AUTONOMY V THE HUMAN

Ladies and Gentlemen

When James Fanshawe asked me to speak at the Conference today, I welcomed the opportunity to put across the view of the International Federation of Shipmasters' Associations. Formed in 1978, IFSMA is an NGO with consultative status at the IMO and currently represents some 11,000 serving Shipmasters from over sixty countries around the world, either through their National Associations or as Individual members. In view of this, I think that some would expect me to be standing before you today with a banner saying AUTONOMOUS SHIPS, over my dead body, but this is far from the case and this is also the view of Nautilus and Nautilus International who have co-written this presentation with me and I hope you will see this as a positive when I have finished.

The subject of 'autonomous' or 'smart' (semi-autonomous) ships has started to emerge with a degree of pace as a future concept for the shipping industry. While the terminology is still being debated around the world, it is generally accepted that 'autonomous' ships are those without marine professionals and utilising advanced technology, whereas 'smart' or 'semi-autonomous' refers to ships where marine professionals utilise the advanced technology onboard.

Technological change can take place at such a slow rate that it may not be readily apparent. Equally, it can occur at such a rate it is difficult to assimilate. The lessons of history suggest however, that it is futile to resist change and much better to embrace evolution in a way that it serves society and those working within the industry.

Looking back to the period of European expansionism, shipping made it possible and technology made shipping possible. This was not without considerable risk to those involved - both financially and at considerable personal risk to the seafarers. The 18th and 19th centuries were a period of considerable technological advance, which furthered commercial growth.

The 20th century witnessed a change from coal to oil, the development of engine control systems and navigation equipment including the gyro compass, radar/ARPA, and terrestrial navigation systems. These developments, while hastened by two world wars, took decades to be universally adopted in commercial shipping such was the reluctance to incur cost and trust in new technology.

In communications, a breakthrough came in the early 1900s with wireless telegraphy, but it was not until the 1980s with satellite communications that navigation changed after 200 years. This fundamental change was not resisted by marine professionals, despite the obvious de-skilling as the worry was taken out of navigation.

The shift to satellite communications not only improved Search and Rescue Communications, but opened up new possibilities for the commercial operation of ships and the social welfare of seafarers.

Technology can be a liberating influence or a further means of making work a virtual prison with an incarceration of ideas and freedom of thought. Smart ships utilising both existing and new technology can reduce human error, improve safety and provide an alternative lifestyle for maritime professionals far removed from the near slave-like conditions experienced by some seafarers today. The 98 hour week and isolation from friends and family should be but a distant memory to future generations.

Shipping is the servant of trade and trade will demand the utilisation of new technology at an affordable cost. The potential for high-value jobs concentrated in ‘hub ports’, manufacturing and on-board ship is enormous, but the concern for many is the nature of the change, the rate of that change and the outcome of that change.

Change in shipping has historically been slow and remains relatively so when compared with other sectors of industry. Shipping is a contradiction, in that risk exists in every sea voyage, yet when it comes to the adoption of new technology the industry has shown not only a lack of willingness to accept it, but is often outright hostile to it.

There is commercial risk and technological risk and the two are inextricably linked. Shipping is a capital-intensive industry where commercial risk is potentially great. Hence there is a reluctance to adopt new technology and jeopardise current income and profit. While there are always early adopters, universal acceptance usually takes a considerable time.

The industry is more comfortable with commercial risk, despite the unpredictability of the predictable ‘downturns’ due to over-capacity and the cycles of world trade. The endless battle over the retention of paper charts in preference to electronic charts is just one recent illustration of the reluctance to accept technological change. Eventually, with a little regulatory help, electronic charts became a favourable option even though they have some fundamentally dangerous flaws and lack coherency of design and operation between the different manufacturers.

There are specific areas where autonomous vessels have been identified as immediately useful. One area is the extension of ROVs currently used for underwater survey work as intelligent seekers. These are referred to as low-cost Unmanned Autonomous Vehicles (UAVs); costing less than 100,000 Euros and capable of being launched by one person. Internet-connected UAVs will be capable of sending observations of seabed and water to data centres for evaluation and transmission to marine users.

The potential for their use in the dredging industry for improving efficiency and effectiveness may be considerable. Other possibilities, including the recovery of persons from the water, have yet to be considered. The possibilities are the limit of imagination, yet the constraints remain economic rather than the technical.

In the military, at sea as in the air, the ability to keep humans out of harm's way has already been recognised with the procurement of mine sweeping vessels; extending to surface vessels to detect and hunt submarine incursions.

Returning to the human factor, let's turn to jobs not even thought of, let's explore and offer some assistance - going beyond specialist autonomous vessels, looking realistically at smart or semi-autonomous ships for the transport of goods, be it liquid bulk, dry bulk or containers.

The transformation of labour structures with displacement and creation of new jobs will be unsettling for the current generation of seafarers and possibly resisted by an immediate past generation now working ashore. However, for a new generation where uncertainty is the norm the opportunities are endless.

Take a container vessel of 16,000 teu sailing from either Rotterdam or Liverpool to New York with a complement of eight; senior master and an alternative master on each watch accompanied by a supporting officer. Two other positions comprise of a specialist ETO and Catering/Medical support. A mooring gang and pilot, both in Rotterdam or Liverpool and New York, board for river transit, docking and undocking and Limited maintenance is undertaken during shore-supervised discharge and loading.

Masters and officers are accommodated ashore before the vessel returns to Rotterdam or Liverpool with the same complement and they take leave, not unlike the aviation industry.

This really is not the end of the seagoing rating - passenger vessels in an ever-increasing number will require personnel of all disciplines, as will specialised vessels such as dredgers and, no doubt, the opportunities for salvage will remain. Employment opportunities will be created in the repair facilities for smart ships and the handling of small specialist autonomous units.

The specialist bridge and watch pattern should reduce risk and fatigue. Duplication of systems and withdrawal from service for planned maintenance would be necessary. Whilst the Engineering maintenance would be transferred to shore, this would necessitate the building of specialist workshops and repair berths. Maintenance ports would develop at key ports and focal points on trading routes around the world similar to that found in aviation. All of which would require significant capital investment in infrastructure and personnel with the skills to install, maintain and operate equipment.

The requirement for pilotage services would depend on experience and frequency of port call, not dissimilar to the present system of pilot exemption certificates that operate today. Mooring gangs would continue until more precise safer and tailored automatic docking systems could be developed and installed appropriate to vessel type.

A shift of jobs from ship to shore and a shift in skills with a requirement for up-skilling both onboard and ashore are to be expected and welcomed. Ideally, the objective should be a balanced lifestyle that is safer and healthier, and more financially secure.

It is with some irony that many individual seafarers, and organisations representing those seafarers, endorse a career at sea, but those individuals still hark back to a time when port stays permitted extensive shore leave. A career in shipping rather than a career at sea is increasingly the norm and by that I mean a limited time at sea gaining experience before obtaining employment ashore.

Technical risk can be reduced by installing duplicate or multiple systems onboard. The big weakness in my view is in the capacity of existing communications and the vulnerability of position-fixing satellite systems. With the smart vessel concept, communication is less significant and vulnerability of position fixing systems can be mitigated. An onboard position-fixing system, modelled on earlier Inertial Navigator Systems, with accuracy close to that of current satellite systems, is estimated to be 10 years away. If developed in this timescale it is unlikely to be made immediately available for commercial use at an acceptable cost.

The ‘smart’ ship option appears the sensible way forward rather than accept the risk associated with totally new and unproven equipment. Nevertheless, before any step can be taken towards either smart or autonomous shipping the issue of fuel needs to be addressed. LNG is one option that would facilitates this as it requires no ‘conditioning’ and maintenance can be more easily managed.

The move to smart ships would require substantial investment, and even more so for autonomous ships. Cost savings on labour would be minimal given the relative low unit cost of labour as a result of economy of size and a fractured global labour market. The current estimate for an efficient operator is that the crew only represents about 6% of the operation cost of medium sized vessel. Labour costs may well increase due to the scarcity of specialised labour required to construct, fit-out, operate and maintain this new technology and this will be a significant factor in the speed of adoption.

The focus so far has been on the possibilities of the technology with little consideration of the economics or social implications. The economist, Martyn Stopford, has examined the possibilities and concluded, predictably, that economics will determine the rate of adoption and others who have addressed this issue have come to a similar conclusion. Yet nobody has considered the social implications. Is this a feature of an industry so conditioned that it considers the workforce as disposable commodities?

Currently, short distance – line of sight communication affords capacity and reasonable security for specific uses. Where satellite communications are involved the risk of interruption is considerable from solar flares, meteorite strikes and sabotage.

Therefore, coastal shipping would be more readily adaptable to autonomous ships given the reduced communication risks although it does increase the risk of greater interaction with other vessels, in particular the unpredictable manoeuvres of fisherman and the leisure user. Addressing this sector of the industry would however remove the greatest abuse of seafarers, namely, excessive working hours from the Master and one officer on a 6-on/6-off interrupted watch pattern causing acute and chronic fatigue with serious long term health effects. Nevertheless, increased satellite capacity and onboard broadband are pre-requisites to technological advance.

Today's generation relies on technology more than any other. Those of past and immediate past generations in referring to navigation readily cite the 'mark one eyeball'. That is fine providing the visibility is good. However, limitations in human sight and aural interpretation do exist and intelligent use of a range of sensing and computing equipment can facilitate an optimum and safer decision making process. Similarly, in the engineroom, sensing and diagnostic tools can help prevent incidents and find solutions to emerging situations.

The helmet of an F35 pilot provides 360 degree vision in differing conditions of light and visibility. The potential to commercial shipping, without the helmet, as seen in the automotive industry most recently with head up displays,

affords the opportunity to increase situational awareness and hence improved decision-making.

This could be transferred to a remote location ashore, but is unlikely until the technological and commercial risks are deemed acceptable, and the extensive regulatory hurdles are overcome.

Remote sensing ashore of engineroom equipment affords the opportunity for expert assistance from manufacturers and so improve maintenance and efficient operation. This is readily acceptable, whereas such monitoring of navigational equipment and support is resisted.

In our ever-congested surface waters, the positive direction or directing of shipping is inevitable and already exists in compulsory pilotage areas, albeit via the advice of the pilot or VTS under the authority of the harbour master. It is a small step from direction of a smart ship to control of an autonomous ship in coastal waters, and in territorial waters the International regulatory complexities are absent.

Notwithstanding, one of the most difficult and controversial areas that will need to be tackled is how Autonomous Ships will be able to show that they can comply with the International Collision Regulations which currently are based solely on the Vessels' Bridge being manned by properly qualified mariners keeping an effective lookout both aurally and visually.

However, I mentioned before the well proven limitations in human sight and aural interpretation, particularly in reduced visibility, and technology can and does helps us today to overcome this. Some advocate change in the COLREGS to accommodate the Autonomous Ship, but I am not one of those and fully believe that these vessels will have to be properly equipped to prove they can meet the current Rules required of manned vessels so that they can all operate and interact in the same space.

What position should marine professionals take? Change is going to happen, indeed change is already taking place. By not only accepting change, but advocating change in a particular direction it is possible to set or influence the agenda and better steer that change towards an acceptable outcome. That is why IFSMA and other Maritime professional bodies are represented on the Maritime Autonomous Systems Regulatory Working Group – not to obstruct its development, but to influence and help its development to the benefit of all so that it can operate safely in our complex and crowded maritime tapestry. The output of this Working Group is crucial to the effective introduction of Maritime Autonomous Systems in the UK and I suspect is a world leader. I hope that other nations will follow their lead and that they will work together for uniformity of operation and terminology around the world. Their ability to influence the IMO will be key.

In summary Ladies and Gentlemen, I believe the autonomous option is likely to be initially limited to specific specialised purposes as we have seen in the increased use in the Military, hydrographic and Oceanographic areas. Development of autonomous ships for coastal waters has arguably less commercial and technological risk than deep sea, with direct remote control from shore, but increases the risk of greater interaction with the many other maritime users. But as Sir Alan Massey, Chief Executive Officer of the Maritime and Coastguard Agency, has previously stated, “somehow we need to construct a Regulatory System that takes account of both manned and unmanned vessels occupying broadly the same water space, rather than imagining that we can always realistically and safely keep the apart. The question is how we ensure effective coexistence in a complex and potentially hazardous environment.”

The risk of choosing the autonomous option currently remains high, particularly away from land, but given the absence of regulatory impediments, the smart or semi-autonomous option appears preferable. If change is managed properly, it affords the opportunity for improving life at sea and creating new highly skilled jobs - both afloat and ashore. Thank you for listening to me.