

SCALABLE SIMULATION FOR BRIDGE OFFICERS AND ENGINEERS TRAINING

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Abstract: The objective of this paper is to highlight the Romanian Navy's progressive development of a scalable simulation training system as the primary tool to support all of its requirements for bridge officer training, from cadets to the ships' captains. It will discuss how the addition of a suite of part task trainers, using a simulation engine common to the Navy's established full mission simulators, has afforded the advantage of compatibility of databases, models and training scenarios. Additionally, it will explain how this new capability has enhanced the accessibility and flexibility of simulation training for bridge officers, hence facilitating the blending of the training process with ship's operational/officer's career cycles to capitalize on experience gained at sea; and more importantly, the inverse.

Keywords: Simulation, training, offices

1. INTRODUCTION

The effectiveness of any production process can ultimately be measured only by the quality of the end product that it generates. A successful system for Naval Bridge Officer training must, over the long term, provide the structure necessary to effectively produce talented warship Captains. In order to fulfil this mandate, the Navy requires a total training system that meets all of its practical instruction demands.

2. DEBUT OF HIGH FIDELITY SIMULATION TRAINING

In 2008, the Romanian Navy embarked on a programme to essentially replace the practical training venues that would be lost when the last of the training vessels were de-commissioned. The first step in this process was taken in 2009 when the Navy contracted from Kongsberg Defence and Aerospace one tactical simulator, ASTT PROTEUS:

PROTEUS ASTT contains surface ship, submarine, aircraft (fixed) and rotary wing simulations by models or editor modeling. These simulations are configured with sensors, combat management systems and weapon simulations systems for the purpose of training decisions makers and

Combat Management Team in decision making and action initiation.

The software simulations is delivered and installed on:

- 25 PROTEUS ASTT Trainee/Student Stations
- 4 PROTEUS ASTT Instructor Stations
- PROTEUS ASTT Server – DATABASE
- PROTEUS ASTT Server – CONNECT.

All equipments emplacement in four rooms: two for trainee (with 13 student console and 12 student console), one for servers and one for debriefings. In each room is present one Instructor Station designate for to create and run tactical scenario with Configuration Editor, or to use Model Editor (with many-many subeditors) in to implement new platforms, sensors and weapons with new physics/functional characteristics, or to use for recording all actions, if necessary, or to use for direct manipulate “war” games on all/each student console.

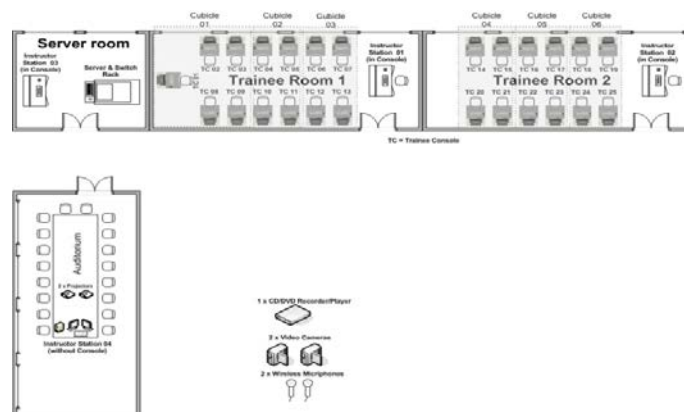


Fig. 1 PROTEUS ASTT - System Layout - Rooms

As open hardware and software systems, PROTEUS ASTT represent a new age in instruction all operators of Romanian Navy by standard NATO. This simulator induces real stress conditions on operators are able to operate in real and complex tactical situations. New level in

instruction permit formed professional men in crews/teams of the ships. PROTEUS ASTT cover middle segment, activity level in each naval entity, and permit new add-ins in future.



Fig. 2: PROTEUS ASTT - System Layout – Trainee Room 1

The second step in this process was taken in 2009 when Romanian Navy contracted from TRANSAS an joint simulator for ship`s maneuvering

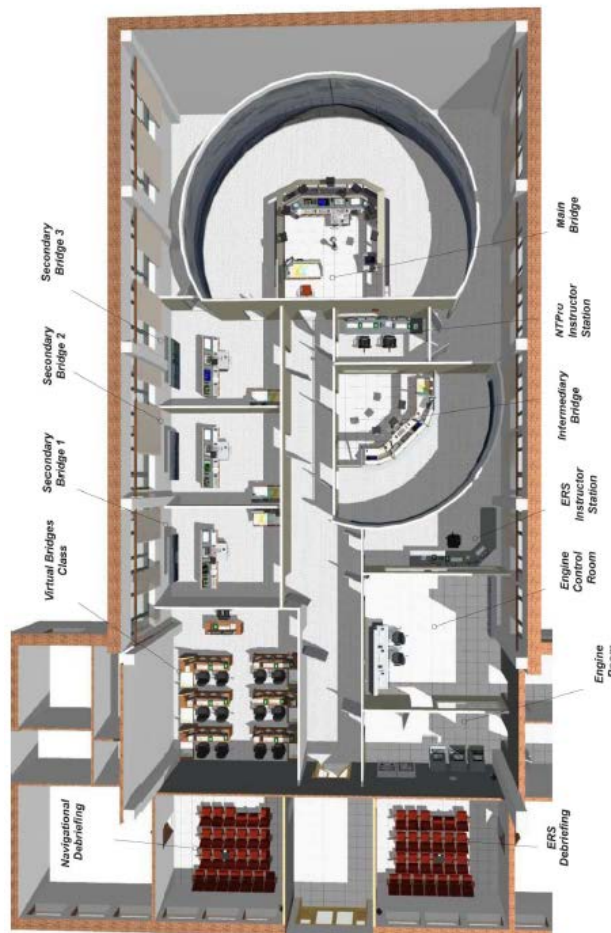


Fig. 3 General overview on TRANSAS NTPRO5000

The joint simulator for ship`s maneuvering have the following training capabilities for more than 20 ship types (2 general cargo vessels, 3 container ships, 2 ore carriers, 3 tankers, 1 LPG carrier, 3 passenger vessels, 2 tugs and 5 military vessels):

- Harbor entering / departing maneuvers;
- Straights passing maneuvers;
- Search And Rescue operational training, according to the actual international regulations;
- Training with ships formations according to the NATO procedure;
- Replenishment At Sea Maneuvers

- Familiarization and basic operational training for Engineering Teams (both for Merchant Fleet and for Romanian Navy)
 - Advanced Bridge Team Management, Engine Team Management and Crisis Management Training;
 - Complex training for crews in order to facilitate the knowledges regarding the onboard systems interaction;
 - Damage Control basic and advanced training;
 - Practicing joint maneuvering of ships in formations;
 - Practicing refueling at sea operations;
- Some other features of the simulator complex are:

- Highly realistic presentation of sea surface, weather, visibility and illumination effects
 - Built-in database on astronomic objects and climatic conditions
 - Full control from the Instructor station
 - Dynamic changes of visual conditions and parameters before or during the exercise.
- The simulator complex consists of:

The Bridge Subsystem:

- 2 x Instructor Stations
- 1 x Main Bridge (HFOV 240°) as per IACS class A requirements
- 1 x Intermediary Bridge (HFOV 120°)
- 3 x Secondary Bridges (HFOV 90°)
- 6 x Virtual Bridges Class



Fig. 4 Visual conditions on TRANSAS NTPRO5000

Training, analysis and debriefing room; GMDSS Communication simulator (on all bridges)

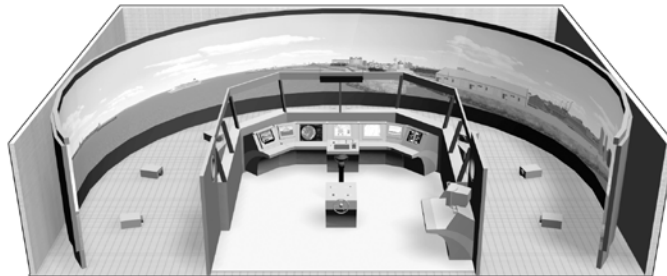


Fig. 5 The main bridge HFOV 240°

The Engine Room Subsystem:

- Instructor Station
- Full Mission simulator of Tanker LCC (slow speed diesel), Ro-Ro (Semi Rapid diesel) and Anzac frigate software (CODOG medium speed Diesels and Gas turbine propulsion plant)
- MCR

- MSB and EPP controls
- 5 x LOP
- Emergency Generator Room
- Integration with Bridge Simulators
- Training, analysis and debriefing room



Fig. 6 The engine room subsystem

The Engine Room Simulator is developed for 3 general types of propulsion systems, with similarities both for navy vessels or for merchant fleet vessels:

- a four stroke, medium speed engine S.E.M.T. Pielstick 16 PC2.2 V-40 propulsion system;
- a two stroke, slow speed engine MAN B&W 6S60MC propulsion system;

– a Combined Diesel or Gas propulsion system for a ANZAC type frigate.

The exercises for ship maneuvering and for free sea navigation can be held in different areas, such the most important straights (Bosforus, Canakkalle, Gibraltar, Mallaca, Dover and Belt), the Suez Channel, five major harbours and the Romanian Harbours (Constanta, Mangalia, Midia, Sulina).

After completing the simulator exercises, the students can replay the entire action and have the possibility to emphasis the mistakes or the correct actions taken, so they will have a superior feed-back action after completing the course.

The entire complex have 85 computers with an energy consumption of 55kW.

The element that gives to this simulator an unique characteristic in Romania, is the possibility to realize Joint Exercises with both simulator modules, and in that way the exercise will achieve the highest level of complexity, by simulating an entire ship with all complex activities onboard.

The combined training of bridge officers and engineering specialists will ensure achieving the goal of improving interoperability between the two type of specialists, realized in almost the same conditions.



Fig. 7 Navigation on the main bridge

3. TRAINING CHALLENGES IN A SIMULATED ENVIRONMENT

With the transfer of the instruction of practical skill sets to the simulator environment, the Navy faced the challenge of accomplishing its training objectives using 11 bridges. In many respects, the simulator environment provided a very efficient and enhanced training medium where instructors had complete control over situational variables and directed training elements.

There were, however, several areas where the Navy could not fully achieve all of its practical training objectives with only 11 bridges.

3.1 Independent Study and Development

In an effort to meet their mandated training objectives, the 11 bridges at the NTPRO 5000 were used at near capacity and taxed instructional staff to their fullest. The lack of additional simulator time and instructor availability dictated that there was no opportunity for a cadet to work independently to further develop or consolidate recently instructed practical skill sets. In the shipboard training environment, this was accomplished by standing night watches in an “on the job” environment, under the supervision of a ship’s officer.

3.2 Instruction of Basic Skills

Entry-level training requires that the students get “hands on time” to complete relatively simple, single tasks while their performance is being continuously monitored. At the early stages of cadet training, the Navy had no option but to use the NTPRO 5000 to conduct this single task and basic practical training. This approach implied an under-utilisation of expensive resource capability and dictated a low student to teacher ratio for simple instructional tasks.

4. SUMMARY

The integration of PROTEUS ASTT and NTPRO5000 provides the Romanian Navy with numerous training venues, the combination of which can cater to all specific bridge officer training needs. The new capabilities for individual self study, skill maintenance and instruction of basic skill sets permit part task training to be conducted in a highly efficient fashion. Correspondingly, the utility of the existing bridges are maximised for team and multi-task training.

The advent of electronic coaching and evaluation mechanisms has enhanced the standardisation of basic skill set demonstration and practice. The e-coach is also the enabling mechanism for experienced instructors to provide remote guidance and mentoring to a large number of students on a recurring basis. Directed and monitored self-study can be conducted both at the Naval Academy and Application School . This guidance is compiled to reflect the procedures and practices accepted by senior naval personnel. The employment of a standardised electronic mentoring and evaluation system greatly reduces the likelihood of students developing bad habits or achieving negative training during self-study sessions. Moreover, the elevation of basic skill set competence at all rank and experience levels has increased the complexity threshold.

The simulators also supplements the training by providing a configurable training device, easily adapted to suit a variety of training roles at all skill levels.

Additionally, follow-on training and post-event analysis can be conducted immediately after employing a technique or conducting a particular manoeuvre at sea. This ability to deliver officer training adaptable to prevailing needs, available on demand, and presented in a fashion in context to

real-life performance requirements is the final step in completing a fully scalable training system.

5. FUTURE CHALLENGES

The task of optimising the Romanian Navy's scalable training system will likely continue for several years. As experience is gained in the use of part task simulators, their effectiveness as an instructional tool to meet specific training elements will have to be thoroughly assessed.

The Navy will, however, certainly investigate whether any savings in training costs are incurred, particularly in the area of instructor resources and equipment maintenance. In the final analysis, the effectiveness of the scalable simulation system will be its ability to enhance the training provided to bridge officers at all stages of sea-going careers from cadet to ship's captain.

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