Reporting back from conferences, seminars and discussions across the maritime world. Join the discussion at LinkedIn, or email **editor@nautinst.org**

AUTONOMOUS SHIPS: WHAT DOES THE FUTURE HOLD?

Unmanned vessels are already a reality in today's shipping industry, and will play a larger role in future, delegates to the London Branch of The Nautical Institute's latest conference were told. More than 70 people attended the Branch's two-day event in Bristol, focusing on the topic *Autonomous ships: what does the future hold?* where a wide range of speakers from class, regulatory authorities, developers and operators outlined what might be in prospect for the industry.

'Marine autonomous vessels are here today, already, in all sorts of shapes and sizes, used for science, for research, for defence and in the oil and gas industry, among other things,' said James Fanshawe, chair of the UK's Maritime Autonomous Systems (MAS) regulatory working group, in his keynote address. He warned that as the size of these vessels increase, they will have to be integrated into a well-established, and complex, maritime world. 'The MAS is determined that autonomous ships should be brought in sensitively and recognise the concerns of all involved.'

Attendees were assured that autonomy would not mean the end of manned vessels for a very long time, if ever. And long before we can hand over to an autonomous control system the manned ships of today need to be safer, greener, more efficient and with crew that have the required skillset, said Hans-Christoph Burmeister, Project Co-ordinator of MUNIN's unmanned vessel test-bed, a project which covered the navigational development of the unmanned voyage. The project involved eight partners, seven of which were investigating technical, legal and liability issues. Despite initial difficulty in finding an owner willing to convert a ship for the purpose of the project, the project saw a ship in use 'with partial help from a remote control'.

As there is not satellite coverage in all areas, the project only allowed for the ship to work autonomously for parts of the voyage. The technology used by MUNIN included electronic lookout and a sensor module. This technology can detect weather phenomena and small objects such as swimmers – all of which an OOW would normally see. He explained that 'as long as you are keeping a lookout, does it make a difference where you are looking from?' Autonomous ships will need to comply with Colregs as they exist at present, but he did not foresee any difficulties with this.

Hans-Christoph's key point was that 'we will have both unmanned and manned vessels in the same environment; we have to ensure this works.' Furthermore, 'How do you cope with handling several ships at the same time?' he asked. It is not as simple as shore-based controllers taking over the responsibility of the vessel's Master.

Risk perception

Dr Andy Norris FNI, past Vice-President of the Royal Institute of Navigation, examined how autonomous ships will challenge the relationships between humans and machines. 'The art of navigation maximises the strengths and overcomes the limitations of humans,' he said. These limitations include 'our natural sensors and brain ability.' But machines are becoming ever more capable; they do not get tired and can be made highly resistant to failure. Dr Norris identified a huge development in artificial intelligence and pointed out that 'autonomous ships must respond intelligently to human errors made on manned vessels.' These risks were further discussed by Adan Lopez-Santander, presenting from the University of Bristol, who asked 'is my perception of risk the same as that of my colleague?'

Developing the technology

Rolls Royce, represented by technologist Dr Eshan Rajabally, stated that their vision was not to completely remove humans from the loop as 'humans are critical to unmanned shipping.' That said, he continued, the main cost argument is around reduction in manning. As well as removing the crew and hotel costs, overall the cost will be affected by the reduced weight, air resistance and fuel consumption if ships can be constructed without the need for crew accommodation. Rolls Royce has published a visual sequence of transitions that they propose will lead to large vessels working autonomously.

Dr Rajabally explained how these vessels are potential products and will generate commercial motivation. He also touched upon the implications for Colregs; 'they are the "rules of the road" and were written for human consumption, hence their machine interpretation is non-trivial.'

Rolls Royce's vision of what an autonomous vessel might look like

Assurance processes

Ben Cuckson from Lloyd's Register's Naval Liaison Office explained his involvement in developing assurance processes for autonomous systems to meet the requirements of operators and regulators. These requirements could be met by setting a 'clear industry standard that is recognisable, shares industry best practice and complies with a design code.' He added: 'The design code's aim is to provide designers with the framework to build capable, reliable, safe and resilient unmanned ships.' Manufacturers will be able to provide evidence in the form of a certificate to show they have complied with this design code. Ben explained that a certification trial for a 6 metre unmanned vessel (UMV) is currently under way.

Insurance questions

A key point throughout the presentations was that the movement towards autonomous shipping and the cost implications is likely to be driven by insurance. 'Will autonomy stop erratic navigation? I suggest yes,' said Stuart Edmonston, UK P&I Club's Loss Prevention Director. 'If we can reduce risks even slightly by controlling things ashore, we'd be quite happy about that,' he added. Crew injury is one of the largest expenses for P&I insurers and without a crew onboard, 'there would certainly be less crew costs, but more risk to the people mooring the vessels.' Due to the reduced crew expenses, would owners expect a lower premium? 'Much of this is unknown territory, precisely because there are no relevant loss records to base rates on,' he answered.

However, Stuart went on to ask attendees 'when will you trust the system enough to put 100 tonnes of cargo onboard?' especially when there is the risk of an automated vessel being hacked through data breaches or malicious interference, which 'could result in catastrophic consequences'. He stated that other issues surrounding the age of autonomous vessels include 'new risks, new fears, public fear and scepticism, media sensationalism and trust.' His presentation sparked a discussion on whether autonomous ships would discourage anyone seeking a career at sea, as there may be fewer jobs. Also raised in discussion was the psychological effect on seafarers of having a smaller crew onboard.

Charter issues

Matthew Williams from the International Chamber of Shipping was rather more sceptical about the prospect of autonomous ships in either the short or the long term. Autonomous ships will have to be designed to be easy to

charter, he said. Charterers will determine what kind of ships they want and if autonomy poses a risk, there will be no demand to charter and owners will not invest. With the matter of insurance to consider, he added that 'these ships will need to work flexibly in ports.' If states ever need to exercise their right to investigate an unmanned vessel or a crew is required to tend to the ship in port, 'autonomous ships need to operate as freely as manned ones, or they will not be attractive.' He explained that 'the focus for shipowners is not autonomy, but meeting today's requirements for better manned ships […] There is no question that autonomous ships are feasible, but there is not a convincing framework for worldwide autonomous fleets in place.' He concluded that 'to actually plan for, purchase and operate unmanned ships, would require many uncertainties to be resolved.' Furthermore, existing conventions and regulations will need to be updated to take the existence of autonomous vessels into account, including Colregs, SOLAS and national regulations.

Dr Alexandros Ntovas from the Institute of Maritime Law, Southampton, further explored the legal considerations of autonomous vessels, and said 'there is a view that advancing technology is bound by the constraints of law.' However, 'no matter how fast it develops, there will be a legal principle to cover it,' he added.

Delegates were assured that autonomy would not mean the end of manned vessels

After a wide ranging discussion and in-depth examination of the topic of autonomy, the conference concluded that while it will be many years yet before fully unmanned merchant ships become a reality – if they ever do – it is vital that the industry starts thinking about the implications of the potential change at an early stage. Then the industry can ensure that the crew are trained and available with new skillsets and that all regulations, legal and otherwise, are in place and understood. Autonomous ships have to be presented as a positive development that will maintain safety and profitability.

A selection of presentations from this conference will be made available on The Nautical Institute's website over the next few months.

Laura Nicholls