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The importance of structured briefings & debriefings for objective evaluation of ARPA simulator training

Master of Science Thesis in Nordic Master in Maritime Management

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Abstract

Simulation is a great learning tool and learning by doing is often motivating and progressive for the students. To evaluate knowledge or performance is however not that easy, especially compared with the traditional classroom teaching. This thesis points out the importance of structured briefings and debriefing to enhance the fair evaluation of the students during their simulator training in ARPA courses. The objectives of the simulator training must be clear for the students as well as the simulator instructor should make the evaluation based on the objectives given in the briefing. The instructors have many challenges in running the simulator exercise and to monitor the progress of several bridges (own ships) with up to three students on every bridge. The instructor should evaluate the actions of every single student, although they are working in groups while performing their objectives.

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Glossary of acronyms and abbreviations.

ABOA MARE	University of Applied Sciences Novia and Axxell
ARPA	Automatic radar plotting aid
COLREG	International regulations for preventing collisions at sea. Also referred to as “rules of the road”.
CPA	Closest Point of Approach
ECDIS	Electronic chart display system.
GPS	Global Positioning System
IMO model course 1.07	Radar Navigation at Operational Level – Radar navigation, radar plotting and use of ARPA
IMO	International Maritime Organization
MOSTIC	Mobile Simulator Training In Critical Situations.
MRM	Maritime Resource Management
OOW	Officer On Watch.
OWN VESSEL	The vessel controlled by the simulator bridge
RADAR	Radio Detection and Ranging
SINDEL	Italian made simulator platform
SOLAS	Safety Of Lives At Sea.
SOP	Standard operating procedures.
STCW-95	Standards for Training, Certification and Watchkeeping.
TARGET VESSEL	Vessels in simulator exercise normally pre-programmed route but may also be controlled by the simulator instructor.
TCPA	Time of Closest Point of Approach

1.0 Introduction

1.1 Background

What is a simulator and how would we define simulation? We may find many various answers to these questions, Your Dictionary on the internet defines simulator as;”*a training device that duplicates artificially the conditions likely to be encountered in some operation..*” and the word simulation is defined as;” *the use of a computer to calculate, by means of extrapolation, the effect of given physical process or the duplicating or reproducing of certain characteristics or conditions, as of a system or physical process, by the use of a model or representation, for study, training etc.*”. (Your Dictionary, 2011) Simulation is however not a new tool, throughout times apprenticeship has been used for passing knowledge to the students. Simulators have become a very useful tool to use in the education and when used correctly the simulator could be an effective teaching method to transfer theoretical knowledge into practical application. (Carson-Jackson, 2010, p. 1-2)

Do we really need simulators in the maritime education and if we think we do, maybe we should we ask why? The benefits of simulator training are many from economical reasons and not least the issue of safety, most of us would agree that it’s safer to train emergency situations in a simulator rather than on a real ship. In a simulator we are able to do repeated training and it’s in a controlled and safe environment. Another advantage would also be the possibility to evaluate the trainee and/or to tutor the trainee with adequate feedback . (Nählinder, 2010)

Most maritime schools and nautical training centres around the world provide training in ship simulators, both for the basic nautical programmes and for active sea personnel participating on different courses. The simulators are however not standardized and may vary from simple table computer based training to training in full mission simulators. The rationale for a full mission simulator is to give as real environment as possible, in a high-fidelity manner, giving the sensation that is similar to an actual bridge (Carson-Jackson, 2010). The full mission simulators are equipped with visual channels, providing a perspective of the scenery around the simulated ship. The steering and sailing directions of the “International Regulations for Preventing Collision at Sea” (COLREG) are determined by the visibility. When using full mission simulators with visual channels, the simulator trainees must also determine the visibility and decide which regulations are applicable.

The use of simulators varies; there are cultural differences and also the question of resources. The full mission simulators are very expensive and need qualified personnel. It's clear that all schools can't afford the latest and best technology regarding simulators, so the amount of hours in simulator training varies depending on where the student gets his/her training. Large shipping companies are however investing in more sophisticated equipment and different joint-venture projects with schools around the world, which is also in the benefit of students. Companies have seen the value of training up their junior officers in simulators, with their own specific training programs, company or even ship specific standard operating procedures (SOP) as a complementary education to the basic training their junior officers received in school. The students on maritime (deck officer) programs have various sessions in the simulator, from basic navigation courses to more advanced courses, for example ship handling and ship maneuvering. The code "Standards of Training, Certification & Watch keeping" (STCW-95) is regulating the minimum requirements of the education / training of deck officers. Some of the courses described in the code are to be held as simulator training, one of these courses is a course called "Automatic Radar Plotting Aids" (ARPA). The IMO (International Maritime Organization) has published an IMO model course 1.07 describing the objectives and purpose of ARPA. The purpose is stated in the introduction of the model course; *"the purpose of the IMO model course is to assist maritime training institutes and their teaching staff in organizing and introducing new training courses"* (IMO, 1999)

Studies have been done on cognitive learning and also about the simulator as learning environment (human factors etc), but I haven't seen any studies conducted on the actual assessment and evaluation of simulator trainees. The focus has been on the simulator environment (human versus machine) or the resource management (how humans work in operative environment). There are also several interesting studies available on workload, both from the aviation and the maritime domain. Staffan Nählinder has a study on the mental workload measuring eye movements and heart rate (Nählinder, 2010). From the maritime domain there are similar studies made on workload by measuring heart rate (Gould, Roed, Saus, Koefoed, Bridger, & Moen, 2009) and also studies where the nasal temperature is measured as one parameter in determining the workload (Okazaki, Murai, Mitomo, & Hikida, 2007)

Training centers' provide training and build up custom-made training exercises for their customers. The participants in the simulation training programs are assessed and evaluated for

their performance in the exercises. (Sjöström, 2010) One typical way of assessment is structured instructor assessment which means that the instructor keeps score using some form of a checklist or rating scale. The final assessment of the participants' performance is usually the subjective opinion of the instructor, lacking the systematic procedures for evaluating the effectiveness of training programs. (Farmer, van Rooij, Riemersma, Jorna, & Moraal, 1999)

1.2 Aim and Purpose

The aim with this study is to analyze the evaluation process in simulator training. Is it possible for the simulator instructor to be less subjective and more objective in his/her evaluation of trainees? If it's possible then the natural follow up question would be – how do we accomplish that? It's a fact that the instructors have different backgrounds; working on different ship types in various positions, this variation could have some effect on the training methods used, maybe different interpretations of the course objectives. There are always room for interpretation concerning for example navigation, because often there are several ways to deal with a problem leading to the fact that there could be several right answers, so how should we build up the simulator training sessions so we would have parameters to measure and evaluate the simulator exercises?

The purpose with this study is to find the important factors to consider when evaluating the students attending the ARPA simulator training sessions. The trainees should be evaluated fairly independently of the instructor, the course layout and objectives should always be the same. There are many ways of measuring activities in the simulator environment, but the aim would be to somehow standardize the briefing and debriefing session to improve the evaluation process. If this is possible without any greater use of additional resources, which are not available in today's school world, then the students would be evaluated more objectively and fair.

1.2.1 Research question

Is it possible for the simulator instructor to be less subjective and more objective in his/her evaluation of trainees?

1.3 Limitations

The study is limited to the ARPA course due to the great variety of courses both in means of the course objectives as well as the different level of complexity. The ARPA course (described below) is however given at all nautical schools due to the requirements of STCW-95, all deck officers are obliged to undertake this course under their training period.

The number of participants of the study is also limited due to the fact that I wanted in this research project to study the evaluation process using the SINDEL simulator platform. The simulator platform gives some tools for assessment and evaluation of the trainee performance, but the possibilities using the simulator system as a tool varies between different manufacturers of simulator platforms. Aboa Mare is the only nautical training academy using the SINDEL simulator platform and therefore the study was limited to the simulator operators at Aboa Mare.

The instructor's room is described in this study as well as the bridge layout, however only one bridge (the bridge "E") is described in detail. During the interview also one exercise in the ARPA course was taken as an example and will therefore also be explained and showed on pictures later on in this study, the exercise is named as "arpachart 1".

The simulator exercises are built up to meet the objectives of the course and all instructors use the same exercises and they are saved on the instructors control station. The author of this study does not include all exercises in specific detail, there ARPA course at Aboa Mare consist of six exercises but only one will be included in this study.

2.0 Theory

2.1 The Automatic Radar Plotting Aids (ARPA) course

To analyze the evaluation process of simulator training we need to look into all the factors affecting a simulation. In this case I will look into the training requirements of the ARPA course, the training of instructors and how simulator instructors built up simulation scenarios. We need also to take a look into the theory behind briefing and debriefing of training scenarios.

The IMO model course 1.07 assists maritime training institute and their staff regarding the outline of the course and exemplifies the course syllabus. The objectives of the course are that the trainee could use the controls, use appropriate modes of display and operational alarms and be aware of the dangers of over-reliance on the automatic acquisition and tracking targets. (IMO, 1987, p. 6)

The syllabus of the ARPA course (see appendix 1) at Aboa Mare is according to the model course and consists of following major topics (IMO, 1987, p. 11);

- Review of plotting techniques

- Principal ARPA systems
- IMO performance standards
- Acquisition, tracking and the limitations
- Processing details
- Setting up and maintaining displays
- Representation of target information
- Errors of interpretation and errors of displayed data
- Risks of over-reliance on ARPA
- Application of COLREG

(STCW- code Part A, Section A-I/12)

The prerequisites to the ARPA course is manual plotting (appendix 1) and the course “navigational aids; Radar (see appendix 4). In manual plotting the students learn the basics of plotting and especially knowledge in manual plotting. The students have been using the radar for manual plotting with bearing and distance measurements but not using the radars ARPA functions. One of the first courses where the student familiarize themselves with the simulator environment is the course is navigational aids – radar course. The student should be able to use the main functions and how to set up the radar display.

The ARPA course is held as a five day course at Aboa Mare. The course starts with one day theory and refreshment of manual plotting. The principal of ARPA systems, performance standards and the theory concerning ARPA is discussed during the lectures. After the theory part the students are doing 5-7 simulator cases which are approximately 2 hours in length. During the simulator runs the students are using the ARPA radars and using the different functions stated in the course objectives. Every simulator exercise begins with a briefing of the exercise, for example the starting point, weather (visibility), means of communications and other instructions that could be in focus. After the exercise during the debriefing the students get the opportunity to explain their actions, for example which regulations of the COLREG have been applied. During the debriefing the instructor will give feedback on their performance and reflections of the use of ARPA. During simulator exercises the students are supposed to learn the (ARPA) functions by using them hands on. The course is completed with a written examination.

General performance standards for simulators used in assessment of competence

2 Each Party shall ensure that any simulator used for the assessment of competence required under the Convention or for any demonstration of continued proficiency so required, shall:

- .1 be capable of satisfying the specified assessment objectives;*
- .2 be capable of simulating the operational capabilities of the shipboard equipment concerned to a level of physical realism appropriate to the assessment objectives, and include the capabilities, limitations and possible errors of such equipment;*
- .3 have sufficient behavioural realism to allow a candidate to exhibit the skills appropriate to the assessment objectives;*
- .4 provide an interface through which a candidate can interact with the equipment and simulated environment;*
- .5 provide a controlled operating environment, capable of producing a variety of conditions, which may include emergency, hazardous or unusual situations relevant to assessment objectives; and*
- .6 permit an assessor to control, monitor and record exercises for the effective assessment of the performance of candidates.*

Figure 1 Extract from the STCW-Code (A-I/12) (International Maritime Organisation, 2001)

The extract above from the STCW code is stating the standards for the simulator training and the main requisites for the evaluation of simulator exercises. The simulator environment must be suitable for the training and also for the evaluation purposes. ARPA course is about the functions on the ARPA radar and when the simulators have real ARPA radars the operational capabilities are fulfilled. The environment is controlled and always the same exercise layout, the exercises are saved in a folder and the basic setting for the training is always the same, irrespective of student group or simulator instructor. The students' interaction with the simulated environment will of course change the result depending on the actions taken on the bridge. Running one exercise with two bridges, there will be two different trails; the actions of the bridge will lead to different solutions and problems. For example if one bridge decides to keep constant speed and alter course for another vessel, maybe the other bridge will instead decrease the speed and keep the course, from this point on the situation will be completely different on the two bridges even if the starting situation was exactly the same.

The simulator platform (SINDEL) also gives the possibilities to monitor the students on the bridge and the instructor may also with radar feed follow the actions taken on the radar. The performance of the students is evaluated by monitoring their behavior and actions.

Radar simulation

4 Radar simulation equipment shall be capable of simulating the operational capabilities of navigational radar equipment which meets all applicable performance standards adopted by the Organization and incorporate facilities to:

- .1 operate in the stabilized relative motion mode and sea and ground stabilized true motion modes;
- .2 model weather, tidal streams, current, shadow sectors, spurious echoes and other propagation effects, and generate coastlines, navigational buoys and search and rescue transponders; and
- .3 create a real-time operating environment incorporating at least two own ship stations with ability to change own ship's course and speed, and include parameters for at least 20 target ships and appropriate communication facilities.

Automatic Radar Plotting Aid (ARPA) simulation

5 ARPA simulation equipment shall be capable of simulating the operational capabilities of ARPAs which meet all applicable performance standards adopted by the Organization, and shall incorporate the facilities for:

- .1 manual and automatic target acquisition;
- .2 past track information;
- .3 use of exclusion areas;
- .4 vector/graphic time-scale and data display; and
- .5 trial maneuvers.

Figure 2 Extract from the STCW-Code (A-I/12) (International Maritime Organisation, 2001)

2.2 The ARPA course in context of the International Regulations for Preventing Collisions at Sea.

One objective of the ARPA course is the application of international regulations for preventing collisions at sea; however it is not intended to be the primary objective of the course, but we should not neglect the fact that the use of radar is one tool to help the navigator in applying the correct rule of the colreg. One of the main reasons of the ARPA is to help the navigator in determining other vessels movements so he/she may act according to appropriate rules of the colreg. Another important angle could be that the simulator training should be consistent and therefore the application of colregs always has an important role in the success or failure of a simulator session, regardless of the main objectives of the course. One of prerequisites to attend the ARPA course is that the students have deep understanding of the colreg. There is definitively a link between the colreg and use of ARPA radar, to mention some of the references to the regulations.

The part B containing the steering and sailing rules states in Rule 6 – Safe speed;

- (b) Additionally, by vessels with operational radar:
- (i) the characteristics, efficiency and limitations of the radar equipment;
 - (ii) any constraints imposed by the radar range scale in use;
 - (iii) the effect on radar detection of the sea state, weather and other sources of interference;
 - (iv) the possibility that small vessels, ice and other floating objects may not be detected by radar at an adequate range;
 - (v) the number, location and movement of vessels detected by radar;
 - (vi) the more exact assessment of the visibility that may be possible when radar is used to determine the range of vessels or other objects in the vicinity.

Figure 3 COLREG - Part B - Steering and sailing rules. Section I - Conduct of vessel in any condition of visibility.

Rule 6 - Safe speed.

The understanding of latter part of rule 6 could be that the officer on watch (OOW) must have the above mentioned knowledge to comply with the colreg. Rule 6 doesn't mention the ARPA functions, but for example the use of appropriate scale is also trained during the ARPA course. The rule 6 (paragraph b) sets some standards to the level of knowledge on radar and the limitations of the radar equipment. Which is of essence also at the ARPA, the students should know the limitations and possible errors in the radar presentation. The assessment of the visibility (vi) is also one of the objectives in the simulator training, to chose what rules are applicable on the prevailing situation. Students must keep in mind that the rules of the COLREG are divided into three sections;

Section 1 – Conduct of vessels in any condition of visibility.

Section 2 – Conduct of vessels in sight of one another.

Section 3 – Conduct of vessels in restricted visibility

Going further in the colreg we note in Rule 7 paragraph b and c;

- (b) Proper use shall be made of radar equipment if fitted and operational, including long-range scanning to obtain early warning of risk of collision and radar plotting or equivalent systematic observation of detected objects.
- (c) Assumptions shall not be made on the basis of scanty information, especially scanty radar information.

Figure 4 COLREG - Part B - Steering and sailing rules. Section I - Conduct of vessel in any condition of visibility.

Rule 7 - Risk of Collision

The OOW should use radar plotting if fitted and he/she shall not make assumptions made on scanty information, furthermore word as “systematic observation” is used to emphasise the importance of continuous monitoring and the ability to use the (ARPA) radar. To obtain the

early warning of risk of collision would mean that the OOW should be able plot the target and determine the risk of collision, which could be linked as primary objective of the ARPA course. We should also remember that if the OOW has failed in the basic setting of the radar it could be possible that he/she will not have an echo in his/her radar.

The last example will be from Rule 19 and that is from section 3 – conduct of vessels in restricted visibility. When the visibility is poor then the use of radar will be also more important, however we should not forget that rule 19 is only in force when one vessel can't see another one visually, with or without using binoculars. This is very important that students understand the differences with section 1, 2 and 3. This is actually defined in Rule 3 – General Definitions;

- (k) Vessels shall be deemed to be in sight of one another only when one can be observed visually from the other.
- (l) The term “restricted visibility” means any condition in which visibility is restricted by fog, mist, falling snow, heavy rainstorms, sandstorms or any other similar causes.

Figure 5 COLREG - Part A - General. Rule 3 - General Definitions

The definitions of restricted visibility are found in rule 3 of the COLREG. The use of the radar is of course very important when sailing in conditions with restricted visibility and the COLREG provides guidance in rule 19 which is the only rule in Section 3 – Conduct of vessels in restricted visibility.

Conduct of vessels in restricted visibility

- (a) This Rule applies to vessels not in sight of one another when navigating in or near an area of restricted visibility.
- (b) Every vessel shall proceed at a safe speed adapted to the prevailing circumstances and conditions of restricted visibility. A power-driven vessel shall have her engines ready for immediate manoeuvre.
- (c) Every vessel shall have due regard to the prevailing circumstances and conditions of restricted visibility when complying with the Rules of Section I of this Part.
- (d) A vessel which detects by radar alone the presence of another vessel shall determine if a close-quarters situation is developing and/or risk of collision exists. If so, she shall take avoiding action in ample time, provided that when such action consists of an alteration of course, so far as possible the following shall be avoided:
 - (i) an alteration of course to port for a vessel forward of the beam, other than for a vessel being overtaken;
 - (ii) an alteration of course towards a vessel abeam or abaft the beam.
- (e) Except where it has been determined that a risk of collision does not exist, every vessel which hears apparently forward of her beam the fog signal of another vessel, or which cannot avoid a close-quarters situation with another vessel forward of her beam, shall reduce her speed to the minimum at which she can be kept on her course. She shall if necessary take all her way off and in any event navigate with extreme caution until danger of collision is over.

Figure 6 COLREG - Section III - Conduct of vessels in restricted visibility. Rule 19 - Conduct of vessels in restricted visibility.

When is this rule 19 in force? Well, you could think that everyone could answer the questions but it is not that self evident. Rules 11 to 18 in other words section II are in force when vessels are in sight of one another. The answer to the question above starts with the reasoning about when are the vessels in sight of one another, the short answer would be when the officer of the watch may see the other vessel by his/her own eyes, binoculars are allowed to use. If the officer on the bridge doesn't have visual contact to another vessel then the rule 19 would be applicable. Many students show lack of knowledge regarding the interpretation of COLREG and rule 19 seems to be especially difficult (authors remark). It seems that students have the impression that vessels approaching from port side should always give way and the latter to continue with same speed and course. But as we read in rule 19, in restricted visibility both vessels are obliged to take actions to avoid collision.

2.3 Simulator pedagogies

There are many different pedagogical methods used in the simulator environment, one of them could be problem based learning. This form of pedagogical instrument demands of the student the ability for teamwork and autonomous learning. The learning is based on solving one or several problems instead of lectures and handbooks. The teacher's role changes and becomes more a facilitator, this method is often used to decrease the distance between working life and the schools environment. (Poikela & Poikela, 1997)

Problem solving is one of the critical foundations of the working life on a vessels bridge, the students have to recognize the problems and then solve them. For example route planning, monitoring the traffic situation, plans for prevention of collisions and problem solving of technical malfunctions of the bridge equipment.

One variation of the problem solved learning is the experiential learning cycle; the cycle contains experience, reflection, conception and experiment. Kolbs model is the most known model of the learning process created by knowledge into experience. (Helakorpi & Olkinuora, 1997)

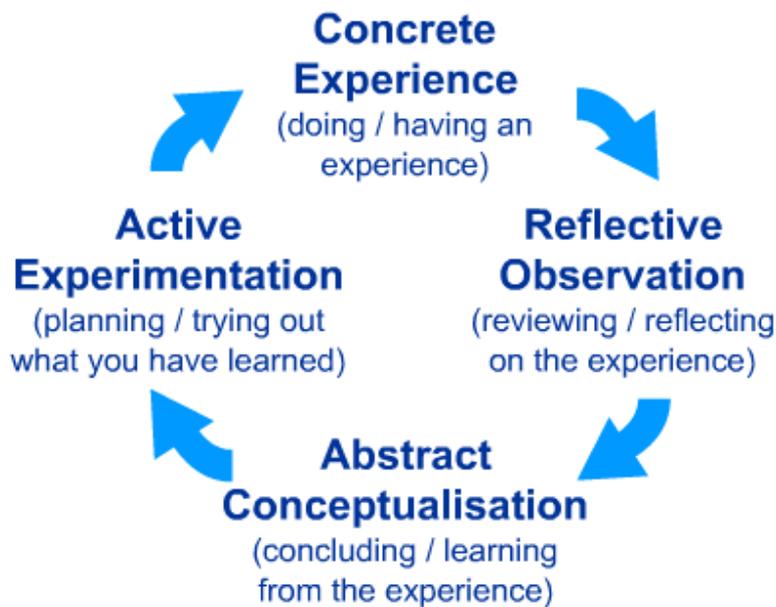


Figure 7 Kolb's model. (Learning 3.0, 2011)

Simulator exercises are carried out with following concept:

1. The groups are divided into bridge teams, normally 2-4 persons in each group.
2. Briefing session where the exercise objectives and scenario is presented.
3. The bridge teams plan the actualisation based on the scenario presented in the briefing.
4. The exercise is performed and team members accumulate experience.
5. When the exercise is over, there will be a debriefing where students may reflect over the happenings in the exercise. Different problems and solutions are weighed and compared.

During the debriefing the students are reflecting over the actions taken during the exercise and if needed the simulator instructor gives feedback and/or comments on the observations made during the exercise. After the completion of one exercise the students are regrouped and assigned to a bridge. The simulator bridges are not identically similar and therefore the students should be at least one exercise on every bridge in use, normally 3-4 bridges are used during ARPA training.

2.3.1 Intervention styles

The simulator environment as learning environment could be divided into inner and outer learning environment. The outer environment is the physical environment such as the

simulator (bridge), the exercise, the equipment and persons involved. The instructor as well as the students also affects the outer learning environment. (Kotila, 2003)

The inner learning environment is influenced of previous experiences, knowledge, bias and fears. These are in the students minds; however the instructor is able to affect the student through facilitation. The change or reconsideration taking place is however done by the student. It will be a challenge for the instructor and if he/she fails it could prevent the learning environment.

Prior to the simulator exercise the students should be familiarized with the bridge equipment and the simulator environments possibilities and restrictions. There should be a reciprocal action between students and instructor; this is often connected to the expectations of the course in general. During the course the students will spend four days in the simulator and to use a few hours to a proper familiarization, will most likely save time and cause less frustration among the students during the days of simulator training.

The teachers leading the simulators session have and tendency to stay in the teachers role and as experts in their field. As simulator instructor they should however take the facilitators role and by guidance lead the students. As Mr. Kotila considers in his book “Ammatti-korkeakoulupedagogiikka” there are four different intervention styles to be used in debriefing;

- *Approval style.* This style would be used when there are a lot of feelings involved. The approval style is about listening and giving time to the student during debriefing to explain by own words about the happenings in the exercise. The instructors' role is to mentor the student and help the student to recognize the reasons for the emotions involved. Sometimes it could be required of the instructor to help the student to deal with negative occurrences. The aim is to get the student to approve changes and through this learn new things and maybe even new roles.
- *Catalytic style.* This style is suitable to use when the student has problems to understand the events in the exercise and the instructor tries to give an overview of the exercise events. This method could be done like an interview, using open questions starting with words like what, where and when. The aim with the questions is to clarify the information as a basis for thought-awakening, decision-making and taking action.
- *Confronting style.* This style could be used if the student has conflicts between actions, thoughts and statements. The student is hold back, to reflect over his/her actions. The

instructors' mission is to act as a mirror for the student to review his/her own actions. Criticism or accusations must not be included in the confronting style.

- *Determinative style.* This style is used when there is a need for fast decisions. The instructor acts as an expert and will by his input solve the students' problem at hand. This could be in situations where students are instructed. This intervention style is effective but the results may be very temporary. One condition for this method is that the instructor must analyze the exercise, give a description of the problem and expert advice for the best solutions and actions to be taken. The risk could be that the student will be dependent of the instructor, the student will not embrace the good advice given or the instructor (expert) does not know his/her limits in giving the expertise.

All these different intervention styles are effective and could be used flexible in various situations. It's important that the instructor's may use the different styles according to the prevailing situations. (Kotila, 2003, p. 166-167)

2.3.2 Briefings

Simulation could be a great learning tool, the simulator and the objectives may be very clear for the instructor however the students represent that variable in the exercise. The first step in a successful simulator training session is that the students must be fully aware of the objectives of the exercise. The instructor should ensure that all questions are answered related to the simulation exercise. (Carson-Jackson, 2010, ss. 51-53)

The briefing helps the student to remain highly motivated and prepares them for the challenge. The instructor may provide the outlines of the exercise scenario and suggestions for pre planning. The students are required to make a route plan and this could be checked by the instructor on beforehand. Exercise parameters like weather, tide, navigational dangers and traffic situation should be provided during the briefing of the exercise. (Fisher & Muirhead, 2001)

Some of the items that should be included in the briefing according to Jillian Carson-Jackson (Carson-Jackson, 2010, s. 54);

- ü Reference to related theory presentations
- ü Opportunity to identify possible application of past experience / related theory
- ü Clarification of objectives – tasks to be completed
- ü The time limits, if required
- ü Problems that the students may encounter

Darrel Fisher and Peter Muirhead have listed key elements for the briefings (Fisher & Muirhead, 2001, s. 113)

- Ü Participation and motivation
- Ü Preparation
 - Level of experience
 - Exercise environment
 - Pre-planning activity
- Ü Exercise environment
 - Roles, responsibilities
 - Purpose and objectives
 - Use of equipment
 - Intervention
- Ü Demonstrations
- Ü Repetition

There are several items and factors to take into consideration while conducting a briefing session. It would be most preferable that there would be a manuscript or some kind of documentation of the briefing. All instructors are individuals and may have different backgrounds and experiences, so to remember all relevant items in the briefing it could be necessary to have good documentation of the briefing. Other additional material like video could be assembled and implemented into the briefing. (Salakari, 2010, ss. 41-42)

2.3.3 The conduction and monitoring of an exercise

The instructor should be active to keep the realism and the simulator atmosphere at a high level throughout the exercise. This will also motivate the students and their experience will be more positive. The intervention should however not be overstrained, but in balance so the exercise is not becoming unrealistic. The instructor could act as engine room and or deck hand and maintain a communication with the bridge with relevant input in the scenario. For example some questions from the engine room or requests of keeping certain pitch or engine rpm (revolutions per minute) could give some reality to the exercise, however to create and emergency situation in an ARPA course is not relevant to the course objectives.

The instructor may vary his/her role as that of a moderator, a facilitator or mentor depending on the situation. Depending on the simulator environment and the type of exercise being conducted. (Fisher & Muirhead, 2001, ss. 116-117)

The key elements of conducting and monitoring an exercise according to Fisher and Muirhead;

- Ü A balanced interaction between trainee and the exercise
- Ü The use of stimuli and cue
- Ü The role of purposeful intervention in creating a “real atmosphere”
- Ü Avoidance of excessive intervention
- Ü Avoidance of excessive stress
- Ü Avoidance of gaming atmospheres
- Ü Instructors role as mentor, moderator, facilitator
- Ü Monitoring purpose and intent of data collection
- Ü Nature of the observational process
- Ü Planned use of the recorded data and information in the debrief

The monitoring process is demanding for the instructor, especially if there are several bridges included in the exercise and possible radio traffic that should be controlled and answered by the instructor. There could be situations when the students do not perform according to expectations, but the instructor must be careful not to intervene too early or too late. (Carson-Jackson, 2010, s. 55) With several bridges to monitor (own vessel) as well as to make notes for evaluation or the debriefing session it could sometimes very hectic and high workload situation for the instructor. It could be very helpful with video capture, sound recordings and other data recordings (from the simulator platform) for analyzing later on when the exercise is completed.

2.3.4 Debriefing

One of the most important aspects of any simulation is the debriefing. The instructor has identified the weaknesses and the strengths of the students. These items may be brought up in general manner to highlight different aspects of interest to all students and ensure comprehension by the entire group. (Carson-Jackson, 2010, s. 57)

The students should be encouraged to discuss ways of how mistakes and errors could be detected and corrected. This would illustrate the lessons to be learned. It's however important that the discussion is focused on the events and not on the persons involved. The discussion environment must be kept blame free and only the events are discussed without any blaming or accusing of anyone's mistakes. (Fisher & Muirhead, 2001, ss. 117-118)

The debriefing is essential for the learning process, this is the time when the students should reflect and gain new experience. Why did it go wrong – or why did it go well. If the

debriefing fails there would be a great risk that the student does not know what went well and what went wrong, without that knowledge what has he/she learned? It could also be possible that the student even draws wrong conclusions and what she/he learned is wrong. (Salakari, 2010, s. 42) The instructor must be attentive when students are analyzing their performance, if the students draw wrongful conclusions it could be necessary for the instructor to intervene and correct wrongful statements.

Key elements of the debriefing according to Fisher & Muirhead (Fisher & Muirhead, 2001, s. 119);

- Ü Purpose and objectives of the debrief
- Ü Exercise strengths and weakness
- Ü Lessons to be learned from errors and mistakes
- Ü Use of peer review technique
- Ü Use of supporting exercise data, recording and observations
- Ü Real life examples – improving performance
- Ü Avoid blaming individuals or giving ‘lectures’ on how to do it
- Ü Use tactful approach
- Ü Good communications are very important

According to Hannu Salakari one could use following questions to analyze the exercise more thoroughly (Salakari, 2010, s. 43);

1. Personal reactions
 - Ü What did you like most in the exercise?
2. Discussion of the events in the exercise
 - Ü What were the most important events in the exercise?
3. Discussion of the problems
 - Ü What problems did you encounter in the decision making or as a result of previous decisions made?
4. Learning objectives
 - Ü What did you learn during the exercise?
5. Links to reality
 - Ü Did you do anything that you would not do in real life? Why?

3.0 The study

The interviews of the simulator operators showed that there is an actual need to develop the ARPA course and they all reflected over the need and desire that the simulator training could be more standardized and specific written instructions would most likely decrease the level of subjectivity. The search of how we should evaluate trainees during simulator exercises resulted in three main questions;

1. What could be evaluated in the simulator?
2. What resources does the instructor have in the evaluation process?
3. What are the relevant factors to evaluate in an ARPA course (simulator part) and how could this be done in a more objective way?

The first question was an open question and the interviewees started to reflect over simulation in general. I wanted all instructors to think about what kind of skills, expertise and procedures that can be learned or experienced in the simulator environment. This open question was not specific for the ARPA course, the interviewees were free to refer or think about other simulator courses.

The simulator instructors were asked to give concrete examples of what could be measured and evaluated during simulator training and the following items were identified during the interviews;

3.1 The Simulator

The simulator training in Aboa Mare is held in facilities with six full mission simulators. There are four simulators with Furuno equipment, one simulator with Sperry equipment and one with Atlas equipment. The simulators have been built in cooperation with shipping companies that use the simulator facilities for training their own deck officers. The layouts of the bridges in the simulator are as close as practicable to the layout on ships.

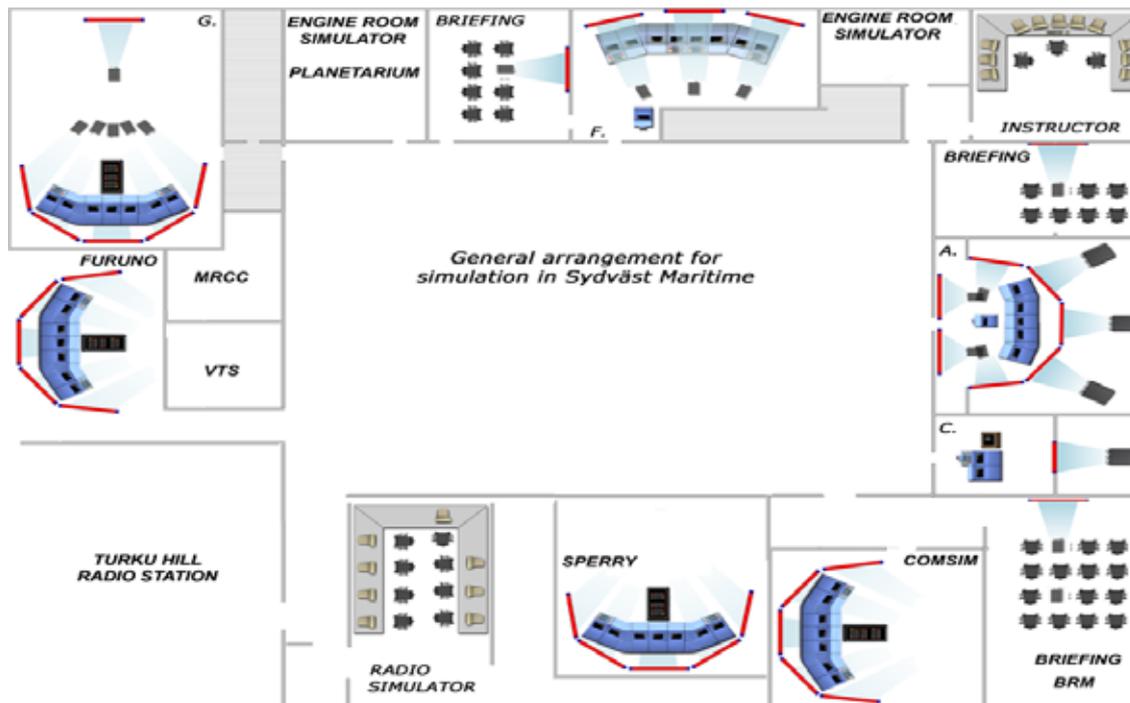


Figure 8 The simulator department at Aboa Mare

The simulator platform is SINDEL which is an Italian company providing simulators both for civil and military use (ECA-SINDEL). The bridges are equipped with real instruments for example radars and ECDIS (Electronic Chart Display and Information System). The MOSTIC-module (Mobile Simulator Training In Critical Situations) provides means to disturb the normal operation of bridge equipment. The MOSTIC module is an interface between the simulator platform and the navigation equipment on the bridges, which gives possibilities to disturb and interrupt the signals from simulator platform to the equipment. This function is very useful during STICS (Simulated Training In Crisis Situations) courses. There are several possibilities and to mention some of the functions, the instructor is able to disturb (deviate) the gyro compass, gps, echo sounder or the speed log sensors. Other malfunctions could be steering gear breakdown, engine failure or autopilot failure, these functions are not used in basic courses but in more advanced and when the objectives are to train for crises situation they are a big asset for the instructor to make the exercise interesting and realistic. These functions are preliminary used during training with experienced deck officers.

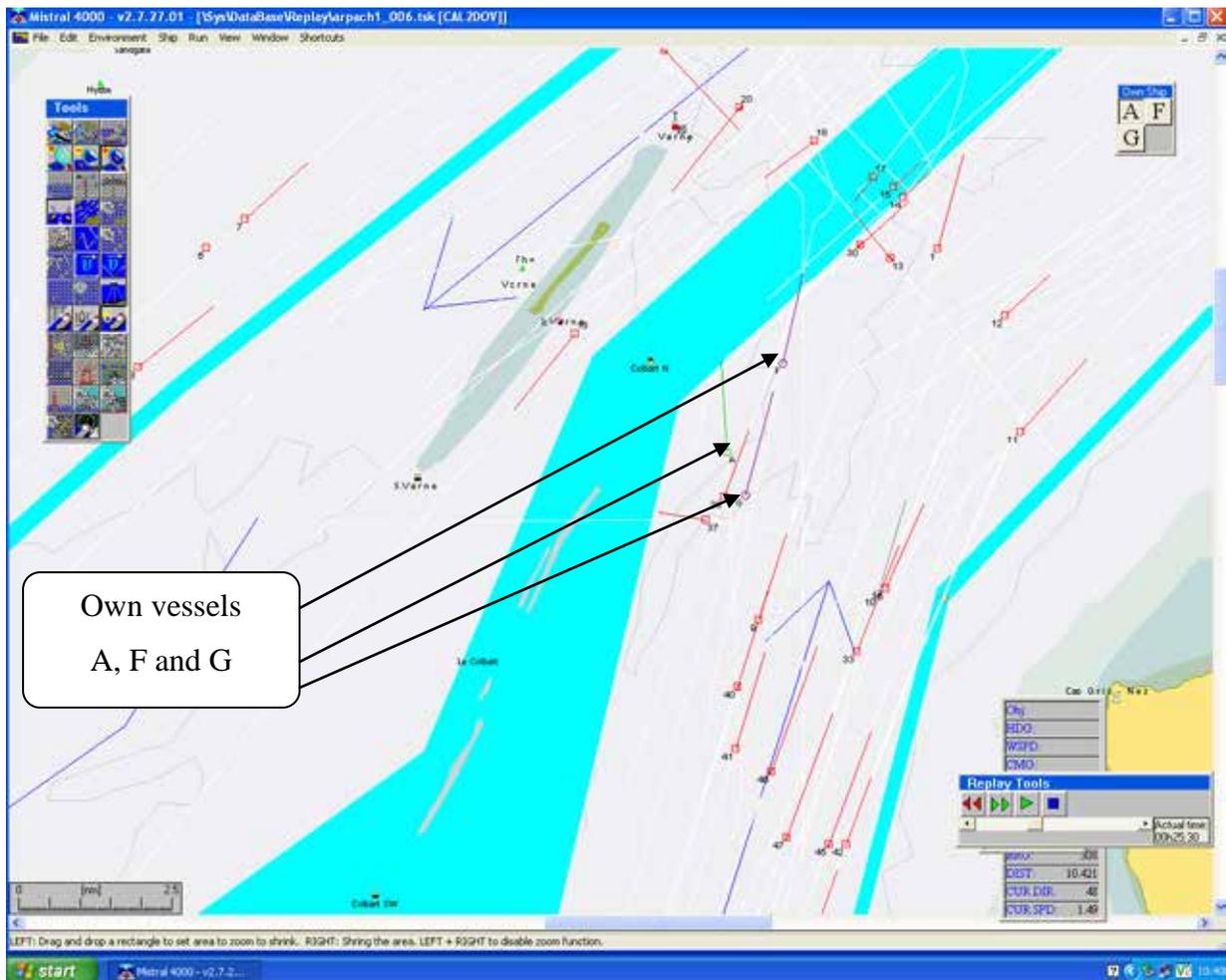


Figure 9 MISTRAL 4000 (SINDEL) control screen with an ARPA exercise

Own vessels are controlled by the students on the bridge of respective vessel. Target vessels are on pre-programmed routes and manually controlled by the simulator instructor when needed, for example of a bridge (own vessel) makes sudden or unforeseen movements and the target vessel should take actions in accordance with the COLREGs (International Collision Prevention Regulations at Sea). The simulator instructor may also change the visibility, wind, current and other external factors that could affect the operations of the vessels. At the operator station the instructor has an overview of the situation as well as the visual view presented on the bridge.

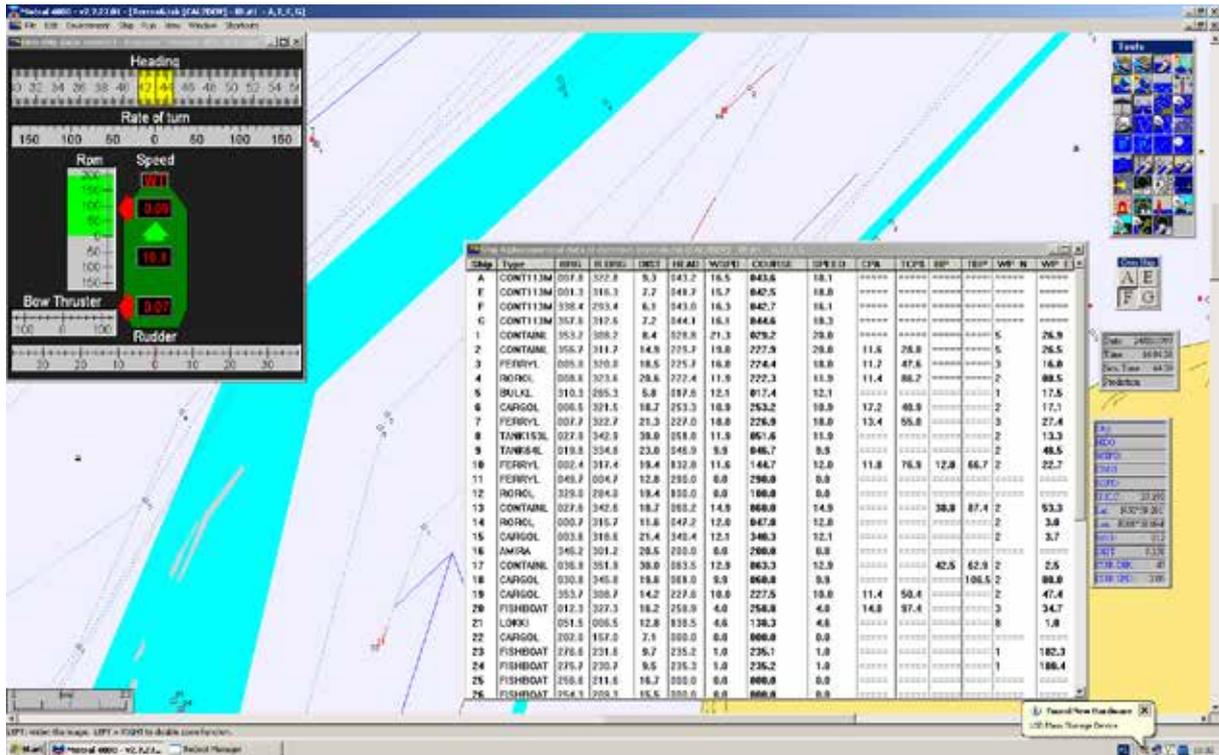


Figure 10 Own ship (bridge) in detail and the target ships in the exercise with detail information. Screen dump from SINDEL.

In figure 3 the simulator instructor has opened the parameters page on top of the normal display. The parameter page shows CPA (Closest Point of Approach), TCPA (Time to Closest Point of Approach), bearing, range, vessel speed and course. The instructor may use this page to monitor that owns vessels are keeping the intended minimum CPA. Sometimes the instructor must also interfere with the target vessels path (pre-programmed track), if the target vessel for example should give way to an own vessel accordingly to the colreg. If more specific information of the own vessels are needed the simulator instructor may open other “boxes” on top of the normal view. For example in figure 3 in the left upper corner the instructor have opened the own vessels manoeuvre controls and he/she may follow in detail how the rudders, bow thrusters and engines are used for manoeuvring. If one own vessel is under strict observation the rudder indicator will notify the instructor exactly when the students on the bridge are taking actions by using engine controls or using the rudder.



Figure 11 Operator control room. Picture taken by Tony Karlsson

Figure 4 shows one of the working stations in the simulator operators control room. From this station the instructor has the same visual channels as the own ship, in other words the instructor has the same “window view” as from the bridge. Above the main simulation computer is the same ECDIS screen as on the bridge, if the students use the ECDIS the instructor will see the exact same view as the students. Next to the ECDIS screen the instructor has the radar screen from the bridge. By looking at the radar screen the instructor may determine if the students are using appropriate range scale and how many targets are plotted. There are monitors showing camera feed from the bridge, at least one camera on every bridge. If needed additional cameras may be installed on the bridge. By using headphones it’s possible to listen to one bridge at the time. By listening on the bridge the instructor may get a more accurate view of the status on the particular bridge, for example indication of stress level or workload. By using all these resources the instructor will have a good general view of the events in the exercise.



Figure 12 Full mission bridge "E". This bridge is equipped with Furuno radars and ECDIS. Photo taken by Per-Henrik Sjöström.

Figure 5 shows the so called “E” bridge which is equipped with Furuno systems. The bridge is designed as a pilot and co-pilot layout with two conning positions. There officer in charge of the navigation may choose what side he/she uses, both positions are equal. The engine control systems are located in the middle console and can be reached from both sides of the console. There are two Furuno radars and on the sides two ECDIS (not visible on the picture). Furthermore there are two autopilots located in the middle console and at the end of the console the helmsman’s position. Between the two radars there are two conning displays where the navigators may choose between several modes depending on what kind of information is needed.

This bridge is built in cooperation with Wallenius Marine and therefore the layout resembles the actual bridge layout of their vessels which are equipped with Furuno equipment.

3.2 Methods and participants

The study was conducted by semi structured interviews. The interviews were held at Aboa Mare during February, 2011. The simulator instructors to be interviewed were contacted in advance to reserve time for the interview. The interviews were about 60 to 90 minutes long and were held at the interviewee's offices. The interviews were recorded and notes were as well taken during the interviews.

When the study was completed the author constructed a new exercise sheet, which emerged from the study results. All participants were asked to give comments to the "new" exercise sheet (presented in study results). The comments were given via email correspondence.

The participants were informed prior to the study about the purpose of the study and they were assured confidentiality. They were also informed of their right to withdraw their participation from the study at any time and without any reason.

The participants' working experience as deck officer:

less than 3 years	3 to 6 years	6 to 9 years	9 to 12 years	more than 12 years
		1 person	3 persons	2 persons

The participants working experience as simulator instructor:

less than 3 years	3 to 6 years	6 to 9 years	9 to 12 years	more than 12 years
	2 persons		3 persons	1 person

The participants are working as simulator instructors as well as senior lectures at Aboa Mare. As senior lectures they have all completed pedagogic training on university level.

4.0 Results

4.1 What could be evaluated in the simulator?

4.1.1 Technical skills

How does the trainee utilize the equipment? Technical skills could be seen in many ways both if all equipment available is used during the exercise and if the equipment is used in the correct manner. For example the use of radar could be checked by following questions;

- § Stabilization: Is the radar used in head up, course up or in north up mode?
- § Range: What range is used and is the radar used primarily for navigation (positioning) or for traffic control?
- § Modes: Relative motion or True motion?
- § Sensors: Is the speed taken from gps or speed log and is the trainee using speed over ground or speed through water?
- § Vector: Is relative or true vectors used on the plotted targets?
- § Are ARPA functions in use on the radar?

The student should be able to state the limitations of the radar and ARPA functions and the risks of over reliance of the data. This could be checked during the debriefing, if the student has to explain for example the different technical functions of the radar. It's not possible to determine from the use of equipment if the student has the understanding of all the functions of ARPA radar.

The type of simulator course sets the prerequisite of the technical skills and the simulator training is planned accordingly. But it's not only knowledge of the bridge instruments that is required, technical skills could also be the understanding of engines. The student must have at least basic knowledge of engines and engine controls. How to use the combination of engine power and rudder controls to maneuver the vessel.

4.1.2 Procedures

Students should be familiar with the procedures of bridge work, including standard operating procedures and start up procedures for the bridge. After the briefing session where the students have been given the objectives of the exercise, students should by own initiative plan for the intended voyage and make all the start up arrangements of the bridge.

On the bridge the students have the necessary paper charts and nautical literature that are needed for the route planning. Start up procedures of the navigational equipment to be used should also be known by the student and he/she will find for example the “departure checklist” on bridge and it should be used and checked prior to the commencement of the exercise. The students are familiar with the Bridge Procedures Guide and should also comply with the general principles of the guide.

If other procedures or instructions are given during the briefing, the instructor of course will also see that these instructions are followed. Attitudes are also of interest, what kind of attitudes the student shows towards standard operating procedures, checklists and routines that should be performed on the bridge. Are all available checklist and procedures used prior the commencement of the exercise? What is the students opinion of SOP:s (Standard Operating Procedures) and have they been used properly on the bridge or only checked off because the instructor “told them to do so”?

4.1.3 Navigation

The use of nautical charts and publications for gathering relevant information that may be needed along the voyage are one of the basic preparations that have to be done before every single exercise. The students must make a route plan and also find out for example VHF (Very High Frequency) working channels for communication, if not given by the instructor at the briefing of the exercise.

After the planning stage, there is the monitoring stage. The student should monitor the voyage throughout the exercise. Monitoring means also that the position should be plotted on the paper chart as well as the active monitoring of radar and other relevant equipment.

The actions of the student (or bridge team) should always be in compliance with the “rules of the roads” (COLREG) and good seamanship. Even that the objectives of the training lies on the use of equipment or something else, the students must always obey the rules of the road. The rules of the road should be taken in consideration already in the planning stage, for example how to cross a TSS (traffic separation scheme), otherwise there is a great risk that the student makes bad decisions during the monitoring stage. When the exercise is running the compliance of rules of the road is vital for the success of the exercise.

4.1.4 Bridge Team Work

Most simulator courses are held for a group of students and the groups are restricted to a maximum of 10 persons. Normally the instructor runs about 3 bridges for one course, which mean that there are about 3 students on every bridge. The collective effort is often in line with the success of one bridge, in other words the team work among the students on one single bridge is vital for the common success.

The bridge team members must cooperate and work closely together to achieve the objectives of the exercise. Sometimes the instructor may at the briefing point out roles for the students as captain, 2nd mate and 3rd mate. If this is the case the students should act accordingly and the captain of the bridge has the responsibility of the team. However, if the roles are not pointed out at the briefing the students should among themselves agree on their duties and responsibilities. This could also be of some interest how the group is formed (group structure) and if someone is stepping up and taking the lead of the group. Furthermore the dynamics of the group could affect the success; if the students have conducted the maritime resource management (MRM) training the students should be able to use MRM techniques to improve the bridge team work. To mention some important features from the MRM training the students should have closed loop communication, especially working in a pilot – copilot setup. Other important features would be delegation of tasks within the bridge team and a high level of situational awareness. The situational awareness is also a vital factor when considering the actions taken by the bridge team and the monitoring of the vessels' progress. If the situational awareness is low the risk for misinterpretation of the situation would be great and could lead to wrong decisions in the operation of the vessel, for example which vessel should give way (interpretation of which rules of the COLREG should be applied) or navigational errors.

The workload of the bridge team members should be somehow equal if the tasks are delegated, otherwise some participants would be bystanders and one or two of the participants would have to deal with all tasks and most likely the workload would also increase for these persons. If there is lack of technical skills or for example lack of skills regarding the COLREG:s it could also be noticed as higher workload due to stress and uncertainty. Although the bridge team is under stress and there are many things happening at the same time the team must stay intact and work systematically and rationally otherwise the team will fall apart and the result of the exercise would be poor.

4.1.5 Communications

Most simulator exercises include both internal and external communication. Internal communication could be using the telephone in discussion with the engine control room. Or crew members (the instructor / simulator operator) calling bridge for information, this is done either to disturb the bridge team members or sometimes the instructor use this way of communication to gather some information. Internal communications could also be using handheld UHF (Ultra High Frequency) calling deck watchman or other crew members that are not present on the bridge.

External communications are mainly trained and done with VHF and the instructor is playing the role of VTS (Vessel Traffic Service), pilots, other vessels or coast radio stations according to the exercise layout and objectives. If several simulator bridges are in the same exercise there could also be need for communications from bridge to bridge.

The second main question in the interview was to identify and specify the means and tools of evaluation of the simulator trainings. It is essential to define what resources are used by the simulator instructors, maybe there are unused resources or resources that should be emphasized. To improve evaluation methods it's essential that all the recourses are identified. The tools that the simulator instructor have at hand to support the evaluation, where identified as;

4.2 What resources does the instructor have in the evaluation process?

4.2.1 Observation

During the exercise one of the bridge team members could be assigned the duty as observer. The observers' role in the simulator exercise would be to observe the other team members and make notes of the events that occur on the bridge. This information would be used in the debriefing session where the observer would give comments of the events. To minimize the subjective role of the observer, he/she would be given some instructions on what to pay attention to, for example the technical skills shown – the observer would focus on how the bridge team members use the technical equipment and if they face any problems concerning the technical matters.

If using observer on the bridge it is also vital to consider the knowledge and preparedness of the observer in his/her duty. Using observation would be good for example when training

active deck officers in a custom made exercise with bridge team training. An experienced master, who is very familiar with the company standard operating procedures, could act as observer and for example recent employed deck officers are the active participants on the bridge. Then the experienced master would provide the necessary knowledge and understanding of the SOP:s (Standard Operating Procedures) and the simulator instructor would use his/her comments in the debriefing to evaluate the actions of the bridge team.

4.2.2 Monitoring

The simulator instructor has several methods of monitoring the students on the simulator bridge.

Camera

The operator has one display showing live feed from the bridge and if necessary additional cameras may be mounted on the bridge to give several views and also possibilities to get “close view” of the students on the bridge. There is one fixed camera on the bridge but smaller “web-cams” may easily be installed and directed to interesting spots of the bridge. For example during maritime resource management courses there is one camera capturing the face expressions and capturing the focus (what the students are looking at) of the bridge team.

The camera picture may also be recorded and this gives possibilities to replay the events happening on the bridge simultaneously with the replay of exercise from the simulator platform, showing the movements of the vessel.

To reach an objective evaluation of students by only observing their actions through a camera is not possible. The camera is more or less a subjective tool for the instructor to see what is actually going on the bridge. The camera itself could be seen as objective, but the interpretation of what the instructor sees, could be quite subjective. However, if the bridge team consists of three students and one of them is not taking any active part in the exercise this could very well be noticed by the instructor. The workload of the students is noticeable via the camera feed but any evaluation or more accurate measurement of workload would not be possible.

Radar and ECDIS screens

The radar and ECDIS screen is also visible for the simulator instructor and facilitates the possibilities to closely supervise the use of the equipment. The instructor is able to determine the use and if the equipment is used in proper manner. In combination with listening to the

bridge team members discussions the instructor is able to determine if the students have problems (lack of skills) using the radar. If the students have been instructed to use the ARPA functions of the radar, then the instructor may follow from the simulator control room that the students actually use the functions as instructed in the briefing of the exercise.

The use of the radar is especially interesting during the ARPA course, because the course is just about the use and understanding of the ARPA functions on radar. The possibilities to see the radar screen at the operators' station gives also a possibility to evaluate the use of radar. The evaluation could be by predefined tasks that the students should conduct during the exercise, for example using true and relative vectors, trial maneuver, trails and so on. Other relevant factors could be the range scale used, vector length and what targets are plotted on the radar. This could also give an indication of the situational awareness on the bridge and if the students are navigating according to regulations and good seamanship.

Microphone

The simulator instructor is also able to listen on the bridge, which enhances the instructors' possibilities to interpret the actions made of the bridge team. Eventual technical problems are often resulting in extensive internal communication among the bridge team members and this could for one example be an indicator for the simulator instructor to more closely follow up the actions taken by the bridge team members.

By listening to the bridge team the instructor will also get some hint of the participation, if all students are taking an active part in the simulator training. During normal training there could be up to three participants' on the bridge and the internal communications is often revealing if all are actively taking part.

Instructors control station

The main computer with the simulator platform is located in the simulator control room. From this position the instructor may follow the progress of all vessels in the exercise and obtain exact information of the vessel parameters. The platform itself provides a lot of information for the instructor about the own ships and target vessels. SINDEL platform however is not that developed with automatic evaluation functions.

Events of interest would be the actions taken by the own (bridge controlled) vessels and also what the actual CPA, TCPA and distances to other (own or target) vessels. The instructor may follow up the actual situation from a bird view and see if the own vessels are complying with the COLREG and the objectives given, for example to maintain a certain minimum CPA.

The target vessels in the exercise have predefined routes assigned to the vessels and in the planning of the exercise the routes have been carefully chosen. The idea is to give some challenge to the bridge controlled vessels. However, the instructor cannot anticipate all actions taken by the bridge controlled vessels and the instructor may need to change speed or course on the target vessels along the exercise. The target vessels should also comply with COLREG. This may cause some additional work for the operator, when a bridge is maybe taking unexpected actions and the operator must change course or speed on the target vessels in the exercise. However, the visibility is restricted and the students are navigating by radar and in restricted visibility all vessels should keep clear from each other.

After the exercise is completed the instructor may save the exercise and use the replay function to show the students the same view as the operator has been monitoring. The operators' computer screen is a "bird view" of the actual situation, but the students on the bridge have the view from the bridge which is some meters above the water.



Figure 13 Simulator instructor with co-instructor in the operator control room. Photo taken by Annina Rosenqvist.

4.2.3 Briefing/Debriefing

All interviewees in the study emphasized the importance of briefings and debriefings and mentioned that this is one of the most important issues for a successful simulator training

session. All above mentioned factors that could be used in the evaluation have a role and function, but all interviewed operators emphasized that the briefing and debriefing of the simulator exercise have the most important role in the evaluation process of students. All operators have been using the existing exercise sheet (see appendix 2), with necessary information for the briefing an exercise and some notes for the instructor. However, the information is quite limited and most instructors have made their own notes and comments on what they are going to check during the exercise as well as items to be dealt with during the debriefing session. Most operators however recognize the problem with own notes, then the exercises will be more depending on the instructor and there is an obvious risk for subjective evaluation of the students. The optional method would be that all instructors follow exactly same procedures in the evaluation.

The simulator training exercise begins with a briefing, which should contain the objectives of the exercise. In the ARPA course the objectives could be the use of radar and the ARPA functions of the radar, furthermore the students should prepare a route plan for the intended voyage (even if it would be rather short one). If the instructor is to evaluate the students performance in the simulator exercise it is very important that the student get clear and defined objectives. If the given objectives are not defined and/ or understood by the student, then any evaluation of the exercise would not be valid. Other essential information during the briefing would be the vessel specification, in the simulator environment there are many different vessel types and the students will get specific characteristics' of the vessel type used in the exercise. Furthermore, the actual weather conditions, currents and VHF working channels would be basic information prior to the commencement of the simulator exercise. The information given to the students in the briefing is stated on the exercise sheet and this is same for all because the same exercises are used by all simulator operators.

When running the exercise the operator has one filed called "notes for the operator", where the operator should make comments of happenings he/she recognizes using the available means of camera, microphones, radar screen and the simulator control station. However, there are not stated which means should be preferred or what items or happenings that should be commented on. This is up to the instructor himself to decide and this could also be different from one instructor to another.

The debriefing of an exercise is the time and place for the students to analyze their own actions, if the students have the skills enough to do so. The instructors said that they like to

have the students first to state by themselves the pros and cons of the simulator exercise. To quote one instructor from the interview: *“if the students analyze their actions and when listening to all groups (three groups, using three bridges) one by one, this could be the moment that is giving even more than the actual simulator time”*. This is also the case with a majority of the instructors that they give the time for the students first to analyze their own efforts in the exercise and afterwards the instructor shows on the screen a replay of the exercise. The use of replay is mostly used if there has been any near miss situation or violation of COLREG:s or similar situations. Due to the “bird view” angle of the replay, the instructor could actually notice the level of situational awareness- if the students have the same picture of the traffic situation as on the instructors’ computer screen or have the students made any misleading interpretations.

4.3 Relevant factors to consider when evaluating ARPA simulator training

The third question in the study was to determine the relevant use of resources and what factors should be considered when evaluating the simulator exercises. The course curriculum is quite strictly defined in the IMO model course 1.07 as well as in the Aboa Mare course curriculum (see appendix 1 and 2).

The simulator instructors answered this question as follows;

Instructor 1:

- ARPA functions; the functions that are defined within the course curriculum.
- COLREG; the students must act according to the “rules of the road”
- Traffic situation; the situational awareness considering the total picture of the situation. The student may make wrong or bad decisions due to lack of situational awareness regarding the traffic situation on hand.

Instructor 2:

- COLREG; how the students interpret regulation 10 (Traffic separation schemes) and in general that the students show ability to act according to the collision prevention regulations.
- ARPA radar; how the students use all functions and also the basic knowledge of radar work. How to set an good picture (settings of gain, anti clutter sea and anti clutter rain).

Instructor 3:

- Technical skills; the use of radar and ARPA functions. Especially the CPA, TCPA.
- COLREG; actions taken during the exercise and interpretation of the regulations.
- Bridge Procedure: during the exercise there are several students on the bridge and the operator should also make observations on their common effort on the bridge. Are the procedures according to the “bridge procedures guide”.
- Navigation; students are making route plan before the execution of the simulator exercise and the route plan should also be planned according to good seamanship.

Instructor 4:

- ARPA and radar use; students should show that they are able to use and show understanding of the ARPA and radar functions.
- COLREG; the interpretation of regulations and actions taken to avoid collision
- Navigation: pre-planned route plan and the monitoring of the vessels progress during the exercise.

Instructor 5:

- ARPA; especially the use of CPA, TCPA and when a target is plotted on the radar. Are all targets on the radar screen plotted or close targets only.
- COLREG; students actions to prevent collision.

Instructor 6:

- COLREG; students actions taken on the bridge to prevent collision and what rules are applied in the navigation.
- ARPA and radar; the use of instruments and the understanding of the different modes on the radar. For example the difference if used way through water or over ground.
- Navigation; was there sufficient pre planning of the route. Was the execution of the route according to the pre-planned route?

- Procedures / Teamwork: Did the student agree on a minimum CPA before the commencement of the exercise.

The answers are listed in the order the interviewees gave them. One interesting detail is that most of the simulator instructors started with the importance of COLREG.

4.4 Summary and results of the study

The study shows that all operators emphasises' the use of ARPA as well as the interpretations made by the students regarding the COLREG:s. However, the methods and the resources used by the operator to determine the students' fulfilment of the objectives may vary to some extent. The simulator operators are aware that the resources used during the exercise could be very subjective, if for example using the camera to observe the actions on the bridge or the computer screen in the operators' room showing the radar picture from the bridge. The evaluation will be to some extent subject to the operators subjective opinion on what is important and also on what the operator are observing and what is not noticed by the operator. If there are several bridges in use during the exercise it could also be difficult for the instructor to notice all happenings and actions taken on one single bridge, especially when observing the bridge with camera feed and using the headphones listening on one single bridge, during this time important events on other bridges may be unnoticed.

All simulator operators agreed that one important issue regarding the evaluation is that the "Exercise sheet" (see appendix 3) should be more structured. The operators emitted the need for more structured briefing – objectives – debriefing. Then it would make the ARPA course more structured and less room for subjective opinions and the evaluation would be more objective. Viewing on the present briefing/debriefing exercise sheet, we could notice that the objectives are left to the operators' decision to make and there aren't any instructions on what objectives should be evaluated neither observed during the exercise. The importance of the briefing and debriefing sessions shows that the operators recognised this as an important tool also when evaluation the bridge success in the simulator exercise.

4.4.1 Structured exercise sheet

The author of this study decided to make some changes to the original briefing/debriefing exercise sheet and present the revised form to the operators. Most instructors said during the interview that the exercise sheet have been complemented with own guidelines and notes. This clearly indicates that the exercise sheet in use (see appendix 3) is not good enough, the objectives are stated by the instructor and what is evaluated is completely decided by the instructor.

The author made a new revised form of the exercise sheet and the main principle is that this form could be used as an examination run in the simulator. The exercise sheet has a structured form and includes the competences that the students should be able to demonstrate to pass the ARPA course.

The present exercise sheet (appendix 3) contains;

- Simulator exercise – basic information of the situation at start up. Ship type (kontti), starting position, wind, weather conditions, current, visibility, paper charts to be used and vhf channels to be used during exercise.
- Briefing – instructions for the students that they are going to pass Varne light vessel and proceed to the south west bound lane. Other instructions (objectives) are given by the instructor (empty box in the sheet).
- Radio traffic – possible radio traffic during the exercise
- Events during exercise – the instructor should fill in the event. However, there are no instructions on what should be noted or evaluated.
- Debriefing – the instructor should fill in conclusions made during debriefing

The new exercise sheet (presented ahead) contains;

- Simulator exercise – same as before. The start up conditions for the own vessels.
- Briefing – the briefing connected to the objectives. The instructor chooses from the listed objectives (1-17) and presents these to the students. For example an examination could contain all 17 items to be evaluated. Other instructions regarding sailing directions or destination should be briefed.
- During exercise – all objectives stated for the instructor. The instructor could “tick” them off easily and give further comments when needed. The listed items will also function as a reminder for the instructor and could decrease the workload when several bridges are in use.

- Debriefing – follow up questions. During the exercise the instructor will notice for example the use of relative and true vectors (using the resources available in control room), but the students understanding of the differences between relative and true vectors could be checked in the debriefing.
- Simulator instructors' notes and instructions – there should be clear instructions for the simulator operator (instructor) on what objectives and evaluation methods should be used.

Four of six instructors gave comments on the exercise sheet and all of them implied that this form could be implemented in the examination of students. Suggestions were given that the practical test in simulator would stand for 50% of the evaluation and the written exam would generate 50% of the grade given in this course.

ARPA SIMULATOR EXERCISE

Simulator exercise	Duration
Arpachart 1	1 h
Target group	
ARPA-kurs	
Instructor file	
I/sys/excercise/kurser/arpa/arpach1.tsk	

Own ship nr/type	Ship Name	Call sign	Latitude	Longitude
1 / Kontti			50°52,5' N	001°27,6' E

Own ship nr/type	Ship Name	Call sign	Latitude	Longitude
2 / Kontti			50°51,2' N	001°24,6' E

Own ship nr/type	Ship Name	Call sign	Latitude	Longitude
3 / Kontti			50°49,5' N	001°25,2' E

Own ship nr/type	Ship Name	Call sign	Latitude	Longitude
35/ Kontti			50°47,7' N	001°24,9' E

Own ship nr/type	Ship Name	Call sign	Latitude	Longitude

Own ship nr/type	Ship Name	Call sign	Latitude	Longitude

Wind	Current	Visibility
090°/ 10 kt	Automatic/ abt 020/1,5 kts	2000

Paper Charts	Literature	VHF channels
GB 1892	Nil	16

Briefing

Position, weather, currents and VHF working channels as mentioned above All vessels to proceed NW and round the VARNE L/V and proceed into SW lane	
Training objectives: 1-17	
Time for route planning and bridge set-up	_____ min
Questions?	

ARPA SIMULATOR EXERCISE

During Exercise

	YES	NO	
1	Set up and maintain radar display	<input type="checkbox"/>	<input type="checkbox"/>
2	Set CPA and TCPA limits	<input type="checkbox"/>	<input type="checkbox"/>
3	Manually acquire targets	<input type="checkbox"/>	<input type="checkbox"/>
4	Display true vectors	<input type="checkbox"/>	<input type="checkbox"/>
5	Display relative vectors	<input type="checkbox"/>	<input type="checkbox"/>
6	Vary vector length (vary radar range)	<input type="checkbox"/>	<input type="checkbox"/>
	ARPA display in True, North Up, Relative Motion & Head		
7	Up	<input type="checkbox"/>	<input type="checkbox"/>
8	Display ground stabilized (bottom track)	<input type="checkbox"/>	<input type="checkbox"/>
9	Display sea stabilized (water track)	<input type="checkbox"/>	<input type="checkbox"/>
10	Obtaining range & bearing to targets	<input type="checkbox"/>	<input type="checkbox"/>
11	Trial manoeuvre with both course and speed change	<input type="checkbox"/>	<input type="checkbox"/>
12	Activate / Silence the lost target alarm	<input type="checkbox"/>	<input type="checkbox"/>
13	Cancel a single target	<input type="checkbox"/>	<input type="checkbox"/>
14	Cancel all targets	<input type="checkbox"/>	<input type="checkbox"/>
15	Designate a dangerous target	<input type="checkbox"/>	<input type="checkbox"/>
16	Any violation of COLREGS	<input type="checkbox"/>	<input type="checkbox"/> If yes; Why?
17	Set up and auto acquisition zone	<input type="checkbox"/>	<input type="checkbox"/>

ARPA SIMULATOR EXERCISE

Debriefing

	YES	NO
Can the student explain the differences between relative and true vectors	<input type="checkbox"/>	<input type="checkbox"/>
Can the student motivate his/her actions during the exercise	<input type="checkbox"/>	<input type="checkbox"/>
Any violation of COLREGS	<input type="checkbox"/>	<input type="checkbox"/> If YES; why?
Minimum CPA >1.0 nautical mile	<input type="checkbox"/>	<input type="checkbox"/> If NO; why?
Was the TRIAL manoeuvre used	<input type="checkbox"/>	<input type="checkbox"/>
Can the student explain the difference of using speed over ground or through water	<input type="checkbox"/>	<input type="checkbox"/>
Was all resources available used	<input type="checkbox"/>	<input type="checkbox"/>
Remarks;		

ARPA SIMULATOR EXERCISE

Simulator instructors' notes and instructions

BRIEFING

- Objectives of the exercise to choose from 1 – 17
- If it's an examination run, all 17 items to be included!

DURING EXERCISE

- Instructor to mark YES or NO if the student(s) have showed the performance activity required (stated in the objectives)
- Additional points may be included, but must then also be stated in the objectives of the exercise

DEBRIEFING

- Questions for the debriefing, the student(s) should analyze their performance
- Check the student(s) understanding of the objectives (1-17)

GENERAL INSTRUCTIONS

- Depending on how many simulator exercises are used in the ARPA course, one suggestion is to slowly increase the objectives starting with some (5) and at the final exercise the student(s) should be able to perform them all.
- Even there are several students on the simulator bridge we should keep score according to the activity required (objectives)
- If using the simulator exercises as examination – only one student on the bridge during examination!

All instructors participating in the study were indicating during the study that the exercise sheet (appendix 3) used in ARPA training was too unstructured. As said before, most of the

instructors had made their own notes and reminders of issues that they brought up for the students in the briefing sessions.

All instructors also implied that the most effective way of making the simulator training sessions more objective and fairly evaluated irrespectively of the instructor was by using a structured and standardized format of the “exercise sheet”. There are additional items that could be on the exercise sheet, for example resource management and the implementation of good watch keeping procedures. The example given in this study could be seen as a technical form, where the main objectives are set by IMO model course 1.07.

5.0 Discussion

The main principle should be that the students get a fair and equal evaluation of their progress in the simulator regardless of the simulator instructor. In other words if one student would participate in six ARPA courses and all lead by different simulator instructor, the students grade should be quite the same. Then we could argue if it is possible to create a simulator course that would be standardized in the meaning of evaluation of the students.

If we break up the ARPA course into smaller elements:

- Theory part – one day of theory about the functions of modern ARPA radar. The instructor uses a power point presentation based on a compendium that is available for the students to buy. The students are also given some manual plotting exercises, which should be familiar to them because the manual plotting course is a prerequisite for attending the ARPA course. The exercises highlights the differences between relative and true vectors and effects of own ships course and speed.
- Familiarization of bridges. Prior to the exercises the students should get an opportunity to familiarize with the bridge equipment and simulator environment as well as the working procedures on the bridge.
- Briefing of exercise. Prior to the simulator exercise the students should be briefed of the objectives of the exercise and about the conditions in the exercise. For example an exact or approximate starting position and destination. Weather conditions with the visibility range should be given and then the students should make the interpretations of which regulations to apply regarding the international regulations for prevention of collision at sea.
- Pre-programmed exercise setup. The exercises used in ARPA course are always the same and the training scenarios are fixed. The vessels used by the students are a container vessel of 113 meters in length and good steering characteristics. The routes of target vessels are pre-programmed as well as the weather conditions and currents. The setup is always the same on all ARPA courses however the actions taken by the students (change of own speed and course) will affect the situation during the exercise.
- Exercise monitoring. The simulator instructor controls the progress of the exercise in the control room and if needed the instructor may intervene in the situation by controlling the target ships. One of the main tasks for the instructor is to monitor the

events on the bridges and the actions taken by the bridges. From the perspective of evaluation this would be the core of the exercise.

- Debriefing of exercise. When the student reaches the destination or fails resulting in grounding or collision the simulator exercise is terminated and followed by a debriefing in classroom. During the debriefing the instructor may show the own vessels (students) progress and the students are given the opportunity to explain the actions taken during the exercise.

The theory part takes place during the first day of the course but the other four points in the above mentioned list are repeated for every exercise conducted. During the week there are in total six or seven exercise followed with a written examination. These named exercise elements should be the same regardless of the instructor in charge of the ARPA course, so actually this is the question – are they the same?

During the theory part of the course the material used is same regardless of the instructor and the material consist of the recommendation of the IMO model course 1.07. However the instructors' role could differ regarding to the pedagogical approach used. All instructors have pedagogical training in that respect they are equal but of course the instructors could point out and emphasize different items in the course material. As former deck officers the instructors may have their own different topics of interest within the material but if it actually affects the fair evaluation of the students is maybe more philosophical question rather than a practical concern.

Familiarization of the bridges will most likely affect the success of at least the first exercises. If the students are well familiar with the equipment it will decrease the workload and the other way around if the students are not familiar with the equipment at all it will increase the discomfort in the exercise when things starts to happen. Worst case scenario would be that the whole learning experience would be eliminated due to too high workload. The ARPA course is not only about the radar functions, it's also about safe and sound working routines and the students should maintain a high level of situational awareness by good bridge practices. On bridges they find familiarization manual, but they must be given sufficient time to familiarize themselves with the bridge. The role of the instructor may vary from a facilitator which intervene when needed or asked for help and support to an instructor that more actively instruct the students how and what to do on the bridge. The study showed however that most instructors like to teach by problem solving and therefore takes the facilitating role when students are in the simulator bridge.

Before the students may commence the simulator exercise they must be well briefed about the training objectives. It is important that the students are well clear about the objectives of the exercise and also the prevailing conditions of the exercise as well as the simulator environment. The evaluation process must be linked with the information given in the briefing, for example if the students are required to perform some of the points in the exercise checklist (see [structured exercise sheet](#)) then it must also be noted during the briefing session. The listed items (17) should be mentioned in the briefing, for example during the first simulator run the item numbered 1 to 5 could be the objective in the exercise and during the second run the item 6 to 10 would be the main objectives during the exercise. Otherwise the evaluation of the exercise will not be appropriate due to lack of information. In this case it's also obvious that the former exercise sheet used (see appendix 3) is not enough structured to meet the evaluation criteria. With a structured exercise sheet the instructor has help of the mentioned objectives and prevents the risk of forgetting something which could be relevant in the ARPA course curricula. The simulator instructors own prejudices and experiences could also affect the briefing session, if not using a structured exercise sheet for stating the objectives of the exercise.

During the exercise the students are on their assigned bridges and drive the vessel from starting point to the final destination. The setup of the exercise is always the same and saved on the computer running the simulator platform. The exercises are built up according to the recommendations of IMO model course 1.07, the general idea is of course that there would be much traffic (target vessels) and the students should use ARPA functions on the radar to determine the dangerous targets and assist them in taking correct actions to prevent collision and grounding according to the international prevention of collision regulations at sea. The instructor follows the running exercise from the control room where he / she observes the actions taken by own ships (students) and to instructors disposal there are several means of observing the bridge environment. Even if the exercises are predetermined the actual happenings are influenced by the students' actions by changing their course and speed, therefore it is not possible to fully predict the outcome of the exercise. Another unpredictable issue is that there are several own ships in the same exercise and they could interfere with each other and create interesting situations. This requires high situational awareness of the instructor, when observing up to four bridges at the same time and the operation of the simulator platform as well. The structured exercise sheet could in this case decrease some of the instructors workload when he/she could easily "tick off" in the boxes if the objectives are

met or not met by the bridge in question. Normally there are three or four bridges in use at the same time and the instructor should be able to closely follow the happenings on every single bridge in order to evaluate the students. If the exercise sheet contains only space for remarks (see appendix 3) it will take more time and effort of the instructor to make notes about the bridges needed for the evaluation process. It could also be challenging for the instructor to remember the precise objectives given in the briefing prior to the execution of the simulator exercise. It's also important that the notes are filled in during the execution of the exercise to reduce the potential risk that the instructor forgets which bridge or student made a certain action or what functions have actually been used by whom. If the instructor would not make these notes or marks during the exercise it would most likely difficult after the exercise to remember correctly leading to inadequate evaluation.



Figure 14 Debriefing session with re-play of the vessels movements during exercise. Photo taken by Tony Karlsson

The remarks and notes will be a good tool for the instructor at the debriefing session when the students are gathered in the briefing room. Many instructors say that the debriefing session is

maybe the most important part of the simulator exercise, because it is during the debriefing when the students should reflect and analyze their own actions. The “perfect” student would analyze own actions, both good and bad, and this would result in a learning experience as an outcome of the practical experiences done in the simulator environment. This is maybe not the case, at least not without any interaction of the simulator instructor. The instructors’ role in the debriefing session may vary from pure teaching to more a role of a facilitator.



Figure 15 Debriefing with camera recording from bridge. Picture taken by Tony Karlsson

ARPA course is more about the technical skills and interpretations of the COLREGs, however it is very useful to use camera recording from the bridge to determine the situational awareness and the activity of the bridge team members.

Bridge procedures and maritime resource management is always a topic when the students are in the simulator. However, the students should not be evaluated on their resource management skills before they have attended the MRM (maritime resource management) course. But one could also argue that the management and bridge procedures skills are “silence skills” that we need to transfer to students. Our ways of working and implementing good working routines

and good seamanship to the youngsters, this is part of all training sessions in the simulator and these topics are always there regardless of the simulator course. The students should take to heart all this good routines and behavior. Even that these qualities are maybe not direct evaluated by the instructor it will most likely affect the overall judgment of the student. The instructor will notice the students that show these good qualities. However, we should never forget the course objectives, if we put too much into one simple exercise there could be a risk of creating high workload for the students and even miss the objectives we had in first place.

6.0 Conclusions and future research

This study shows that structured briefings and debriefings will lead to more objective evaluation of the students' participating in ARPA simulator training. By using detailed and structured exercise sheet the objectives are specified both for the instructor as well as for the participants undertaking the simulator training. Clear objectives will also lead to more fair and objective evaluation, less room for influences of instructors' knowledge or experiences. From the students point of view the evaluation is fairer and uniform if all instructors use the same objectives throughout the course, instead of instructor based objectives that are developed from the instructors own learning's and bias. It is not possible by this study to put an exact scale or grading system on how objective or subjective the evaluation will be by using structured exercise sheet, this could however maybe be an interesting topic for further research.

Writing this thesis has been most interesting and learning for the author. Further research related to do this thesis would be interesting to do concerning exercise assessment and evaluation of the instructors. How should we train the trainer? By researching this it could benefit new methods to improve the learning experience in the simulator. Also to do studies comparing different methods used by the maritime universities in Nordic countries would be most interesting to study.

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Figure 1 The simulator department at Aboa Mare

Figure 2 MISTRAL 4000 (SINDEL) control screen with an ARPA exercise

Figure 3 Own ship (bridge) in detail and the target ships in the exercise with detail information. Screen dump from SINDEL.

Figure 4 Full mission bridge "E". This bridge is equipped with Furuno radars and ECDIS. Photo taken by Per-Henrik Sjöström.

Figure 5 Simulator instructor with co-instructor in the operator control room. Photo taken by Annina Rosenqvist.

Figure 6 Extract from the STCW-Code (A-I/12) (International Maritime Organisation, 2001)

Figure 7 Extract from the STCW-Code (A-I/12) (International Maritime Organisation, 2001)

Figure 8 COLREG - Part B - Steering and sailing rules. Section I - Conduct of vessel in any condition of visibility. Rule 6 - Safe speed.

Figure 9 COLREG - Part B - Steering and sailing rules. Section I - Conduct of vessel in any condition of visibility. Rule 7 - Risk of Collision

Figure 10 COLREG - Part A - General. Rule 3 - General Definitions

Figure 11 COLREG - Section III - Conduct of vessels in restricted visibility. Rule 19 - Conduct of vessels in restricted visibility.

Figure 12 Kolb's model. (Learning 3.0, 2011)

Figure 13 Debriefing session with re-play of the vessels movements during exercise. Photo taken by Tony Karlsson

Figure 14 Debriefing with camera recording from bridge. Picture taken by Tony Karlsson

Picture on cover page taken by Tony Karlsson.

APPENDIX 1

Course description

Code	SFY 10044	Attendance obligation	 Red
Course	Radar Plotting 1: Manual plotting		
Prerequisites	Watchkeeping Duties 1A, Navigational Aids 1, Terrestrial Navigation B		
Competences	To provide the student with the skills to manage traffic situations as the officer of the watch through the use of radar plotting and with ability to use radar in order to maintain safety of navigation and fulfil the requirements set in the IMO Res. A.483(XII).		
Scope	1 credit		
Contents	<ul style="list-style-type: none"> • Basic principles of radar plotting • Different methods of manual radar plotting • Planning evasive manoeuvres • Confirming the speed and course of the current in radar plotting • Errors in radar plotting 		
Method of instruction	Classroom lectures. Exercises in the simulator.		
Evaluation A-II/1	STCW.95- Code: Table A-II/1 column 4; pages 31 and 32 as applicable including: <ul style="list-style-type: none"> • Information obtained from radar is correctly interpreted and analysed, taking into account the limitations of the equipment and prevailing circumstances and conditions. • Action taken to avoid a close encounter or collision with other vessels is in accordance with the International Regulations for Preventing Collisions at Sea. • Decisions to amend course and/or speed are both timely and in accordance with accepted navigation practices. • Adjustments made to the ship's course and speed maintain safety of navigation. • Communication is clear, concise and acknowledged at all times in a seamanlike manner. • Manoeuvring signals are made at the appropriate time and are in accordance with the International Regulations for 		

APPENDIX 2

Course description.

Code	SFY 10045	Attendance obligation		Red
Course	Radar Plotting 2: ARPA			
Prerequisites	Radar Plotting 1			
Competences	<ul style="list-style-type: none">• To fulfil the requirements of the IMO Resolution A482(XII) with reference to ARPA equipment training.• To provide the student with the skills and knowledge in terms of managing the system of radar charts in ARPA equipment.			
Scope	1.5 credit			
Contents	<ul style="list-style-type: none">• Presenting ARPA-data• Manual and automatic target selection• Graphical and alphanumeric representation• Planning evasive manoeuvres• Symbols• Stabilizing the ARPA-picture• Route planning using ARPA• Technical construction and functioning of ARPA-equipment• The reliability of ARPA-equipment and the IMO requirements			
Method of instruction	Classroom lectures. Exercises in the simulator			
Evaluation A-II/1	STCW.95- Code: Table A-II/1 column 4; pages 31 and 32 as applicable including: <ul style="list-style-type: none">• Information obtained from radar and ARPA is correctly interpreted and analysed, taking into account the limitations of the equipment and prevailing circumstances and conditions.• Action taken to avoid a close encounter or collision with other vessels is in accordance with the International Regulations for Preventing Collisions at Sea.• Decisions to alter course and/or speed are both timely and in accordance with accepted navigation practices.• Adjustments made to the ship's course and speed maintain safety of navigation.• Communication is clear, concise and acknowledged at all times in a seamanlike manner. Manoeuvring signals are made at the appropriate time and are in accordance with the International Regulations for Preventing Col-			

APPENDIX 3

Typ av övning

Övningens längd

Arpachart 1	1 h
-------------	-----

Målgrupp

ARPA-kurs

Stig till filen

l/sys/excercise/kurser/arpa/arpach1.tsk

Own ship nr/typ

Namn på fartyg Call sign

Longitud

Latitud

1 / Kontti			50°52,5' N	001°27,6' E
------------	--	--	------------	-------------

Own ship nr/typ

Namn på fartyg Call sign

Longitud

Latitud

2 / Kontti			50°51,2' N	001°24,6' E
------------	--	--	------------	-------------

Own ship nr/typ

Namn på fartyg Call sign

Longitud

Latitud

3 / Kontti			50°49,5' N	001°25,2' E
------------	--	--	------------	-------------

Own ship nr/typ

Namn på fartyg Call sign

Longitud

Latitud

35/ Kontti			50°47,7' N	001°24,9' E
------------	--	--	------------	-------------

Own ship nr/typ

Namn på fartyg Call sign

Longitud

Latitud

--	--	--	--	--

Own ship nr/typ

Namn på fartyg Call sign

Longitud

Latitud

--	--	--	--	--

Vind

Ström

Sikt

090°/ 10 kt	Automatic/ abt 020/1,5 kts	2000
-------------	----------------------------	------

Sjökort

Litteratur

VHF kanal

GB 1892 eller annan lämplig	Nil	16
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Briefing

Samtliga runda Varne L/V till SW-gående lane
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--

Radiotrafik för operatören

Nil

Händelser under övningen

--

Debriefing

--

APPENDIX 4

Course description

Code	MM10OB01	Attendance obligation		Red
Course	Navigational Aids; Radar			
Prerequisites	Terrestrial Navigation A			
Competences	The student knows the operational aspects, reliability and limitations of radar equipment and the basics of determining the position and monitoring the traffic situation with the help of radar.			
Scope	1 credit			
Contents	<ul style="list-style-type: none">• International regulations and technical requirements on radar equipment• The operational aspects of radar equipment• Technical definitions• Radar construction and performance qualities• Meteorological, technical and physical factors which have an effect on the radar performance• Different types of radar picture mode and their differences• Basic radar functions for optimal position and traffic situation determination• Radar overhaul and maintenance onboard the vessel• Practical exercises in the use of radar			
Method of instruction	Lectures and demonstrations in the classroom and practical exercises in the simulator.			
Evaluation A-II/1	Information obtained from the radar is correctly interpreted and analysed, taking into account the limitations of the equipment and prevailing circumstances and conditions.			
Examination	Written examination and a practical test in the simulator and possible assignments passed.			

APPENDIX 5

Vecka, dagar eller datum:		V42		Ämne :	Radarplottning 2: ARPA			R	X	E	G	S	Klass :	VS3/G1	
Lärare:	Tony Karlsson			Winha-kod :	SFIO02040		Poäng/ Studiev:		1,5 p						
Önskat klassrum	Herrö		Motivering	Briefing/debriefing											
Tid	Måndag 10:00 – 16:00	Tisdag 08:30 – 16:00	Onsdag 08:30 – 16:00	Torsdag 08:30 – 16:00	Fredag 08:30 – 12:00										
		simulatorövning arpaplot 1 (1)	simulatorövning arpachart 1 (Dover Strait)	simulatorövning arpachart 4 (Dover-Calais)	simulatorövning arpachart6 (Singapore, Main Strait)										
	Repetition av manuell plottning	simulatorövning arpaplot 1 (2)	simulatorövning arpachart 2 (Dover Strait)	- "		- "									
	Lunch	Lunch	Lunch	Lunch	Lunch										
	ARPA-teori	simulatorövning arpaplot 2 (1)	debriefing +teori simulatorövning arpachart 3 (Gedser, dimma)	simulatorövning arpachart 5 (Fehmarnbelt, dim- ma)	tentamen										
	ARPA-teori + bryggintroduktion	simulatorövning arpaplot 2 (2)	- " - arpademo	- " -											
Examinationsform	skriftlig tentamen														
Övrigt															