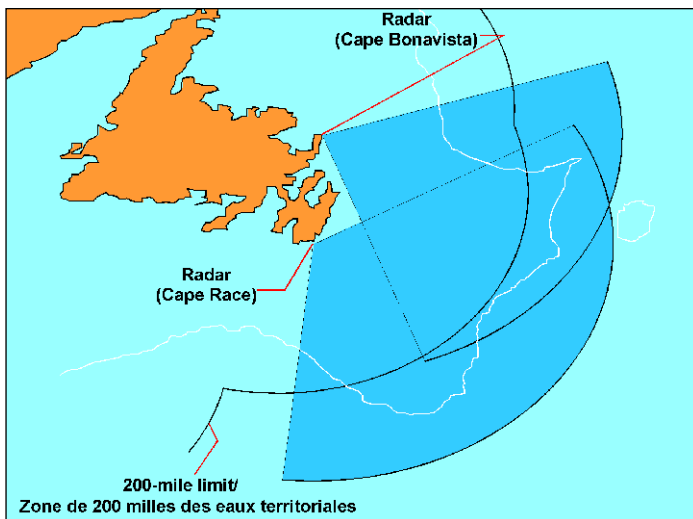


## HFSWR: High Frequency Surface Wave Radar

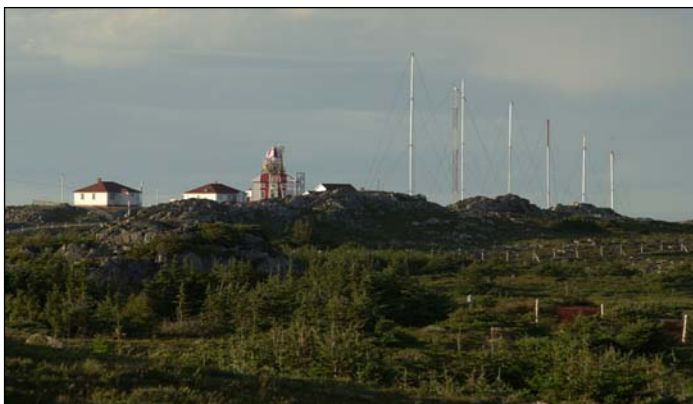
Microwave radars detect targets that are within the line of sight. Because of the curvature of the earth, low-altitude and surface targets promptly drop below the horizon for most ground-based microwave radars. High-frequency surface-wave radar (HFSWR) is a technology that can overcome this limitation. Surface waves propagate efficiently for vertical polarization over a conducting surface. Consequently, over-the-horizon application of HFSWR is practical for coastal installations where the ocean surface serves as the conductor. The Canadian HFSWR technology has been developed through the combined effort of scientists and engineers of DRDC Ottawa and Raytheon Canada Limited (RCL) over more than a decade. The R&D effort on this technology culminated in a collaborative technology demonstration project between DRDC Ottawa and a Canadian Industry consortium led by RCL (with partners Northern Radar Systems Limited and Stratos Global Networks). Two HFSWR systems were built. One was installed at Cape Bonavista, the other at Cape Race, Newfoundland. These two radars have completed a successful operational evaluation (OPEVAL) trial in 2002.



East coast HFSWR coverage



Receive antenna array



Transmit antenna array

### HFSWR as a new sensor for a common operating picture

The Navy considers the results of the OPEVAL very positive in the HFSWR's potential for enhancing the Recognized Maritime Picture (RMP) and common operating picture (COP), surveillance tools for the Canadian Forces (CF). The Navy is in the process of taking over the two HFSWR installations and operating them as part of its maritime surveillance sensor suite. The HFSWR provides information on low-altitude and surface targets within its surveillance area on a real-time basis. Tracks of detected targets will be sent to the Operation and Control Centre (OCC) from the radar sites via communication links. Besides providing tracks of vessels, icebergs and aircraft, the radar data are processed to extract information regarding the conditions of the ocean surface, for example, the height and direction of waves. This

# HFSWR: High Frequency Surface Wave Radar

information has until now been collected by long-range patrol aircraft and from reports sent by surface ships. As a result the monitoring of the coastal regions within the economic exclusion zone has been both spotty and costly. The introduction of this new sensor promises to provide more timely surveillance data to Maritime Command. The continuous surveillance data provided by the HFSWR make it possible to associate contacts from dissimilar sensors and form composite tracks. This enhances Maritime Command's ability to manage and exploit raw sensor data.

## Maritime Security Initiatives

In 2003 Canada announced the maritime security initiatives. There is a provision of a \$45 M funding to procure a network of HFSWR that oversees the east and west coasts. DRDC Ottawa, working closely with the Operational Research Directorate, is providing support for the site-selection process for these radars. The DRDC Ottawa transportable HFSWR facility, operated by RCL,

was deployed in 2002 at Andros Island, Bahamas under the sponsorship of the U.S. Drug Enforcement Agency (DEA) for encounter-smuggling, encounter-drug applications. It demonstrated an excellent ability to detect small fast boats and low flying aircraft. In 2003 this system was deployed at Key West, Florida, for trials sponsored by the U.S. Coast Guard. Further trials by other U.S. agencies are being planned. DRDC Ottawa is providing support through analysis of the trial data and continuing research in the suppression of ionospheric clutter to further improve the radar's performance. DRDC Ottawa is also exploring other applications for the HFSWR technology.

## Potential Users

Potential users of HFSWR systems include DND, the Canadian Coast Guard, and the RCMP. In addition, the oil industry, which operates offshore drilling platforms in the North Atlantic, is interested in monitoring iceberg movement and current direction. HFSWR has the capability of providing this information.



IMG-1258



IMG-1173

DRDC Ottawa's transportable HFSWR deployed at Andros Island, Bahamas

## Benefits to Canadian Industry

Because Canadian industry has been involved from the beginning, they are in a good position to capitalize on the technology to develop commercial products. The potential international market for sales of such systems is considerable. Navies of many maritime nations have made inquiries about this technology.

The two radar facilities in Newfoundland provide an ideal proving ground for further refinements to the radar and a place to showcase the technology to potential customers.

## Business Opportunities

Access to this technology is available to government departments, allied nations, industry and academia through a variety of business models. For information on collaboration, partnering, fee-for-service and technology transfer opportunities please contact the Business Development Office.

## Technical Inquiries

Head, Radar Systems Section  
Email: [RS-SR@drdc-rddc.gc.ca](mailto:RS-SR@drdc-rddc.gc.ca)

(613) 998-2218

## Business Inquiries

Business Development Office  
Email: [collabo-ottawa@drdc-rddc.gc.ca](mailto:collabo-ottawa@drdc-rddc.gc.ca)

(613) 998-2203

## Defence R&D Canada – Ottawa

3701 Carling Ave., Ottawa, Ontario K1A 0Z4  
Phone: (613) 998-2127 Fax: (613) 998-2675  
Email: [info-ottawa@drdc-rddc.gc.ca](mailto:info-ottawa@drdc-rddc.gc.ca)  
Web site: [www.ottawa.drdc-rddc.gc.ca](http://www.ottawa.drdc-rddc.gc.ca)  
Fact Sheet RS-SR 211

©DRDC Ottawa March 2005