbourne following a request by **Telstra** and **Iridium** to design and manufacture a satellite terminal for the Australian market.

SELEX Elsag is to provide customer-specific engineering services to optimise **SnapTV's** modular IP infotainment system in the UK maritime market. The company will also provide after-sales support in the country from its 15 regional service support centres.

www.beamcommunications.com
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Stena and Color Line extend GSM contracts with MCP

www.mcp.com

Maritime Communications Partner (MCP) has signed separate extended contracts to deliver wireless communication services to Stena Line's European ferry operations as well as Color Line, Norway's largest cruise and transportation company.

The new contract with Stena is an extension of an existing contract, and expands MCP's services on to two additional Stena Line vessels. These vessels include the former Scandlines vessels Sassnitz and Mecklenburg-Vorpommern.

The new contract will cover access to mobile communication services onboard, with MCP in the process of upgrading its GSM service to include higher bandwidth systems like 3G and LTE in the next few years.

"Our partnership with MCP goes back many years, as our first contract was signed in 2004," said Niclas Ingeström, CIO of Stena Line.

"We have always worked closely together with MCP, testing new innovative solutions to ensure that we are able to offer our passengers the latest and best within mobile services."

"It is clear that innovation and research is a top priority for MCP, always focusing on future growth and technologies. Having a partner like MCP ensures us that our passengers have the best communication services."

The deal with Color Line meanwhile will see MCP extend its provision of mobile communications services onboard the company's vessels.

"It is crucial that our passengers receive the best wireless communication service available. This includes the opportunity to use their mobile phones and data roaming like normal when they are out of the range of terrestrial coverage," said Jo Eirik Østmo, acting CIO, Color Line.

"Our cooperation with MCP goes back to 2006, and we are very pleased to take part in, and get the benefits of, their constant drive for innovation and future technologies. With MCP as a partner we can rely on the best possible wireless communication services for our passengers and crew."

Color Line operates a fleet of six ships, transporting more than four million passengers, close to 900,000 cars and over 170,000 trucks each year.

Stena Line and Color Line passengers will be able to continue using their mobile phones at sea via the MCP service

"Ferry operators all over the world are facing a growing demand for reliable wireless access from passengers and commuters wishing to take advantage of the internet and other communications services. Ferry operators must be highly adaptable to meet the mobile social networking revolution," said Eivind Madsen, CEO, MCP.

"We are proud to have Color Line as a partner as they are always looking to meet and surpass their passengers' needs and wants – including their desire for mobile connectivity."

Globalstar edges closer to launch

www.globalstar.com

Globalstar has announced that all six of its second-generation satellites scheduled for launch in early February have been delivered to the Baikonur Cosmodrome in Kazakhstan.

Following the successful completion of their pre-shipment review at Thales's manufacturing facility in Rome, the final two satellites arrived at the launch complex on December 9th.

Once deployed, Globalstar says that the six satellites will restore full service to its customers and position the company as the first mobile satellite service provider to deploy a second-generation constellation of low-earth-orbit (LEO) satellites.

"After more than six years of design and development, we are proud to announce that Globalstar is on the threshold of completing the deployment of our new constellation," said Jay Monroe, chairman and CEO for Globalstar, Inc.

Globalstar hopes to complete its final next-gen launch in February. Photo: Arianespace

"This successful delivery signals the achievement of one of the last key milestones for our fourth launch and restoration of Globalstar's industry leading service quality."

Two of the six satellites previously delivered to the launch site have already been fuelled and mated to the upper stack of the dispenser of the Soyuz launch vehicle.

With the delivery of the final two satellites, Globalstar says it remains on schedule for a launch in early February. Three of four launches consisting of six satellites per launch have been completed.

This news was the latest positive development for the company after it was also recently able to return to commercial service a satellite it was forced to remove in early 2011 after it was affected by a momentum wheel issue.

This satellite was originally launched in October 2010 before being removed from service shortly afterwards. However, with the spacecraft now back in working order, Globalstar now has all 18 of its launched second-generation satellites providing commercial service.

"After more than a year of development, Globalstar and Thales Alenia Space completed the software engineering, uploaded and tested the solution, and then successfully returned the affected satellite to commercial service," said Mr Monroe.

"The solution not only permitted this satellite to return to service but also provides a fix for similar problems that may happen across our constellation. Once again, I would like to thank all the Globalstar and Thales engineers and their respective teams for this collaborative solution."

KVH extends mini-VSAT capacity

www.kvh.com

KVH reports that it has completed an upgrade to its mini-VSAT Broadband network that will provide customers in Europe, the Middle East, and northern Africa (EMEA) with a 60 per cent increase in satellite capacity.

The company says that the added capacity was provided by consolidating bandwidth covering two separate regions into one unified beam, and by implementing Variable Coding, Spreading and Modulation (VCSM) technology provided by ViaSat, KVH's partner in the mini-VSAT Broadband network.

"We actively monitor and manage our mini-VSAT Broadband network to ensure we are delivering the speeds and quality of service our customers expect," explained Marc Edwards, KVH's director of network operations.

"Rapid growth of our customer base, which now includes well over 2,500 systems in the field, resulted in increased utilisation of the network during peak periods in the EMEA region. We reconfigured our satellite coverage to more effectively serve this region with a single beam, which allows the ViaSat ArcLight spread spectrum technology used in our network to more efficiently carry the traffic."

"At the same time we implemented VCSM, and the combination of changes increased our network capacity by 60 per cent overall in the EMEA region."

VCSM will be introduced throughout the remainder of the mini-VSAT Broadband network not covered by this extension in the coming months.

"One of the significant advantages of providing a fully integrated end-to-end solution where we control both the hardware design and the network architecture is that we are able to continuously enhance the quality of the service we're delivering to our customers and upgrade our equipment in the field with over-the-air modem software updates," said Mr Edwards.

"We also have the ability to dynamically reconfigure the satellite maps used by our onboard terminals, which enables us to load our network evenly and bring additional capacity online whenever and wherever it is needed."

Thuraya agrees Japan deal

www.thuraya.com

Thuraya Telecommunications and SoftBank Mobile, a Japanese telecommunications company, have announced they have signed an agreement to offer mobile satellite communication services to the Japanese market using Thuraya's satellite network.

SoftBank Mobile has applied and successfully received approval from the Japanese regulator to provide Thuraya's satellite network services in Japan, and, commencing from February 2013, Thuraya handsets and airtime services will be sold to customers via SoftBank Mobile's distribution channel.

As part of the agreement, the two companies will collaborate together to design a new version of Thuraya's handset with special features, which will be available exclusively from SoftBank Mobile.

These services will be available throughout Japan and in the maritime areas surrounding the country.

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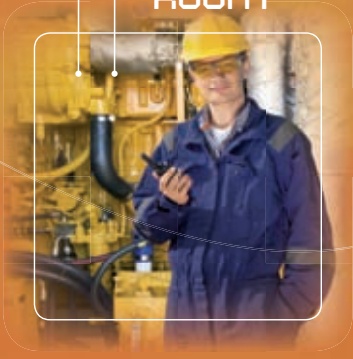

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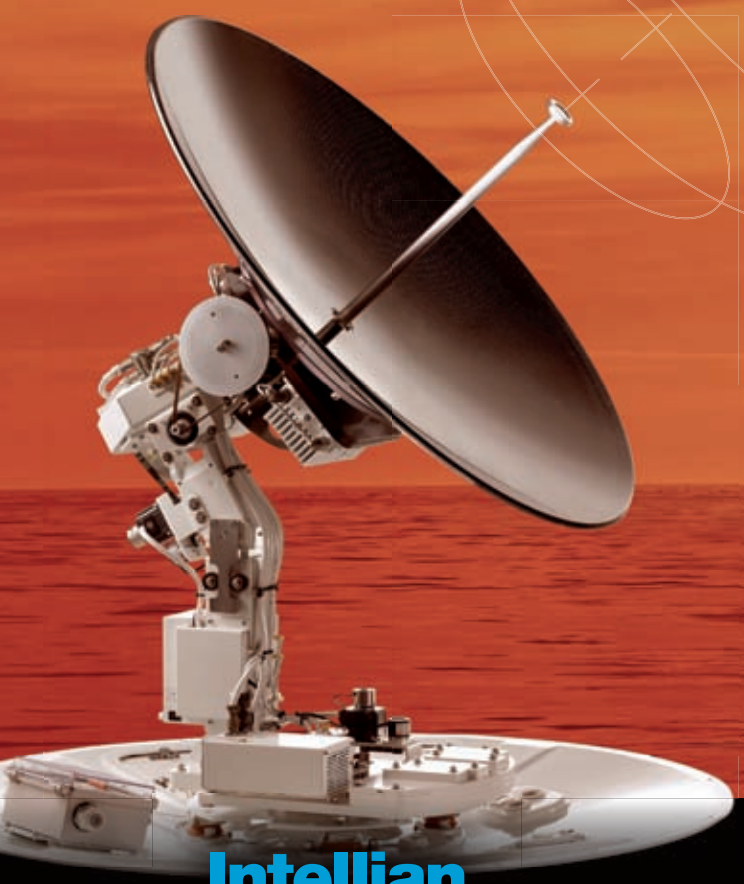

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Hybrid connectivity makes the leap from land to sea

Satellite technology has formed the backbone of maritime communications for decades, but the ever-increasing hunger for bandwidth should see hybrid networks incorporating new technologies become increasingly important to vessel connectivity in the near future, *writes Tore Morten Olsen, Astrium Services*

With Alexander Bell's patent for the telephone granted in 1876, it's safe to say that everyone alive today has lived in a world of electronic communication.

Of course, at home or in the office, we take our connectivity for granted. But look a little further afield and even in 2013, 137 years after Mr Bell set us on the path of communicating by electricity and later, RF and digital, much of our planet still doesn't have access to reliable telephony, especially broadband internet.

Many countries in the developing world lack critical terrestrial infrastructure. If it is in place it may be unreliable and at the mercy of a power grid that can't deliver due to economic, natural resources or political issues.

So, for commercial businesses, banks, heavy industry and humanitarian organisations operating in these often remote, sometimes unstable locations, custom, managed VSAT services are a communications lifeline.

In the last decade or so though, the communications possibilities being provided to VSAT users on land have exploded as service providers have invested considerable R&D spend in developing hybrid networks, using a harmonised selection of disparate technologies and bandwidth to ensure their customers have reliable, high bandwidth connectivity at all times, regardless of local conditions.

These developments have, over the last few years, transferred to connectivity at sea, where voice communication, e-mail, broadband internet and IP applications are delivered by multiple carriers within a single network.

Hybrid at sea

So, after becoming established as a method for supplying communications on land, hybrid networks are now becoming more common at sea, with ship owner investments in communication aimed at improving operational efficiencies, supporting crew recruitment and retention, enhancing passenger welfare and securing vessel safety.

The bottom line is that today, more bandwidth is needed and single antenna/technology solutions may not always be the best approach in order to stay cost-effective. We see freight rates at record (relative) lows and no end in sight to the current woes in the global economic outlook.

Hybrid networks however, can offer all the bandwidth that's needed, but automatically select the least cost carrier, depending on where a vessel is at any one time.

A hybrid network on board a vessel may consist of just two different communication platforms or several, depending on the specific needs or indeed route of a vessel.

Technologies available are across the board: MSS including Iridium and Inmarsat, C/Ku/Ka-band VSAT, 3/4G, Wi-Fi, WiMax and even TVRO, where inbound data can be channelled through a vessel's satellite TV antenna.

Rather than simply installing a range of disparate platforms and equipment though, the critical aspect that makes a real hybrid network on board is a central point that can manage and select the best carrier for the job in terms of bandwidth required and least cost routing. And all automatically.

These boxes are already commonplace, deployed on a number of vessels within all maritime industry segments, but today the alternative carriers to MSS and VSAT are only available close to shore or in port, which doesn't reflect the true potential.

A true hybrid solution will always find the best carrier available for the job and, because of this, will be able to provide always-on connectivity for vessel-wide Wi-Fi, so the potential for changing usage patterns in the maritime transport segment is high.

This is an area of development which still may be seen as being in its infancy.

On land, these systems have been in development for a number of years and we are able to learn from the work already done. At sea, few service providers are positioned to offer these kinds of solutions, which are designed to provide the best channel available based on the changing local connectivity environment whilst introducing cost efficiencies in regards to automatically selecting the cheapest way of sending and receiving, depending on where the vessel is.

Applications

But why is more, cheaper bandwidth needed and how can shipping companies profit from the investment that the satcoms industry requires them to make?

For starters, we're well aware that e-mail has become an important tool for vessel management, whilst the ability to send and receive files is a boon for completing forms etc, before coming into port.

On that level, many vessels don't require a huge amount of bandwidth. However, factor in the crew communication aspect, more bandwidth hungry equipment and real time vessel monitoring applications where data from on board systems is continuously transferred to shore, and we quickly see the requirement for bandwidth increasing.

So finding the fastest, most cost effective route for communications at any one time will, without a doubt, save a vessel money when we look at how a modern vessel uses the internet. We can also look one step ahead, at solutions proposing to completely integrate all vessel or operation data into a single online system that can be viewed by stakeholders on board and ashore.

Such 'collaboration' systems are currently being used within the oil & gas industry, to support exploration and production, with, for instance, drilling software available to give all experts a detailed view of what is happening in the well.

This data has to be unified and transmitted, often in real-time to shore, so that all experts have the best information, allowing them to make informed decisions to enhance efficiency.

This level of collaboration isn't required within the maritime transport segment, but there are a number of systems available that can integrate all of a vessel's performance, fuel consumption and emissions data and display it in a web browser for ship managers on shore.

This means that disparate systems have to talk to each other in standardised formats, such as WITSML used by the oil & gas industry, which in turn creates the need for even more bandwidth.

Developers of these systems put a lot of effort into compression and efficiency, to ensure that the bandwidth they consume whilst communicating doesn't cripple a vessel's communication budget. But still, as real time monitoring becomes more important for enhancing ship operation efficiency, more bandwidth than traditional 'dump' reporting is required, so hybrid networks and least cost routing can help to reduce the financial burden.

It may not be immediately measureable, but the benefits in crew retention, HSE and vessel efficiency outweigh the spend on communication, whether for a single VSAT or full hybrid solution.

The nature of hybrid networks mean that a service provider may select from several communication carriers to meet a vessel and shipping company's requirements, and there are several new technologies, or carriers, in development that will increase bandwidth available even more.

Bouncing Wi-Fi off of vessels is one such new approach. Although some way off from becoming mainstream, this technology enables the availability of high-speed multi-megabit broadband internet at terrestrial rates.

Another new technology in development is communication by laser light. Again, this won't be making its way to vessels any time soon, but an American company has announced its intention to launch what it says will be the world's first commercial satellite communications constellation based entirely on optical wave technology.

The planned constellation is to be comprised of 12 satellites, eight primary satellites and four spares, which will be placed in a Medium Earth Orbit at 10,500 km.

One of the most interesting aspects of the system is that it will not rely on radio frequency (RF) spectrum, as typically used in maritime satellite communications. The

The Color Magic is just one example of a vessel combining 3G, 4G and Wi-Fi with its onboard VSAT to extend its bandwidth capabilities

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** Euroconsult Report, March 2012 and NSR, May 2012*

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Laser-based communications could form part of future hybrid networks

possibility that this service will be lower cost than current or planned satellite services, as it does not require wireless spectrum, regeneration stations, multiple gateway facilities, and other infrastructure associated with RF communications, means that it has potential to be an important technology for future hybrid networks. Whether laser can overcome obstacles such as weather conditions and blockage remains to be seen.

Increased access

With hybrid technology providing access to lower-cost, more available connectivity, usage patterns are already starting to change. The internet is now more accessible to crews than it was just a few years ago.

This actually introduces a new challenge for managers in that full vessel Wi-Fi can actually be too easy for crew to access, with a potentially negative impact on efficiency and even vessel safety.

Systems are available that offer quite detailed management of how and when a crew member can access the internet though, so vessels can avoid the situation where crew are able to check personal e-mail on their smartphones even when they are on the job.

Another area that may change as connectivity becomes more available throughout a vessel, is the job of the engineer.

Already, data monitoring and control systems are available that can be accessed on a laptop/tablet on board or ashore. This could lead to a future where every engineer has his or her ruggedised tablet, which can deliver all the information they need about any system in seconds and can even duplicate this in real-time for colleagues on land.

This is only one example, reflected by the plethora of systems being shown off at maritime exhibitions, where it's almost impossible to pass a stand without seeing data on some kind of tablet.

The technology is here though and it is now down to owners, managers and engineers themselves as to whether they choose to use the new levels of connectivity available through hybrid networks to enable portable data management and control on board their vessels.

Ship operators are increasingly requiring more complex communications capabilities to support a multitude of applications and the availability of flexible services is fundamental to this.

There is no 'one-size-fits-all' communications solution, so the modern approach to maritime broadband allows users to combine a range of services and hardware to satisfy their individual needs – hybrid networks.

VSAT and MSS hybrids are more than enough for most vessels currently, but in the coming years, with connectivity being so heavily relied upon for business critical applications, providing more, cheaper bandwidth over hybrid networks is going to become increasingly more important.

As systems become more complex in order to allow land usage patterns to be replicated at sea in a cost effective fashion, the user must continue to experience seamless and reliable connectivity.

So, as an industry, whilst developing cutting-edge technological solutions, we have to always remember that reliability is critical, regardless of the technology or platform being used. **DS**

About the author

Tore Morten Olsen *is CEO of Astrium Services Business Communications – Maritime. Mr Olsen was previously CEO of Marlink, prior to Astrium's restructuring of the Group, and has more than 16 years' experience in the satellite communications sector*

Imtech to Infinity

www.imtech.eu/marine
www.navarino.gr

Imtech Marine and Navarino have announced a partnership whereby Imtech has become a global supplier of the Infinity bandwidth management and optimisation system.

Infinity can be used onboard ships equipped with IP-based satellite terminals, such as Iridium Pilot, FleetBroadband or VSAT, and will be used by Imtech to support its Global VSAT network and various connectivity solutions.

Imtech Marine offices that will be offering Infinity include those in the Netherlands, Germany, Belgium, China, Singapore and the USA.

"Imtech Marine's vision is to be a true lifecycle management partner for our customers and help them lower their Total Cost of Ownership," said Eric van den Adel, managing director of Imtech Marine.

"By effectively combining our expertise in system integration and maintenance of technology on board, we support our customers during the full lifetime of a ship. Connectivity solutions are an important part of our lifecycle portfolio."

"We are very happy to partner with Navarino, as they have proven that they can tailor the Infinity product to the operational needs of our customers. Infinity can provide the ship owner with detailed reports on usage and visualise the savings on their airtime, while providing the most economical and effective business and crew communications. It is a very effective tool to help ship owners improve efficiency of their operations considerably, and thus it fits perfect in our life cycle management strategy."

Imtech's Global Technical Assistance Centres in Singapore, Houston and Rotterdam already perform remote monitoring and maintenance support for ships at sea. Infinity is expected to help these centres to directly access the satellite communication equipment onboard through a back-up connection.

"We are very pleased to be able to offer Infinity in conjunction with Imtech Marine," said Panos Tsikopoulos, Navarino's commercial director.

"Infinity is a very successful solution in the marketplace and we are careful only to work with quality resellers whom we are confident have both the technical expertise and commercial strength to fully support and promote Infinity."

"Imtech Marine, as one of the world's most prestigious leading maritime companies, is precisely the sort of company we enjoy working with and well placed to meet the quality standards we insist upon. Their global reach means customers around the world will be able to experience Infinity."

In other news, Imtech, has also announced that it has recently received new marine services and maintenance orders worth approximately €82 million, a business area that has become a key focus for the company.

"In the marine market, Imtech is working towards strategic growth in its services and maintenance activities and a strong expansion of the number of services branches along important shipping routes," said René van der Bruggen, CEO Imtech.

"Imtech now has the most extensive global service network in the marine market. These services branches focused previously on navigation and communications technology, but now offer Imtech's entire marine services package, leading to cross-selling and further growth."

"The new orders are good evidence of this. A new development is following vessels remotely, 24/7. This offers Imtech numerous new possibilities."

The 24/7 remark relates to the previously mentioned Global Control Centre, which offers continuous remote support and maintenance to vessels at sea.

The data created by this competence centre also provides further opportunities for application in business intelligence and data management areas.

A digital platform allows users to access vessel data while vessels are underway. Imtech says that, in the future it will also be possible to integrate this data with vessel movement data in ports.

SpeedCast buys Australian satcom company

www.speedcast.com

Hong Kong-based SpeedCast, together with its majority shareholder, private equity firm TA Associates, has completed a buyout of Australian Satellite Communications (ASC), a service provider in Australia.

ASC provides satellite-based communications solutions throughout Australia and surrounding regions, to maritime as well as the mining, oil & gas, construction and government sectors.

The company is headquartered in Adelaide, Australia, where it owns and operates its primary teleport and runs sales and support centres.

"As a profitable and rapidly growing company, ASC is an ideal fit with SpeedCast's global growth strategy," said Pierre-Jean Beylier, CEO, SpeedCast Ltd.

"SpeedCast is executing on its strategy of organic and acquisitive growth. With the acquisition of ASC, SpeedCast consolidates its leadership position in Asia and extends its penetration into the important Australian market, particularly for the oil & gas and mining verticals."

ASC's Adelaide teleport will be added to SpeedCast's global network, adding a second point of presence in Australia in addition to SpeedCast's existing teleport in Perth.

This combination will provide dual-site redundancy for SpeedCast's Australian customers and serve as a back-up to SpeedCast's Hong Kong infrastructure.

"The acquisition of ASC by SpeedCast is a very positive development for our customers, our employees and our suppliers," said Chris Joseland, managing director, ASC.

"With SpeedCast's experience, we believe that our business will now be able to take the next step in business growth. We see a great opportunity to offer our customers a broader range of satellite services and solutions, global satellite coverage and worldwide engineering support."

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Live training over satellite – the next wave?

As pressure increases on crew availability in the maritime industry, companies are looking to apply new technologies to seafarer training to increase the availability of education. Capt Pradeep Chawla, Anglo Eastern, spoke to *Digital Ship* about the potential of using satcoms to push the boundaries even further

In this magazine we often try to simplify the ever changing maritime technology environment by compartmentalising new developments and innovations as into one of a few major sectors – namely satellite communications, software and navigation systems.

For a number of practical reasons this works quite well, and does help to make our news easier to navigate for those with specific interests.

However, for the people at a shipping company tasked with making sure that operations run as smoothly and efficiently as possible, none of these technologies exist in separate silos.

Satellite communications act as a conduit to feed information from shore to ship and back again, and it is that data that is used to run the planned maintenance software systems, or deliver updates and licensing information to the electronic charts used by the onboard ECDIS.

Countless other systems interact in a range of different ways to keep companies at the leading edge of innovation, to try to gain and maintain a competitive advantage in an increasingly difficult market.

In the near future, in the deep sea shipping sector, one of the areas that looks likely to have a major impact on this ability to stay competitive is the recruitment and training of crews.

To date, the application of technology in this sphere has been focused on the development of simulators and computer based training systems that can making training more accessible to seafarers with greater demands on their time than ever before.

One of the main limitations in pursuing this type of training comes when you try to put these systems onboard the ship. To an extent they can work very well, but the restrictions caused by communication over a satellite link mean that allowing the seafaring student to interact 'live' with the shore may be impractical.

However, impractical or otherwise in the current environment, extending e-learning to ships at sea is an inevitable next step in the evolution of maritime training, according to Capt Pradeep Chawla, director of quality assurance and training at Anglo Eastern Shipmanagement.

Working with a company that manages 426 ships, and with influence over about 500 ships through a new joint venture agreed with Teekay earlier this year, Anglo Eastern employs around 18,000 seafarers – and with the changes that have taken place in shipping over the last couple of decades, the need to be able to offer effective training to those crews onboard ship has never been greater.

"In those old days, training really meant onboard training. The Master took on the crew he liked and he made their life miserable – they were taught like that. It took maybe 20 or 30 years to become a senior officer on a sailing ship," said Capt Chawla.

'With roughly 750,000 seafarers at sea at any one time, it would be nice if we could do some training while they are on the ship' – Capt Pradeep Chawla, Anglo Eastern

"In the modern era, we moved mainly into classroom based training, with a few gadgets thrown in. Basically, it's knowledge being given out of somebody speaking – maybe using PowerPoint or video clips, but it's pretty much classroom based."

"Then we came into these futuristic days that the communications companies would like us to get to, where we broadcast lectures from our Mumbai college all the way to the ship, having people listening in and interacting in groups with MAN BMW engine experts in Trondheim. We have started dreaming of these things as communications has become easier – and the communications providers are dreaming of how many dollars they are going to make."

Capt Chawla believes that the recent success of modern e-learning systems in traditional universities has raised the profile of the technology as a potential driver for future education and training.

"It's a growing market in universities and schools and colleges, and people say that it's going to grow to $50 billion in the next few years," he said.

"One of the reports I saw on the internet said that the market would be $107 billion by 2015, but if the rest of Google is saying $50 billion then they can't be right."

"Venture capitalists in the US and elsewhere are pouring money into the e-learning market, things like blackboard.com. There are close to 30 major e-learning providers around the world right now, who are mainly working in the university sector though some of them are in the corporate area."

As Capt Chawla notes, there are some immediate obvious benefits involved with using this type of technology.

"Those that have teenage children will realise the fees that they pay to the colleges for the very little teaching that they do. So it reduces costs, and you don't have to get people to the classroom," he said.

"This is something that's attractive to shipping companies as it's expensive to bring people to the classroom. That's probably the biggest driving factor."

"Self-paced learning is another possible benefit, though it also has the disadvantage that the learner has to also be motivated. If he wants to learn, then he'll use the e-learning courses."

The ability to deliver the courses to a wider audience than is possible using traditional methods is also something that could prove particularly beneficial in maritime.

"This is very important for shipping, because when new regulations come in you want to spread it all over your workforce," said Capt Chawla.

"In shipping, we are 1.5 million seafarers, so at any given time with roughly half of them out at sea, you're looking at 750,000 seafarers. It would be nice if we could do some training while they are on the ship."

Learning types

The effectiveness of various approaches to education is dependent on how the student is able to assimilate the information being presented to them. Understanding the process of learning is imperative if technology is to be effectively applied to improving the situation.

"In the training world, they talk about, making somebody competent, with knowledge, skills and attitude. I won't talk about attitude, because even with all the money spent on knowledge and skills we still have accidents in the world. So lets leave that out," said Capt Chawla.

"Then transfer of knowledge and acquisition of skills are the two main parts. How does transfer of knowledge happen? For most people it has been school and colleges, classroom learning. Typically in shipping it's a six-month kind of preparatory course for each of the competency exams that are given."

"The systems in different places may be slightly different, but in order to get competency to a level of Master or chief engineer you're looking at something like two to four years of college time."

From Capt Chawla's point of view, there is a limit on how far e-learning can really go in aiding people in the acquisition of 'skills' – fundamentally, he believes that practical, hands-on experience in this aspect of education cannot be substituted.

"With the acquisition of skills, you are sort of training people in a really hands-on way, opening machinery and closing it and so on. You can't really do this too much using e-learning media," he said.

"You can have blown up diagrams of machinery and you can tell them to virtually open this machine using a tool like a screwdriver on the screen, and you can observe the process to see if they do things the right way."

"There are other new ideas that we are trying out – but to really take out a piston from an engine on a 400,000 ton ship, you can't learn it virtually, you have to learn it onboard. So I don't see this affecting future training in this area."

On top of this initial core level of education it is important that what is learned is reinforced and built on in the future, through 'continuous learning'.

"This is where I think there's a lot more opportunity for things like satellite systems etc," said Capt Chawla.

"If you're doing six months in the college, why not reduce that to three months and give him the learning material on the ship? Each of the experts, in theory, could interact with the seafarer onboard. It could be experts in any field as well as the college based teachers. That would be a future goal in how learning is changing."

However, Capt Chawla believes that there will continue to be, for a long time to come, a significant gap between the kind of data that would need to pass over the satellite link to enable these systems and what can more easily be delivered to the ship in a physical form.

"Would people really send that material over satellite, or will it go preloaded on tablets, iPads, servers or whatever else, some kind of storage media?" he said.

"If we're looking at data sizes, we're talking about big data sizes. I would say that the jury is still out at the moment, but

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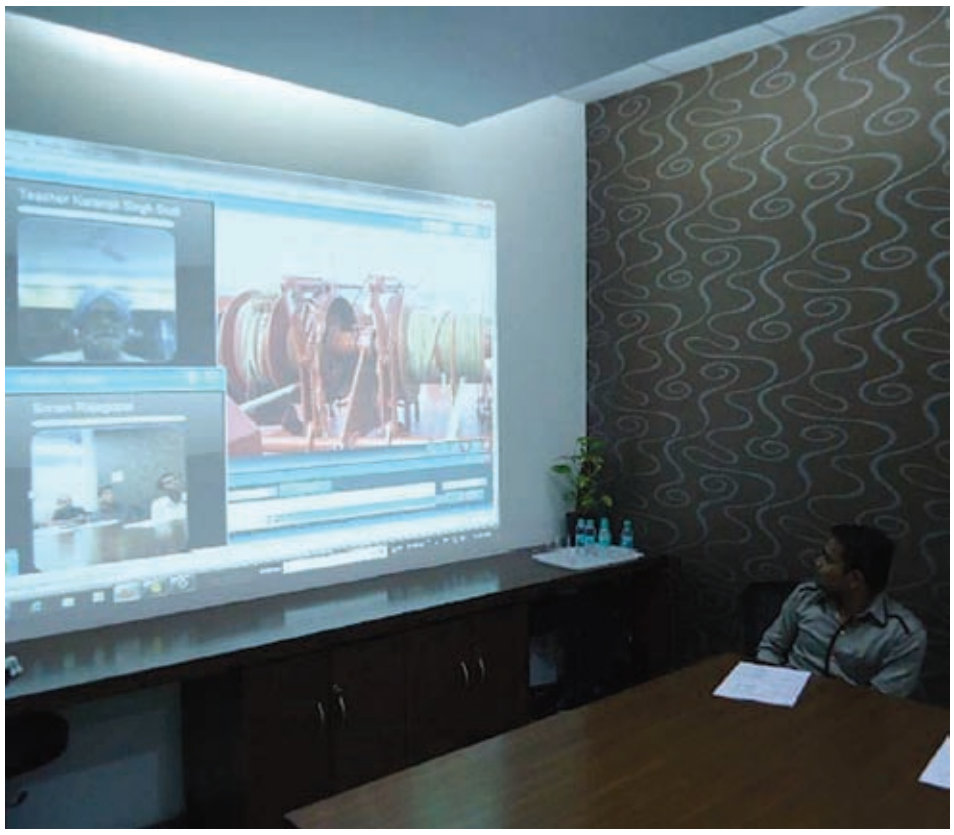

Anglo Eastern has introduced a number of new technologies to expand its training capabilities, including the use of 'virtual classrooms'

is probably more in favour of preloading stuff and sending that onboard."

"In Anglo Eastern our need would be to get 18,000 seafarers to learn something quickly, like new regulations. For that, I am interested in learning about how we can use modern communications to reach out to the seafarers."

The use of online simulators is another area that Capt Chawla believes could hold potential for internet connected training, though to a limited extent.

"(Simulation) is a field that seems to be having some interest in the market, with people trying to put these things on to the web. The natural extensions of that would be that we could do that on the ship once we have the super speed systems that the satellite guys are going to sell us in the next five years," he said.

"However, I don't think that's going to become too popular because it's very heavy stuff. The most recent thing that I've seen in the market is ECDIS training being put on the web. The lobby for ECDIS training seem to have been able to change shipping quite a bit, introducing type-specific learning, which is a very smart move for the manufacturers."

"In all these years we never had type specific training for a JRC radar or a Kelvin Hughes radar but all of a sudden now we need specific training for X and Y ECDIS units. I see some interest in it, but I don't see much in doing it over VSAT or whatever."

Present systems

Anglo Eastern has been a keen early adopter of learning technologies in maritime, having begun to use computer based system in the education of its seafarers as far back as 2006.

As Capt Chawla notes, the use of these systems developed out of necessity, given the huge numbers of people involved.

"Whenever there is a new regulation, typically we will do something with e-learning so we can get to many seafarers quickly, because bussing 18,000 people into classrooms would take three years," he said.

Besides regulations training, there are a number of other specific areas where Capt Chawla finds e-learning to be particularly beneficial.

"Accident case studies are a good area that a lot of training companies are getting into, recreating accidents so that people can learn from them. Again, if you have an accident in the fleet you want the whole of the rest of the fleet to learn from it. That's an area of e-learning that is useful," he said.

"Assessments is another, the world is asking for more and more proof that the people that are onboard are competent, and there is more assessment happening for the seafarer."

"This is a sector which sits very nicely with multiple choice questions on the web. Examinations for things like medicine in the US are also now done using multiple choice questions, so this is tried and tested in other areas and marine people will also adapt to it. Though there's not much of it happening at the moment (in shipping)."

Virtual classrooms are another area to which Anglo Eastern has been applying technology to extend the reach of its training facilities using the internet.

"You can have people sitting ashore and having 20 or 30 people logging in from anywhere in the world, or 20 or 30 people on the ship logging in and trying to do an interactive learning session," said Capt Chawla.

"We've been doing all of these things since 2006."

These experiences have put Capt Chawla in a good position to judge the potential of connecting similar systems to shore via satellite – however, the data required by the systems Anglo Eastern has been using would seem to be far from practical in this environment.

"An average 20 to 40 minute session is in the region of 550 MB, because of the videos and animations you've got to make it interesting," he said.

"There are many ways that we try to make it interesting and engage the learner, so they're not switching off from what's happening on the screen."

"PDF documents shown on screen, people have tried that for a long time and they've already realised that the next generation of people are visual learners – they don't like to read books, they don't like to read newspapers, they like to be given television ads of 20 seconds where they absorb the knowledge."

Capt Chawla believes that it will be difficult to reduce the data required to run these courses in an engaging way, without reducing their appeal significantly – and thus defeating the purpose, to an extent.

"The design of an e-learning course is very different from the design of classroom teaching. It's very different, there's a different set of people – ex-master mariners and ex-chief engineers are not necessarily the best people to write these programmes for the e-learning market. It requires a lot of thought going in," he said.

"In the e-learning world people are thinking about new techniques to draw the learner in, things like gaming which will be even more data heavy in terms of the programs."

"There is also the major disadvantage of the loss of peer based learning. Students learn from each other in schools and colleges, and when you take that away and put it on a computer screen, which they are supposed to do as self-paced learning, typically there will be a loss of peer learning. That's considered by educationists as a very good way of learning, as there is no teacher-student relationship, it's one student asking another student."

To date, Anglo Eastern's use of e-learning has not involved extensive use of satellite communications to transfer data – a situation Capt Chawla expects to continue for the foreseeable future.

"Presently, we do not transport much of this data over Inmarsat or VSAT. We keep it preloaded," he said.

"All of the companies that are doing this are doing it by putting a server onboard which is preloaded with the heavy duty data files that are required – we don't send a video file over Inmarsat or VSAT, we send it on a thumb drive or hard disk or DVD or whatever. That gets loaded onto the shipboard server."

"Right now, in terms of education and training, not much is happening over VSAT etc."

Future developments

There are a number of developments in the satellite communications and wider technology market that Capt Chawla believes will be necessary before shipping companies will be able to seriously look at moving to the next level of onboard training.

"First thing I need is high connection speeds, for a satisfying user experience if I want to transfer big amounts of stuff or if I want to stream a video of me speaking to my seafarers. That's going to be very high consumption of the bandwidth," he said.

"What are we going to end up with, how many MB per second will we reach in 2015 or 2020? I hear a little bit about what's happening, but I don't see this moving fast enough to really realise the role of shipboard e-learning."

Beyond the speed, the other standard complaint about satcom availability also applies to e-learning – that it costs too much to be viable – and Capt Chawla believes that expanding budgets to incorporate additional spending on training communications will prove very difficult.

"This comes up all the time – money comes up all the time, and that's a pretty critical thing," he said.

"I've seen all the new plans with unlimited data and so on, but today you're looking at most of the ships, for their business needs, needing less than 200 MB. Most of the shipmanagers, I would assume, are in that region – there are specialised ships where it might spike, but for most I think it's around there."

"How are we going to move from 200MB per ship per month into 10 GB or 20 GB, which is what we would need if we are going to get into education and training over satellite on the ships? In the future, are we going to get unlimited data, at a fixed price, at good speeds? This is what is relevant to e-learning."

Capt Chawla notes that this is a symptom of the wider issue of a general lack of funding for training in the maritime industry.

Anglo Eastern today runs its own training centres, where e-learning plays a significant role

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"The budgets in the industry for training are typically only one per cent of the payroll costs. If you check any high hazard industry, like chemical or nuclear, people in that industry are spending three to five per cent of their payroll cost, minimum," he said.

"Then we hear about the depressed freight market and when is it going to go up. That's a challenge for the next few years."

"And then there's something that is not normally considered by the technology providers – who is going to do this? There is a huge shortage of e-learning practitioners all over the world, not only in shipping."

Compounding the problem caused by the lack of e-learning experts in maritime is the further lack of support for any technology-based training that is installed on the vessel.

"We all assume that everybody is as competent or incompetent as we are in the office with our machines. But we have an IT department who comes to support us," said Capt Chawla.

"On the ship there is nobody to help them, so whatever system we design has to be robust. We hate it when any IT suppliers to us say 'please ask the master to copy this file from this folder to that and send it to us'."

"Nobody has the time onboard, nobody has the inclination onboard to do that. Management of this infrastructure would need to be stabilised before we can move into the e-learning world on ships."

Beyond the practicalities of running a digital training network on the ship, Capt Chawla is also concerned that the time pressure modern seafarers are under would make proper learning onboard a close to impossible task.

"Will they do their eight hours of watch, do three hours of extra work maintaining the ship, and then sit and do a nice e-learning module because the company has asked for it?" he said.

"In reality, it depends on the ship type, if you're on a small chemical tanker running around in Europe you can forget it – the man barely has enough time to sleep, he's not going to do e-learning no matter what satellite system you put onboard."

"Fatigue and rest hours today is a major issue in the industry, and that stops us from putting a lot of new stuff onboard because there is just not that many people to handle the extra jobs that we have been creating on the ship in the last twenty years. In the old days we had more than enough time to mentor our juniors and took pleasure in teaching them while they were on the ship. All that is gone."

Conclusions

Technology in training is a wide ranging topic, and there is no doubt that there is the potential for significant improvements that could introduce a range of benefits. But the restrictions necessarily imposed by having remote students in locations far from conducive to fast, cheap communications will continue to frustrate those wishing to apply these systems to shipping.

In Capt Chawla's opinion, use of e-learning in maritime will certainly grow – however, the connectivity component of the equation will not be significant in the near future.

"E-learning in the maritime sector, in my opinion, will grow at a fast pace ashore. We will all have learning management systems," he said.

"Today, out of my competitors, maybe 50 to 60 per cent of them have similar systems to us. But there is another 40 per cent who will also adapt as these systems become cheaper and more user friendly. Those of us who are doing this with servers and so on, we will take a long time to adapt to using satellite if they are going to charge us a lot of money to transport the data."

"Growth in communication needs created by e-learning will not be very significant in the short term – in my definition that means the next three to five years. I'm hoping the providers are going to bring down the costs to the extent that I'm going to rush to put e-learning onboard, but I don't see that happening at the moment. For communication needs to grow for training, speeds and costs must be more favourable, and there is a huge need for teachers for e-learning."

As it stands, Anglo Eastern will continue to pursue its own e-learning projects, and will use technology to try and meet its ever growing demand for training – with or without a satcom connection to the ship.

In the modern world, Capt Chawla believes that this is the only way to keep up with the pace of business in the shipping sector.

"In my sailing days I changed between eight companies and sailed with 18 nationalities – but rarely did companies send us on special courses for training. Today, any of the big ship managers, the good ones, are likely to have 50 to 60 value added courses running in their training centres," he said.

"The big change that has happened is that, rather than ship owners supporting colleges, it's the ship managers that are now supporting colleges and running their own colleges like us."

"We had to go down that route because we found that the ship owners were typically no longer supporting the colleges, and the national governments had stopped funding colleges so the equipment was out of a museum." DS

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Software produces 5.8% fuel saving for Bore

www.napa.fi

Finnish shipping company Bore has announced that it has verified a 5.8 per cent reduction in fuel consumption following a trial of an electronic SEEMP (ship energy efficiency management plan) software system.

The company says that its 89-day sea trial of the NAPA for Operations SEEMP software, conducted between April and July 2012 along routes between Cadiz and Naples and Cadiz and Pauillac, delivered calculated annual fuel savings of 320 tonnes, equivalent to $210,000 in fuel savings per annum, onboard the Ro-Ro vessel M/V Bore Sea.

Voyage reporting and electronic logbook systems were installed for a 63-day reference phase to establish the benchmark performance of the vessel before efficiency management processes were enacted for the trial.

Fuel consumption and efficiency data continued to be transmitted to shore every 10 minutes throughout the second stage of the study to give an accurate foundation for analysis.

Trials of the technology on the Bore Sea delivered fuel savings of $210,000. Photo: Bore

NAPA Speed Optimiser software was implemented to enable efficiency improvements to the vessel's speed profile, reducing the standard deviation of the speed profile from 1.6kn to 0.7kn.

Using a range of normalisation calculations NAPA says that it was able to factor out the difference in average speed, the effect of wind, and constant rpm mode to combinator mode from this result, and that the process showed that speed optimisation alone created a 5 per cent reduction in fuel consumption, with potential from trim optimisation providing another 0.8 per cent.

Through this normalisation process and data analysis, NAPA says that it could also verify additional savings of approximately 10 per cent through the use of WE Tech Solutions' Variable Frequency Drive Shaft Generator (VFD SG) application.

"We are exceptionally pleased with the outcome of this trial of NAPA for Operations SEEMP systems," said Jörgen Mansnerus, VP marine management, Bore.

"We challenged NAPA to prove that an electronic SEEMP could provide measurable and tangible fuel and cost savings to our fleet and this study does just that. During the benchmarking period, we saw that the business-as-usual annual consumption of M/V Bore Sea would be around 5,600 tonnes."

"Given the 5.8 per cent savings afforded by implementing two elements of the NAPA package, we should see significant financial savings."

Matti Salo, executive vice president, NAPA for Operations, noted that, based on his company's calculations, the savings achieved on the M/V Bore Sea equate to a 1,000 tonne annual reduction of CO2 emissions for the vessel.

"There is also potential for further savings to be achieved aboard this vessel with other elements of NAPA for Operations software, such as route optimisation, cargo positioning, ballast and fouling amongst other measures," he said.

The International Maritime Organisation's (IMO) SEEMP legislation has become mandatory from January 2013.

Nautical Control Solutions reports that its FuelTrax marine fuel management system has been granted patent protection by the Canadian Intellectual Property Office, an agency of Industry Canada. The company was previously granted a US patent in 2006, and has also applied to several European countries for equivalent patent protection.

www.fueltrax.com

COSCO and Intergraph extend deal

www.intergraph.com

COSCO Shipyard Group Co (COSCO) has extended its five-year master agreement with Intergraph, the companies report.

COSCO has previously delivered numerous offshore projects using Intergraph's SmartMarine Enterprise software, and will expand its use of the applications following the new deal.

"We have been using Intergraph technology for many years, and we are pleased to extend our long-term strategic relationship with Intergraph," said COSCO, in a statement.

"We have achieved great success through the implementation of SmartMarine Enterprise for our engineering projects, and we are confident that SmartMarine Enterprise will continue to deliver tremendous value to our company."

The package features the SmartMarine 3D offshore and shipbuilding design system, which uses knowledge-based and rule-driven technologies to improve delivery schedules and offers improved detail and manufacturing design productivity of up to 30 per cent.

"Since first implementing SmartMarine 3D in 2006, COSCO Shipyard Group has seen significant gains in productivity and quality through the use of our next-generation, rule-driven offshore and shipbuilding design solution," said Gerhard Sallinger, Intergraph Process, Power & Marine president.

"Intergraph is a long-standing, trusted partner in China, and we are pleased to see the tremendous success COSCO is having with our solutions."

FORAN CAD/CAM updated

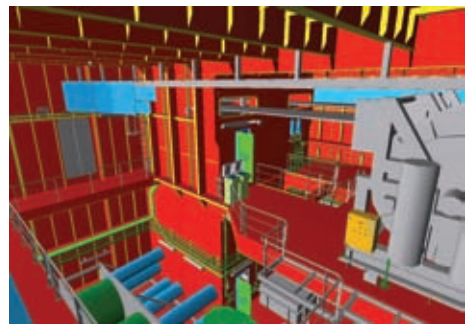
www.senermar.es

SENER has launched the newest version of its FORAN shipbuilding CAD/CAM software, with the release of V70R2.0.

The company says that the new release aims to strengthen the links between basic and detailed designs, and between the ship design and the running PLM solution.

This has been achieved by improvements such as unifying input data windows, opening the electrical data to generic pipe and HVAC fittings, and controlling the equipment position in the ship with regard to the maturity of the already connected cables.

FORAN V70R2.0 also includes better management of ship applicability, to offer full control of sister ships (such as modifications applied downstream being restricted upstream, or maintaining integrity of shared standards).



A ship model, created by the FORAN system

The PLM links in the system have additionally been extended.

Further changes in the Hull Structure application allow for quicker generation of a 3D model of the structure, while a new module called FNEST, for the management of nestings, has been added, along with new profile definition options and a clash detection command to calculate interferences between structural parts.

Latest version of tanker broking software announced

www.axsmarine.com

Shipping software company AXSMarine has announced the release of AXSTanker 3.1, an enhanced version of its AXSTanker product which will allow tanker brokers to access AIS and Fixtures information.

The first new feature is a fixture option, which offers supplementary information to users in their bottom panel. This information is proprietary to their company, which means no other AXSTanker member can see the fixture information they enter.

The ability to enter and search fixtures using the fixture module has also been added to the launcher menu, including optional rates and multi-grade entries.

The second new feature is an AIS tab inside the ships register, which allows users to see 90 day trading histories, maps and vessel traces.

With AIS search, members can search vessels in any given zone, and since they are searching based on physical positions no exclusions are required. Results contain all vessels, including non-market vessels.

AIS activity is also shown in DWT search results when users search through their saved proformas.

Octopus order for Dockwise

www.amarcon.com

Amarcon, a member of the ABB group, has received an OCTOPUS-Onboard order for the newbuild Dockwise Vanguard.

Dockwise Vanguard is the largest heavy lift vessel ever built. The vessel was launched in November 2012 and is currently undergoing sea trials.

The Dockwise Vanguard shall be equipped with OCTOPUS-Onboard for the purpose of motion monitoring, response prediction and heavy-weather decision support during heavy cargo transportations.

The vessel will also feature a three sensor motion measurement set-up to allow multiple critical locations on the vessel, for instance the cargo, to be measured and displayed on the bridge.

The OCTOPUS product line is part of ABB's Vessel Information and Control (VICO) systems package, which incorporates a range of automation and advisory solutions specifically for marine applications, based on ABB's process automation technologies.

Dockwise was founded in 1993 as a merger between Wijsmuller Transport and Dock Express Shipping, and has now ordered seventeen OCTOPUS-Onboard installations from Amarcon.

The Dockwise Vanguard will implement the system

PortVision TV launched

www.portvision.com

PortVision has created PortVision TV, a series of online videos designed to inform viewers about its technologies.

The PortVision system combines AIS-based vessel-tracking with analytics, reporting and process-improvement tools.

PortVision TV launches with three channels, and includes segments on AIS vessel monitoring with historical playback, marine terminal optimisation (including dock management), and fleet management.

The videos are available for viewing at www.portvision.tv, with video content also available on YouTube and on the company's public website.

"PortVision TV is our latest initiative to better educate our customers, prospects, and industry partners about the power of AIS-based maritime business intelligence," said Dean Rosenberg, PortVision chief executive officer.

"This video series offers valuable information for maritime users across the supply chain, from dock management to fleet management, and beyond."

The online videos provide details on PortVision technologies

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Performance optimisation at Maersk

The economic downturn and the consequences of fierce competition, as well as all-time highs in fuel prices, require shipping companies to adapt to changing market circumstances. With ever-increasing supply in carrying capacity meeting faltering demand, drastic measures are inevitable for many firms. Maersk Line's head of global optimisation, Niels Bruus, spoke to *Digital Ship* about his company's future strategies

In an economic climate where energy prices are dramatically increasing, companies need to be creative in finding new solutions to save on energy expenses. Since 2007, fuel oil prices have increased substantially and with the current economic depression the problems for shipping companies have grown as sinking demand for goods and maritime transport have hit the world market.

This situation has been aggravated further by the avalanche of vessels ordered in the boom times. Now delivered, they have created an imbalance of supply and demand with regard to the carrying capacity of the global fleet. This imbalance has resulted in a slump in charter rates and led to fierce price competition among vessel operators, particularly container lines.

Maersk Line's head of global optimisation, Nils Bruus, explains his take on the situation.

"The shipping market is in a very difficult position. As a result of high fuel prices and freight and charter rates being under pressure, we are experiencing a fleet utilisation reduction, as well as a higher and fiercer competition in the market," he says.

"Shipping companies have invested substantially over the last years into new builds. Consequently, and especially now with the low freight rates, there is a lot of debt in the existing fleet. Shipping companies striving to operate profitably in a strained market need to focus on maximising their energy efficiency as well as through-life costs."

"Ship efficiency, which comprises both fuel efficiency and financial efficiency, is influenced by a number of factors: vessel design, system integration, equipment technology, fuel flexibility, vessel operation and vessel maintenance. Upgrades and retrofits as well as strategic partnerships can help achieve a new efficiency target."

The measures that shipping companies adopt in order to stay in business are diverse.

Bunker costs are among the largest cost factors for shipping companies, and since vessels sailing at lower speeds use significantly less fuel and are thus more economical, the most prominent way of optimising resources is slow steaming, where the average vessel speed is throttled from around 20 knots to 17 knots and less.

With the deepening of the crisis in the shipping industry, some shipping companies have adopted 'super slow steaming' – sailing at 15 knots or less. Effectively, this has seen the carrying capacity of the global fleet artificially reduced, which is expected to result in stabilisation of supply and demand.

However, conventional vessels are not designed to sail at such slow speeds, and some experts consequently fear that such an approach may lead to damage to the engines.

"The shipping industry has reacted to the difficult developments with a significant reduction of the average vessel speed," explains Mr Bruus.

"So far so good. However, the shipping companies are facing another problem now – the existing vessel structures and technology are not adapted to steaming at slow speed."

Maersk Line has reduced the average speed of its ships to approximately 14.5 knots. Photo: Maersk

Shipping companies now face a difficult decision: should they order newbuilds, adapted to sailing at slower speeds, or is retrofitting the existing fleet at considerable cost a viable alternative?

In addition, there is also the question of what happens when the effect of slow steaming is maximised – what can shipping companies do then in order to optimise their fleets' performance?

The Maersk example

Maersk Line, part of the Danish global shipping and energy corporation, A.P. Moller Maersk, is continuously striving to optimise its cost base in order to sustain a competitive edge. Reduction of the company's fuel oil consumption, which is the single largest annual cost for Maersk Line, is consequently at the forefront of its endeavours.

"Constantly increasing fuel prices and dramatically reduced freight rates mean that shipping companies wanting to stay in business need to work on their cost base," Mr Bruus says.

Maersk Line has implemented a great variety of measures for performance improvement and optimisation in the past. Prominent amongst them is the reduction of average vessel speed – in other words, slow steaming.

Additional measures include optimisation of operations, trim optimisation, optimum weather routing, the utilisation of wind power, as well as changes to hull and machinery. For many of these methods, the support of maritime technology is essential.

In times where supply is exceeding demand, Maersk Line decided that it was important to adjust the capacity of the container fleet rather than entering into endless price wars and competing on the dramatically reduced freight rates.

A considerable reduction of the average vessel speed, which at the same time was expected to result in significant fuel oil savings, was deemed to be an efficient measure to achieve this.

As such, in 2007, as a consequence of the steep increase in fuel oil prices, the Danish shipping company introduced slow steaming. Despite a notable decrease in its energy expenses following this move, a further change to super slow steaming was introduced in the recession year of 2009, both on the company's owned and chartered vessels.

Over the last few years, Maersk Line container vessels have reduced their average speed from over 20 knots to below 15 knots. Now, the average speed ranges at around 14.5 knots.

Gas carriers in the A.P. Moller Maersk Group have seen a smaller reduction, from just above 15 knots to below 15 knots, and crude oil carriers and product carriers have also reduced their average speed by a moderate amount. The effect of the speed reduction is considerable.

"At Maersk Line, we have come a long way with regards to fuel efficiency," says Mr Bruus.

"Over the last 7 to 8 years we have managed to increase our relative efficiency by over 50 per cent. Responsible is mainly a reduction of the fuel oil consumption."

The effectiveness of slow steaming is subject to good ship to shore communication.

Normally, vessel operators specify the arrival time of their vessels at port. In order to reduce the ship speed, the operator has to work closely with the master on the vessel.

Information on weather conditions and port congestion, for example, is exchanged regularly. In addition, the port agent needs to be notified if the estimated arrival time is delayed and the operator needs to adjust the schedule.

The slow steaming and super slow steaming strategies have led to a number of operational improvements for Maersk Line, according to Mr Bruus.

"The initiatives," he says, "have helped us to control the capacity of the container fleet in times where supply is exceeding the demand. That is probably the most important outcome of the slow steaming initiative."

"In addition, the slow steaming initiatives have helped the container industry to reduce their cost base – an absolutely necessary achievement in order to survive the recession."

Optimising for slow steaming

What do shipping companies need to do now in order to make their fleet fit for slow steaming? In the current strained economic climate, every shipping company has to decide whether to optimise its existing vessels, originally designed for higher average speeds, or whether to opt for newbuilds.

A vessel has a life-span of 20-30 years. Consequently, many older vessels use technology that has long been outdated. Today, newer and better technology is available, which enables vessels to operate more profitably and efficiently.

"Whatever was put on the vessel back in the day it was built may not be the latest and most optimal solution," Mr Bruus notes.

"There is technology available today that can help save a lot of fuel. It is possible to build vessels today that are more efficient than what you have in the fleet, we think that 10-15 per cent savings are realistic through new designs. So, why don't we get rid of the old fleet completely and build new vessels?"

As Mr Bruus notes, the shipping market is already groaning under a rising surplus of carrying capacity.

"Supply and demand forecasts indicate that there will be an overflow of tonnage in the near future," he says.

"Whereas supply and demand were level in 2005, the demand has been growing much slower than the supply, even

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declining in 2008/2009, and the gap is continuously widening."

"Considering that, in 2013, further newbuilds will be delivered that will add another nine per cent capacity, or in other words 1.5 million TEU, to the world fleet the gap between supply and demand can only be expected to increase further."

In addition, financing options are scarce in the aftermath of the global financial crisis and shipping companies are often invested so heavily in their assets that scrapping is out of the question. Maersk Line estimates that more than US$80 billion is tied up in the company's existing container fleet.

Consequently, shipping companies are searching for viable ways to proceed. Retrofitting the existing fleet with modern technology could provide a solution – instead of further feeding the already saturated market, retrofitting would develop the existing capacity.

"The major question shipping companies need to answer," says Mr Bruus, "is 'how can we utilise the existing fleet?' How can we improve the efficiency of our current vessels and how can we ensure that our vessels operate profitably?"

Maersk Line has decided to opt for retrofitting. The company has already completed a number of retro fits and equipped existing vessels with up-to-date technology.

"There are a number of reasons why we have chosen to retrofit our fleet. Since we already have a modern fleet, it doesn't make any sense to embark on further newbuilding schemes now. The calculation is simple: the financing and the funding to scrap the existing and build a complete new fleet is not available," Mr Bruus says.

"Our way forward is to take our existing fleet as a starting point and optimise the performance of our vessels until they are able to compete with newbuildings."

"We claim that we can apply the same technologies and gain the same efficiencies with our existing fleet than what is possible with completely new vessels, also with regards to the cost of operation and capital."

In their endeavour to bring the fleet up to scratch and adapt the vessels to slow and super slow steaming, Maersk's biggest issues are oversized engines and propellers, as well as hull-lines that are optimised for much higher speeds.

New propellers and other energy saving devices are one way of achieving the necessary technical changes. Alternatively, the engine can be de-rated, with cylinders cut out, while other potential measures include modification of the bulbous bow.

However, at one point the potential of slow steaming is maximised. Already, the Danish shipping company envisages difficulties in extracting further significant benefits from this method.

"No matter how slow we steam, we cannot bridge the gap between supply and demand," says Mr Bruus.

"Global trade in Q3 2012 grew by a mere 0.4 per cent. At the same time the supply of global container vessels increased by 2 per cent after we have taken out what has been recycled or scrapped. So, the situation is not really improving."

Operational performance and ICT

As slow steaming is nearing its maximum benefit, Maersk Line continues to optimise the shipping company's operational performance through both operational and technical innovation. At the forefront of the shipping company's measures is data collection.

Accumulating sufficient significant data is the basis of determining where changes can be implemented effectively. On the basis of the collected information, experts are able to monitor and adjust performance optimisation tools.

"Unfortunately, efficiency improvements only get harder with each year, so we have to keep pushing operational and technical boundaries to get there, but we must move even further," says Mr Bruus.

"For Maersk Line, greater efficiency has to be a continuous pursuit."

Measuring the fleet's performance through analysis of data is a key prerequisite in order to spot room for improvement – it is only if such opportunities are detected that suitable measures can be determined. This process is called controlled performance management.

A specialised ship technology knowledge and competence centre within the Maersk group, Maersk Maritime Technology (MMT), is constantly working on performance optimisation tasks.

The MMT provides specialised technical services and advice on ship technology issues, on eco-efficiency, performance monitoring and innovation, as well as energy consumption, environmental performance and safety.

In order to manage the fleet's performance effectively, the MMT has developed a series of tools. Prominent among them are a data collection system, Maersk Ship Performance Service (MSPS), the Vessel Performance Onboard Analyser (VPOA) and the ECO-Voyage planning tool.

Together, these tools constitute Maersk's Vessel Performance Management Service (VPMS) Programme. The main objective of these tools is to drive energy efficiency across the entire Maersk fleet and to optimise its daily running costs.

Maersk's Vessel Performance Management Service is a decision support system, whereby decision-makers are supplied with relevant information to aid in monitoring and controlling the fleet's fuel oil consumption.

The tool is based on daily reports of operational data submitted directly from the vessel. In addition, it takes into account other information sources, such as paint type evaluation, dry docking intervals, hull cleaning intervals and hull efficiency, propeller polishing intervals, the evaluation of treatment from dry dockings, hull cleaning, propeller polishing, as well as main and auxiliary engine efficiency.

As part of the performance analysis, the system compares actual normalised values with reference models. Thus, the system automatically detects any deviation from the expected value criteria. It then performs a trend analysis and, when sub-optimal performance is spotted, triggers an e-mail alarm.

In addition, the VPMS provides an onboard reporting tool which can be used, for example, to create noon reports or sea and harbour reports. Data added to the report is automatically validated and the system issues an automatic e-mail warning if important information is missing or clearly different from what it should be.

The vessel data is fed into a central database from which it is analysed. From there, reports are created for a number of different stakeholders.

Technical management receives reports on daily communication, auto warnings, hull/propeller efficiency, engine efficiency, cylinder oil optimisation and off-service. Ship operations, on the other hand, is provided with reports on fuel tables, schedule optimisation, vessel deployment and off-service, and Maersk Maritime Technology gets reports on fuel efficiency, antifouling, machinery, new buildings and regulatory affairs.

Knowledge sharing is seen as a valuable means of performance optimisation at Maersk. Sister vessels are able to access the central database and obtain information and reports, which they can use to improve and optimise their own performance.

The Danish shipping group relies on a continuous cycle of monitoring (the action of the vessel), analysis (of existing structures and procedures), decision support (on the basis of the collected data), decisions (on the basis of the information provided by the decision support service) and improved action. Subsequently, the cycle starts again with the monitoring of the new and improved action.

The decision support service is operated across a large number of different vessels. Thus, the expert team is able to collect statistical feedback and operational experience across different business units and provide individual vessels with advice on a great variety of topics.

Besides energy efficiency, the MMT also advises on technical issues, extraordinary operational issues, off-service days, DRC and safety.

Maersk Ship Performance System

As part of Maersk's Ship Performance System (MSPS), the shipping company collects key performance indicators (KPIs) from its vessels. Developed under close cooperation between Maersk Line vessel management, Maersk Maritime Technology and its ships, the system was implemented on the vessels in 2009.

The MMT is responsible and in charge of the MSPS, which has been designed in order to boost overall vessel performance as it helps to facilitate decision-making amongst the various stakeholders.

Today the overall scorecard consists of four parameters - energy, safety, daily running costs and cooperation (best practice sharing). So far, only the energy KPI has been evaluated in terms of profitability.

Over the last three years, the key performance indicator system has led to notable performance optimisation – 160,000 tons of fuel oil have been saved as a result of higher propulsion efficiency, with savings of US$90 million having been realised overall (not including savings from other energy initiatives such as trim optimisation and basic load reduction).

The system of key performance indicators has proven to be a valuable tool for Maersk. Since its implementation in 2009, the scheme has been expanded to include the entire fleet of Maersk Tankers' own vessels, as well as other business units.

In addition, new key performance indicators are planned with energy, safety and financial indicators prominent amongst them. Other business units, such as Maersk Supply Service, which currently has around 70 vessels reporting data through MSPS, are focusing predominantly on environmental KPIs.

At the beginning of 2011, Maersk Line also introduced a new vessel performance optimisation tool called ECO-Voyage. This voyage planning tool, developed through collaboration between Maersk Maritime Technology and a number of Maersk Line captains, uses real-time weather data to improve the reliability and fuel efficiency of the vessels.

ECO-Voyage continuously analyses information about unexpected ocean currents, depth, as well as wind and waves along a planned route, and calculates the most efficient power and speed needed throughout the voyage. The information is stored on a central server and can be accessed by other vessels sailing on the same route.

The ECO-Voyage system enables the captain of each respective vessel to run several alternative routes before embarking on a voyage. It takes into account the differences in fuel oil consumption and enables large vessels to plan a dual speed voyage in order to optimise the use of the waste heat recovery system.

The voyage planning tool is also fully integrated with other efficiency programs already on board the vessels. Maersk Maritime Technology estimates that fuel savings of 0.5 to 1 per cent per year can be realised through the use of ECO-Voyage.

Outlook

The Danish shipping company has decided to optimise its existing fleet and introduce slow steaming for all vessels. In addition, Maersk is expecting its 18,000 teu EEE vessels to be delivered during 2013.

"We believe that the global container fleet is trading at average speeds that are around two knots higher than our average," says Mr Bruus.

"There is still a huge potential in slow steaming and there is still a lot to be gained through slow steaming."

"We do not see a reason why the speeds should go up again. Despite the fact that there might be variances – one knot up or down – we believe that the future will bring a further downward trend and speeds will remain low across the whole industry."

However, at one point the beneficial effects of slow steaming will be exhausted. Then, further performance optimisation through technical and operational changes may be necessary.

"There has been and still is a lot of waste in the way we operate our fleet," says Mr Bruus.

"And although the super slow steaming initiatives have supported our efficiency drive and resulted in notable cost reduction, we definitely see a need to push the potential even further. This shows us that there is still room for improvement and optimisation in the way our fleet is operated." DS

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Unified systems for better shipping

The management of data is a critical component in managing a shipping company, and is key in making operations as safe and efficient as possible. Stylianos Siafakas, OceanBulk Maritime, shared his views with *Digital Ship* on how integrating and unifying the various data systems used within the organisation could go a long way towards making this process as simple as possible

It's hard to argue with the classic song from the musical Cabaret proclaiming that Money Makes the World Go Round – and I think it's a sentiment with which most ship owners would agree.

In the modern maritime industry however, getting your hands on that money involves running your business at a high level of efficiency. If you aren't optimising your operations there is a competitor out there that will. And once that competitor starts winning more business it can make life very difficult indeed.

In any business serious about optimisation, the control of information must be a major focus. That you can't manage what you can't measure has become a cliché at this stage, but the underlying truth remains – accessing, analysing and acting upon the data produced within an organisation is the first step in making operations as efficient as they can possibly be.

In shipping, the ability to manage data has often been constrained both by the inherent infrastructure limitations imposed by the oceans as well as the traditional methods of working that have seen paper transactions as the basis of business.

Technology is slowly helping maritime companies to get a better grasp of their data, with systems like electronic purchasing and planned maintenance software improving an organisation's ability to efficiently manage essential processes, but is only able to assist to a certain degree.

Stylianos Siafakas, operations and assurance manager at OceanBulk Maritime in Greece, has spent many years working on information control, and as he notes, the demands are increasing all the time.

"There is so much information that we have to control on a daily basis in our offices, as everybody knows," he said.

"This information comes from our vessels, the industry, customers, charterers, oil majors, legislation, IMO, US Coast Guard, company strategy, internal procedures, financial needs – and there are so many others."

In Mr Siafakas' mind, the basis of effective information control is creating a well defined relationship between the office, the ship and the industry.

"We have the information input, from the vessel, from outside in the industry or inside the company, and then we have the process within the office or the ship which leads to a decision, and we have results from that decision," he said.

"Then we need to do a gap analysis – to see the gap between what we expect to have and what we actually have after the decision has been made."

"Finally we need to make any corrective actions in order to meet our expectations."

This might seem relatively straightforward, but it is important to realise the type of environment that the shipping company is working in, and how that has evolved over time.

"In the past, shipmanagement and daily operations were based on very basic communication. We had radio, telex and common mail systems, but no real time data. Later we had Inmarsat, with phone and fax and very slow data exchange," said Mr Siafakas.

The cockpit of the Falcon 7X – a model for integration and unification of data systems

"For navigation, it was based on celestial observations, bad performing radars, paper charts that were not always updated, difficult to use position fixing systems like LORAN and OMEGA before satellite navigation later appeared, and some basic weather forecasts."

"Between the office and the ship we had too much paperwork, starting with typewriters before some PCs later appeared – with printing facilities. Older people will also remember the Telex room."

Comparing that type of infrastructure to what is presently available on ships, with advanced communication through modern satellite systems and real-time data, the improvements have been significant – yet issues remain.

"Today, navigation is based on modern systems and accurate satellite navigation, we have very good bridge integrated systems and electronic charts that can be fully updated on a real-time basis," said Mr Siafakas.

"We have accurate weather forecasts with voyage optimisation, and so many other facilities."

"However, we still have too much paperwork, everybody knows that, mostly of the offices operating with those PCs with their printing facilities. And of course we now have amazing mail software. But it's still difficult to control information."

Different systems

From Mr Siafakas' point of view, one of the biggest issues with information control in modern maritime organisations is the wide range of different systems that proliferate across the industry.

"Let's look at the office first. We have hardware, software, mailing systems, monitoring systems, we have performance monitoring, planned maintenance systems, crew integration – everything," he said.

"On the ship's part, we have navigation systems, cargo monitoring systems, performance and speed monitoring, engine room controls, everything – it's a huge amount of data that we have to exchange on a daily basis."

"In every single company we are using a different kind of software for each type of monitoring or other information we need to have. Some companies are lucky and have just one system, or a couple of systems, but others, for example, may have software for planned maintenance, another software for crew management, another software for the operations, and at the end of the day you have at least four or five different systems you have to use on a daily basis."

Mr Siafakas believes that the industry is in need of a greater level of standardisation, and would like to see a single integration point that would allow data to flow between all of these separate software packages.

"The problem we appear to have today is that there is no core process or core monitoring system that will handle all this information and take care of the interrelation between the office and the vessel," he said.

"From my personal point of view this is the most important process for the shipping company."

So what would this unified system look like? Mr Siafakas has some of his own ideas on the essential elements that he would like to see included in the system.

"We need a continuous flow of trusted and accurate information from the ship to the office – but the problem is, who controls this information? Who decides what the next steps are, what kind of procedures will they follow? What kind of tools do we have in our companies for this?" he said.

"We need more automated information exchange systems, some systems that will not require user action, either from the vessel side or from office personnel. There should be no user interference in routine tasks. Of course, there are some other tasks which will be more complicated so a decision or a meeting will be required, or some other actions, but on some routine tasks it should not be required for a simple user to do anything – he should just have information in front of his eyes."

"This integration may result in us having less communication between the office personnel and the ship's crew, and we may even need less personnel – and, we hope, less cost. But everybody is expecting that we will require more and more training for these new systems that will appear in the future, not to mention the current systems as well."

As an example of where such integration could be useful, Mr Siafakas describes a typical daily shipboard procedure which could easily be improved.

"The master, every day he has to report to the owners, the charterers, very simple things like consumption or bunkers onboard," he said.

"He has to ask the chief engineer to go to the tanks and get information, then he has to prepare an e-mail, then he has to select the people from his address book and send the e-mail."

"This is time consuming, for a simple time consuming task. You could have the monitoring system automated with the

tanks and the gauges so the information goes automatically."

Developing integration

The scope of such a system is not lost on Mr Siafakas, who realises that the range of different data sources within a shipping company is vast indeed.

"The integrated data system has to, on a daily basis, integrate and process data regarding the management systems and procedures of the company, for example cargo control information, voyage procedures, financial data, navigation data, weather information – so many things," he said.

"It also has to cover data exchange and backup and routine communication and correspondence. Maintenance monitoring and ship performance monitoring also need to be part of it."

"Then there are crew requirements, we have new MLC regulations that are coming and will require more and more information exchange, and we have training, which is one of the most important things. We have to control it, from the office side, onboard the vessel."

One example Mr Siafakas points to as an illustration of a well integrated collection of data sources is in the cockpit of the Dassault Falcon 7X jet airplane (pictured).

"This is supposed to have the best integration of information under the fingertips of the pilot," he said.

"I'm sure that, in the future we will see something similar onboard our vessels as well."

"The most important thing (in the 7X cockpit) is that you have all of the information in front of you, you don't need to change anything – you have it in front of you, you can process it immediately on multiple monitors, and you can have different kinds of information. You can look at the engines, horizon, charts, navigation – everything."

Mr Siafakas suggests that, as part of the process of improving system development, those involved in creating new technology need to spend more time getting to understand the mindset of the user.

"Today it appears that many developers ignore what I'd call 'the engineering behind the user's mind'. It's very important for the software or hardware developer to put themselves in the shoes of the end user that will use this software or this tool on a daily basis," he said.

"I'm afraid that even today sometimes we forget who is behind the PC. It's a simple operator or a technical guy in the office or a superintendent – they might not have any serious knowledge of PCs or information technology but need to have access to accurate information."

"Sometimes developers provide software that is fantastic and can do amazing things, a thousand different things – but the common user needs just two very simple things, and those two simple things are hidden behind others."

As a starting point, Mr Siafakas suggests that developers begin by finding answers to the following questions: What is the knowledge level of the common user?; What are users' daily processes?; What do users need to see?; How do users want to see it?

"The human is behind all of this software. The human is behind the development, the user interface, the process – everything. It is the human element that is going to process the data to make the decision and create results," he said.

"How do humans make sense of things? How do we take risks, take decisions, make mistakes? How do we get tired and stressed, learn and develop, work and communicate with others?"

"Everybody knows that, for example, when a developer wants to make software he might go to the technical superintendent to create the PMS software. He has to get into the mind of this person. But when he is creating the software of the simple operator he has to be in the mind of that person, not staying with the options and tools wanted by the superintendent."

Next steps

For Mr Siafakas, the future of maritime technology lies in tying all of the various available systems together and simplifying the process of sharing data.

"Today we are facing a problem of integrating all of this information. If you go to a company you can see, for example at a company that has decided to change its mail software, somebody goes there and proposes a new software program. Either the previous software wasn't correct or isn't complying with their requirements, or their needs change," he said.

"They are facing a serious problem which is quite common to everybody – how do we transfer the data from the old program to the new one? In some cases it will be easier than others, but sometimes you will find that the data hasn't been transferred correctly or the integration is not correct."

The obvious potential solutions to this lie in customising the IT infrastructure at a company to create its own integration process, or introducing a single common data point – and it is the latter of these two that Mr Siafakas sees as the more attractive option.

"I've seen some customised solutions in the past, and they were not 100 per cent accurate in transitioning data from one system to the other," he said.

"It could help if the software development companies could decide to cooperate amongst each other and decide to at least have a common meeting point somewhere. I think this is the only way it can work, maybe some kind of common module. It's like Windows, where you have thousands of different software developers making systems that are Windows compatible – maybe something like this is the solution."

"All these problems, that appear on a daily basis, have to be resolved in the future. Maybe a core software can be deployed and developed in order to give the ship owners and operators the ability to combine different software and different data between systems. The developer that manages, in the future, that manages to create a software or piece of hardware that will take care of all of this kind of information and exchange the information between the different systems, will be very successful." DS

Weather routing vs voyage optimisation

Traditional weather routing, while serving its purpose of avoiding bad weather in the past, has reached its limitations as shipping companies attempt to minimise fuel consumption by slow steaming and virtual arrival. It should be supplemented by more advanced voyage optimisation– for the sake of safety, efficiency and the environment, *writes Henry Chen, Jeppesen Marine*

Regulatory requirements, coupled with higher fuel prices and low freight rates in the foreseeable future, have placed the spotlight on fuel efficiency in the shipping industry.

Post voyage analysis has compared the historical passages of ships that sailed using weather routing to see how they would have performed, in terms of saving fuel if they had used a voyage optimisation technology instead. The results show an annual improvement of up to 5 per cent.

Furthermore, ship owners who make the switch not only yield a higher return on their investment, through increased operating efficiency and safety, but also reduce their GHG emissions.

Unlike traditional weather routing with its inherent limitations, voyage optimisation also supports new operational tactics such as slow steaming and virtual arrival.

A closer look at the disadvantages of weather routing shows why the time is ripe for ship owners to embrace more sophisticated technology.

Ship response

Weather routing does not take into account ship responses.

A ship slows down either involuntarily due to increased resistance from the wind and waves, or voluntarily due to navigation hazards or fear of heavy weather damage from excessive ship motion, propeller racing, slamming or boarding seas.

The weather routing advisory service must take both of these into account when estimating dead-reckoned ship positions in relation to the movement of weather systems. Otherwise, the best route charted by the unknowing planner could lead to a dangerous situation.

Some weather routing companies have started to realise the limitations of their methods and are trying to develop ship response prediction capabilities.

To predict ship motion, voyage optimisation tools digitise the ship's body plan, bilge keels and other appendages as well as calculate its loading conditions in terms of fore and aft drafts and GM.

A sophisticated hydrodynamic program then computes added mass and damping coefficients and solves the equation of motion.

The results are the so-called Response Amplitude Operators (RAO), which are combined with forecast wave spectra to predict ship responses.

Only during the last few years, the computing power of a desktop PC has been able to run such computationally intensive programs in less than a minute as part of onboard software to provide seakeeping guidance and safe operating limits.

Engine overload

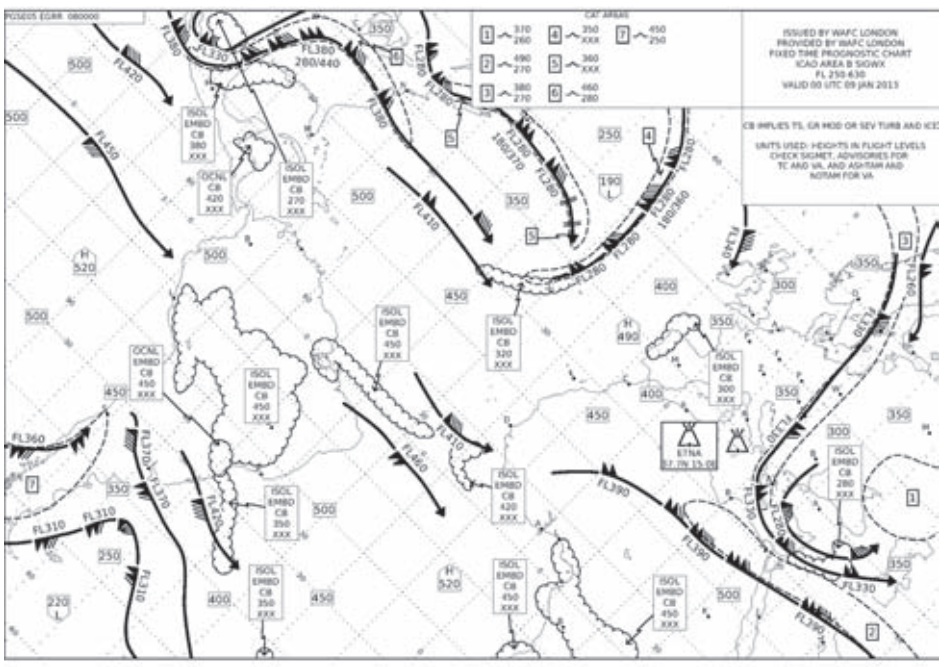
Weather routing does not take into account engine overload.

Shipyards use sophisticated finite element models and high tensile steels to reduce weight and production costs in order to be competitive. Similarly, propulsion systems are often optimised for calm weather trial conditions in order to satisfy the recent IMO requirement on the Energy Efficiency Design Index (EEDI).

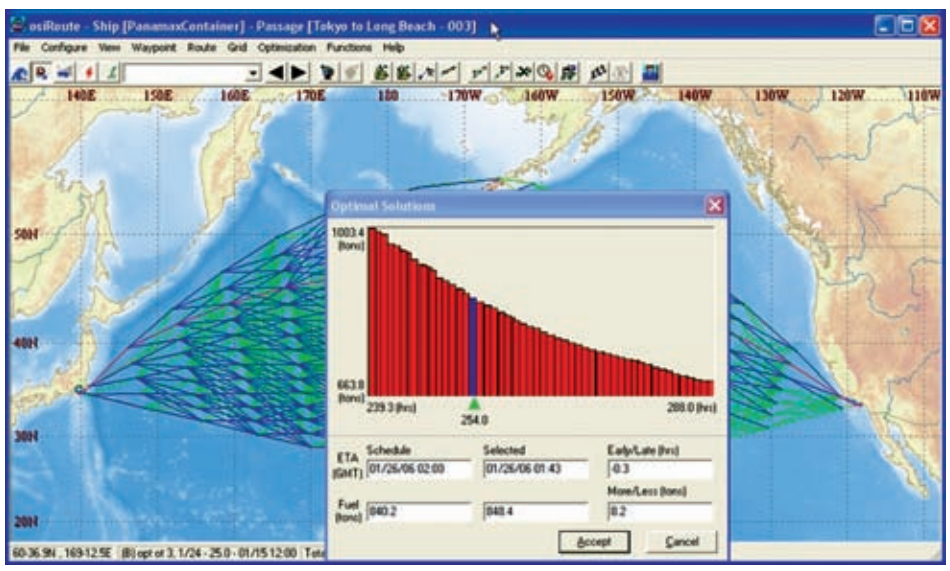
One such design consequence for slow speed diesel engines with direct-drive fixed-pitch propellers is high pitch coupled with minimum acceptable sea margin.

With calm weather and a clean hull lightly loaded, the vessel easily makes the contracted speed and good EEDI. Unfortunately, such a practice leads to frequent engine overload when the ship encounters high wind or seas or increased hull fouling as ships age.

Again, if such events cannot be predicted by the weather routing tools, this can lead to over-optimistic ship speed and mistaken diversion decisions when facing heavy weather, not to mention inaccurate estimates of fuel consumption and time of arrival.



The accuracy of weather reports can vary due to a number of factors



Voyage optimisation systems can take ship responses into account and adjust their predictions

Speed management

Weather routing algorithms ignore speed management.

There has been substantial research over the years in the area of ship routing algorithms, with most of the weather routing software using variations of the Dijkstra's Algorithm, in which the program simulates a vessel departing with full power toward the arrival port with different headings.

After each time interval (e.g. six hours), the ship's dead-reckoned position forms a so-called 'isochrone' until it arrives at the destination.

A route is then traced back from the earliest arrival time, and fuel consumption is estimated using a tonnes-per-day rate. The claim is that minimum time results in minimum fuel consumption.

The calculation is fast, especially when only using speed reduction curves and not taking into account ship motion responses or engine overload.

Unfortunately, the problem with such an approach is that the algorithm ignores one important option: speed management.

As storms move across the ocean, it is possible for the ship to slow down and let them pass and then catch up, instead of sailing a longer distance to go around, or 'hove-to' in bad weather.

Such a strategy not only significantly reduces fuel consumption for a given arrival time, it also reduces the risk of heavy weather damage when fully implemented with ship response and engine overload.

The simple speed reduction curves used in weather routing algorithms cannot find the optimum route since they operate only in one dimension.

Without modelling the ship performance from first principles, it is not possible to minimise the fuel consumption for a given arrival time without exceeding the safe operating limits.

Speed and heading are both integrated into route optimisation, making the problem multi-dimensional.

An algorithm called 3-D Dynamic Programming can be used to minimise fuel consumption for a range of arrival times subject to the constraints of safe operating limits imposed by the captain.

The optimisation is performed on a user-defined grid for safe navigation. This allows trade-off between fuel costs and arrival time in a complex inter-modal transportation network.

The computation effort is obviously greater since the algorithm must evaluate thousands of speed and heading options compared with hundreds in the case of heading-only weather routing.

With computer processor speeds doubling every year, the time to solve the problem is reduced from several hours to a few minutes, including the full implementation of ship responses and engine overload.

Such systems can be implemented at routing centres shore-side, or onboard ships with daily updates of forecast environmental conditions via satellite communication.

RPM v speed management

Constant RPM is not as efficient as speed management.

A strategy often used by weather routing services is advising the ship to use minimum RPM to arrive on time, since horsepower increases with the cubic power of ship speed.

However, this only makes sense in calm weather, because in severe head sea and wind conditions, the added resistance from the wind and waves could result in 50 per cent or more horsepower than that required for calm sea in order to maintain speed.

With voyage optimisation, the speed profile on a single route is optimised to arrive on time by slowing down in head seas and speeding up in beam/following seas to catch up after a storm passes.

In addition, using a minimum RPM or engine power strategy can preclude better options, such as passing in front of a storm.

For example, a ship could speed up to pass in front of a storm in the Gulf of Alaska, so that the rest of the voyage can have following seas and calm weather in the Bering Sea. This is a well demonstrated routing strategy for crossing the North Pacific from the US West Coast to Asia.

The alternative route, even with shorter distance at lower latitude would face head seas all the way, resulting in hundreds of tons more fuel for a large container vessel.

Data sources

Weather routing typically relies on only one weather forecast source.

The advent of supercomputers and numerical models has significantly improved the accuracy of weather forecasts over the past decade.

National centres such as NCEP/NOAA, US Navy, UKMET, JMA and ECMWF are routinely producing long-range wind and wave forecasts 15 days ahead and beyond.

However, the accuracy of each model varies due to model resolutions, how the physics is implemented, and many other factors.

The centres tend to calibrate their models to perform better when storms threaten their own countries, but pay less attention to mid-ocean storms passing shipping lanes.

None of the models can consistently produce accurate forecasts for tropical cyclones due to their complex physics and rapid development.

Human forecasters are employed during the typhoon/hurricane seasons to issue track and intensity forecasts based on consensus of model outputs as well as past experience.

In any case, accuracy starts to deteriorate after 3-5 days, leading to even larger uncertainties between 5-7 days.

Most of the weather routing service providers use products from only one forecast centre.

In the US, surface pressure, wind and sea state forecasts are available as free downloads over the internet from NOAA. While the quality of such forecasts may be good enough for weather routing, their level of detail is not sufficient for ship motion response prediction and voyage optimisation.

This is particularly true in predicting the sea and swells generated by tropical cyclones since meteorologists at typhoon or hurricane centres often issue vastly different forecasts from the model predictions.

Currently, the best approach to ocean weather forecasts is to adopt a 'man-machine' mix, in which experienced forecasters quality-control the sea surface pressure forecasts, including the wind fields derived from the track and intensity forecasts from various forecast centres.

This forms the input to a marine boundary layer wind model and the output drives a numerical wave directional spectra model.

The 'Super Ensemble' forecast approach takes the best of each national centre's forecast and quantifies the uncertainties in wind and waves.

At each grid point in every forecast horizon extending to beyond 15 days, the values for mean and standard deviation can be used to judge the accuracy levels of the forecast.

The spread between minimum and maximum typically is smaller in shorter-range forecasts, as various models are more in agreement. The spread will increase as the forecast horizon increases and the accuracy of the forecast models differs.

This type of consensus knowledge will provide greater insight in selecting the optimum route, taking into account the risk of heavy weather damage as well as predicted fuel consumption for virtual arrival due to forecast uncertainties.

Besides the more accurate wind and wave forecasts, voyage optimisation also takes into account sea surface currents since they can significantly impact ship speed and fuel consumption.

High-resolution global circulation models enhanced by satellite measurements can now produce accurate daily depictions of major currents and eddies.

Benefits of voyage optimisation

The benefits of voyage optimisation can be further extended to ship design, fleet deployment, and operational logistics.

In this regard, the technology is able to:

- Determine ship design criteria such as speed, sea margin, maximum ship motions, and bending moment by repeatedly simulating voyages using historic wind and wave hindcast databases.
- Optimise the deployment and schedule of vessels for the trade route taking into consideration schedule reliability, fuel cost, and seakeeping capability.
- Estimate the probability of on-time arrival so that shore-side operations such as loading and unloading of trucks and trains can be efficiently scheduled.
- Extend the fatigue life of ship structures by predicting stress cycles and providing ship officers with seakeeping guidance to reduce ship stresse DS

About the author

Dr. Henry Chen *is chief naval architect at Jeppesen Marine, and is an Associate Boeing Technology Fellow. He has 37 years of experience in the maritime and offshore industries and a Ph.D in Marine Systems from MIT.*

Buss Data updates software

www.buss-data.de

Buss Data, a subsidiary of Organization Reederei Buss in Germany, has launched a number of new updates to its maritime software applications.

One of these is FuelStar, a graphical analysis tool used to monitor fuel consumption based on different draughts and trims.

The system allows various configurations to be analysed and revised to optimise performance.

The relevant data can be provided in a list for export to MS Excel, or analysed within the tool.

Buss Data has also added a new insurance tool as an additional component to its ClaimStar software module.

The insurance tool aims to streamline handling of insurance claims, offering a range of templates - for example, a 'war risk calls' template - that includes claims commentary and all relevant data. A second template is then used to show relevant analysis.

This new tool will be added to existing guarantee claims and stevedore damages tools in the software package.

The third new product is a registration management and analysis tool for the nautical and technical operational sector, named SupportStar.

This tool is used to manage support requests for navigation and communication equipment. It provides options like an overview of all equipment, management of claims histories, control of warranty timebars, organising of certificates, and records of all supplies and services.

Additionally, the software can be used to control all maintenance and survey intervals, such as radio surveys, and annual performance tests of voyage data recorders or gyrocompasses.

Equipment lists can feature reminder information, processed by e-mail. This reminder system provides updates on all upcoming repairs, surveys and related work onboard, so all respective data can be analysed and recorded.

BASS catch in Indonesia

www.bassnet.no

Indonesia-based logistics and shipping company, PT Pelita Samudera Shipping (PT PSS) is to install the BASSnet software package to assist in managing its operations.

PT PSS operates a fleet that includes Floating Loading Facilities (FLFs), tugs and barges, and Floating Bulk Unloaders.

"After an extensive evaluation of the various fleet management software in the market, we are very pleased to have selected BASS' software solutions to future proof our operations," commented PT PSS director, Hans Peter Glipman Jorgensen.

PT PSS is deploying the BASSnet Maintenance and Procurement modules. BASSnet Maintenance will be used in the planning and execution of maintenance across the fleet, while BASSnet Procurement will be used to streamline purchasing activities and optimise the purchasing cycle.

BASSnet software is built on the Microsoft .NET platform, which BASS says should also make it easier to adapt the systems to any enhancements in the future.

"BASS is dedicated to providing a holistic solution to the diverse needs of ship owners and operators. We provide a business solution that streamlines and automates processes across the organisation and fleet for achieving the efficiency gains that can make or break a business in the current turbulent environment," said BASS' regional sales manager, Derrick Lee.

"We have been working on the Indonesian segment for a while now. This contract gives us an entry point to a vast field in shipping, crew management, rigs, floating production, storage and offloading facilities and offshore units."

"With PT PSS in our portfolio, we see many others seeking to enjoy the benefits of our future-proof software solutions."

Online support for AMOS

www.spectec.net

SpecTec has announced the launch of new online product support services for AMOS users.

"We have looked very carefully into what we provide in terms of services and support and how we provide it," said Giampiero Soncini, CEO of SpecTec.

"We have made some significant improvements to our product support services, in order to ensure that our customers experience not only improved service delivery but also an improvement in the effectiveness of AMOS within their daily business."

The new services aim to assist those who already work with AMOS and related solutions in optimising their software usage.

These users will have access to SpecTec product managers, software architects and business analysts, and will have the opportunity to talk to them about any issues or concerns they have relating to the software.

The services will be provided through webinars and web conferences, which SpecTec clients can subscribe to using an online subscription form available on the SpecTec website.

The company says that it also plans to include new software releases in the online product support service. The Product Development department at SpecTec has planned new releases for both AMOS and AMOS2 during 2013.

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RS Platou, Managing Partner and CEO, **PETER M. ANKER**

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"Most of the 20 top shipping banks have stopped their active funding. Watch out for unexpected maritime finance alliances and new providers of debt financing."

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‘Train the trainer’certified on Kongsberg ECDIS

www.kongsberg.com

Kongsberg Maritime has launched a new ECDIS Instructor Training course, designed to train captains and senior personnel, so they can train other officers and crew members in familiarisation of Kongsberg ECDIS on board vessels.

Offered in Norway and Singapore, the course meets the requirements of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), and has been developed as a response to new IMO regulations and demand for certification in the use of ECDIS, resulting in an increasing requirement for ECDIS training.

Those who take part in the course will be cleared to conduct ECDIS familiarisation training

“We have developed a new training course that includes both technical ECDIS training on our systems as well as pedagogical components,” said Tommy Edvardsen Hvidsten, product manager training, Kongsberg Maritime.

“The course enables Captains to train their own officers and crew, which significantly reduces training and travel costs compared to each crew member attending separate ECDIS training courses.”

In addition to certificated training, course participants receive a kit of exercises to use when training their own staff.

Although those who take part in the instructor course are cleared to conduct Kongsberg Maritime familiarisation ECDIS training, Kongsberg Maritime is still responsible for testing the skills of officers and crew that have been trained by the course participant, and for issuing the ECDIS competence certificate.

“While the participants of the ECDIS Instructor Training course complete the test at our training centres, those who are trained by someone who has taken the course must complete an online test,” said Mr Hvidsten.

“Based on the results of this test we will issue the necessary certificate. This gives us the possibility of controlling quality and ensuring course participants have in fact received the required training according to the standard.”

The new Offshore Vessel Simulator at Lerus

“The goal of this and all of our courses is to provide realistic training in a safe environment, in order to give the participants the necessary confidence to operate our systems in all conditions.”

In other news, Ukrainian crewing company Lerus Ltd in Odessa has opened a new training centre outfitted with a Kongsberg Offshore Vessel Simulator.

The new Lerus Training Centre, established to meet growing training demand in Ukraine, Russia, Poland, Lithuania, Latvia, Romania and other European countries, is the first in the Ukraine to offer fully integrated offshore vessel operations training.

The Offshore Vessel Simulator at the facility features a 240 degree field of view, for courses covering: Ship Handling (AHTS, OSV, ROV, DSV, VLCC, MPSV), Dynamic Positioning, Crane Operations (Stage 1, 2, 3), Anchor handling and Towing/Rig Move.

Different teams may interact within the same exercise, with a Dynamic Positioning simulator integrated alongside an offshore crane simulator to more accurately represent real life operations. A standalone crane simulator for training on harbour operations is also included.

“Kongsberg is a clear leader in simulation for the offshore industry and since our crews mostly work on vessels with Kongsberg systems, it’s also beneficial that we use Kongsberg equipment for training,” said Ruslan Gromovenko, managing director, Lerus Training Centre.

“Investment in the new training facility and inclusion of the most sophisticated offshore vessel simulator available today will help us to maintain a strong position in the market, by supplying crew with high levels of training and competence for the oil and gas industry worldwide.”

UK marine research facility 'topped out'

www.lr.org

A new state-of-the-art marine technology and research centre of excellence at the University of Southampton, which incorporates the Lloyd's Register's Group Technology Centre, has reached the milestone of "topping out" as development continues on the facility.

This collaboration between the university and Lloyd's Register aims to create a £116-million research hub, providing world-class facilities for marine-related research and development.

"The collaboration between industry and academia is vital for technical innovation. We want our new Group Technology Centre to lead the world in helping to develop the solutions that will support safer, cleaner, more efficient shipping and offshore activity," said Richard Sadler, Lloyd's Register's chief executive officer.

"A fundamental understanding of new technology is essential in solving the world's technical challenges. Putting our practical experts next to the university's learning and research facilities will stimulate technical innovation and I believe, in future, it will allow us to broaden our relationship into areas as diverse as the food and information security sectors."

"Our investment in this unique collaborative venture will benefit the UK employment market, its reputation for technology development and UK businesses in general."

When it opens, the new campus will be home to the Lloyd's Register Group Technology Centre, where 400 staff will form part of the organisation's global research and development network.

"With the completion of our new campus, the range of expertise in the marine and maritime sectors in Southampton will be unparalleled in the UK, and among the best in the world," said Professor Don Nutbeam, vice-chancellor of the University of Southampton.

The first phase of the development is scheduled for completion in 2014.

Italian company signs for TRANSERV

www.transas.com

Italian shipping company Navigazione Montanari has signed an agreement to implement Transas' TRANSERV programme for 11 vessels.

Nine of the vessels are already equipped with Transas Navi-Sailor 4000 Dual ECDIS, using the Transas Admiralty Data Service TADS (Official SENC) to sail paperless.

The two additional vessels will be fitted with the ECDIS and TADS in the spring of 2013.

TRANSERV is a Support and Maintenance programme for the management of the ECDIS set-up onboard, incorporating service coordination, chart ordering, software updates and preventive maintenance.

This will be used to ensure that the navigation systems onboard Navigazione Montanari vessels will always be up-to-date and compliant with regulations, while supporting any changes in chart format and creating an interface to other bridge systems.

The onboard crew will also receive training on new functionalities and guidance on how to improve vessel routines in using and maintaining the system.

Thomas Gunn Navigation Services has announced that Doug Anderson, the company's customer service director, is to retire after 18 years with the Group. Mr Anderson has headed up Thomas Gunn customer service and support since 1994, having joined from Brown and Perring, where he also held the position of director of customer service. Responsibility for Group customer service has been transitioned to Gareth Kirkwood, chief operating officer of Thomas Gunn owner GNS Group.

www.thomasgunn.com

Tidewater in Furuno BNWAS deal

www.furunousa.com

Tidewater Inc, a provider of Offshore Service Vessels to the global energy industry, has agreed a deal with Furuno USA to act as its primary supplier of BNWAS (Bridge Navigation Watch Alarm System).

With hundreds of vessels included in the agreement, varying from Platform Supply and Fast Crew Supply Vessels to Offshore Tugs and a variety of other specialty vessels, the companies say that the installation project will take the majority of 2013 to complete.

The Furuno BR500 BNWAS system to be installed is a casualty avoidance system that monitors the watch officer's presence on the bridge. The system will initiate a predetermined sequence of alarms if it senses inactivity on the bridge for a set period of time.

The watch time can be reset using a number of different methods, including operation of either ECDIS or radar with appropriate outputs, pressing a timer reset button, or activating an optional motion sensor during normal bridge activity.

If the OOW (Officer of the Watch) doesn't respond to the alarm, the system transfers the alarm to Cabin Panels installed in other areas of the vessel in order to inform backup officers of the OOW's incapacity.

The Furuno BNWAS will issue alerts if the OOW is incapacitated

Up to twelve Cabin Panels may be installed in these areas using Furuno's single-cable installation method.

"We are excited to continue our long-standing working relationship with Tidewater by assuring that their vessels remain in IMO compliance with our BNWAS solution," said Dean Kurutz, Furuno USA marketing manager.

"We feel that our Global Support & Service Network, coupled with our flexible BNWAS architecture, led to Tidewater's decision to purchase Furuno's BR500."

Jeppesen adds Malaysian ENC coverage

www.jeppesen.com

Jeppesen reports that it is now distributing official Electronic Navigation Charts (ENCs) for Malaysia, a recent addition to the company's worldwide ENC portfolio.

Jeppesen will distribute the Royal Malaysian Navy (RMN) ENCs through its local partner Okenos.

Included in this newly available ENC coverage is the Strait of Malacca, the main channel between the Indian and Pacific Oceans. The Strait of Malacca links the major Asian economies of India, China, Japan and South Korea and carries an estimated 25 per cent of all oil transported by sea.

"This is a significant development for Jeppesen, as well as for our shipping clientele around the world," said Michael Bergmann, Jeppesen maritime industry director for affairs and services.

"We want to express our gratitude to the Malaysia Hydrographic Office and our local partner Okenos for working closely with us on this important partnership."

In related news, Jeppesen has also recently signed a direct ENC distribution agreement with the Korea Oceanographic and Hydrographic Association (KOHA), further expanding coverage in Asia.

"This agreement with KOHA is further evidence of our commitment to bring maritime customers the ENC coverage they need, with affordable, flexible licensing options that make sense for today's changing shipping industry," added Mr Bergmann.

What do these market leaders have in common?

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e-Navigation infrastructure – should we care?

As the infrastructure that will form the basis of IMO's e-Navigation programme continues to evolve, it is important that technology standards are introduced if the initiative is to truly fulfil its potential, ***writes Fred Pot, Marine Management Consulting***

IMO's Correspondence Group on e-Navigation (CG) is on schedule to recommend a Strategic Implementation Plan (SIP) by December 2014. The SIP will probably specify the dates by which various classes of SOLAS ships and shore-side entities will be required to implement e-Navigation solutions.

These solutions will address many of the 'gaps' that the CG formally identified (see NAV 58-6 Annex 2[1]).

Currently the CG is estimating to what extent each of the 50 or so potential solutions[2] will improve the likelihood that ships complete their voyages safely, securely, efficiently and in an environmentally friendly manner.

The CG will then subject the highest ranked solutions (in terms of their efficacy in mitigating risks) to a rigorous cost/benefit analysis and, at some point in time, develop minimum performance requirements for those solutions that make it all the way through this 'Formal Safety Assessment' (FSA) process.

Many of the potential solutions involve information exchanges between ships and shore-side entities.

Some information exchanges will make decision support information available to the mariner that wasn't available before, for instance information from shore-based water-level, current, wind and other sensors. Other information will likely include real-time bathymetry, bridge clearances, lock openings, etc.

Information exchanges are also being considered to provide shore-based VTS[3], MRCC[4] and other users with decision support information from ship-board sensors, bridge alarms and other sources.

AIS[5] already provides them with basic information but e-Navigation will likely complement that with more detailed information, for instance about the accuracy of the ship's navigation instruments, the health of the ships' systems, its voyage plan, its cargo manifest, etc.

Other information exchanges are being considered to automate updating ENCs[6] and nautical publications and to streamline reporting to coastal and port authorities. The intent of these information exchanges is to lessen the administrative burden on mariners and thus allow them more time to conn the ship.

Other potential solutions will provide mariners and shore-based users with an indication of the accuracy and health of their sensors and make the human/machine interface of their instruments more intuitive and ergonomic.

Automated information

One of the potential e-Navigation solutions is to completely automate information exchanges, relieving mariners and shore-based users from having to operate communications equipment.

What is currently not clear is which of the many potential e-Navigation solutions will be adopted by IMO member states.

It is, however, quite clear that developing detailed specifications for each solution to estimate its costs and (risk mitigation) benefits will take time and that developing a minimum performance standard for each solution once it has made it all the way through the FSA process will take more time.

Decision support information is typically presented to the user on a screen. Radar and ECDIS screens on-board and shore-side VTS screens are examples.

The software that presents decision support information on screen and that gives the user control over what and how information is presented is an 'application'. The application software relies on information that is stored in a database (i.e. ENC), directly received from sensors (i.e. GPS, AIS, Radar, fathometer, etc.) and from the instrument's knobs and controls.

Historically, instruments were independent from each other and only presented information from a single sensor (i.e. radar, fathometer, GPS, Gyro, etc.). It was left up to the user to gain situation awareness by combining information from different boxes.

Gradually applications have become more task-oriented. They soon will present users with all information that they need to perform a particular task.

Proposed e-Navigation System Architecture

Derived from a proposal for e-navigation shipboard technical architecture presented by Woo-Seong Shim, KIOST, Korea

Any User Device with intuitive Human Machine Interface including Audio (i.e. INS, Workstation, Heads Up Display, Tablet, etc.)			
Secure connection to e-Navigation Applications running on the Private Computing Cloud			
Certified e-Navigation Applications from **any** vendor	**On-Board**		**Ashore**
	• Collision Avoidance/Passage Planning • Route Monitoring • Route Planning/UKC/Airdraft/Weather/Fuel • Conning (Mooring/Anchoring/etc.) • Alert Management • Systems Monitoring/Trouble Shooting • Ship Reporting to Authorities (FAL Reports) • Information Subscription Management • CBT including equipment familiarization materials • Database Search Engine that allows geo-referenced and other searches	• ISM/SMS Application • Trim & Stability • Fire Fighting • (SAR) Messaging • Etc.	• MSI Publication Management • Traffic Organization Service (TOS) • Remote Inspection of Quality of Ships' Instruments • Navigation Assistance Service (NAS) • VTS Services Advertising • MRCC Incident Management • Marine Domain Awareness (MDA) • Information Subscription Management • Database Search Engine that allows geo-referenced and other searches • Etc.
Private e-Navigation Computing Cloud	**Any** Certified Instance of the **Open Source Reference System Architecture** Architecture — Certified Services		• Information Management System (IMS) with S-10X format subscriptions to Information Services from local & remote sensors and other equipment/sources (i.e. Radar, AIS, GNSS, MSI's, Voyage Plan, Manifest, ENC & Nautical Pubs updates, SAR Sources) • Ship/Shore Radio Communications Network Router to automate wireless digital information exchanges via **any** network • Ship/Shore Network Connection Status Updates for **all** available communication networks • Security Key Manager for encrypted communications • **Any** Data Base Management System and **any** other Application Services
			Engine (Service Broker, Port, Context, HAL, UI Framework)
			Middleware (**Any** Operating System, Containers, Discovery & Peering, Communications, Load Balancing, other generic services)
	Virtualization Layer		
	Hardware		Redundant Physical Servers (**Any** CPU, **Any** Storage Hardware or Device)
			Networking & Firewalling, Connections to local Sensors, Radar, Radio Communications Equipment, User Devices and other equipment, using **any** network protocol (i.e. TCP/IP, **all** versions of IEC 61162 and **all** proprietary protocols).
			Data Center Mechanical & Uninterruptable Power Supply (UPS)

Required Characteristics of the e-Navigation Open Source Reference System Architecture (similar to AUTOSAR for the auto industry and SAVI for avionics)

1. To make the architecture future proof for industry innovation and to avoid vendor lock-in, it should be technology neutral and thus allow certified e-navigation applications to be deployed on **any** server hardware, **any** operating system and **any** user device without interfering with legacy systems. Also to allow "Mixing and Matching", certified e-navigation applications from different vendors should not interfere with each other.
2. To achieve redundancy, multiple reference architecture instances should be hosted on each physical server with automatic load balancing and failover.
3. To avoid the need to customize e-navigation applications for the local portfolio of sensors and other information sources, these sources should comply with Universal Plug-n-Play (UPnP) standards (IEC 29341-1). Sensors and information sources should be replaceable on-the-fly with automatic discovery & peering.
4. To securely manage complex information exchanges and to allow encryption where necessary, a Pub/Sub messaging pattern should be used.

Examples are collision avoidance in congested waters, mooring/anchoring, voyage planning, alert management onboard; and traffic organisation, SAR[7] incident management and managing MSI[8] publications ashore.

Users will no longer have to go from box to box to gain situation awareness; they can call up relevant decision support applications on 'their' screens for whatever the tasks at hand are. The INS (integrated navigation system) workstation is a good example.

E-Navigation will most likely affect almost all existing decision support applications. E-Navigation solutions will also require a number of new software applications to automate information exchanges, for instance.

E-Navigation will furthermore change the information that sensors provide to add details about their accuracy and their health.

Standards

Unlike the automobile, aviation and many other industries, there currently is no standard system architecture for the marine industry that covers electronic bridge and shore-side systems.

Instead, each vendor builds his own proprietary equipment with a CPU (computer processing unit), an operating system, his own system architecture, his own Human Machine Interface (HMI) and develops his own complement of proprietary decision support applications to run on his equipment.

Most vendors also bundle their sensors with their system and often use proprietary connections between their sensors and the rest of their system. Each individual sensor typically has a CPU, an operating system, a database and runs its own proprietary sensor specific software.

Electronic equipment and systems are typically selected by the shipyard and offered with the ship as a package that can be changed, but the change order fees tend to be significant.

The result is that ship owners and operators typically are prevented from using their own criteria (cost, features, intuitiveness, quality, reliability, maintainability, etc.) to select their decision support applications and their sensors. Ship owners and operators cannot easily 'mix-and-match' electronic equipment from different vendors.

The IEC 61162[9] digital interfaces standard should make that possible, however it can only process sensor values and it cannot process video. It is not suited for reporting sensor health and accuracy, it cannot be used to remotely (i.e. shore side) monitor, trouble shoot and upgrade sensor system software, nor can it process the messages using the verbose e-Navigation S-100[10] standard protocol.

The situation for shore-side equipment is very similar.

The result is that ship owners and coastal and port authorities are typically locked into a single vendor for support and upgrades. That suits vendors because they can, and often do, charge a premium for their support and upgrades.

Partially due to this vendor lock-in, ship owners and coastal and port authorities typically delay a major refit of electronic equipment as long as possible. Yet the pace of technology development is, if anything, speeding up rather than slowing down.

It appears that the CG doesn't intend to change this situation, because it will likely rely on vendors to add e-Navigation solutions to already installed (shipboard and shore-side) electronic equipment through software upgrades and, where that is not possible, to develop and market new stand-alone equipment that has the functionality required by the various solutions.

It doesn't have to go that way. With the introduction of e-Navigation solutions, the CG has a unique opportunity to improve the situation.

It has an opportunity to mitigate the effects of vendor lock-in. Specifically, it has an opportunity to unbundle applications from their computing platform by setting a standard for the platform's system architecture that can accommodate any operating system, any database and any CPU.

Such system architecture will also provide the CG with an opportunity to allow any application to use all local and remote sensors and other sources of information without interfacing issues.

Future-proof

Roll-out of e-Navigation solutions will not likely occur before the 2015-2025 timeframe and technology can be expected to change drastically between now and then. Therefore the CG should anticipate technology improvements and the direction of industry innovation as much as possible to make e-Navigation future proof.

In other industries the trend towards industry-wide reference system architecture (RSA) standards is clear (for instance AUTOSAR[11] in the automobile industry and SAVI[12] in the avionics industry) and has proven to increase availability and quality of solutions while reducing their cost.

The marine industry stands at the cusp of realising the same benefits if it adopts an industry-wide system architecture standard.

If the CG adopts an RSA[13] then it will provide the framework within which any software application (i.e. e-Navigation solution) can run on any operating system on any CPU using any data storage device and use any source of information on any communications network.

The framework will also allow ship owners and port and coastal authorities to adopt better, more reliable and less expensive technology without having to wait for a major refit, because all components will be 'Plug-n-Play[14]' (see IEC 29341-1[15]).

A major reason why the CG should consider adopting a standard RSA is that it will assure interoperability between shipboard and shore-side systems.

It will provide the framework for automatic seamless and secure e-Navigation information exchanges irrespective of the systems that are involved in the exchange, as long as they adhere to the RSA standard.

The aviation industry's SAVI RSA allows it to use fly-by-wire technology and meet all relevant performance standards.

The automobile industry's AUTOSAR RSA allows it to run several mission critical applications on a car's computing platform:

1. Break by wire (i.e. ABS)
2. Steer by wire
3. Accelerate by wire

All of these comply with the automobile industry's stringent performance and reliability standards.

The computing platform that runs these applications is also used to integrate smart telephone and music playback functionality into the car's sound system using a Bluetooth connection, for instance.

For safety, security and performance reasons, the RSA should be the overarching standard for all applications and all computing platform layers will need to be clearly defined ('abstracted').

Most ships already carry a computing environment for business purposes such as e-mail, stores inventory and purchasing, HR, payroll & time keeping, online forms, etc. Using a robust RSA as the overarching standard, and with a few Commercial Of The Shelf (COTS) additions to increase its reliability, the already available computing environment (i.e. servers, LAN, database management system, etc.) could host both business applications and e-Navigation applications without affecting each other.

Using a private cloud for all applications greatly reduces the need for proprietary and expensive single function electronic equipment.

An RSA will also provide a common infrastructure to remotely monitor, troubleshoot and upgrade software for (the remaining) electronic equipment. An RSA provides the necessary secure (ship/shore) real-time communications and access security that will allow vendors to remotely service their electronic equipment in most cases before it fails and without having to dispatch service engineers.

A developer of an (e-Navigation and other) application that is designed to run in an RSA cloud doesn't have to worry about customising it for the portfolio of sensors and the particular computing environment that application will run on the ship or ashore. The RSA cloud insulates developers from such complications.

IT industry experience shows that more than half of the effort to develop an application is spent on adapting it to the computing environment it will run in rather than on the application itself. This is the reason why RSA cloud applications are less expensive and of higher quality.

The number of choices of applications that perform similar functions also typically increases because development is no longer limited to those who are employed by a particular electronic equipment vendor.

Conclusion

Shipowners and port and coastal authorities would be major beneficiaries if the CG were to adopt an RSA for the e-Navigation infrastructure.

Doing so would have the effect of changing the market for electronic equipment from a sellers' market to a buyers' market. It would give you a way to avoid vendor lock-in and allow you to mix and match applications and sensors without interfacing issues.

It would increase competition among vendors to provide you with the best possible (e-Navigation and other) solutions.

It would not only significantly reduce the cost of providing the required e-Navigation infrastructure but, beyond that, it would allow you to future proof all your systems, limiting their total cost of ownership while increasing their quality, reliability and maintainability.

Shipowners and port and coastal authorities are encouraged to verify the claims that this author makes about the advantages of an RSA by consulting their software engineering experts.

If, as expected, your experts agree, then the author urges you to ask your CG representatives with the IMO, the International Chamber of Shipping (ICS) or IALA[16] to encourage the CG to adopt an RSA for e-Navigation.

DS

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About the author

Fred W. Pot *is principal of Marine Management Consulting and can be reached at fred.pot@enavigation.org. For further information visit www.enavsolutions.org*

Changing traditions for the PlayStation Generation

The advent of ECDIS may seem like a significant shift in ship navigation, but traditional skills continue to be important – and will remain so after ECDIS itself becomes a 'tradition' in watchkeeping, *writes Natalie Robson, ECDIS Ltd*

As an ECDIS instructor I am often met on a Monday morning by a new batch of trainees grumbling about traditional methods being the best.

I know 'change' is a dirty word at sea so I wanted to share my opinion as a relatively young mariner on these changing times.

As a cadet I did my navigation training using the traditional paper chart. However, once qualified I was forced to make the transition to digital navigation as the ships I was operating on were fitted with ECDIS.

I have to admit that at first I hated ECDIS.

In fact, I loathed going up on the bridge knowing that I would have to deal with the ECDIS alarms, but of course that was in my earlier 'uneducated' days. I know now that one has to experience new methods so as to make an informed judgement, rather than discounting a new technology outright.

Once, whilst on passage as a cadet from Southampton to Bogen in northern Norway, we lost our GPS signal that fed the Integrated Bridge System (IBS). At the time we only had one GPS unit fed into the systems and myself, the second mate and the lookout had to man the alarms...and OMG how the systems alarmed!

The loss of GPS caused the IBS to alarm, the GMDSS was alarming which caused the IBS to alarm, the GMDSS repeater was alarming, which caused the IBS to alarm, the ECDIS was alarming which caused the IBS to alarm.

We then switched the ECDIS into DR mode and diverted into Bergen through the fjords whilst managing the alarms. This allowed us to navigate through the fjords on our paper charts looking for the red compass roses under the red lighting!

Tradition

Tradition is the transmission of customs or beliefs from generation to generation, or the fact of being passed on in this way. Our traditional charts (that I so often hear about when I am teaching ECDIS) have evolved to be what we use today.

So, would Captain Cook be able to use his traditional methods of navigation on our traditional charts? I can't answer that for you, but what I can tell you is that in time ECDIS will become the traditional means of navigating.

In 10, 20, or even as little as 5 years' time given the rate of technological advances, we may be discussing whether or not we should keep ECDIS as the traditional way of navigating. The regulations have already changed to force ECDIS upon us, but is this really a bad thing?

Ships weren't traditionally built with GPS, RADAR or AIS, but would we go to sea without them in this day and age? Well no, because we are required to have them fitted and we have now learnt how to use them in order to aid the execution of navigation and collision avoidance.

Imagine being able to have all that information in one place so that you can just glance at the screen and see the volume of traffic in relation to the land, your passage plan and then get back to looking out of the window.

It is a fact that, when applied properly, the enhancement of spatial awareness possible when using such aids to navigation are immense.

The routine that I adopted on the bridge was always to look out of the window as much as possible, and fix at a frequency appropriate to the environment. When fixing on a paper chart, say every 15-20 minutes in coastal areas, I would also check the radar and the AIS to ensure that the ship's position correlated.

With the advent of ECDIS the fixing routine is less verbose. In principle, all you have to do is prove that the position displayed on ECDIS is correct periodically. This is particularly quick if correlating Radar Information Overlay (RIO).

My routine stayed the same but fixing could be as quick as correlating the RIO with the ECDIS position and noting in the navigation record book 'ECDIS correct'.

Of course, when your ECDIS is configured correctly the time for looking out of the window is vastly increased giving you spare capacity to conduct collision avoidance.

Traditionalists always cite the inability to look out of the window when using ECDIS, but the opposite is true if used and configured correctly. Remember, there is not a warning on the paper chart to 'look out of the damn window'!

What seemed 'traditional' in the past.....

The future

Unfortunately, whether we like it or not technology is the future. I just about fall into the category of a technology native, whereas the majority of seafarers still fall into the category of a technology alien or 'a traditionalist'.

Traditional ways of navigating can still be achieved on an ECDIS, it is just knowing your system's capabilities and where to find the tools to achieve it.

ECDIS allows you to insert alarmable no go areas, Limiting Danger Lines (LDL), Parallel Indices (PI) and clearing bearings into the system. Some systems even facilitate the plotting of HSAs and VSAs!

These are in keeping with traditional methods of navigation and importantly allow the watchkeeper to spend more time looking out the window during the watch.

Traditional skills will still be needed for a long time into the future, yet some flag States still require vessels to carry up-to-date paper charts for back up, even when the entire voyage is conducted in ECDIS mode (no need for RCDS mode).

Moreover, when operating in RCDS mode, some flags require the paper chart to be prepared with the route on it, for the chart to be on the chart table and the ship's position to be updated regularly in addition to the ECDIS.

Remember, some vessels will still not be required to have an ECDIS fitted until after 2017. So traditional skills are still relevant and will continue to be so for some time to come.

Like I have already said, tradition is evolving and what we class as traditional methods now will have thousands of mariners turning in their graves. But ECDIS is still in its infancy and is evolving to be what we want and need it to be.

If you don't like your system then is that down to the fact that:

- The person purchasing it has never sailed with ECDIS?
- Your equipment is made by the lowest bidder?
- Those who are sailing with ECDIS are only grumbling amongst themselves?
- Lack of training and understanding?
- All of the above?

Manufacturers want to make systems we want to use but it is a two way process.

Manufacturers need to utilise the knowledge of mariners experienced in navigating with ECDIS at sea to develop their software. This will allow mariners to get the functions they need, instead of what engineers can provide.

In turn, mariners must provide no BS feedback to manufacturers about their software. If this process of evolution can be made to work, then, coupled with meaningful training, ECDIS can truly evolve into the excellent navigation aid that it has the potential to be. ■

.....will be replaced by a new vision of 'traditional' for the next generation

About the author
Natalie Robson *is an instructor at UK-based ECDIS training company ECDIS Ltd. www.ecdis.org*

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