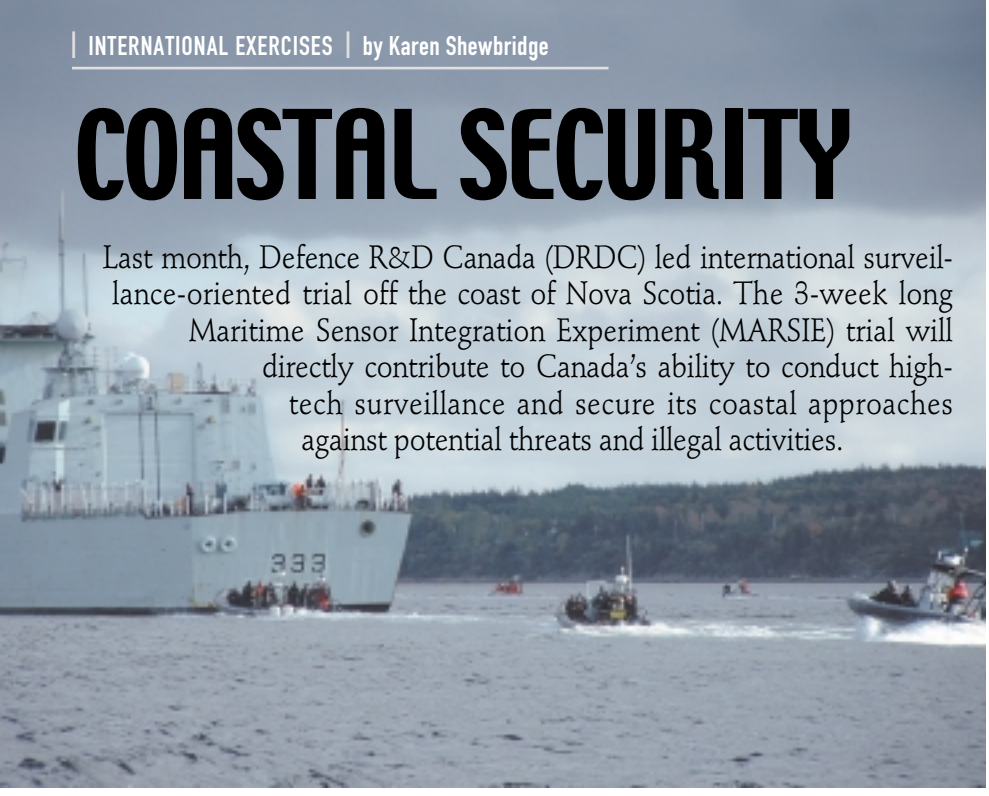
COASTAL SECURITY



Last month, Defence R&D Canada (DRDC) led international surveillance-oriented trial off the coast of Nova Scotia. The 3-week long Maritime Sensor Integration Experiment (MARSIE) trial will directly contribute to Canada's ability to conduct high-tech surveillance and secure its coastal approaches against potential threats and illegal activities.

One of the largest surveillance trials ever carried out in Canada, MARSIE will provide valuable data for scientists and authorities to evaluate surveillance technologies which will improve sensors and ensure effective marine security.

Several departments and agencies with responsibility for marine security for the Government of Canada, the United States and the United Kingdom, were involved in tracking a barrel (representing contraband) as it traveled from Liverpool, UK, to Chedabucto Bay, Nova Scotia.

"The international and inter-governmental collaboration was absolutely necessary to build the complete maritime security picture," says Commander Anthony Cond, head of the trial. "This also served as an excellent and productive opportunity for all the marine-oriented government departments to share ideas and to work together for a common security cause."

The Navy, Army, Air Force, RCMP, Canadian Border Services Agency, Canadian Coast Guard, Environment Canada, Fisheries and Oceans, and Transport Canada all cooperated as a team to plan this massive trial.

MARSIE took place under the auspices of The Technical Cooperation Program (TTCP), which has initiated a program to test various near-term experimental sensing technologies alone and in concert with existing maritime investigation, reconnaissance and surveillance (ISR) assets in order to evaluate their contribution to the improvement and automation of the Recognized Maritime Picture (RMP).

The simulated contraband was placed on a container ship that left Liverpool and traveled across the Atlantic Ocean. It was dumped off the coast of Newfoundland where it was collected by a fishing trawler, and then transported to Nova Scotia and handed off to a smaller, shore-bound craft in Chedabucto Bay. The RCMP Emergency Response Team, together with the Coast Guard, then boarded the vessels to test boarding techniques.

The exercise was carried out three times while being observed by a multitude of land-based surveillance-oriented sensors, several marine vessels and patrol aircraft. "The data that we now have from the trial will be applied to our research projects so that we are developing the right technology for the most effective recognized maritime picture," says Dr. Ross Graham, Director General, DRDC Atlantic. "The results of this trial will directly contribute to improved marine security."

The data will be analyzed to determine the most efficient use of the new and existing reconnaissance and surveillance sensors for national security purposes, including the Marine Security Operations Centres (MSOC) project.

Various sensors, both operational and experimental, followed the progressive simulated activities in the North Atlantic and the Canadian coastal area.

Monitoring the trial from undersea were experimental sensors such as DRDC's *Stealth Buoy*, which is designed to lie on the ocean floor until it rises to the surface in response to a sound, such as the noise of a ship's propeller. The buoy monitors an area within a kilometre or two of its placement, transmits data and then returns to the ocean floor to wait for the next event. The *SLOCUM Glider*, a self-propelled underwater gliding vehicle that can support a wide range of acoustic and non-acoustic sensors, also carried out surveillance during the trial.

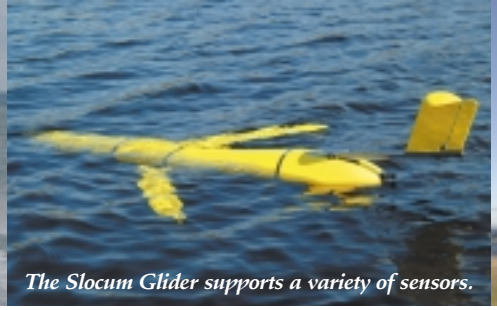
Several vessels collected data from an Automatic Identification System (AIS). The system provides information that is difficult to determine with conventional sensors, such as the vessel's name, call sign, destination, dimensions and cargo. It has great potential to supplement traditional sensors. Of particular interest during the trial was the fusion of AIS data with other sensors.

HMCS *Toronto*, provided two different radars that provided positional information of the vessels in its vicinity during the exercise. The Canadian Coast Guard surveillance system received data from their Surveillance Radars in near real-time, to build the tactical RMP as well.

Several shore-based sensors were employed to monitor activity around Janvrin Point, Chedabucto Bay. These included the new Infrared (IR) Eye, out of DRDC Valcartier, that is based on the human eye and simultaneously uses two fields of view to optimize area coverage and detection/identification capabilities. The trial also included the Enhanced Low Light Visible and Infrared Surveillance System (ELVISS), which is tailored to conduct surveillance in poor visibility. To monitor activity around Janvrin Point, the *Accipiter® Radar* was used. This is system is designed for homeland security and wide-area surveillance applications. It is network-enabled to support unattended operations and land-based networks for multi-sensor integration. The new capabilities associated with these sensors will be analyzed and compared to the Coyote LAV that uses radar and photo imaging to create a local ground picture.

The longest-range shore-based sensor was the HFSWR, a long-range surveillance radar that detects and tracks vessels, icebergs and aircraft beyond the horizon over a conductive sea surface, providing information on low-altitude and surface targets on a real-time basis.

RCMP Emergency Response Team (ERT) moves to intercept.



The Slocum Glider supports a variety of sensors.

The trial compares new technologies to information generated by sensors on this Coyote.

The trial was monitored from the air by several surveillance assets, such as the *Silver Fox*, a mini Unmanned Aerial Vehicle with an Electro Optical camera. Air surveillance was required to determine the vessels' course, speed and position, and observe the shore-based activity.

The Provincial Airlines (PAL) *King Air Search* radar, sponsored by Fisheries and Oceans Canada, was also used to track vessels. Data was collected from AIS-equipped vessels to the information system aboard the aircraft, and transmitted to the operation centre in near-real time.

The CP-140 Aurora aircraft used a standard suite of sensors to build the RMP in near real-time. The long-range maritime patrol aircraft, equipped with a surface search radar, conducted a surface plot in the assigned area that allowed them to find contacts to be visually identified and digitally photographed. Also in the air, the Royal Air Force (RAF) flew the Nimrod maritime patrol aircraft to perform surface surveillance of the container vessel after it had departed its European port.

The CASI-550 Hyperspectral sensor for HYperspectral iMage EXploitation (HYMEX) provided the newest sensor technology at the trial. This is a daytime sensor that can be used to identify ships and floating targets such as contraband or search rescue targets.

The CV-580 C-band Synthetic Aperture Radar, polarimetric radar system was flown by the Environment Canada Convair-580 and is capable of emulating the future Radarsat-2 sensor capabilities. It is also capable of generating polarimetric radar imagery that permits the detection of vessels and the specific radar response that could be used for vessel classification. While it emulated a future space borne capability, current space-based assets were also used during the trial. Canada's satellite RADARSAT-1, and the European Space Agency's Envisat radar system collected radar imagery of large areas of the ocean to provide a true picture of conditions at sea.

Other technology participants included the new Commander Tactical Picture Compiler. The *COMMANDER C3* is Thales Systems Canada's newest Marine Command, Control and Communications System. During the trial, it provided seamless near real-time sharing of the Common Operating Picture, contact data, messages and geo-referenced map overlays between vessels and shore installations. It also demonstrated real-time interoperability by providing a gateway from the Janvrin Point trial area to the operations center in Halifax, using naval data link standards.

A United States Coast Guard (USCG) General Campaign Analysis Model was adapted for use with Canadian Forces areas of operations to support analysis of existing and new technologies. The simulation model established baseline operations to allow investigation of the impact of new technologies at the tactical level.

Canadian Forces air and surface assets were modeled to conduct daily operational missions throughout the entire MARSIE trial area. Concepts of operations and tactical rules were also modeled to guide Canadian Forces and violator interactions and to collect operational measures of effectiveness for quantitative comparative analysis.

The Multi-Sensor Integration within a Common Operating Environment project, MUSIC, investigated automated methods to combine surveillance data. This unique method of data fusion creates an enhanced RMP without increased personnel requirements or workload.

Since September 11, 2001, national security has become an important emphasis for the Government of Canada. With the longest coastline in the world, Canada is working on fusing more complex intelligence and surveillance information to ensure that our marine security measures reflect more accurate, comprehensive intelligence, surveillance and reconnaissance methods.

The MARSIE trial has been a successful part of the TTCP and the emphasis on national security and the protection of our coastline. It will provide important data for analysis and will greatly contribute to the collaborative use of existing and high-tech experimental sensor technology to prevent illegal acts off Canada's coast and enhance Canada's future marine security. FL

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