TRAINING ENGINEERS FOR REMOTELY OPERATED SHIPS OF THE FUTURE

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ABSTRACT

A key driver within the development of today's maritime technology is the quest for autonomous or rather the remotely operated ships. It is inevitable that shipping in the 21st century and beyond will progress towards remotely operated ships, utilising the advancement in technology and engineering already making a significant impact within a range of vehicles linked to the aerospace industry and underwater operations. Once the autonomous ship Yara Birkeland is in operation later this year, the reality of such vessels and the required competencies of the marine engineers to remotely operate such vessels will be clearer [1].

As seen in the introduction of any new technology, the initial breakthrough is fraught with difficulty, but once that stage is successfully overcome, it settles into an accepted routines and trends. This stage is followed by a relentless pursuit for improvements, as economic factors will drive the industry to improve and expand the technology and its use.

The success of future remotely operated ships will depend on several factors such as:

    a. reliability of the machinery;
    b. accuracy of the instrumentation and control systems; and
    c. critical thinking and decision-making ability of the remote operators.

The first two factors depend on technology while the third depends on the training and human factors.

It should also be remembered that beyond the engineering challenges associated with remote ships, the effective application of autonomous technology would depend upon the environment in which it is deployed. It is not just the physical maritime environment that needs to be considered, but also the business, regulatory and legal environments that all present significant challenges affecting the development and application of the technology itself. [2]

This paper investigates and discusses how modern training tools, such as engine room simulators, can be used to instill critical thinking and decision making of engineers to enable them to remotely operate ships with minimum downtime and heighten safety.

The past, current and future trends in marine engineer training

Ever since machinery were employed for ship propulsion, engineers were required to operate, maintain and repair the main propulsion machinery and the assorted auxiliary systems scattered across the vessels. The training philosophy for engineers in the past dictated apprenticeships and engineer cadet schemes with a mix of shore and ship based training. The certification required appropriate duration of sea service with certain propulsion machinery and both written and oral assessments. Once

qualified, the engineers at various levels of competency required further sea service plus associated education/training in order to appear for further written and oral assessments to progress up the hierarchy.

The off the job (shore based) training for engineers for certification mainly attempted to provide theoretical concepts and practical training, usually delivered separately. It is unfortunate that this continues to happen to date, with many Maritime Education and Training (MET) institutes categorizing the theoretical subjects as 'Part A' and the practical or operational subjects as 'Part B'.

In many cases, the certificate of competency examinations also tend to separate them, with the 'Part A' subjects often treated as less important or relevant, although the overall curriculum requires both theoretical and practical subject knowledge for certification. In reality, the engineers need a range of competencies in order to successfully carry out their duties. To achieve these competencies, engineers require exposure to both theory and practice. However, as there is less emphasis on Part A subjects, students tend to gravitate towards paying more attention to the learning of operational concepts, as they are perceived as more relevant and pivotal in their final examinations and on ships

The knock-on effect of the whole practice is that engineers do not see the theory-practical connection. Although some find it within their ability to analyze and theorize some of it, a considerable void exists in engineers in grasping real situation that may hamper their critical thinking and problem solving skills, which is essential for the future marine engineers who operate the autonomous ships.

In this paper it is suggested how modern engine room simulators can be employed to upskill the operational aspects in order to impart improved critical decision making ability to engineers, enabling them to successfully carry out the required tasks associated with remotely operating the next generation of ships.

The modern full mission engine room simulators come with an array of possible malfunctions that can occur in machinery, providing exercise designers with the capability to develop integrated training and assessment of engineers for remote operations. The proper exploitation of these capabilities within the simulator environment can narrow the gap between the delivery and assessment of theory and the practical components discussed above.

An example is the gap that has been created between the electrical engineering theory and practice within the marine engineering curriculum. In many cases, this is viewed as two different areas rather than being treated as an integrated learning and assessment function. This paper shows how the smart use of the engine simulator enables the integration of the theoretical and practical components within the combined training and assessment processes. This enables the students to think critically when faced with operational and emergency issues, thus providing better and more qualified solutions. Another gap that exists is in instrumentation and control, where the theoretical concepts do not adequately support the practical training within the curriculum. The paper will investigate the issue and propose the solutions based on capabilities of modern simulators, such as creating extreme conditions that is not possible with normal operating ships.

Finally, the overall effort is to utilize engine simulators to upskill the future remote operators of autonomous ships with balanced theoretical and practical training that will enable them to bring the ship to port as on-board repairs and maintenance out at sea will be non-existent in future ships.

REFERENCES

[1] The World's first autonomous ship to debut in 2018, The Marine Professional, the Institute of Marine Engineering, Science and Technology, 10 May 2017.
[2] Global Marine Technology Trends 2030, Autonomous Systems, Lloyds Register Group Ltd, QinetiQ and University of Southampton, pp. 5, August 2017, ISBN 978-1-5272-1347-0