USING THE ENGINE ROOM SIMULATOR FOR TEACHING AND TRAINING THE TEAM HOW TO ACT IN MAJOR ACCIDENTS AND DISASTERS

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Abstract Making practical decisions is always the best way to train engineers, both for the merchant and the naval fleet. However, the difficulties for access to real vessels makes simulator training more and more necessary for the final part of every education stage. The implementation of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers — (STCW'78) with the Manila Amendments (2010) at the Naval Academy ensured a high level of competence for the trained personnel and unification of maritime education in Europe.

Keywords: engine simulator, team working, practical problems, maritime personnel

Introduction

The introduction of new and more sophisticated main and auxiliary machinery management systems on the ship required the development and implementation of special automated training systems. These modern tools have led to time saving and increased lifetime and learning efficiency. They are subdivided into simulators, simulator systems and imitators.

Simulators are used to create habits and skills. They are exact copies of part of the ships systems. The simulator systems are complete replicas of the real-life ship equipment and help form complex skills and habits at the stage training and teamwork. The imitators reproduce various operational effects and are used in conjunction with simulators and simulator systems.

The main link I the training of maritime command staff is the "learner-system" link. The leader-learner relationship is determined by the opportunities for instruction, explanation, display, repetition, data registration, evaluation of decisions and reports. Thus the link depends on the technical solution and the possibilities, through the teamwork of the trainees

operating the system [1].

New technologies require a long-term reorganization of the operation and operation process. With the introduction of training simulation complexes, the manager has the opportunity to guide the learners, to develop the pursuit of independent actions, to control the building of certain skills and habits in emergency situations.

Under real circumstances, the ship mechanic needs to make rapid and rational decisions in a self-contained or grouped manner, in the absence of sufficient information, a limited amount of time, and the variety of possible, sometimes unpredictable, problem situations that may arise.

The task of the publication is to show chronologically the possibilities for practical use of a marine engine simulator for learning and training of the team in case of major accidents.

In the publication, the order of such a task as an example.

Practical Fighting Exercise at the Willingen Frigate in the ERS-TehSim5000 Training Complex	**Evaluation criteria**	
	Yes	**No**
Option 1. Distribution of crew in emergency groups : - Creating a fire party with the available crew on the ship	According to the alarm schedule, the crew distributes to: fire-fighting teams, engine room teams, technical teams and first aid teams. For example: "Fire Party #1 consists of deck bootman, ruler № 3, motorman №2 and chef assistant. Party Leader is the Chief Mate. "	He does not know the alarm schedule. He does not know the basic organizational rules of the ship.
Option 2. Drawing up and action plan in the event of a fire in the engine room.	Draw up a plan including at least the following fire-fighting tactics: These procedures include: 1. Alert and Notification 2. Alarms instructions 3. Saving human life 4. Emergency breathing devices for evacuation 5. Limiting the fire 6. The use of fire doors 7. Using fire and smoke detectors 8. Extinguishing a fire	He does not know the basic organizational rules of the ship.

Mutual trust between the crew, knowledge, habits and skills helps to get the work done and ensure the proper functioning of the ship and its safety [4]. In an emergency, each crew member must perform his/her duties and, in so doing, not to impede or delay the operations involved and to endanger a given life. Mutual trust related to emergency operations can be obtained by:

- Positive results from previous exercises;
- Mutual respect;
- Learning and training.

At a conceptual level, the description of the simulation processes is most effectively performed on the basis of scenario models based on real ones. Usually, there are three types of situation in the simulators: - work situations; - emergencies related to the wrong actions of the trainee on the simulator; -situation related to his/her actions in emergency situations, which are determined by the peculiarities of his/her behavior pattern.

The simulator has the ability to configure different exercises according to requirements, including simulation and integration of real physical for marks – use of a smoke generator. The simulation training system offers a variety of solutions to provide focused sessions and recurring tasks with a variety of scenarios and accidents in a short period of time. The simulator also allows the crew to interact. The aim of the exercise is to achieve confidence and skills by the crew in the engine room as well as professional orientation in the used equipment and systems. An example of this type of training of fire engineers is given in the figure1.

Figure. 1 Reacting to a situation – a fire in a machine room (using a smoke generator)

A real instruction is also given to work with the ship power plant and the response of the

crew in case of a fire in the engine room of the Willingen frigate. [7].

Any response to an emergency must be a team effort in order to ensure success. When all parties involved understand the organizational structure and their roles within that structure, confusion is held to a minimum. Confusion must be avoided if the vessel master and officers (Command) are going to have any chance of directing the appropriate resources to the defined goals (strategies) and objectives (tactics). Additionally, and most importantly, the use of an existing defined fire team organization results in a safer operation for all involved [6].

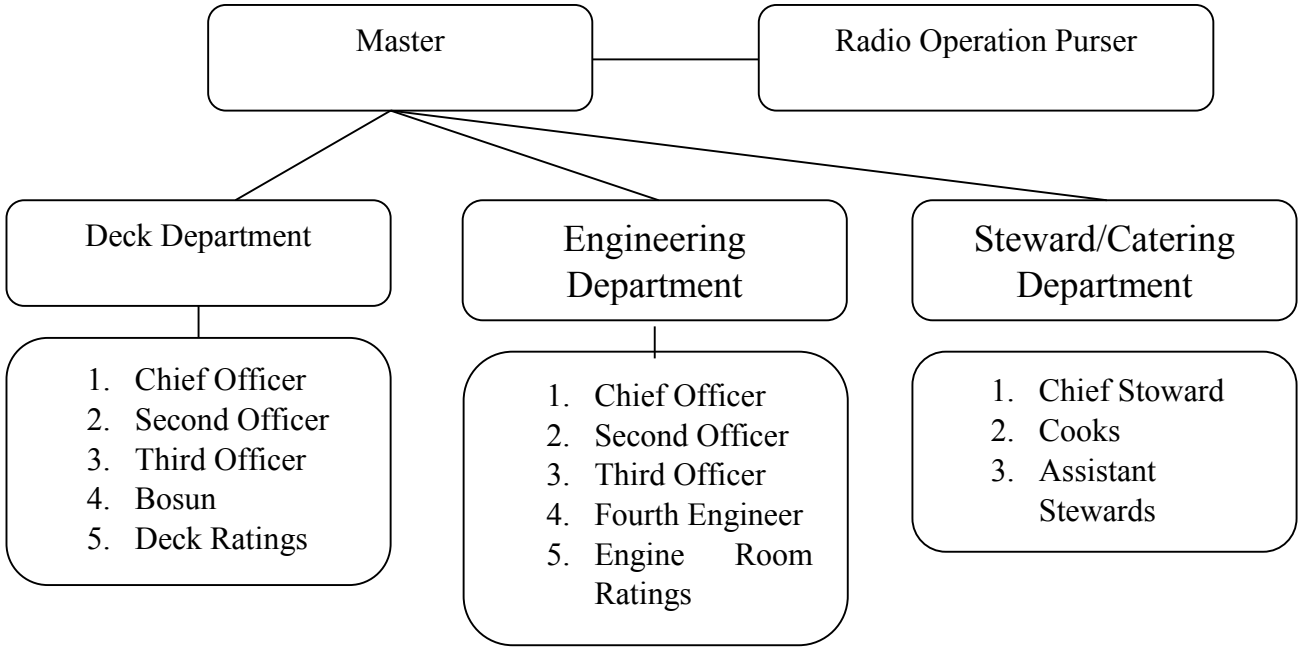

Figure. 2 Organizational structure for fire response

The organizational structure for fire response takes into account the existing organizational structure for day-to-day operation of the vessel (Figure 2). Like an industrial plant, a vessel is organized into various departments, each under control of a department head (chief mate or chief officer, chief engineer, and chief steward). The chief mate or chief officer is second to the master in the chain of command and is usually in charge of safety, lifesaving and fire fighting equipment, and the training of the crew. The station bill lists duties for major emergencies: fire, man overboard, and abandon ship (boat stations). However, more specific information is needed for fire emergen-cies than can be provided on the station bill and muster list (the list of names and ranks or ratings on board). It is up to the master to determine how the existing organizational structure can be modified for emergency response, taking into account the nature of the vessel, the size of the crew, and the abilities

of officers and crew to serve in particular roles. One emergency organizational structure example is shown in Figure 3. There must be flexibility for the organization to respond effectively to changing circumstances. The location of a fire determines which team serves as the primary attack team and which serves as the support team. For example, if the fire were in the engine room, the chief engineer would lead; if the fire were on deck or in the accommodations area, the chief officer or first mate would direct operations. In order to provide a unified response, the master (backed by the chief engineer) has overall command of the response actions, while the chief officer or second engineer (de-pending on where the fire is located) leads the suppression effort.

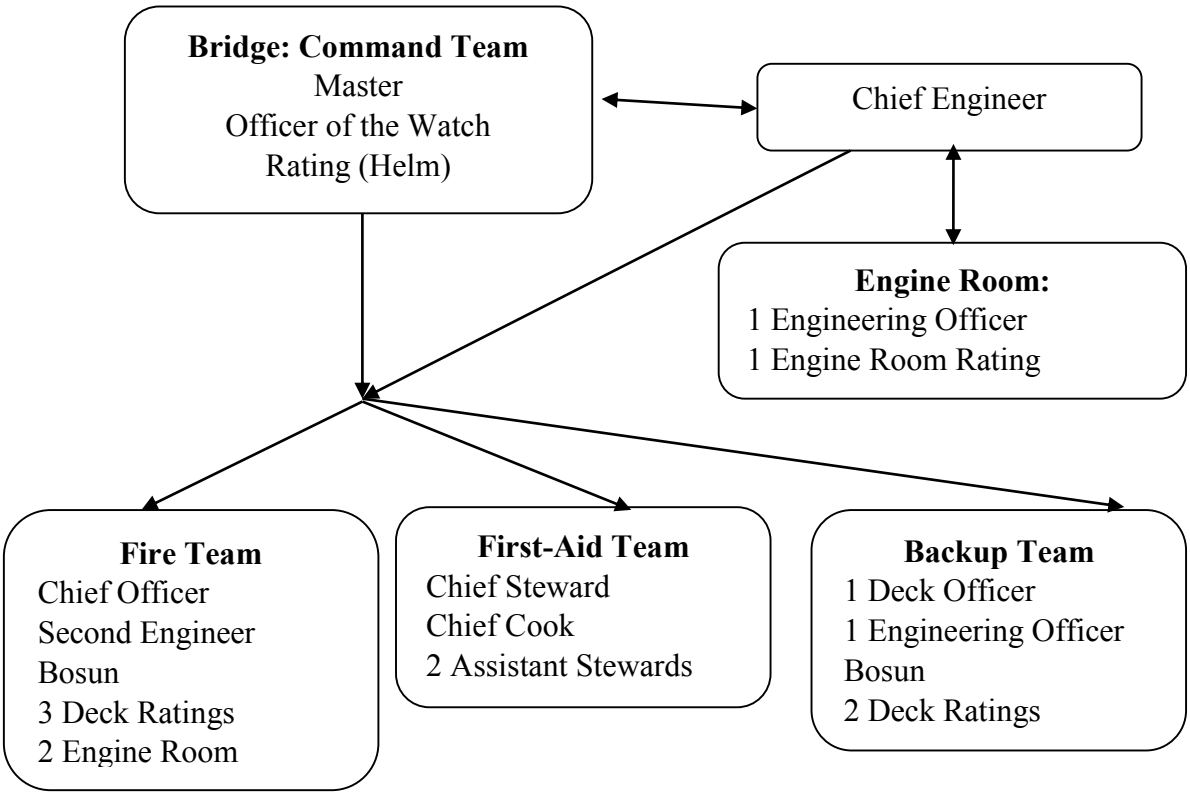

Figure. 3 Modify the basic organizational structure for a vessel emergency

Test, evaluate, and review emergency organizational structures to establish the best structure for the vessel. While emergency response cannot be totally prescriptive, preincident planning, allied with relevant training and drills, gives the best approach to quick and effective response with sufficient flexibility to react to changing circumstances. In preparing and training the emergency teams, it is possible that some members will be involved in or possible casualties of the incident itself. All team members should be crosstrained so vacant positions can be competently filled.

Conclusion

There is no standard formula to combat fires on board ships. Depending on the circumstances, a set of instructions can be made to develop and complement during the training on the simulation complex. Firefighting operations are accompanied by a number of unforeseen actions and incidents that need to be taken into account when organizing compiling scenarios and patterns of work.

References

1. BAKALOV , I. D., 2016. Morski nauchen forum. Izpolzvane na simulacionen kompleks za provejdane na obuchenie I trenirovki po borba s pojari.pp. 29-32.
2. BELCHEV S.,Uzuntonev T.,Dimitrov R.,2011.Analisys of the formulae for calculating the heat transfer to the coolant fluid in internal combustion engines.XVII technical and scientific conference Transport, ecology- sustainable development. pp 75 – 81
3. ZLATEVA , P., 2014. Toplotehnika. Izmervane na parametrite na dimni gazove na gorivni instalacii s prenosimi gazoanalizatori. pp.7-11.
4. STOQNOV, R. Z., 2014. Rykovodstvo za prakticheski zadachi. I. Bakalov. Obuchenie po syvremenni metodi za borba s povari po razshirena.
5. BRADFORD, 2008. Current Issues and Future Directions in Simulation-Based raining, S. Bell, Adam M. Kanar, Steve W. J. Kozlowski, , Human Resources Management Commons, 2008.
6. BARDARA, 2000. Marine Fire Fighting, John F. Lewis, Donald Merkle, Jon Swain, Robert B. Wright.
7. ERS_5000_ANZAC_Trainee_Manual_en.