

Innovative Military Surveillance Company Takes AIMS: New Image Management System Revolutionizes Situational Awareness and EO Effectiveness

by Eleanor Beaton, CarteNav Solutions

It was the best cold call Rick MacDonald never had to make.

In the fall of 2004, MacDonald, chief technology officer at CarteNav Solutions, a Halifax, Nova Scotia-based firm that specializes in maritime security, remote sensing and communications software, saw a number he didn't recognize flash across the display screen of his cell phone. The caller introduced himself as Paul Cameron, a Navigator and Tactical Coordinator with the Royal New Zealand Air Force (RNZAF). He is now a maritime aviation systems consultant from the company Marops Ltd (www.marops.net) in New Zealand.

Cameron had just returned from a business trip to the Defence Science & Technology Organization (DSTO) lab in Adelaide, Australia. There, he had witnessed an innovative new software tool developed by CarteNav to study Electro-Optical (EO) sensor operator effectiveness. Based on his observations, Cameron concluded the tool would have a dramatic impact on Operator Situational Awareness. He was calling to find out how the RNZAF could buy the software for its P3-K Orion fleet.

"We were flattered - and excited," MacDonald says. "We knew it was the commercialization opportunity we were looking for."

At the time, CarteNav's Adaptive Image Management System for Intelligence, Surveillance and Reconnaissance (AIMS-ISR) software was being used for research purposes only, in an effort to help the company's military clients identify ways to improve situational awareness in electro-optical surveillance. But the time was ripe to make the tool more widely available. In recent years, international defense departments have invested heavily in upgrades to airborne electro-optical sensor equipment, including telescopic, wide lens and infrared cameras.

"In theory, the new hardware should improve EO operators' situational aware-

ness," says MacDonald. So far, however, the improvements have been limited. That's because new software that would allow the equipment to operate at full effectiveness is still under development. In fact, industry insiders estimate it could take as long as five years for the world's major

Despite significant investment in airborne electro-optical (E/O) sensors, operators are provided with limited Situational Awareness and are unable to effectively manage multiple images in real time. This sub-optimization impacts negatively on the use of the sensors for ISR, particularly during covert missions. CarteNav's "AIMS-ISR" (Adaptive Image Management System for Intelligence, Surveillance and Reconnaissance) is the next generation digital video application that facilitates the collection and storage of geo-located imagery and associated sensor data such as radar and AIS.

military suppliers to release accompanying software for the new surveillance equipment.

But in CarteNav's AIMS-ISR software, Cameron and his colleagues at the RNZAF found an innovative tool to close the technology gap. In December 2005, after fulfilling RNZAF procurement procedures, a deal was struck between the Air Force, CarteNav, and Marops Ltd., Cameron's NZ-based military aviation consulting and systems integration company, to tailor the software to the specifications of the RNZAF's P3 fleet. This development partnership would ultimately give rise to industry-leading software that has revolutionized both situational awareness, and the EO role.

The AIMS-ISR Approach: Less is More
"Focus on the end-user, eliminate clutter, and keep things simple so the operator can concentrate on his job."

John Garden, CarteNav's lead software developer, describes the philosophy that guided the development work of Carte-

Nav's employees, a tightly-knit group of engineers, software developers and retired military professionals. In use by EO operators since the launch of its first prototype in May 2003, AIMS-ISR has been continuously refined and tailored to client specifications.

"The software has already been in use on missions for hundreds of hours," Garden explains. "It's given us the opportunity to observe the EO operators at work, and design a program that caters to their needs."

A digital video application that integrates moving maps and other analysis tools as required, AIMS-ISR was specifically designed for military surveillance. The program integrates with existing aircraft tactical computer systems, eliminating the need for hardware or system upgrades.

"Our goal was to provide our clients with a commercial, off-the-shelf solution they can access today," Rick MacDonald says. "All you need to run AIMS-ISR is a laptop."

The software offers real-time integration of up to three EO video channels, recorded imagery, Geo-spatial Information System (GIS) overlays and sensor data including Radar, AIS contacts, GPS position, MAD contacts, etc. Currently, AIMS-ISR is the only known software in the world with this multiple-stream integration capability. Mapping and graphic overlays provide both the aircraft position and precise camera focus point and ground footprint using any mapping data. EO operators can enter notes and mark EO contacts on the AIMS-ISR map as they are observed. Meanwhile, video snapshots and aircraft position data can be transmitted to an operations centre and made available to the entire crew for real-time viewing. EO operators have full control of the digital video recorder controls, and can initiate in-flight playback with the simple touch of a display screen button. The playback function, which correlates and synchronizes all metadata, sensor data and imagery, also allows for a

highly detailed post-mission analysis.

According to Garden, one of the most important design challenges was providing the maximum amount of surveillance information in a simple, streamlined format.

“Operators don’t have time to deal with a complicated interface, or a cluttered screen,” Garden says. In keeping with this philosophy, the AIMS-ISR display screen is refreshingly simple: one primary map view and a three channel video display provide seamless correlation of aircraft position and camera view.

In creating a user-friendly tool that provides a comprehensive surveillance picture, AIMS-ISR helps operators achieve better mission results in less time. “Operators no longer have to calculate specific co-ordinates and enter them manually into a computer,” MacDonald says. “AIMS-ISR does this automatically each time they mark a contact.”

Understanding the Endgame

Key to the development of AIMS-ISR has been the cooperation between CarteNav staff and its development partners, Marops and the RNZAF. While thousands of miles and twelve time zones separated the New Zealand crew from its Canadian counterparts, the group was united in its mission to complete Project E30 - the Enhanced Early Electro-Optical System - as quickly and efficiently as possible.

Beginning in September 2005, the RNZAF began installing the MX-20 EO/IR system on the P3 to provide the Air Force with superior visual and infrared capabilities. However, to use the equipment to its full potential would require a full upgrade that would be another five years in the making - too long a wait given the increasing demands placed on P3 surveillance units globally. In AIMS-ISR, the RNZAF found the interim solution they were looking for. In early 2006, the Cartenav team began integrating, testing and evaluating its AIMS-ISR software on three P3 aircraft at Base Auckland’s Whenuapei airfield. AIMS-ISR accesses the MX-20 data through the 1553 bus, and interfaces to the RNZAF proprietary tactical data handling system.

Over the next four months, Cartenav and Marops staff spent days at the airfield, observing the software in use on the

RNZAF’s P3, making adjustments and improvements where necessary. In fact, the team spent so much time at Whenuapai that Rick MacDonald jokingly refers to it as his New Zealand home.

Marops Director Paul Cameron served as test director. In his 11 years with the RNZAF, Cameron accrued over 2,000 hours with the P3 fleet, on missions that included maritime surveillance and reconnaissance, exclusive economic zone patrol, anti-surface unit warfare operations as well as search and rescue. The experience rendered Cameron well poised to critically evaluate AIMS-ISR’s effectiveness.

After weeks of test missions, Cameron concluded the impact on situational awareness for both EO operators, as well as the entire crew, was significant.

“At a glance, the operator was able to establish where the MX-20 turret was looking and pointing, by referencing the MX-20 point to commonly used digital maps,” he says.

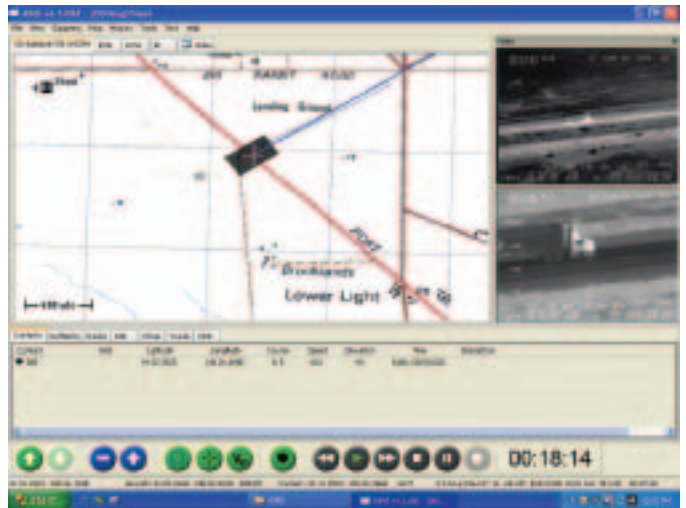
Furthermore, AIMS-ISR allowed operators to easily select a point over land or water and automatically slew the MX turret to the object.

Previously, Cameron says, operators often experienced difficulty in locating targets, or had to pass the positional information to the navigator in order to figure out where the turret was looking.

“We experienced a massive increase in crew situational awareness, combined with a much lower workload for EO operators,” Cameron says. “In addition, we found that targets were much more easily acquired.” AIMS-ISR installation was completed in June 2006, just in time for the RNZAF to participate in Exercise Neptune Warrior in Kinloss, Scotland. A training activity that provides joint and combined collective training for ships, aircraft and battle staffs from a number of nations in a multi-threat environment, Neptune Warrior was an opportunity for RNZAF crews to put AIMS-ISR to the test.

“The installation of AIMS-ISR on the P-3K aircraft is providing a significant increase in visual and infrared detection capabilities as well as providing a much higher level of Situational Awareness for our EO operators.” Flight Lieutenant Michael Bishop, Air Electronics Officer and AIMS project officer on No. 5 Squadron, RNZAF.

Cameron describes the AIMS-ISR installation as a success, enhanced by a sound working relationship with the Canadian team. “The CarteNav personnel were easy to work with, met all their time targets and delivered everything they promised,” he says. “The project would not have worked without the synergy between CarteNav, Marops, and the RNZAF.”



Screen shot of AIMS-ISR showing Moving Map Display and multiple video windows.

The Next Mission

With their New Zealand installation successfully completed, the CarteNav team is now looking to the future. In the spring of 2007, the company will complete AIMS-ISR installation on the P3 fleet of another military customer. With two AIMS-ISR “missions” successfully completed, MacDonald says CarteNav is focusing on its own post-mission analysis.

“AIMS-ISR is a work in progress,” he says. “We’re committed to improving the tool continuously.” For a company that prides itself on innovation, those are fine marching orders indeed.