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EFFECTS OF CONNECTION BETWEEN ENGINE ROOM SIMULATOR AND BRIDGE SIMULATOR

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ABSTRACT
Naval academy in Varna "Nikola Vaptsarov" uses simulators toinstruct students in its Marine Program. Our engine room simulatorsare important for the future marine engineers, while bridge simulators are used by students who study in the Navigation program. Usually students in the two programs practice with these simulators separately. In this paper we want to show the effects on instruction when an engine room simulator Wartsila works together with a bridge simulator. The integration between the simulatorsgives studentsvaluableexperience in team work on ship board.
KEYWORDS: ***engine room, bridge, simulator***

1. INTRODUCTION

Ship simulators provide authentic environmentfor practicing ship handling in variousoperational condition and for testing knowledge and skills of students to take correct actions in routine and emergency situations [1]. The aim of the study is to present different challenging scenarios for collaborative work ofdeck and engine crew in networked together bridge and engine room simulators [2,3,12,13]. The expected effects of using the integrated training system are in the improvement of:

- Situation and risk assessment;
- Situational awareness;
- Communication;
- Shipboard training;
- Leadership and team management;
- Workload management.

Advantages of having such technology tool we see in:

- Expanding the academic opportunities of Nikola Vaptsarov Naval Academy –Varna to provide modern and effective teaching/learning process in highly realistic virtual environment;
- Conducting advanced courses for professional marine engineers and deck officers;
- Enhancing the prestige of the academy.

The presented training meets the requirements of STCW Table A-II/2, A-III/2 and A-III/6 (Master, Chief Officer, Chief Engineer, Second Engineer, and Electro-technical Officer).

2. SIMULATOR EXERCISES FOR VARIOUS DECK AND ENGINE OPERATIONAL ROLES

The rehearsal exercises we offer in this paper are designed on the basis of typical and real life situations in different ports and open sea. All practical trainings in the simulators are preceded by theory sessions in which participants analyse and discuss case studies from texts and pictures.

2.1. Exercises focused on simulator familiarisation

Bridge	ERS
• Open sea, TSS(Rule 10) • Simple Collreg situations • Different roles on bridge (OOW, Captain, Helmsman) • Variable speed	• Preparation of systems and mechanisms for operation • Basic regulations for maintenance of ship high voltage systems

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The aim of the exercises is trainees to use engine controls, steering modes, etc., rehearsing simple Colreg situations in open sea. This should be in relatively open environments (i.e. English Channel) to test Rules 10 (in the TSS), then the rest of the steering and sailing rules. All of the bridge team should rotate around roles on the bridge (helmsman, OOW) and should increase and decrease speed to get Engineers used to engine simulator. They should use watch handover checklists (attached) when swapping roles and put into practice 'assertive communication' when declaring intentions to alter course/change speeds [7,8,9].

2.2. Exercises simulating anchoring off Shanghai

Bridge	ERS
• Arriving in Shanghai • Create passage plan from initial position to assigned anchorage • Heavy traffic and fishing boats avoidance • No pilot onboard • Use checklists (Zodiac QMS) • Good visibility, smoothly drop, fog • Only OOW and helmsman on bridge	• Deviations from the normal operational process of the diesel engines • Practicing performing maneuver commands from the bridge

Prior to exercise, Master should use Bridge 14 checklist for pre arrival briefing. Vessel should be on passage to arrive in Shanghai with an assigned anchorage and passage plan (already programmed into the ECDIS) to this anchorage. There should be other charted anchorages around the one the passage plan leads to. Bridge should initially just have OOW and helmsman up, then increase manning level with Captain for arrival (no pilot). Handover checklists as per attachment. Numerous crossing traffic and fleets of fishing boats directly on vessel's track to be dealt with. Engine simulator to be prepared for SBE as per checklists (Bridge 2 and Engine 2, attached), same for pre-arrival checklist on the bridge. Vessel to proceed to anchorage, upon closer inspection the anchorage will be filled with a fishing fleet. To see if crew initiate VHF call with port control (they will not inform the vessel of the fishing boats in the anchorage area) to go to other clear anchorage. Exercise to stop once vessel is stopped in new anchorage location. During all of this, visibility should regularly drop and improve, due to fog (should us Bridge 4 checklists for restricted visibility) [6,10,11].

Assesment points

- Traffic avoidance
- Initiative upon getting closer to the anchorage (calling port control, looking for alternatives)
- Use of QMS checklists to prepare vessel for arrival, from both engineers and the bridge.
- Use of Engines for collision avoidance (if they don't do this much, this should be reminded to them as mentioned in rule 8 as an option (even if alteration is the best) so they have this in mind for future exercises where alteration is not possible).

2.3.*Anchorage in Xiamen*

Bridge	ERS
• At Anchorage in Xiamen, bridge team is preparing for departure • Cloudy, Heavy rain • Heavy stormy weather • ETD will approved by the instructor • Use checklists • Weather forecast • VHF communication	• Preparation of the ship main engine for maneuvering and sailing in heavy stormy weather • Use checklists, procedures of emergency situation

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Bridge Team and Engineers are preparing for departure as per QMS checklists.

Vessel's heading to the North West with wind from that direction , 10-15 knots. While completing the checklist, clouds will darken and rain will start. Wind will then move to 50 knots from the East. Vessel will start to drag anchor. No input should be given to the simulator from port control etc. until they call on VHF or vessel starts to drag with no one noticing. This should be after anchor watch alarm goes off. Vessel should be surrounded by other (smaller) vessels to the West in the anchorage, so she drags towards/on to them. Depending on how quickly they respond using company checklists, they should either drag onto the other vessel and collide (starting collision checklist) or be able to regain control. At that point, exercise should end [4,5].

Assesment points

- Use of Company checklists
- Spotting signs of changing weather
- Communications from Bridge to Engine Room in an emergency
- Response to emergency situation and initiative (calling for tugs, informing port control, informing other vessels).

2.4. In the English Channel - Bridge and Engine Team on watch through English channel, in Dover TSS.

Bridge	ERS
• Dover TSS • Restricted visibility, increase to good • Overtaking and crossing traffic (Dover/Calais) • Fault in equipment • Response to emergency • Communication with VTS, Another ships, Bridge-Engine room	• Preparation of the ship engine • Deviations from the normal operational process of the diesel engines • Use checklists, procedures of emergency situation - steering gear failure

Initially in restricted visibility, but this should lift as the exercise proceeds. Traffic overtaking in TSS and ferries crossing at Dover/Calais. After getting past these, rudder will stick at port 15. Crew will then need to initiate steering gear failure checklist, reducing speed and dealing with the situation. Traffic should be tight, but

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they shouldn't hit anything during initial response (i.e. they should be clear to alter course to port at the point steering gear fails).

Assesment points

- Use of Company checklists
- Response to emergency (communications between bridge and ECR)
- Management of Engineers to deal with this situation
- Use of external parties (i.e. calling traffic to clear the area, asking for tugs, anchoring areas etc.)

2.5. Approaches to Singapore

Bridge	ERS
• Approaches to Singapore • Heavy traffic, incl. not under command • Reducing speed to avoid a collision • Use company checklists	• Servicing the systems, the machinery and the main engine under way and keeping ER watch • Steering gear failure /Procedures of emergency stop - if necessary/

Captain, OOW and Helmsman are already on the bridge on approach to Singapore from the West. Should be raining heavily throughout the exercise, with reduced but not restricted visibility. Will need to cross TSS prior to arrival to Singapore anchorage for bunkers. **Team should feel like this will be another anchoring exercise and not that any emergency will happen.** Again, crossing traffic in TSS throughout and team are to be using engines where possible for collision avoidance due to high starting speed (max possible) and various vessels they are overtaking. Inform them that port control have requested speed of 10 knots by wheel over to alter into Singapore, so they will need to reduce speed throughout the exercise. About a mile before the alteration to port to cross the TSS (with oncoming traffic but a clear gap to cross if they alter speed accordingly, a vessel on their starboard side at around 8 knots (smaller) should start to be overtaken. As she gets to beam on, she should call the vessel and inform her that she has steering gear failure (stuck to port) and is altering towards her. Bridge and Engine team should then respond to the impending collision and then the aftermath of the collision. Exercise should end once satisfied with their response to the emergency (they shouldn't get to the point of crossing the TSS).

Assesment points

- Traffic avoidance
- Communication with engine room on reducing speed
- Use of Company checklists

3. Conclusions

Simulators are effective tools in the maritime education as they provide opportunities for deck and engine teams to collaborate in dynamics in real on-board situations. There are significant number of publications in the scientific literature regarding the applicability and effectiveness of simulators in the instruction of students and professionals. However, there aren't enough investigations on the use of interconnected engine room simulators and bridge simulators. This report is a first step towards researching this new technology and implementing it in marine training. In Bulgaria such synchronization of simulators is carried out for the first time and a special training program has been piloted. It is to be expanded and introduced in the curricula, not only to be used in refresh courses. It is necessary on the basis of questionnaires with participants in the trainings to make a quantitative and qualitative analysis of the set and achieved effects of the use of this technology.

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