MASS – Potential Applications in Superyachts

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Abstract. The current superyacht “Industry” continues to grow both in overall size and variety of vessel designs. Superyachts are sometimes only used privately by their owners whilst others are chartered out on a commercial basis and many operate in a combination of such modes. The largest numbers are for under 12 passengers and thus, despite having operations more akin to cruise ships, they are considered by most regulations as “Cargo Ships” those yachts carrying 13 or more passengers are considered “passenger ships”. Essentially Superyachts are just another type of ship and, as such, can easily benefit from developments in improving many ship related operations by MASS. This paper will cover a few of these areas. The views expressed in this paper are those of the author and not necessarily those of his employer.

1. Trials and Research

Whilst the vast majority of Superyachts are used for pleasure purposes by their owners or Charterers, for carrying passengers, who are frequently referred to as guests. Some Superyachts are also currently used for new technology trials and research, indeed they have been for many years.

Yachts are, in many ways, ideally suited for trials and testing as they primarily provide accommodation for passengers. Some passengers could be the technicians trying out additional/ MASS related equipment, others may be potential customers wishing to witness the technology in action. Upon completion of the trials vessels can be readily converted back to conventional superyacht use. This re-allocation of assets can reduce the overall costs of research projects.

Some Superyachts already carry such devices as remotely operated submersibles and of course drones whose operations are similar to those of sophisticated dedicated research vessels.

Many superyacht owners are involved in hi-tech companies developing automated systems for many different applications, they may like to see some of these developments on board their yacht.

2. Manning.

Operational crew are needed to get the yacht from A to B and maintain the technical and guest services at all times.

The service crew are primarily expected to attend to the needs of the owner and passengers although, of course, they also provide services to fellow crew.

Essentially all crew members have to be provided with accommodation and facilities on board, the provision of which reduces space available for the guests thus there is economic pressure to reduce crew numbers. Any automation may help reduce crew numbers, however, certainly from the front of house service side it is likely that most owners are going to want to retain humans. There are, of course, currently available things like robotic bartenders, although at the current stage of development humans are still quicker and more flexible.
Such things as robotic vacuum cleaners have been around for several years to assist with cleaning tasks but still retain the need for significant human intervention.

As far as navigational aspects go the unmanned bridge or “B0” possibilities for moving navigational functions away from the traditional location to somewhere else on board, would enable greater development of panoramic lounges etc. Of course, moving the traditional bridge functions off the vessel completely to a shore control center would free up even more space, as would full autonomy of this function.

Use of appropriate sensors could lead to reduced lookout needs, which could cut manning, or re-designate manning to improve service. The use of sensors could, in fact, improve practical lookout aspects from some of the bridge/wheelhouse designs currently being seen, although, of course, avoiding such phenomenon as relative motion illusion will need to be considered at the stage of human involvement. Improvements in optical sensors and displays could also initially lead to further equivalences being developed to the current bridge visibility requirements, which will lead to a much smaller footprint being needed for the navigational bridge to something more akin to aeroplane cockpits. This in turn frees up attractive space for guest use and of course enables changes in the yachts styling. There are further possibilities for improvement in aerodynamic performance of designs with the associated potential for improvements in environmental performance.

MASS related technology has the potential to reduce manning levels. The benefits will in general not be as marked as with the potential with respect to conventional cargo ships, as often Superyachts do not spend as much time at sea and of course service crew are a higher proportion of the on board seafarer numbers. Because of the wide variety of operational scenarios it is difficult to accurately conduct generic cost benefit analysis. Superyacht owners do have widely differing views in how to spend their money on their yachts with some happy to invest heavily in new technology and enhanced features in excess of statutory requirements whereas a few others are reluctant to even meet the lowest statutory requirements.

3. Training

One of the main challenges, as we progress towards autonomy, is ensuring that all involved are properly trained. In the past the Maritime Industry has not always been good at ensuring proper training is done as new technology is introduced.

As systems are developed the role of their operators will change away from traditional seafaring functions. It is very important that the seafarers remaining on board are properly trained for new responsibilities, that they may need to take on, especially should there be failures in automated systems.

A major challenge will be ensuring that persons know when they need to intervene due to any failures and of course that they know how to do so.

4. Comfort,

Comfort for guests could be improved by better vessel routing. The understanding of weather systems and accurate prediction of future weather patterns continues to improve, as does Communication transmission of real time data from monitoring stations, which can include vessels. This assists in the provision of data for analysis, and predictions of weather patterns, which, in turn aids the ability to avoid uncomfortable passages and can help the selection of comfortable anchorages.

In situations where the navigation of the vessel is not controlled on board then the comfort of those persons remaining on board needs to be ensured by using appropriate motion sensors to input into the decision making for the vessels course and speed, as well as trim.

Stabilisers could be considered a very early form of automation for improving comfort. These systems have continued to evolve to improve performance and enable a more comfortable voyage without a great increase in fuel consumption. Stabilizer systems for use at anchorages also continue to evolve with increased utilization of technology for predicting and countering motions effectively and thus enhance comfort.

As autonomous systems develop accurately predicting and reacting to all human senses will be one of the many challenges to ensuring acceptability.
5. Propulsion and powering

With respect to propulsion - diesel electric propulsion is already being used by some superyachts with the advantages of such features as azimuthing propulsion and thrusters, are already being realised. Many existing yachts have relatively high propulsive power for their size due to some owners having the desire for speed and not being too bothered by the cost of high fuel consumption. That said there are also many owners and charterers who desire to both keep the running costs down and reduce environmental impact.

Battery power for yachts is quite logical as many are only used for relatively short-range voyages and not all owners want fast yachts.

Electric outboard motors, as well as, electric inboard motors are becoming more popular for use with tenders. Suitable systems have been developed for rescue boats.

From the environmental side; most Marinas already provide adequate shore power to provide the domestic power requirements on yachts, which are, of course used to plugging in when in port. Increasing capacity to cope with charging propulsive batteries should be relatively simple. Although many areas visited by yachts do not currently have “clean energy” supplies, there is increasingly a drive towards “clean energy”

Whilst the proportion of sail propelled superyachts is relatively small this could change as environmental advantages outweigh the perception of unreliability of wind propulsion. There is great potential with wind assisted propulsion, improved weather information will help with better routing to efficiently utilize winds. Variations on traditional soft sails are continually being developed as are solid sails, rotors and turbines. There is potential, possibly to a lesser extent for solar power use.

6. Operations

Yachts often have tenders of varying sizes so there are possibilities of a mother ship with remote controlled tenders, if MASS principals are appropriately applied. Whilst most larger Super-yachts carry their tenders on board, the smaller Super-yachts currently tow tenders, which can lead to problems.

There is also the possibility of using convoys of Super-yachts, and their tenders, for re positioning voyages, where one yacht could act as the lead vessel and others following on under remote operation. This kind of operation will face regulatory challenges as there are possibilities of different flag vessels being involved, as well as different Coastal and Port States.

7. Communication

Improvements continue in all aspects of communication including increased capability and reliability, as well as reducing costs. Continuation of these trends will be vital for autonomous developments.

Many superyachts already have very sophisticated communication systems to ensure the continual connectivity of business managers with their offices and the additional capacity required by MASS features can be added at relatively little extra cost – However of course, some owners want to switch off when on board their yacht and thus do not want to invest in this technology!

Cyber Security will be very important in preventing interference with vital communication links

Improved communication has over the years owners and operators to exercise increasing monitoring and control of vessels and can be considered as another factor in the ever changing skills required by seafarers.

8. Security

Developments in such areas as video monitoring and movement sensing can be used on both existing vessels and newbuilds to improve vessel security. Better overall monitoring of the vessel benefits the effectiveness of on board staff in carrying out their security functions or, indeed, assists remotely based personnel. With the high value assets involved cost effective security is often high on the requirements of owners and of course also of interest to insurance companies.
9. Safety Equipment

Safety equipment continues to evolve with the introduction of new technology. This technology has been proven to be sufficiently reliable for use in safety critical areas where the possibility of failure needs to be very small.

Some examples include; Cruise ship man overboard detection systems are under development such as MOBTRONIC [1] based on micro radars and infrared sensors.

Self-propelled remote controlled Lifesaving Buoy such as U SAFE® [2] and Dolphin Smart lifebuoy [3] are being developed and this technology could possibly be further developed for autonomous tracking to a person overboard and even recovery of unconscious persons.

As with any newly developed products it can be expected that the purchase costs will reduce as demand and production increases.

10. Conclusion

In the short term it is anticipated that Superyachts will potentially benefit from developments in propulsion systems associated with MASS. There is also potential for superyacht like vessels to provide a platform for testing and development of new technology related to MASS.

Medium term it is probably the development of optical sensors that will probably have the most influence in allowing for movement away from the traditional needs of the yachts bridge and free up space for even more innovative designs as well as possible redeployment of crew.

Longer term there is of course potential for fully autonomous superyachts, however this is likely to be a very small market – probably only extremely reclusive rich people.

Currently superyachts come in many forms from those modelled on traditional designs to extremely modern designs. Future designs incorporating autonomous features will probably not look that much different to some of the current designs and it is likely that they will retain service staff on board at least some of whom will be able to intervene in the autonomous operation if necessary. MASS related features will enable greater oversight of vessel operation by managers and owners.

References

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