

Calian delivers immersive training solutions for the Royal Canadian Navy

Mixed Reality (MR) simulation-based training for Replenishment-at-Sea (RaS)

The Customer

The Royal Canadian Navy (RCN) delivers introductory training and advanced training to thousands of sailors every year. The RCN delivers combat-capable maritime forces to support Canadian Armed Forces (CAF) missions at home, abroad, and in collaboration with Canada's allies and partners. From advanced collective training for surface, subsurface and anti-air activities in the operations room, to individual training on systems and structures aboard ship, training and skills development is essential for the RCN.

All warships rely on fuel and supplies for sustainment. Fuel is essential for propulsion of the ship to get to its destination; consumables like food and ammunition are essential to sustain operations; and replacement parts are essential for maintenance. Replenishment-at-Sea (RaS) is the process of transferring fuel, consumables, and supplies from an auxiliary ship to a warship while underway. This is a complex process, with safety a primary concern for the crews of both ships.

The Challenge

The RCN was exploring the possibility of using simulation-based training to train sailors on the RaS process on land before doing in-real-life on board ship. The intent was to train sailors on the RaS process to familiarize them with everything from the initial connection of lines between ships, to disconnecting when the transfer of goods is complete.

Calian was tasked with developing a simulation-based training solution to train sailors on the overall RaS process, the roles and responsibilities of all the crew members involved in RaS, understand what the physical space looks like on board ship, and familiarize themselves with tools and steps. Using a mixed reality (MR) solution, the challenge was to train sailors on the RaS process on land in preparation of doing so in-real-life on board ship. The purpose of the simulation-based solution was to accelerate the time-to-competence for sailors, reduce the cost of training, and reduce the risk of injury or accident in the RaS process.

The Solution

The RaS trainer that Calian developed was a MR application using the Microsoft HoloLens 2 hardware to provide an immersive environment. The MR solution provided a realistic, immersive environment, showing accurate dimensions for the workspace on board ship and realistic representation of the tools and equipment the sailors will use. This approach gives the trainee a highly realistic representation of the environment



they will face and equipment they will use when they eventually perform a RaS in-real-life.



Calian worked directly with the RCN to develop models of a Halifax-class frigate and the Asterix-class auxiliary replenishment ship. This was important to immersing the sailor in a simulation-based environment that accurately reflects what they will face in-real-life.

The solution provides training in two modes: spectator or active engagement. In spectator mode, the MR solution shows the bird's eye view of the overall RaS process. Spectator mode allows the trainee to observe the process, from the auxiliary replenishment ship pulling up alongside the receiving ship, though to connecting the lines, and transferring supplies. The spectator can observe the process and hear the commands the Station Captain issues to conduct the RaS process. In spectator mode, the user can also toggle between the bird's eye view and the first-person view from the deck of the ship. This allows for flexibility on observation of the entire operation from a broad point of view as well as observation on individuals and their specific function.



In active engagement, the trainee will have a viewpoint from the deck of the ship, receiving the connecting line, connecting the line to the fuel transfer module, and transferring bulk cargo. In active engagement, the trainee assumes the role of the Station Captain and uses their actual voice to issue commands that prompts the exercise to continue. The automated voice recognition capability allows the Station Captain to control the flow of operations through voice commands that prompt action from the avatars in the environment.

Spectator mode is most useful for teaching the process and overview, and active engagement is most useful for the trainee to practice the actions and voice procedure of conducting a RaS. Combining both gives the trainee a detailed understanding of the sequence of activities, and then teaching the execution of the process. This approach combines the "what" of the process with the "how" of execution.

The Results

The RaS trainer development and delivery was a success. Working directly with the RCN, Calian developed a trainer that accurately reflected the ships and the equipment, and provided an immersive training experience.

The RaS trainer provides a valuable, lower-cost training system to develop sailors' knowledge base and skills. The RaS trainer was successful in developing skills and proficiency faster than the traditional mock-ups and in-real-life training alone. Fewer training cruises were required to develop RaS competency, significantly reducing the cost of training. After receiving the MR training for RaS, the crews had greater knowledge, greater confidence levels, thereby reducing the cost of training, reducing the risk of an accident, and reducing the risk of crew injury.

The MR trainer provides an intuitive guided experience that trains sailors on the RaS process and on performing tasks. The MR trainer delivered success faster and cheaper than the alternatives, improving the overall training experience.



About Calian

We keep the world moving forward. Calian® helps people communicate, innovate, learn and lead safe and healthy lives. Every day, our employees live our values of customer commitment, integrity, innovation and teamwork to engineer reliable solutions that solve complex problems. That's Confidence. Engineered. A stable and growing 40-year company, we are headquartered in Ottawa with offices and projects spanning North American, European and international markets. Visit calian.com to learn about innovative healthcare, communications, learning and cybersecurity solutions.