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Navigation and Engine room simulations joint research

I Bakalov[1], D Komitov[2]

[1]Departament of Engineering, Nikola Vaptsarov Naval Academy
[2]Departament of Navigation, Nikola Vaptsarov Naval Academy
73, Vasil Drumevstreet, Varna 9002, BULGARIA
bakalov@nvna.eu[1], d.komitov@nvna.eu[2]

Abstract. NVNA Varna, Bulgaria uses simulators toinstruct scholars in its Marine Program. Our machine room simulatorsare important for the unborn marine masterminds, while ground simulators are used by scholars who study in the Navigation program. Generally scholars in the two programs practice with these simulators independently. In this paper we want to show the goods on instruction when an machine room simulator Wartsila works together with a ground simulator. The integration between the simulators gives students valuable experience in platoon work on boat board.
Keywords: bridge room, engine room, bridge, simulator, case study, simulator familiarisation, additional exercise.

1. Introduction

Navigation and Engine room simulations joint research is extremely useful. Personnel training: Simulators provide the opportunity for crew to train in realistic conditions without the risk of damaging ships or putting lives at risk. They can familiarize themselves with various scenarios and situations that may arise while sailing and learn to react effectively and quickly.

Enhancement of skills and experience, simulators provide an opportunity for hands-on training of various skills and exercises. The crew can practice maneuvering, working with specialized tools and equipment, troubleshooting and other important procedures that require practice and experience.

Assessing response in real situations. Simulators allow the crew to face various challenges and emergency situations, assessing their response and ability to make sound decisions. This helps build trust and confidence in the crew's ability to handle complex situations at sea.

Cost and resource savings. The use of simulators can reduce training costs as no real ships and fuel are required for the practical exercises. This also allows more time for training and repetition of exercises without having to use real resources.

Simulators help improve the safety of sailing by training the crew to deal with emergency situations and prevent accidents. They can be used to simulate different weather conditions, obstacles on the road, maneuvering in confined spaces and other real situations [1,2,5].

The operation of the two simulators - engine room and bridge simulators - is extremely important, as they represent two key parts of the ship's operation and must coordinate and cooperate effectively. Communication and coordination between the ship's engine room and bridge is essential to the safety and efficiency of navigation. The operation of the two simulators can be used to train communication procedures and to create scenarios in which the crew must deal with complex situations and coordinate in real time. Crew members in the engine room and on the bridge must understand the role and

functions of the other part of the ship. Simulators can be used to train and train the crew to understand what is happening in the other part of the ship, what are the important procedures and how they can help each other. The operation of the two simulators together allows the creation of realistic scenarios in which the crew must deal with complex situations and take appropriate actions. This can include accident simulation, maneuvering in confined spaces, emergency maneuvers and other critical scenarios where the crew must work together to achieve the ship's objectives. The operation of the two simulators can help to optimize the work processes of the ship. They can be used to train the crew to work more effectively and efficiently, perform their tasks quickly and accurately, and handle complex situations better.

2. Simulator exercises

The anchoring procedure is of particular importance on board ship and simulator exercises are of particular importance. Anchoring is a method of maintaining a ship's position in the water. When the ship reaches the desired position, the anchor is dropped to prevent unwanted movement of the ship under the influence of current, wind or other factors. Ships use anchors to protect themselves from exposure to hazards by avoiding collision with other ships, rocks, shores and other obstacles. Correct anchoring procedure and proper anchor anchoring ensure that the vessel remains stable and secure in place.

Anchoring allows the ship to stay in place without using up fuel or other resources. This is especially useful when the ship has to wait a certain time before proceeding with its voyage, or when a temporary interruption of the voyage is necessary. Anchoring can help regulate a ship's sailing, especially in conditions of strong currents or winds. The anchor allows the ship to be held firmly in place and wait for an opportune moment before moving forward.

In many cases, legislation requires ships to drop anchor in certain areas as a safety precaution. This is particularly important in areas with limited traffic such as ports, canals or near the coast [6,7,8].

Anchoring in Shallow Waters - exercise

(Depth 30m or less)

Except in an emergency, the anchor should always be walked back in gear until the anchor is out of the hawse pipe and clear of the bulbous bow (this is particularly important if the vessel is rolling). Once it is walked back to about 5 to 10 metres from the seabed, the anchor may be let go on the brake.

Ships with a summer deadweight (SDWT) of > 60,000T, it is highly recommended to walk back the anchor all the way, even in shallow waters.

Caution: Care must be taken when letting go so that the anchor will not be damaged by falling a considerable distance onto a hard bottom and also that the cable will not take charge and run, out of control.

Anchoring in Deep Waters (Depths more than 30 m)

In deep waters with depths of more than 30 m, the anchor shall be walked back for the full length of cable required.

The speed of the vessel during the approach before lowering the anchor under power (walking back) must be less than 0.3 knots over ground. When walking back the anchor, it is desirable to have a slight stern way to ensure that the chain is not piled up over the anchor. This will reduce the possibility of the chain knotting up when the vessel swings about the anchor.

Caution: Astern speed to be limited to 0.3knots and engine to be used to ensure this speed is not exceeded. Excess astern speed when walking back the anchor can lead to excessive stresses on the Windlass resulting in failure of the Windlass motor.

Caution: At depths greater than 30 meters, letting go the anchor can cause a large momentum which can result in uncontrolled payout, damage to the windlass, chainlocker, hawse pipe and bitter end. Possibility of injury to personnel in the vicinity.

The OCIMF Booklet "Anchoring Systems and Procedures for Large Tankers" gives some good advice for anchoring large Tankers but the principals are the same for other large vessels and where large forces are likely to be experienced on the anchor system.

Note: In an emergency, anchors can be let go from the hawse pipe to slow down or stop the ship.

PRE – ARRIVAL CHECKLIST - Navigation simulation

Section 1 – Information & Routines

No	Item
1	Draft/UKC & Trim in Compliance with Port Restrictions & Company Requirements
2	Passage Plan Updated & Approved. Tides updated. ECDIS/User Maps/Charts Updated and Route to Berth Available
3	ECDIS alarm and safety settings changed as per MSO and Passage Plan.
4	All Berthing information available.
5	All Relevant Bridge members briefed on Arrival Plan.
6	Anchors Cleared Away
7	Manual Steering Engaged in Sufficient Time for Helmsman to become accustomed.
8	Crew and ER have been advised of the time for standby/mooring
9	Latest Navigational/Weather information available from all sources (Navtex/EGC/VHF)
10	Reports sent to VTS/Port Authorities as required by local regulations

Section 2 – Equipment (Tested & Ready to Use)

No	Item	Tick	No	
1	Clocks Synchronised		2	Mooring Winches Tested and Ready
3	Course & ME recorders		4	Mooring Lines/Wires laid out for use
5	Flags/Nav Lights/Shapes/Sound signaling equip		6	Deck Power/Lighting available (as applicable)
7	Ships VHF/UHF's, Internal comms (Incl ECR/ Mooring stations).		8	Gyro/magnetic compass & repeaters incl repeater in steering gear room
9	All Nav Equipment (including ROT/RPM/Rudder indicators, Radars, ECDIS, Echosounder, GPS)		10	2 Steering Pumps Running (if applicable) & Steering Gear Tested a/p CL#8
11	VHF's tested and listening watch maintained on the correct channels.		12	After Confirming "All Clear" has the Main Engine been tested Ahead & Astern
13	Notice has been given for the bowthruster (if applicable)			

Section 3 – Pilotage Info

No	Item
1	Pilot Station advised of ETA
2	Pilot Card completed and ready for use
3	Pilot boarding side, speed and arrangements agreed with Pilot Station
4	Pilot Embarkation arrangements checked and found ready for use

Section 4 – Checklist Completion

No	Item
1	Master informed that the Checklist has been completed (GO / NO GO)

Section 5 – Once Alongside

No	Item
1	AIS Settings changed from 'Underway' to 'Moored'. For tankers the power output of AIS and VHF shall

	be switched to 1W or switched off a/p OCIMF guidelines.
2	UKC at berth compared to UKC calculated. Any discrepancies advised to Master • Pre-Arrival Calculated minimum UKC at Berth from Passage Plan = • Actual minimum UKC at Berth (Present UKC – Present Tide + LW) =
3	BWNAS to be switched off by Master

PRE-ARRIVAL CHECK LIST - Engine simulations

1. Obtain time of Stand By from Bridge
2. Inform Chief Engineer and other required ER staff
3. Drain water from MDO and Fuel Oil service and settling tanks
4. Drain water from air reservoirs and control air systems
5. Synchronize clocks with Bridge
6. ER / Bridge communications tested
7. ER / Bridge Telegraph tested
8. Shut down evaporators prior to arrival in coastal waters (deep water away from estuaries)
9. Change sea water intake to high suction
10. Carry out function test of steering gear
11. Start additional generators
12. Check generators on load and parallel
13. Shaft generator taken off load
14. Auxiliary systems checked
15. Air, Power and Water available on deck (as applicable)
16. Obtain permission from Bridge to test Engine ahead/astern at a safe location.
17. All required ER staff reported for duty
18. Enter in log when all gear tested
19. Inform Chief Engineer
20. Report to Bridge that ER ready for Stand By
21. When Stand By received, Log all movements in movement book
22. Soot Blowing of economizer and Auxiliary Boiler/s if applicable to be carried out before arrival to the port, as late as practically possible

Figure 1. Simulator synchronization exercise

Composition of the Navigational Watch

Masters must assess the risks and implement a bridge organisation appropriate for the prevailing circumstances and conditions, making the most effective use of available navigation aids and manpower. Among factors he should consider are:

- complexity of the navigation;
- traffic density;
- speed;
- weather (e.g. restricted visibility, ice, heavy weather);
- proximity of land and navigational hazards;
- the number of personnel available;
- expected duration of the conditions and the effective management of fatigue.

Table 1. Bridge Team Composition

Watch Level	Bridge Team Composition			
	Master	OOW	Lookout	Helmsman
Level 1		X	X	
Level 2		X	X	X
Level 3	X	X	X	
Level 4	X	X	X	X

Watch Level 1 or Level 2 composition may be used for open water navigation, having in mind the prevailing weather/visibility/traffic conditions.

Watch Level 2 may be used for Restricted visibility in open seas. Master may increase the watch level after reviewing traffic density and proximity to navigation dangers.

Watch Level 3 composition shall be used for:

- Restricted visibility in coastal waters
- Heavy traffic. Master to review and increase to watch level 4 if helmsman is used for steering duties.
- Ice Navigation, Distress assistance
- At any time that the Master considers necessary for the safety and security of the vessel.

Watch Level 4 composition shall be used for:

- SBE to the berth, Berth to FAOP
- Any canal or river passages.
- Pilot boarding or disembarkation
- Pilot boarding or disembarkation
- OPL calls(from SBE to FAOP)
- Anchoring or weighing anchor
- Restricted visibility when in confined / congested / pilotage waters
- At any time that the Master considers necessary for the safety and security of the vessel.
- Special navigation transits – Congested or narrow waters as determined by a full appraisal of prevailing circumstances and conditions
- River passages, Canal transits, Straits such as, Dardenelles/ Bosporus
- Dover Straits
- Torres Straits
- Magellan Straits – Cape Horn
- Messina Straits
- Malacca Straits – One Fathom Bank
- Singapore Straits – From Brothers Island(Pulau Iyu Kecil) until clearing Eastern Bank.
- Straits of Gibraltar
- Taiwan Straits
- Congested areas of Japan's Inland Sea and
- Any other similarly hazardous areas as identified by the Master

Note:

- The lookout must be able to give full attention to the keeping of a proper lookout and no other duties shall be undertaken or assigned which could interfere with that task.
- The duties of the lookout and helmsman are separate. When the vessel is on hand-steering, the helmsman cannot be considered as a lookout and dedicated lookout must be called to meet watch levels described above.

3. Conclusions

By teaming up, the crew members can coordinate their actions more effectively. They can communicate and synchronize their efforts, ensuring smooth and efficient anchoring operations. An engine and navigation simulator provides a realistic virtual environment for practicing anchoring procedures. By working together on the simulator, the team can enhance their situational awareness and develop a better understanding of the complexities involved in anchoring a ship.

Skill development crew members to develop and refine their skills in a safe and controlled environment. They can practice various scenarios, learn from mistakes, and gain confidence in their abilities, ultimately improving their anchoring proficiency [3,4].

Anchoring a ship involves inherent risks, such as potential equipment failures or adverse weather conditions. By using a simulator, the team can simulate and train for these scenarios, identifying potential risks, and developing appropriate contingency plans to mitigate them.

Conducting training on a simulator can be more cost-effective than real-world training scenarios. It eliminates the need for using actual equipment and reduces the risk of accidents or damage during training exercises. Teaming up on a simulator fosters teamwork and collaboration among crew members. It allows them to understand each other's roles and responsibilities, build trust, and develop effective communication and decision-making skills.

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