

# APPLICATIONS OF SHIP ENGINE ROOM SIMULATORS IN MARITIME EDUCATION AND TRAINING

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**ABSTRACT** *Shipping is the most indispensable component of the global trade. Around 90% of global trade is carried through our seas. Because of the proven cost effectiveness, shipping remains the most preferred mode of transport of bulk cargo across the world. Maritime Education and training (MET) is the most vital component as it produces quality manpower for the world shipping industry. However, maritime accidents are quite disasterous as they could result in huge economic loss. Besides the actual cost of the ship, the cargo it carries is quite expensive and any accidents to a cargo carrier lead to great economic disaster. In this aspect, many studies were done to find the actual cause for maritime accidents. It is generally found that three factors could potentially lead to maritime accidents. They include violoting rules and regulations, lack of alertness during ship operation and mis management of resources. All these three factors are thought to get worsen when human error happens. Hence, human errors are found to be the root cause for maritime accidents. Simulators are systems that simulate or mimic original conditions or processes. Simulators are used in many fields such as space missions, aeronautics, maritime navigation, engineering applications, medicine, robotics etc. Simulators are succesfully used in maritime education and training. They are used for both navigational training and marine engineeirng applications. This article provides an account of applications of engine room simulators in maritime education and training.*

**Keywords:** *Shipping, simulators, engine room, maritime education, training*

**Introduction**

It is enviaged by the former Secretary General of International Maritime Organizations (IMO) Efthymios Mitropoulos, if maritime transport through shipping is not there, half of the world would freeze and another rhalf of the world would starve. The IMO declares that over 90 per cent of global trade is carried through shipping. It is to be noted additionally that around 70 percent of the total value of global trade is also carried by the shipping through seas. Hence, it can be concluded that for the economic trade and development, shipping is the indispensable component.

**Trend in Maritime Education and Training**

Untill 1960, Maritime Education and Training was traditionally offered with the only ultimate aim of providing assisting maritime cadets and officers to gain a ceretificate of competency at their required levels. Sometimes these training are given for getting some of the required professional licences. However, there was a sea change in maritime education and training world wide after 1970s. Because of the need of the industry, the maritime education and training is evolved into two major aspects. Lewarn (2001) has classified the changes in the directions of maritime education and training after 1970s in to three major categories. They are summarized in the Table 1.

Table 1. Category of Maritime education and training (MET) activities after 1970s

Sl. No.	Strategy of MET	Features	Countries adopted during 1970s
1	Integration of COC training with Sub Degree courses	<ul style="list-style-type: none"> <li>• COC Training is coupled with UG and PG degrees</li> <li>• Provide training for those who choose to continue their studies in MET</li> <li>• Provide broader and deeper knowledge</li> <li>• Help to get COC</li> </ul>	Australia and Great Britain
2	Integration of COC training with degree courses	<ul style="list-style-type: none"> <li>• COC training is coupled with basic degree</li> <li>• Provide more than required level of knowledge to get COC alone</li> <li>• Help to get COC</li> </ul>	USA and Japan
3	Traditional	<ul style="list-style-type: none"> <li>• Offer studies to get COC alone</li> </ul>	Singapore and

	approach	<ul style="list-style-type: none"> <li>• Provide required knowledge for getting COC</li> <li>• No additional degree provided</li> </ul>	Malaysiya
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**Introduction of Simulators in MET**

However, the above strategies have taken up a massive change after the introduction of Standard of Training, Certification and Watch keeping for Seafarers (STCW) convention. The STCW conventions have permitted providers of MET to use simulators along with competency tests to produce seafarers. Simulators are a combined system of many devices that imitate and produce situations that are similar to real life processes and operations to give hands on experience.

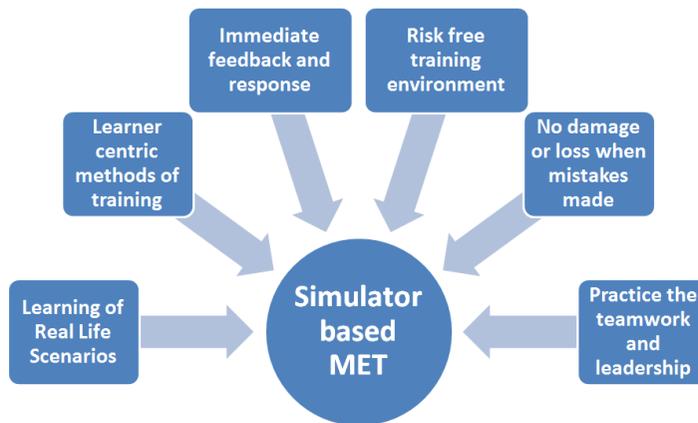
**Applications of Simulators**

Simulation is now attaining popularity as a new academic discipline where a large body of core knowledge has been developed and practices. Simulation is used to train students at all levels. Simulation is also used to train professionals for their skill enhancement and practice (Lateef, 2010). Simulation is used as one of the training modules in varied domains and applications that include Automobiles, medicine, Biomechanics, satellites, digital appliances, disaster management, Engineering, Technology, and Processes, Economics and Finance, Aeronautical, Marine, Military, Project Management, Robotics, Sales Process, Sport, Space Missions, Satellite Navigation, Weather Forecasting and many more (Gaba, 1999; Amaran et al., 2016; Bhoopathy Bhaskaran and Rajasekar, 2018).

**Benefits of simulators in MET**

Simulators are increasing used in maritime education and training. The simulator based training are having many potential applications. These applications are summarized in Figure 1

**Figure 1: Benefits of using simulators in Maritime Education and Training**



The benefits of using simulators in MET as depicted in Figure 1 is elaborated as follows

1. **Learning of real life scenarios:** The shipping simulators are capable of simulating real life scenarios that one may experience at sea. For example, navigation in a stormy weather can be simulated.
2. **Learner centric method of training:** The learners can get training on maritime applications at their own. Since it is a mechanical system, any time it can be operated and also it can be tried for number of times so that one can get fullest satisfaction of learning
3. **Immediate feedback and response:** While using simulators, the trainee cadet can try any of the real life situations that may arise at sea. For example navigating the ship in heavy vessel traffic sea lane. When the cadet makes a mistake, the ship in the simulator may collide. The mistake will be recorded and it can be analyzed and rectified which will never happen in real situations.
4. **Risk free training environment:** Since it is a simulated environment no risks may be posed upon the trainee. Whatever the mistake the cadet makes, the simulator will record and respond. However, no personal risk is there when simulators used in training.

5. **No damage or loss when mistakes are made:** Upline physical training and real situations, in simulators, no damage or loss happens.
6. **Practice for teamwork and leadership:** While using simulator for MET, oppoortunities can be made for the trainee cadets to practice for team work and leadership.

### Engine room simulators

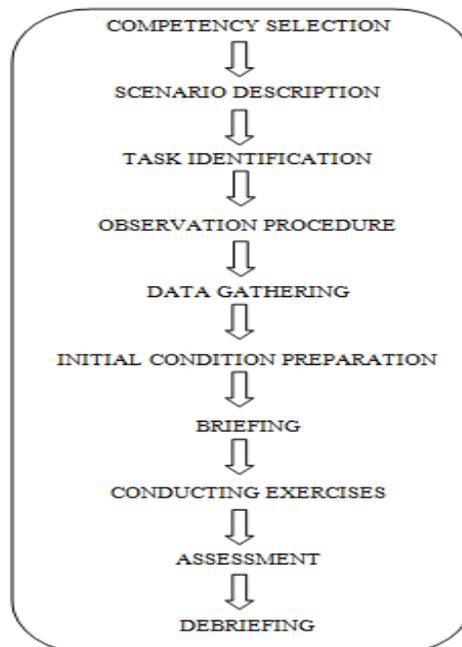
Success in shipping for the global sea trade is extremely rely on the qualified, trained and alert crew members. Modern ship technology developments have led to the enhancement in ship size, enhanced propulsion, speed, output power of main engines and full automation of entire ship engine room machinery. All these have resulted in the reduction of the size of the engine room crew. However, the technologically advanced present day ships warrents a marine engineering to be efficient in engineering practices with environmental considerations (Laskowski et al., 2015).

Research studies have been done to find the cause of maritime accidents. In most of the cases, almost 90% of the accidents have been caused due to humar error (Barnett, ML. 2005). Chybowski and Matuszak, (2009) have done a study on finding the causes of accidents in marine power plants. They found that human errors are one of the largest contributors for the accidents in marine power plants. Their study has concluded that simulator based training may have considerable effect on reducing accidents in marine power plants. Laskowski et al. (2015) has identified five major benefits while using full mission engine room simulators for the training of seafarers.They are

1. It encourages students to act and simulate their interests
2. It widens the theoretical knowledge and deepens the technical skills
3. It increases the problem solving ability of the students
4. It helps to develop professional skills
5. It imporves the students ability to perform in critical situations

Simulators are one of the most important resources for training of cadets in marine engineering programmes. The required competencies for a marine engineering cadet can be achieved by usig full mission engine room simulators with designated learning outcomes to meet the required competencies as per the STCW conventions. The learning outcome of any teaching or training process needs to be clearly defined. Moreover, an appropriate assessment system to ascertain whether the expected learning outcomes are achieved need to be developed and implemented (Chybowski and Matuszak, 2009).

Most of the Full Mission Engine Room Simulators are following the below mentioned protocols in order.



Use of simulators in the process of maritime education and training would help in reducing the the accidents caused by human factors errors (Hanzu-pazara et al., 2008). Apart from traditional theoretical and practical training, hands on experience in Engine room simulators would certainly help in improvising the skill and knowledge of marine engineering students.

**Conclusion**

Maritime accidents are largely caused due to human errors. Effective teaching methods at maritime education and training would reduce human errors. Full Mission Engine Room Simulators could be a potential choice for enhancing the skill, competency, situational alertness and emergency preparedness of the Marine Engineers.

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