UNIVERSITY of TASMANIA

Assignment 1 Initiation Report
Fast Rescue Boat (FRB) Partial Mission Simulator

KIT301 ICT Project A

FAST RESCUE BOAT (FRB) OPERATOR'S COURSE (AMCS, 2024)

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1. Project Summary

The project aims to build a partial mission simulator to train Fast Rescue Boat (FRB) operators. The client, AMC Search, has requested that the simulator include at least one mission for training “Man-overboard scenarios” and options for ocean conditions. For realism, graphical fidelity should be prioritised over general program performance. Some other nice-to-have features include one or more extra missions for training other scenarios and options to simulate different times of the day.

2. Project Context

2.1 Context of the organisation and the client:

This report outlines our collaboration with AMC Search, a prominent maritime training and consultancy entity. As the training and consultancy division of the Australian Maritime College, AMC Search specialises in developing immersive 3D online training solutions and is a global leader in Autonomous Maritime System training. Our collaboration specifically focuses on AMC Search’s Digital Services division, which is dedicated to crafting innovative maritime training courses and digital experiences for defence and maritime industries.

John Courtney, the Digital Services Supervisor at AMC Search, is our main point of contact. Alongside his team, John oversees the development of cutting-edge training solutions to meet industry demands.

The core of our collaboration is centred around the development of the FRB Partial Mission Simulator, which aims to enhance training capabilities. By leveraging our experience alongside AMC Search's extensive expertise, we aim to deliver a solution that adheres to industry standards and surpasses client expectations.

2.2 Introduction to AMC Search:

AMC Search, the training and consultancy arm of the Australian Maritime College, is renowned for its expertise in maritime training and consultancy services. Specialising in immersive 3D online training solutions, AMC Search is a global leader in Autonomous Maritime System training, offering courses ranging from basic to advanced levels.

The Digital Services division is the team we are working with at AMC Search. Some of the main members we will be in contact with for the project are John Courtney, the supervisor of the digital services, Philip Lenthall, the Deputy Director of Maritime Operations & Coastal Seafaring, and Balin Puccetti, a University of Tasmania alumni who is now working for AMC Search Digital Services. We will also be working with other members of the Digital Services team, whom we have yet to meet.

AMC Search is requesting the development of the Fast Rescue Boat (FRB) Partial Mission Simulator because of the weather's unpredictability and the inability to train FRB operators in all sea and weather conditions consistently. This partial mission simulator will allow trainee FRB operators to experience conditions they might not have had the luck to experience during their course, providing a more varied training experience.

3. Project Objectives

3.1 Core Training Simulation Development:

Design and implement a high-fidelity 3D simulation of a Fast Rescue Boat (FRB) operation to serve as a primary training tool. This simulation will provide a realistic third-person perspective of the FRB, offering immersive training experiences.

3.2 Dynamic Environmental Conditions:

Realistic environmental conditions, including varying wave mechanics and wind conditions, are incorporated into the simulator. These elements are critical for providing a diverse range of training scenarios, enabling users to experience and adapt to the challenges of real-world sea conditions.

3.3 Mission Scenario Implementation:

Develop a comprehensive and fully realised ‘Man-Overboard’ operations scenario as the cornerstone training module of the simulator. This scenario will be meticulously designed to teach and evaluate the essential skills required for effective man-overboard recovery operations. Our primary focus will be ensuring this mission is as accurate and instructive as possible, making it the project's central goal. While the ‘Man Overboard’ scenario will be our primary focus, we remain open to introducing additional mission scenarios in the future. Any decision to expand will be based on our success with the initial scenario and whether we can maintain our commitment to quality and educational value. However, it is crucial to underscore that our priority is to perfect this foundational mission, ensuring it is a robust and effective training tool for all users.

3.4 Difficulty Scaling Through Environmental Variations:

We are integrating the ability to modify environmental conditions, specifically wind and wave mechanics, before each simulation session to alter the

difficulty of the ‘Man Overboard’ mission. This foundational feature aims to create a scalable training environment, enabling instructors to set specific challenges for trainees, thereby gradually enhancing their skills under controlled yet realistic sea conditions. Initially, we will focus on perfecting these core environmental simulations to mimic natural sea behaviour closely.

Once we achieve a high-fidelity simulation of realistic winds and wave conditions, we will explore the addition of secondary weather variations, such as rain, fog, day-night cycles and cloudy conditions, to further diversify training scenarios. These enhancements will simulate visual and navigational challenges, providing trainees with a comprehensive understanding of the complexities involved in man-overboard recovery under various weather conditions.

The incremental introduction of these environmental elements underscores our commitment to creating a highly realistic and effective training tool. Initially, prioritising wind and wave simulations ensures a solid foundation upon which additional atmospheric conditions can be layered, offering trainees a controlled yet challenging environment in which to develop their skills. This phased approach also allows clients to customise training sessions according to specific learning objectives, gradually increasing the complexity as trainees' proficiency grows.

3.5 Realistic Boat Handling Mechanics:

Ensure the simulation accurately replicates the FRB's physical and operational characteristics, capturing its manoeuvrability, speed, and response to control inputs and environmental conditions. To achieve authentic hands-on training, this objective includes precise modelling of boat physics and seamless integration with custom-designed simulation hardware, such as steering wheels and throttles.
The Australian Maritime College (AMC) has indicated the availability of existing boat models from previous projects that could meet our requirements. While these models provide a valuable starting point, we acknowledge the possibility that adjustments or enhancements may be necessary to align them with the specific demands of our simulation. Our team will evaluate these models to determine their suitability and make any required modifications to ensure they accurately reflect FRBs' real-world performance and characteristics. This process is crucial for providing a realistic and immersive training experience, and we will prepare to collaborate closely with AMC to leverage these resources effectively. Our goal is to minimise development time and cost by utilising existing assets where possible while still committing to the high standards of accuracy and realism this project demands.

3.6 Training effectiveness and feedback mechanisms:

Initiate the development of a mechanism within the simulator to provide immediate and impactful feedback to users on their performance, mainly focusing on their adherence to best practices for man-overboard recovery and manoeuvring under various conditions. We are exploring various feedback tools, including a scoring system, debriefing sessions, and target suggestions for improvements. However, it's important to note that the specifics of these mechanisms are in the conceptual phase and will be refined through collaboration with the Australian Maritime College (AMC).

We aim to devise a feedback system that effectively rewards trainees for correctly executing manoeuvres, such as approaching a man overboard in a prescribed manner and appropriately addressing errors or unsafe practices, like contacting the person in the water. The goal is to reinforce the right behaviours and techniques while providing clear guidance on areas for improvement. We acknowledge the sensitivity and complexity of creating a balanced and educational feedback loop. We are committed to working closely with AMC experts to ensure our feedback mechanisms are accurate and effective in enhancing the learning outcomes. This collaborative effort will be crucial in developing a system that evaluates performance and contributes to a deeper understanding of fast rescue boat operations mastery.

3.7 Scalability for Future Training Modules:

The simulator's design allows additional training scenarios beyond the initial man-overboard mission. This scalability will enable the AMC to extend the simulator's utility by incorporating other pressure operations or maritime challenges in the future, thereby maximising its long-term value.

4. Project Deliverables

After this project, the Australian Maritime College will receive a comprehensive package comprising a Partial Mission Simulator tailored for the Fast Rescue Boat (FRB) Training facility. This package enhances the training experience, leveraging state-of-the-art simulation technology to prepare trainees for real-life rescue operations.

4.1 Key Components

4.1.1 Partial Mission Simulator Core System

A high-fidelity simulation platform that integrates custom-designed vessel hardware and software to simulate Fast Rescue Boat operations in a 3D third-person perspective environment.

4.1.2 “Man Overboard” Scenario

A fully developed and immersive mission scenario focused on man-overboard recovery operations will include detailed instructions, objectives, and feedback mechanisms to guide trainees through the rescue process, emphasising best practices and safety.

4.1.3 Variable Wave and Wind Patterns and Intensities

Dynamic environmental simulation capabilities allow for adjusting wave and wind conditions. This feature aims to replicate the unpredictability of the sea, providing trainees with various conditions to test and refine their skills.

4.1.4 Integration with Simulator Control Schema

Seamless integration of the simulation software with bespoke simulation hardware controls, including steering wheels and throttles, ensures a realistic and responsive training experience.

4.2 Desirable Additions

4.2.1 Additional Missions for Diverse Scenarios

Additional resume and navigation scenarios may be developed depending on the success of the initial ‘Man Overboard’ Scenario and project timelines. These would offer varied challenges to trainees, further enhancing their readiness for various situations.

4.2.2 Variable Time of Day and Weather Settings

Advanced environmental settings allow instructors to simulate different times of day and weather conditions, adding layers of complexity to training exercises and improving situational awareness and adaptability.

4.2.3 Potential VR Support

Exploration of Virtual Reality (VR) integration as an optional enhancement to provide an even more immersive training experience. VR support would depend on the project’s technical feasibility and additional resource availability.

5. Project Benefits

5.1 Improved Training Effectiveness Through Realistic Simulation Scenarios

The deployment of the Partial Mission SImulator will significantly enhance training effectiveness by providing highly realistic and immersive simulation

scenarios. Trainees will engage with dynamic, true-to-life conditions that accurately reflect the unpredictability and challenges of maritime rescue operations. This realism ensures that the learning experience closely mirrors real-world situations, learning to gain a deeper understanding and retention of rescue techniques and protocols.

5.2 Enhanced Preparedness of Maritime Professionals for Real-Life Rescue Missions.

By training within these simulated environments, maritime professionals will be better prepared for actual rescue missions. The ability to practise manoeuvres and decision-making in various simulation sea conditions and emergency scenarios means that professionals will enter real-life situations with a significantly higher level of preparedness. This readiness can make a difference in critical moments during an actual rescue, potentially saving lives and improving mission outcomes.

5.3 Increased Confidence and Competency Among Trainees.

Confidence and competency go hand in hand in high-pressure operations. The simulator provides a safe space for trainees to practise, make mistakes and learn from them without real-world consequences. This process is invaluable for building the technical skills and the confidence required to execute operations effectively. Trainees will complete their training with a solid foundation of knowledge and the self-assurance needed to apply their skills under pressure.

5.4 Alignment of Training with Industry Standards.

The project aims to align the training provided by the Australian Maritime College with current industry standards and best practices. This alignment ensures the training meets and exceeds maritime rescue operations' regulatory requirements and expectations. By adhering to these standards, the AMC positions itself as a maritime training leader, offering programs recognised for their quality and relevance to the industry. Furthermore, THis alignment facilitates the continuous update of training content to reflect the latest technology, techniques and regulatory changes, ensuring that the AMC remains at the forefront of maritime education.

6. Project Quality and Compliance

6.1 Realism of the vessel movement

As the simulation will be used for training, the team is committed to make handling of the vessel as accurate as possible. The Unity physics system should be used consistently and pushed to its limits by using all information the team can gather on the vessel. That will include but won’t be limited to

buoyancy, mass, centre of mass, force leverages, force of the engines, and acceleration curve of the vessel.

6.2 Realism of the water physics

The water physics will be required to be realistic both in appearance and the way the vessel interacts with the water. The water should prove a serious challenge to traverse by moving the vessel up and down as well as side to side. It is critical to get the feeling of the water right for a successful simulation.

6.3 Easy manipulation of the waters into a wide range of conditions

The project cannot be considered a success if the water is not easy to manipulate or the range of conditions it creates is too small. The reason simulation is required is to save on time it takes to conduct the training in different weather conditions. If different weather conditions are not implemented and easily adjusted, normal training would be preferable.

6.4 Accurate mission layout

The project should leave as less as possible up to the imagination and should represent what a real mission would be like. The UI should never be intrusive, leading, or “game-like”. For example, the trainee will not have any indication of where the man aboard is on the screen but instead will be told where approximately they are through a radio, which is how it is done on real missions.

6.5 Modularity and flexibility of the project

The project will adhere to industry standard values of modularity and flexibility. The project will be easy to build up, cut down, or modify. Any of the details of the mission should be changed with minimal coding required and the system will account for the possibility of new missions in the future.

7. Project Scope

7.1 Included in Scope

7.1.1 Simulation Software Development

Design and development of the FRB simulation software using Unity, including integrating realistic environmental conditions (wind, waves) and a detailed ‘man-overboard’ rescue scenario.

7.1.2 3D Modeling and Environment

Creation and/or integration of 3D models for the FRB and other necessary assets. Whenever existing models from AMC Search are utilised, adjustments and new models will be developed as needed to ensure realism and accuracy.

7.1.3 Environmental Conditions Customisation

Development of adjustable settings for environmental conditions, including wind strength, wave patterns and possibly variable weather conditions. To allow for different training scenarios.

7.1.4 Control System Integration

Integration with physical simulator controls, such as steering wheels and throttles, ensures that the simulator responds accurately to user inputs.

7.1.5 Feedback Mechanisms

Implementation of immediate feedback mechanisms for trainees, focusing on performance evaluation and improvement suggestions based on their actions during the simulation.

7.1.6 Training Scenario Complexity

Incorporating variable difficulty levels within the ‘Man Overboard' scenario allows instructors to set conditions to suit the training needs before the simulation starts.

7.2 Excluded from the Scope

7.2.1 Development of a Comprehensive Range of Missions

While the project focuses on the ‘Man Overboard’ scenario as the primary training module, developing additional diverse scenarios will not be included in the initial scope but may be considered for future updates.

7.2.2 Live Environment Data Integration

Real-time environmental data integration (such as live weather feeds) to simulate current conditions will not be included, with the focus instead on predefined condition variables.

7.2.3 Full Mission Simulator

The project will develop a partial mission simulator focused on specific FRB operations rather than a full mission simulator encompassing all maritime operations.

7.2.4 Hardware Development

Physical manufacturing or extensive customisation of simulator hardware (beyond essential integration with existing controls) is out of scope. The project will utilise available hardware and ensure compatibility with the software.

7.2.5 Advanced VR/AR Capabilities

While potential VR support is identified as a ‘Desirable Addition’, developing advanced virtual reality (VR) or augmented reality (AR) features is not included in the project’s initial scope.

8. Project Stakeholder

8.1 - AMC Search

AMC Search (AMCS) is the client for whom the project is to be completed, and is who will be receiving the project deliverables at its conclusion. The quality of the project deliverables, as well as its scope, will determine how AMCS will implement the simulator into its existing course, if at all. As such, they will be the primary point of contact for the project team, and should be updated on project progress as much as possible.

8.2 - Course Takers (End Users)

Course takers are the people who will be the end users of the app. The quality of the app will directly influence the quality of their training and how easy it will be to transition the learned skills into practice. To account for the needs of the course takers, it is important to test the app as frequently and rigorously as possible in each of the agile cycles.

8.3 - AMC Teachers

The primary purpose of the project is for AMC Search, and by extension, the Australian Maritime College, to create a learning tool for the purpose of teaching Fast Rescue Boat operation. As such, the project needs to be developed in such a way that it is simple enough for course instructors to change parameters to account for differing conditions. To account for this, it is important to ensure that everything is documented in an in-depth and easy-to-understand fashion.

8.4 - University of Tasmania

University of Tasmania is accommodating the project, and hence, putting their reputation on the line. Depending on the outcome of the

project, the effect on the reputation can be positive or negative. To make sure the project maintains quality accepted by the university, all work will be conducted within the unit guidelines, the framework of the unit will be accurately followed, and the team will conduct its work in a professional manner. Any concerns regarding the project will be forwarded to the unit coordinator and all the required documentation will be provided throughout the unit.

9. Client Acceptance Criteria

9.1 The Success of the Fast Rescue Boat (FRB) Partial Mission Simulator will be Measured by

9.1.1 Integration of the Partial Mission Simulator with Simulator Controls:

The Fast Rescue Boat (FRB) Partial Mission Simulator will need to run using the simulator controls, which include a boat steering wheel and a boat throttle. The success of the deployment will be measurable depending on how well the controls are integrated and how responsive the boat movement is to the controls.

9.1.2 Realism and accuracy of simulated scenarios:

Because the Fast Rescue Boat (FRB) Partial Mission Simulator is going to be used for training supplementation, the realism of the scenarios is extremely important. This means that procedures that are used when on a mission are reflected accurately in the simulation.

9.1.3 Positive feedback from end users regarding the simulator:

As the simulator is going to be used by people who have done training on the Fast Rescue Boats, we can measure the success and realism of the simulated Fast Rescue Boat and scenario by getting feedback on how well the simulator operates compared to how the boat operates out in the water.

9.1.4 Depth of Documentation

As the purpose of the simulator is to be used as a tool by AMC Search (the client) in order to training Fast Rescue Boat operators, a degree of success can be measured by looking into not only whether the provided documentation is easy to understand, but also in maintaining adequate depth to ensure that, should the client wish to expand the

simulator in the future, it can be done with relative ease. The project aims to be a modular base that new features could be easily added to.

References:

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