



Defence Research and
Development Canada

Recherche et développement
pour la défense Canada

Canada

DRDC OTTAWA

Defence Expertise Across the Spectrum



DRDC Ottawa is the leader in Defence R&D Canada for defence technology related to electromagnetic sciences. Our expertise includes radio frequency communications, sensing and electronic warfare, network information operations, space systems, synthetic environments, and radiological and nuclear defence. Our mission is to meet the S&T needs of the Canadian Forces.

We are one of six research centres within Defence R&D Canada, an agency of Canada's Department of National Defence. Combining scientific expertise, unique experimental facilities and strategic alliances, we work to advance Canada's S&T innovation for national security and defence.

“ *The Canadian Forces must be effective, relevant and responsive, with the ability to address threats both at home and overseas. The CF will be a transformed military, with the right capabilities, the right equipment and operational structures and leadership to perform effectively in demanding operations.* ”



The Science of Canadian Defence

STRENGTHENING CIVILIAN SAFETY AND PUBLIC SECURITY

The current security environment has brought a faster pace of international military commitments for the Canadian Forces as well as an increased threat of terrorist attack on Canadian soil.

DRDC Ottawa responds to this very challenging environment with advanced technical solutions to strengthen Canada's counter-terrorism efforts and protect our citizens, infrastructure, and way of life. As part of the science branch of Canada's Department of National Defence, we know the Canadian Forces and understand their needs. Our technologies help to protect Canadian personnel both at home and abroad.

Our expertise covers the spectrum – from R&D to support military operations to advice on defence policy

and procurement to assessment of emerging trends, threats and opportunities. We work with military forces from concept and research right through to deployment in the field.

With more than 60 years' experience in defence R&D, we have a strong international reputation built on established partnerships with Canada's defence industry, government, academia, NATO allies, and The Technical Cooperation Program (TTCP).

We offer a unique array of testing facilities and laboratories at our campus in Shirleys Bay, Ottawa. Working with energetic partners, we aim to strengthen Canada's defence industry by turning innovations into leading-edge commercial products.

Electronic Warfare



COMMUNICATIONS AND NAVIGATION

Advances in wireless communications create new opportunities and new risks for national security. DRDC Ottawa researches and develops military and civilian technologies for mobile communications. We design tactical systems that detect and locate radio emissions and improve situational awareness on the battlefield. We work to keep the Canadian Forces at the leading edge in wireless and mobile communications for military operations. We also develop techniques to protect and defend military and civilian use of GPS systems.

Detecting enemy signals

Today's conflicts demand advanced technologies for radio surveillance. The Military Digital Analysis System (MiDAS) can rapidly detect and locate radio transmitters on the battlefield, including those using sophisticated modern communication systems. MiDAS uses commercial off-the-shelf antennas, tuners and digitizers in concert with the Windows 2000 operating system for cost-effective and flexible situational awareness.



Protecting GPS against attack

The vulnerability of GPS to electronic attack threatens its growing use for military and civilian navigation. DRDC Ottawa works with military partners on techniques to protect GPS systems and on assessing adversary susceptibilities. We provide advice and develop technologies for both military and civilian use.

RADAR

Providing effective security against coastal and ground-based threats depends, in part, on the rapid and accurate analysis of radar signals. **DRDC Ottawa** works on advanced radar detection and analysis systems for the Canadian military. We also design radar jamming techniques. We also design radar jamming techniques and develop electronic support measures systems to meet specific needs, such as the payload limits of unmanned aircraft.

Our system for measuring the radar signature of ships – currently in use by the Canadian Navy – and our expertise in signature prediction could influence future ship design to minimize radar return. We also study measures to harden and protect electronic systems from high-power microwaves and electromagnetic pulses caused by small munitions.



Telling friend from foe

The growing agility and similarity of radar signals often make it impossible for pilots and their crew to distinguish friendly radar emitters from potential threats. The Intentional Modulation on Pulse unit (IMOP) helps electronic warfare systems to quickly identify and classify radar sources. IMOP detects the intentional modulations within individual radar pulses and uses them to identify the source that is generating the signal.

Sharpening a ship's situational awareness

As ships face stealthier and faster anti-ship missiles and more hazardous coastal operations, operators must quickly assess threats and make tactical decisions. The Shipboard Integration of Sensors and Weapon Systems (SISWS) technology combines input from multiple sensors and cameras to create an integrated picture that the operator can easily understand. The system also cues both sensors and weapons systems to engage a defensive tactic, such as dispensing chaff, transmitting jamming electronic signals or launching a missile.



Radiological and Nuclear Defence

Many counter-terrorism efforts are focusing on the potential risk from radiological dispersal devices (“dirty bombs”). For decades, DRDC Ottawa has helped the Canadian Forces to improve radiation detection, assess radiation dose and develop medical treatments for human exposure to radiation. We are working with government partners to develop a strong emergency response plan for Canada in case of nuclear or radiological attack.

TRACING RADIOACTIVE “FINGERPRINTS”

DRDC Ottawa is designing a portable detector that can trace the signature left by radioactive sources on materials such as brick, concrete, cement or sand. The technology – called forensic Optically Stimulated Luminescence (OSL) – could help law enforcement officials to prove that radioactive materials were once stored in the garage, basement or car trunk of a suspected terrorist.



KEEPING RADIATION AT ARM'S LENGTH

Conventional techniques for detecting radiation require placing a device in the radiation field – usually in the hands of a human operator. New standoff detection techniques can measure contamination indirectly by sensing the effects of radiological agents on the surrounding air. These techniques will make it possible to map a contaminated area while keeping the operator at a safe distance from the radiation field.



Radar

DRDC Ottawa's international reputation for radar technology began with our breakthrough work in synthetic aperture radar (SAR) in the 1970s. Since then, we continue to develop advanced radar systems – from surveillance radar for manned and unmanned aircraft to future capabilities such as through-the-wall surveillance and tracking of ground vehicles from space. We exploit the potential of modern radar systems to more accurately detect and classify targets from a safe distance. We also integrate data from disparate sensors for a better understanding of the big picture.

PEERING OVER THE HORIZON

Protecting Canada's more than 200,000 km of coastline is a growing priority. However, the curvature of the Earth limits the range of most ground-based radar to about 50 km from shore. High-Frequency Surface-Wave Radar (HFSWR) solves this problem using a long wavelength signal that travels along the ocean's surface. HFSWR can track ships up to 400 km from shore, offering broad and continuous coastal surveillance. The system is now in use on Canada's East Coast.

SHARPER SURVEILLANCE ON LAND AND SEA

Canada's coastal patrol aircraft – the CP-140 Aurora – performs multiple roles, from maritime patrol to coastal and land surveillance. Spotlight Synthetic Aperture Radar (SpotSAR) is a flexible radar system for the CP-140 for imaging ocean and land targets. High resolution images allow the CP-140 to classify unknown ships from a safe distance. A new version will be installed on Canada's entire fleet of CP-140 aircraft.

SEEING THE BIG PICTURE

With rapid advancements in radar technology, it's now possible to detect moving objects on the Earth's surface from satellites or aircraft. But using this complex tracking data to make rapid tactical decisions can be a challenge. Using simulated data from a theoretical system of Earth-orbiting satellites and actual data from airborne systems, DRDC Ottawa showed how detections of moving targets from various sensors can be displayed on a map or satellite image of the geographical area. The result is a unified real-time picture that can be shared over a coalition network.



Synthetic Environments

As public security plays a growing role on the world stage, Canada must close the gaps between today's military capabilities and the needs of tomorrow. DRDC Ottawa performs modelling and simulation that can predict the best value of future military capabilities today. We support technology development from concept to experimentation to demonstration. Our tools for mission rehearsal and training allow military personnel to practice using technologies that are still in development. We offer flexible solutions that are interoperable with other government departments – both now and in the future.



LOOKING INTO THE FUTURE

Canada's military is evolving to meet changing needs in everything from airlift and sealift capability to strategies for neutralizing biological warfare agents. DRDC Ottawa supports this process with the Collaborative Capability Definition, Engineering and Management (CapDEM) project. CapDEM will demonstrate the concept of capability engineering, which brings science and rigour to the process of developing future military capabilities. The result is a technology roadmap that is agile and responsive to changes in the defence environment.

SUPPORTING MISSION REHEARSAL

Unmanned aircraft could help strengthen Canada's maritime patrol and better protect our coastlines against illegal activities. DRDC Ottawa's simulation expertise helped the Canadian Forces (CF) to safely rehearse unmanned flights before the aircraft even left the ground. Pilots remotely flew a simulated version of the actual aircraft over modelled terrain and practiced tasks such as searching for a ship or a piece of debris. The experiment helped to reduce risk and to determine the type of aircraft needed to meet CF needs.

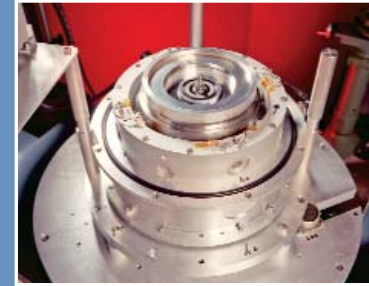


Space Systems

DRDC Ottawa's expertise in radio communications extends back to Canada's first satellite – the Alouette I – launched in 1962. This early success led to strong programs in satellite communications and remote sensing. Today, we help Canada to develop space technologies ranging from space-based radar architectures to micro-satellite technologies for space-based surveillance to advanced satellite communications systems.

STREAMLINING ATTITUDE CONTROL FOR SATELLITES

Traditional attitude control for spacecraft uses multiple components for sensing and controlling movement. The GyroWheel – a momentum wheel for inertial control – combines the functions of three reaction wheels, the wheel drive electronics, a two-axis gyroscope and a separate processing node. This technology could make future satellites smaller, cheaper and more power efficient. The GyroWheel has been launched on Canada's SCISAT-1 scientific satellite.



HELPING NORAD TO TRACK SATELLITES AND ORBITAL DEBRIS

DRDC Ottawa is supporting Canada's upcoming space surveillance system, called SAPPHIRE, which will launch a satellite to monitor man-made objects and space debris. Using images taken from telescopes in Kingston, Suffield and Valcartier, our space surveillance laboratory is developing detection algorithms and ensuring that the satellite data meets the technical specifications required to contribute to NORAD's space surveillance network, which tracks more than 10,000 objects each day.

ADVANCED SATELLITE COMMUNICATION (SATCOM) TECHNOLOGY

In response to the military's need to replace older hardware-based communication radios with versatile software defined radios (SDR), DRDC Ottawa is developing an SDR technology for satellite communications. The SatCom terminal will combine the functions of four or more separate terminals into one, reducing cost and time for upkeep and replacement. In the future, this could lead to a family of next generation SatCom technology for the Canadian Forces.



Network Security and Information Operations

The world is seeing an explosive growth in digital information networks for military and commercial operations. DRDC Ottawa provides sound scientific solutions for the security and integrity of computer networks. Our research areas range from biometrics – with a focus on fingerprint, facial and voice recognition – to technologies for secure mobile networking, such as the use of handheld wireless devices for secure communications.



FOR YOUR EYES ONLY

Until now, communicating with allies while protecting sensitive national information required physically separate computer networks. Secure Access Management for Secret Operational Networks (SAMSON) will integrate advances in areas such as identity management, security policy and labelling of information into one flexible and secure network. The system will allow multiple “need-to-know” access compartments for everything from e-mail and chat sessions to documents and databases. In the future, SAMSON could help government to protect the privacy of personal information.

DEFENDING COMPUTER NETWORKS AGAINST ATTACK

Modern military forces rely on computer networks in all phases of a mission – from intelligence gathering to operational planning to time-critical decision making in the field. The Joint Network Defence and Management System (JNDMS) is an integration, analysis and monitoring system that provides network situational awareness for computer network defence. The JNDMS is focused on providing better situational awareness to decision makers in a more timely fashion.



Working with Us

In addition to our traditional role supporting the Canadian Forces and public security, DRDC Ottawa works with other government departments, allied nations, academia and the defence industry. We can help you to meet your defence technology needs in research and development, field applications and operations, consulting services or technology partnerships and licensing.

We have several research programs that support the development of innovative technologies for defence and civilian use. Our business models cover the spectrum from full cost recovery to shared costing relationships to in-kind contributions.



BELOW ARE SOME OF THE WAYS YOU CAN WORK WITH US.

Collaboration: We can work with multiple partners to pool knowledge and facilities as well as share costs to increase access to resources.

Facilities leasing: Clients with technologies under development can take advantage of our unique, world-class facilities and staff expertise.

Consulting: Our scientists offer advice on customizing technologies to meet specialized needs of the Canadian Forces or defence industry.

Technology transfer: We transfer developed technologies to companies that are ready to take innovative solutions to market.

We're Open for Business

DRDC Ottawa helps companies connect to new technologies and provides technical support to take innovations from concept to R&D to working systems. We're looking for energetic business partners interested in working with us to turn defence innovations into leading-edge commercial products.

Extend your reach – Connect with other government departments, universities, international allies and the Canadian defence industry.

Share risk and cost – Explore opportunities for collaborative ventures and funding options to meet your needs.

Profit from experience – Take advantage of our world-class facilities and wealth of expertise in defence science.

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