Southampton Marine & Maritime Institute, University of Southampton – Written evidence (AUV0028)

1. This submission focusses on autonomous marine vehicles. The University of Southampton is one of the UK’s leading universities for naval architecture and marine engineering, as well as having one of the top institutes for maritime law. Both of these form part of the University’s Southampton Marine and Maritime Institute.

2. With 90% or more of world trade travelling by sea and with a global fleet of large ships greater than 90,000, there is a potentially lucrative market for the application of a wide variety of autonomous systems. Typically on-board personnel costs can form 40% of the operational cost of a ship and anything that can help make more effective use of ship board officers and crew, improve their working hours and conditions will enhance the sustainability of the industry. Crew numbers have reduced significantly in the last few years. For example in the extremely competitive container shipping market the recent high profile collapse of a major player indicates quite how sensitive their margins are and the pressure to reduce costs all round.

3. A recent workshop on Large Ship Autonomous Systems organised by the University of Southampton’s Maritime Robotics Laboratory with the support of the Transport Systems Catapult brought together more than 50 key individuals from a wide range of industry partners to debate the technology challenges and other aspects associated with greater adoption of on-board autonomous systems.

4. There was wide agreement at this event that there is a significant operational benefit that can be obtained from developments of on-board systems that can support existing crew and also that these changes are already starting to happen and at a greater pace than would have been anticipated a few years ago. The technology already developed for small autonomous surface vessels, for example by companies such as ASV Global Ltd or by student project groups such as the University of Southampton’s Team Fortitude has the potential to make autonomous ship operation a possibility within a relatively short time frame (less than 10 years). The developments made in the commercial and academic sectors place the UK in a unique position to lead the future direction of maritime autonomy in a global context.

5. There are many tasks on-board ship which require a highly trained individual but only for relatively short periods of time. Watch keeping and collision avoidance would all benefit from improved systems that can support and potentially reduce the risk of human error whilst maintaining compliance with national, regional, and international requirements. Similarly many of the survey and inspection tasks that help ensure ship safety and maintenance are physically challenging and at times, dangerous so using systems that can automatically inspect and monitor vital

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1 https://en-gb.facebook.com/fortitudeASV/
components of the ship’s structure and machinery could significantly enhance ship safety.

6. While there are aspects of generic technology that can be applied across a number of transport sectors the maritime sector has some unique challenges. For instance, communication via satellite in the open ocean is both expensive and has limited bandwidth compared to the wireless networks that can be used on land and in coastal areas. In coastal waters the variety of sizes of marine craft and with relatively limited traffic control especially for leisure craft provides a complex environment in which to manoeuvre vessels which have relatively slow rates of response. Similarly the skills of pilots in navigating the currents and tides would be very difficult to replicate. The robustness of sensors and other systems has to be sufficient to survive the extreme storm conditions experienced in the maritime environment. While the challenges are significant, automation can be introduced at different levels ranging from partial assistance of specific functions to full autonomy. Each level poses operational benefits and a step-by-step approach to integration can accelerate the development of mature technologies. Furthermore, many aspects of automation can leverage existing digital and physical infrastructures (e.g. communications, ports) and so can be introduced with minimal disruption to on-going activities.

7. A key requirement is the necessary engineering expertise to develop and push the technical possibilities in this growing sector. It is interesting to note that a Master’s level module SESS6072 Maritime Robotics, introduced two years ago as part of the MEng in Ship Science degree programme for Naval Architects and Marine Engineers at the University of Southampton, is one of the most popular final year modules. Students combine their knowledge of maritime engineering with an ability to code distributed microprocessor systems. They are already aware that these are the skills that the successful Maritime services industry in the UK has a shortage of. It is also an area where there is considerable potential for the growth of entrepreneurial start-ups that can deliver systems which meet specific maritime industry needs in a short timescale with the potential to scale rapidly across many ships.

8. Policy decisions on how quickly and on what terms the new technology will be introduced in the commercial world and how it will interact with existing navigational and operational rules will need to be taken. These should be evidence based, ensure safety for human life and the protection of the marine environment, encourage innovation and efficiency and reduce the environmental footprint of marine activities. New regulations prescribing the construction, communication, navigational, operational and training standards for such systems and their operators need to be developed and complied with. These have to develop gradually in collaboration with the industry as otherwise they may be proven either too restrictive for technological development or too permissive and may create unnecessary risks. The use of new maritime systems with international capability also requires engagement with the international regulatory body for shipping, the

http://www.southampton.ac.uk/engineering/postgraduate/taught_modules/sess6072_maritime_robotics.page
International Maritime Organisation. Other fora, for example the European Defence Agency has also been exploring the legal position in relation to the development of such systems and need to be taken into account if the technological and regulatory offer is to have international scope.

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