United States Marine Corps

The cockpit of the CH-53E training simulator, featuring a 220 degree horizontal by 60 degree vertical image.

Creating an immersive, virtual training experience for CH-53E helicopter pilots

The Sikorsky CH-53E Super Stallion is the largest and heaviest helicopter in the United States military. It has the distinctive duty of providing heavy lifting and transport capabilities for both the United States Marine Corps and Navy.

The CH-53E Super Stallion is one of the few helicopters in the world configured with 3 gas turbine engines and in-flight refueling capabilities, giving it an indefinite flying range. While a typical load would be a 16,000lb howitzer or a 26,000lb light armored vehicle, the helicopter also carries personnel and can retrieve a downed aircraft, including another CH-53E.

With several modifications recently made to the CH-53E's, the Naval Air Warfare Center Training Systems Division (NAWCTSD) contracted Aero Simulation Inc. (ASI) to develop, deliver, and support a simulated training system for the aircraft.

The goal of the training system is to provide Marine Corps pilots with the techniques and skills that encompass cockpit familiarization, flight characteristics, operating procedures, and mission procedures.

"Being able to have the pilots experience the real-world without risking man or machine is what makes the difference. Thanks to the Christie Digital system, we can make that happen like never before."

Jeff Adams,
Senior Staff Engineer, Aero Simulation Inc.

The fixed based, non-motion simulator is the eighth CH-53E training system to be deployed by the Marine Corps worldwide. However, according to Jeff Adams, Senior Staff Engineer, Aero Simulation Inc., "what really sets this system apart from the ones before it is the use of a new Christie® digital projection system."

End User:
U.S. Marine Corps

Customer:
Naval Air Warfare Center Training Systems Division (NAWCTSD)

Location:
Joint Base McGuire-Dix-Lakehurst (JB-MDL), New Jersey

Industry/Market:
Aerospace

Partners:
- Aero Simulation Inc.
- Aechelon Technology Inc.
- FlightSafety International

Requirements:
- Reliable performance
- High resolution
- High brightness
- High contrast
- Ease of use

Summary:
Aero Simulation, Inc. uses Christie technology as they develop, deliver, and support a fixed based, non-motion simulator for the largest and heaviest military helicopter in the United States military.

Products:
- Christie Matrix StIM WQ projector (6)
- Christie Matrix WU7K-J 3-chip DLP projectors (4)
- Christie AutoCal (4 cameras)

Results:
Aero Simulation Inc. delivers an immersive, engaging and innovative simulator to help train U.S. Marines Corps pilots on the CH-53E Super Stallion military helicopter.

Using 6 Christie StIM™ WQ projectors, images are projected onto the main out-the-window display screen, a 5 segment collimated glass mirror provided by FlightSafety International. The resulting display system envelops the cockpit inside a 220 degree horizontal by 60 degree vertical image. "With each of these 6 channels projecting over 4 million pixels of resolution, that's over 24 million pixels total. It's absolutely stunning," says Adams.

Four additional Christie StIM WU projectors display onto direct view screens that extend the vertical field-of-view downwards in the Chin and Side Window regions to almost 80 degrees. This vertical extension of the outside scene provides the pilots with additional, crucial visual information downwards. These areas are especially important for use in low-level flight work, such as hovering, ship-board landings, and low visibility scenarios.

Javier Castellar, Co-Founder & VP of Business Development at Aechelon Technology, the company responsible for developing the Image Generator and content used in the simulator, describes the level of detail employed on this project. "During the simulation, you can actually cut the refueling hose, spray fuel all over the windshield, and see the oily drops of the fuel drip down the windshield. This is possible because of the high contrast and resolution of the Christie projectors. Before, there was no sense in preparing those kinds of effects because they would have been almost invisible. But now, the high resolution and pixel range of Christie technology is pushing us to add more features."

Low maintenance was another important requirement for ASI when choosing the technology for the training simulator. The Christie projectors, which have an estimated 50,000 hour replacement cycle for the LED light source, provide the system with more than 20 times the usage than older technology. ASI also used the Christie AutoCal™ alignment system to line up the 10 projected scenes. Adams describes the task as being, "a breeze." He continues, "what once was a labor-intensive and repetitive task for technicians is now basically a push-button operation with minimal down time."

The result is a training environment that truly immerses the trainees into a virtual world where they forget they are operating in a simulator. "The idea is for the students to encounter things in here in order to prepare them for what they will experience operating an aircraft. We can provide the trainees with all types of scenarios that they would encounter in the real-world operation of the aircraft. Anything from basic flight characteristics, to radio navigation, to aircraft malfunctions, to dealing with different types of weather," Adams continues.

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Contact Christie

Contact us today to find out how your organization can benefit from Christie solutions.

Simulation of in-flight refueling behind a KC-130 tanker aircraft.

Virtual world created by training environment helps trainees forget they are in a simulator.

The views expressed herin are those of the authors and do not necessarily reflect the official position of the Department of Defense or it's components.

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