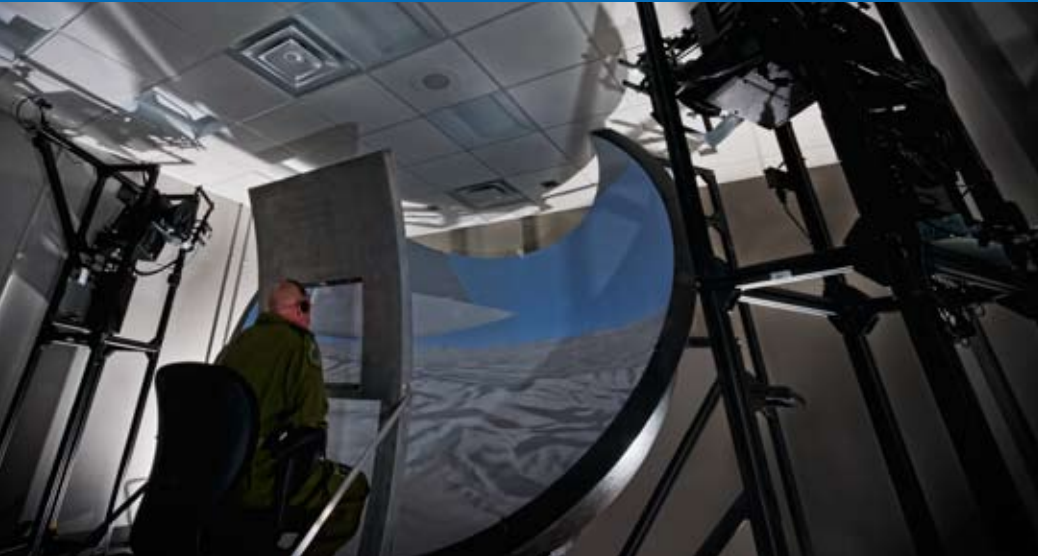


# Application Story

Defence Research & Development Canada – Toronto



*A loadmaster takes part in a simulation training session in the state-of-the-art Hercules Observer Trainer at CFB Trenton .*

## Christie Matrix StIMs chosen for Hercules Observer Trainer

In the world of cutting-edge simulation training, Canada's Department of National Defence is making some impressive gains. Defence Research and Development Canada and the Canadian Forces Aerospace Warfare Centre have partnered to advance training methods for the Royal Canadian Air Force. Recently they improved their state-of-the-art Hercules Observer Trainer (HOT) by adding two Christie® Matrix StIM projectors.

A loadmaster is an aircrew member on military transport aircraft. CC-130J loadmasters are an important element in the mission success and survivability of the aircraft and flight crew. They are responsible for visually scanning the air and ground outside the pilot's view — their observations are used for everything from search and rescue, air-to-air refueling, and monitoring the space around the aircraft while on the ground. In hostile environments, loadmasters report air-to-air and air-to-ground threats. This training is logistically and financially challenging — it was previously done using classroom lectures and practice in live flight with low-fidelity threats. The HOT allows loadmasters to train on the ground, in a dynamic, interactive virtual environment, at a fraction of the cost.

The HOT combines commercial, off-the-shelf hardware and software to simulate the loadmaster's view from the paratrooper door on a CC-130J Hercules Aircraft. At the heart of the HOT are two Christie Matrix StIM projectors which display images on a hemispherical screen to provide a wide field of view simulation. The projectors allow for the use of night vision goggles (NVG), giving loadmasters a realistic impression of how their world in flight will appear in day or night. Users even experience the same interference between the window and their helmet and goggles as when they are in actual flight.

Integral to the development process were technology partners at Renaissance Sciences Corporation (RSC), a firm that specializes in development and integration of modular, reusable, physics-based sensor simulations to enhance visual displays. This was particularly important for presenting the best possible visual scenes to trainees viewing night scenarios through their NVG. Jeff Clark, President of RSC, was instrumental in

### Customer:

Defence Research & Development  
Canada – Toronto

### Location:

CFB Trenton - 8 Wing, Ontario, Canada

### Industry/Market:

Military training simulation

### Partners:

- Acron
- Renaissance Sciences Corporation

### Requirements:

Defence Research Development Canada (DRDC) required two projectors that could produce specific field-of-view images to complete their Hercules Observer Trainer – an aircraft simulator used for training loadmasters with the Royal Canadian Air Force. They chose two Christie Matrix StIM projectors to fulfill several requirements, including NVG capabilities, excellent resolution and compact physical features that could fit into a small space.

### Summary:

Two Christie Matrix StIMs were used as part of a combination of off-the-shelf equipment used to construct the Hercules Observer Trainer (HOT). Excellent resolution and field-of-view, low cost-of-ownership, NVG capabilities and a compact physical unit were all deciding factors in purchasing the projectors. DRDC is extremely happy with the decision to purchase the Christie Matrix StIMs, and look forward to licensing the HOT for commercial and military usage worldwide.

### Products:

- Two Christie Matrix StIM projectors
- Christie TWIST
- Christie MotoBlend

### Results:

Used in conjunction with cutting edge software, the two Christie Matrix StIM projectors provide the resolution, clarity and NVG capabilities needed to support the military flight training simulator.

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suggesting the hardware needed for the HOT and felt confident that the Christie Matrix StIMs were the best equipment for the job. "This was an ideal match, technically, given our multi-color image generation abilities. Our software provides six colors of simulations — six wave bands on one video card. The Matrix StIMs offer four-colour image generation capabilities, which makes them the most advanced to date," he said.

Acron, a systems integrator specializing in simulation applications, was brought in by DRDC to help develop the HOT application. Working with the various software providers and RSC in particular, Acron ensured the various communications, image generator and simulation applications worked seamlessly together. They also helped enhance the image generator software by adding a number of features to the effects, the models and terrain that could be stimulated in the nighttime scenes by RSC's software for realistic NVG training.

The reconfigurable station takes up 5 x 6m of space and includes a correctly sized mock CC-130J Hercules aircraft door with a window which trainees look through to see the simulation screen. The standard 20-inch square window can be swapped with a smaller round window to replicate the view available from earlier models of Hercules. Also impressive is the fact that the HOT can network with other simulators, allowing whole flight crews — from the pilot and co-pilot to the loadmasters — to train together as a team. Previously, this option was never available.

"We designed the HOT to work over a network, so the instructor acting as the pilot doesn't have to be physically co-located with the trainee," said DRDC engineer, Tony Ghoman. "Also, we can modify the program to reflect other aircraft types, although so far the emphasis has just been on the Hercules," he continued.

The first rendition of the Hercules Observer Trainer, developed in 2008, saw a slightly smaller configuration with only one projector. The unit was successful, but presented some technical and logistical issues. "We wanted to increase resolution from a single channel system, so two projectors were better than one," explained Stuart Grant, Defense Scientist with DRDC. "We also wanted to address the HVAC issues. The heat thrown from the projector in close proximity to trainees made sessions uncomfortable. Since the Christie Matrix StIMs produce less heat, they were complimentary to this application. We were able to locate them off to the side of the unit, giving students more room and less heat in the small space," he said.

DRDC also wanted to incorporate infrared projection and NVG technology. "The Christie Matrix StIMs provided NVG capabilities, as well a stable system where light levels could be controlled. This was very important in an NVG environment. Furthermore, focal distance was an issue, so we improved this



*The first rendition of the Hercules Observer Trainer (HOT) had only one projector. By having two projectors and a larger screen the second HOT has increased resolution and field of view.*

with the two projectors and a larger screen. We're very happy with the results," continued Grant.

Trainees at CFB Trenton will soon be impressed with the results as well. The new, three-story, 17,000 sq. m. Air Mobility Training Center on the base houses classrooms, training rooms and the new HOT simulator, which will provide pre-deployment training for countless military personnel. Currently, the HOT uses several terrain and flight path scenarios in training, including an approach to Kabul, Afghanistan and an extended Vancouver, BC database environment for search-and-rescue activity.

"A threat is quite startling the first time you see it — with training in the HOT you overcome that sense of surprise and amazement, which helps users to develop an adaptive reaction. Their judgments and decisions regarding threats, distance, location and the like really improve with practice in the HOT. It's a valuable tool to have in our repertoire," continued Grant.

Indeed, initial testing on trainee reaction times and errors has been promising. Compared to the prior training approach, trainees made 79% fewer errors and reduced their response time by 11% when trained with the HOT.

In terms of worldwide usage, DRDC has commercialized the HOT system. The hope is that military operations across the globe could make use of the HOT to improve their own simulated training programs. It would also support further DRDC initiatives, as all funds earned through licensing agreements go back into its budget to support future research and development activity.

### Contact Christie

Contact us today to find out how you can benefit from Christie projection and simulation solutions.

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