Assured near real-time access to high-value synthetic aperture radar satellite imagery and geospatial information products

MDA offers rapid access to all-weather imagery and surveillance information for a wide range of civil, commercial, and defence applications. MDA has extensive experience in successfully delivering near real-time information solutions for complex and demanding operational support. This has made MDA the primary source of geospatial solutions for the Defence and Security, Oil and Gas, Mining, Disaster Management, Natural Resources, Aviation, and Agriculture markets.

RADARSAT-2 is a mission designed from the beginning to be responsive to end user needs and serve operational applications that require rapid delivery of newly-acquired data. Data processing and delivery timelines have been continually reduced to be able to provide data to users as fast as less than one hour. RADARSAT-2 has a huge imaging capacity allowing each user access to data with a reduced chance of conflicts between users.

MDA operates the largest global network of ground receiving stations of any SAR mission. These RADARSAT-2 Network Stations provide the fastest access to SAR data and give Network Station operators expanded control and privacy over the exploitation of their data. RADARSAT-2 Network Stations build on the very successful RADARSAT-1 Network Station program and the systems are the latest progression of MDA’s 30-year evolution of multi-sensor ground stations.
Defence and Security

Maritime Surveillance

MDA offers multi-sensor Maritime Domain Awareness and threat detection solutions for maritime security organizations worldwide. MDA provides navies, coast guards, customs, law enforcement, and fisheries agencies with immediate access to global areas of interest, using the near real-time broad area capabilities of RADARSAT-2 and other available sensors. Available through a variety of delivery models, MDA's Maritime Surveillance solutions include information and tools to help customers detect potential threats including foreign naval vessels in or near territorial waters, suspected pirate ships, potential terrorist threats on inbound vessels, illegal fishing, bilge dumping, and the trafficking of illegal goods by sea. These solutions are available as satellite imagery, as direct data feeds into existing systems or via MDA BlueHawk, MDA's turnkey web-based maritime information solution.

Integration of RADARSAT-2 data together with AIS and the vessel registry database allows for the automatic identification and flagging of Vessels Of Interest (VOI).

Intelligence and Reconnaissance

MDA is a leading international provider of turnkey intelligence and reconnaissance solutions that address the information and operational needs of defence and security customers. MDA's solutions are used by decision makers to safeguard national security and monitor targets of interest. MDA's solutions are deployed globally, seamlessly collecting and fusing a broad range of space-based sensor data that allows maritime customers to quickly monitor any area of interest, ranging from a single port to coastal approaches on the open ocean. On land, military and law enforcement operators can monitor vast areas far beyond the range of EO/IR cameras, and MDA's solutions enable airborne or ground system operators to detect and track moving vehicles in real time. MDA's heritage in satellite and airborne sensor design, data collection and processing, and information delivery allows customers to immediately realize the benefits of near real-time situational awareness.

Graphic shows how high-resolution optical and SAR data can be used in combination to provide vital intelligence data (including cloud-covered days).
MDA Oil Tracker is a suite of services that support incident response efforts, proactive monitoring of offshore operations and support for regulatory requirements. MDA Oil Tracker provides rapid delivery of accurate oil on water analysis using commercial SAR satellites, including RADARSAT-2 and others. MDA's operational control of RADARSAT-2 provides customers extremely flexible and timely imaging and analysis anywhere in the world with industry-leading service reliability. MDA Oil Tracker delivers GIS-ready information along with overview reports suitable for senior management and regulatory reporting. MDA Oil Tracker programs can integrate with other maritime security and traffic information and with metocean data streams to provide enhanced maritime domain awareness distributed to field sites and regional or global management teams.

MDA's Surface Movement Monitoring for oil and gas operations supports production and health, safety, and environmental (HSE) monitoring of enhanced oil recovery (EOR) and carbon capture and storage (CCS) activities. Using proprietary highly-accurate InSAR techniques, MDA's experienced oil and gas operations team identifies and reports surface heave and subsidence. MDA's customers, including those operating at sites that MDA has monitored for over 10 years, utilize the surface movement information to optimize injection/production ratios, identify potentially dangerous heave/subsidence conditions, and fulfill regulatory reporting obligations related to surface integrity. MDA's surface movement monitoring is a turnkey service providing GIS-ready information products for reservoir engineers and other specialists to easily integrate into operational workflows. MDA's InSAR processing and analysis R&D drives leading edge solutions used operationally around the world.

Energy

Offshore Oil Monitoring

Surface Movement Monitoring

Oil Tracker monitoring provides broad area offshore situational awareness, giving operators insight into oil on water from all sources in all weather conditions.

The image above shows MDA's InSAR product capability of detecting millimetre-level changes in surface movement. Surface movement is a prime indicator of changes in caprock integrity.
MDA IceView is a suite of monitoring programs that support operations involved in planning, exploration, development, and production of arctic offshore oil and gas resources. MDA provides high repeat coverage over Arctic areas using C-band SAR satellites specifically designed for year-round ice monitoring and analysis. Combining the capabilities of RADARSAT-2 with MDA’s reliable and rapid delivery of specialized ice imagery and derived products, MDA IceView services are in high demand by key oil and gas players in the US, Canada, Greenland, Russia, and the Caspian Sea. MDA IceView’s At Sea and IceView’s Planning and Operations services provide both strategic and tactical imaging with customized deliverables for key Arctic constraints (e.g. shore-to-ship imagery sharing). These turnkey services provide GIS-ready information products and integrate into operational maritime systems. MDA’s 30 years of working in the Arctic and dedicated ice monitoring R&D keep MDA IceView on the leading edge of northern offshore monitoring.

MDA leverages the advantages of both synthetic aperture radar (SAR) and optical satellite imagery to address the asset security needs of oil and gas producers and explorers worldwide. MDA routinely supports critical health, safety, and environmental (HSE) needs in assessing flood extents and impacts, locating vessels that pose a threat to offshore operations, monitoring geotechnical hazards and encroachment for pipelines, understanding natural seep behavior and illegal bilge dumping around operating assets and others. MDA’s operational flexibility and control over RADARSAT-2 provide effective near-real time information product delivery worldwide. MDA exploits the ability of a variety of SAR satellites to provide information day or night in any weather and leverages high-resolution optical imagery where additional visual detail is required. From individual events to long-term monitoring for hazards and flood potential, MDA has a track record of success in providing valuable information in times of urgent need.

MDA’s Ground Cover Variability Index combines the output of various satellite systems and other sources of information to provide a comprehensive understanding of the ground conditions affecting a pipeline. MDA’s unique combination of information retrieval from multiple sensors and multiple types of information from radar data provides more usable information to our clients. MDA’s Ground Cover Variability Index combines ground movement, vegetative change, and land use change from satellite radar with optical imagery and other geotechnical information.
# Mining

## Surface Asset Monitoring

MDA’s Surface Asset Monitoring (SAM) solution provides routine, reliable wide-area, space-based monitoring of mining operations on a global scale. MDA’s Surface Asset Monitoring focuses on delivering information about the movement of key mining assets, focusing on pit walls, tailing dams, waste piles, surface assets and third party infrastructure. MDA delivers detailed surface movement information for mine geotechnical teams along with high level summary reports for management and regulators. The monitoring reports identify areas of movement for investigation by the site geotechnical team that can be early indicators of future failure. These regular reports allow mine managers to proactively manage potential risk while ensuring corporate users have operational insight across their mining portfolio.

## Mine Closure and Mine Legacy Monitoring

There are many potential environmental or physical hazards associated with operational, closed, or abandoned mines. While many mines were far removed from populated areas, increasing urban expansion has led to developing communities and infrastructure on top of abandoned mine sites. MDA’s Mine Closure and Mine Legacy Monitoring solution uses proven and reliable InSAR–based remote sensing technology to cost-effectively monitor decommissioned or abandoned mine sites with millimeter-level accuracy. Delivered as a series of quarterly reports, MDA’s Mine Closure and Mine Legacy Monitoring solution delivers an accurate, cost-effective, easily interpreted overview of the state of the mine site, ensuring a greater understanding of the post-mining infrastructure sub-surface. This solution is suitable for both ad hoc analysis and long-term site monitoring to meet all regulatory, environmental, security and operational needs.

### MDA has developed the Homogeneous Distributed Scatterer (HDS) algorithm to increase the accuracy of InSAR monitoring. It provides a dramatic increase in spatial resolution points for both mixed terrain and sparse vegetation environments. HDS incorporates full scene phase modeling to counter atmospheric errors.

### This InSAR/CTM image is from an abandoned mine monitoring project in Ontario, Canada. The red targets identify areas which are related to past mining methods. All areas are provided with detailed ground movement time series profiles.
Aviation

Airport Mapping

MDA has a long history of providing high-quality Airport Mapping Databases (AMDBs) for international civil and military aviation markets. AMDBs are developed to international standards including RTCA DO-272 and DO-200. Employing Earth Observation techniques that include satellite imagery and aerial photography, MDA collects accurate aerodrome information and constructs geospatial databases that meet the quality and accuracy requirements for airports around the world. Airport authorities use AMDBs to optimize taxi routes, maximize flow efficiency and minimize runway incursions. MDA tailors its AMDBs to create high-resolution airport maps for overlay in surveillance systems and in cockpit displays for aircraft operators. These in cockpit Electronic Flight Bags are essential tools for increasing safety, by providing pilots with improved situational awareness. Airport operators recognize the operational advantages of an accurate geo-database of their assets that can be used for construction, security planning and submission of aeronautical data to national aviation authorities, or as supplements to ground surveys.

Obstruction Mapping

MDA has developed an innovative, cost-effective method for civil aviation authorities to conduct airport surveys that meet geospatial information requirements for government and the International Civil Aviation Organization. MDA’s Electronic Terrain and Obstacle Data (eTOD) enables aviation authorities and flight procedure designers to increase safety, efficiency, and reduce operational costs, while meeting regulatory compliance requirements. Integration with MDA’s Flight Procedure Designer allows users to optimize the amount, location and accuracy of the data they collect. MDA employs the highest resolution commercial imaging satellites, as well as pictometry and conventional aerial photography, LiDAR, and external datasets to obtain data for aerodromes and their surrounding areas to minimize impact on airport operations.

Up to date high resolution and accuracy airport maps are produced to DO-272/D-200 standards for incorporation into surveillance systems like ADS-B and airport moving maps displays on EFBs.

MDA’s airport obstruction mapping solutions are used in airport design and flight procedure development.
### Natural Resources

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<th>Illegal Fishing</th>
<th>Ice Monitoring</th>
<th>Forest Monitoring</th>
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<td>MDA provides solutions to maritime agencies responsible for detecting illegal fishing activities. Illegal fishing causes significant harm to a country’s GDP by stealing fish from legitimate and properly managed fisheries. MDA’s proven solutions for illegal fishing combine SAR-enabled monitoring of large, remote areas with identification of suspicious ships using SAR-based ship detection and AIS. Routine monitoring and near real-time data allows for immediate response. Maritime agencies become more effective by putting limited resources into action only when suspicious activity warrants intervention. Using RADARSAT-2, customers are able to detect vessels in restricted fishing areas, intercept and prosecute offenders, and ultimately reduce illegal fishing activity.</td>
<td>MDA IceView is a powerful suite of historical and near real-time ice monitoring and forecasting products that improve safety, and enable the cost-effective operation of offshore platforms and vessels in environmentally challenging, ice-infested regions of the world. MDA IceView leverages the strengths of RADARSAT-2 and provides the best available ice discrimination and feature classification capabilities. MDA IceView delivers near real-time ice mapping and monitoring, historical ice condition analysis and reporting and near real-time operational support. For customers operating in demanding arctic conditions, MDA’s operational experience and complete control of the supply chain ensures that information is dependable and reliably delivered when and where it is needed.</td>
<td>MDA’s forest monitoring service provides a disruptive new capability for monitoring illegal logging and deforestation. Using RADARSAT-2 and proprietary change detection techniques, MDA can provide accurate detection of clear cuts, selective logging, and natural forest degradation for any area in the world. RADARSAT-2’s unique wide-area beam modes and its ability to see through cloud enable it to routinely monitor entire regions, consistently detecting changes that are not picked up by other methods. A subscription to MDA’s forest monitoring service includes monthly or bi-annual reports on forest changes within the monitoring area, including easy-to-use GIS data layers showing the exact location and size of changes. These regular updates on changes to forest cover give government agencies a powerful new tool to better allocate their resources for forest management, and provide an independent means of verification for forest monitoring.</td>
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**RADARSAT-2 data was used by the Canadian Department of National Defence (DND) in support of an international high seas drift net surveillance program called Operation Drift Net. The goal of the operation was to detect and deter vessels that engage in using illegal high seas driftnet fishing across a large area in the North Pacific Ocean.**

**RADARSAT-2 provides reliable broad area ice information for planning and execution of critical ice missions.**

**Forest Monitoring (Hainan Island, China) – In this example, MDA uses SAR and optical imagery for base mapping, then SAR-based change detection to monitor for evidence of illegal tree removal. This analysis is done using Canopy Structure Change-Detection (CSCD) which requires radar reflection from near the top of the canopy, as provided by RADARSAT-2.**
MDA FloodWatch is a monitoring service that enables local, regional and federal agencies to rapidly assess the impact of floods in areas ranging in size from cities to entire states. Using RADARSAT-2’s unique wide-area imaging capabilities, MDA can deliver accurate GIS-ready flood maps within hours of an emergency, regardless of weather conditions. Flood maps showing the location and extent of flooding are updated regularly as the disaster occurs, giving disaster relief agencies the information needed to effectively respond to the threat. Flying hundreds of kilometers above the weather and capable of imaging directly through cloud, RADARSAT-2 is the “eye in the sky” providing critical information for disaster response teams around the world.

MDA FloodWatch is a subscription-based service that provides regular, weekly coverage of key areas during flood season, and the option to order additional emergency coverage when floods occur. MDA FloodWatch customers benefit from assured access to up-to-date information in an easy to use GIS format.

MDA provides a range of customizable Flood Modeling data products to enable government agencies to accurately simulate floods and landslides. Using RADARSAT-2, MDA provides 3D digital elevation models (DEM), drainage network maps, and water body vectors for use in flood and landslide hazard analysis. RADARSAT-2’s ability to rapidly acquire data through cloud cover gives end users access to the most up-to-date data available, and makes it the fastest, most economical choice for flood hazard mapping of large areas.
Agriculture

Crop Monitoring

MDA delivers crop monitoring solutions with the ability to do accurate crop classification and identify forecast crop yield, enabling governments at all levels to establish food security critical to the health and economy of a nation. RADARSAT-2 is a vital tool that collects all-weather crop status information and is sensitive to soil moisture. The quad-polarization data offers superior crop identification capabilities which are used to create valuable crop yield forecasts based on accurate acreage estimations. MDA’s crop monitoring capabilities allow for the mapping of crop characteristics over large spatial areas, with full weather independence.

Rice Monitoring

For large parts of the world, rice is the single most important crop. The ability to monitor rice production is a critical role for agricultural agencies. MDA has developed highly reliable solutions for monitoring rice crop production with a focus on yield and classification. RADARSAT-2’s high resolution, dual and quad-polarized data provides significantly higher classification accuracy versus single-polarized data, and more reliable results than is provided by other sensors. Through routine monitoring, data is acquired in the early part of the cropping cycle and supplemented with four to five acquisitions throughout the season. Reliable crop classification results are used to compare the radar response with field measurements of yield to provide an estimation of rice crop yield.

Crop Classification using RADARSAT-2 (Indian Head, Saskatchewan) – This crop classification map is derived from a time series of RADARSAT-2 Fine-Quad images acquired between May and September 2009 showing a high degree of accuracy.

Broad-Area Rice Monitoring (Bangkok, Thailand). The image is a composite image based on quad-polarization RADARSAT-2 imaging. The colours correspond to the different crops, change during crop growth, and change after harvest.
ABOUT MACDONALD, DETTWILER AND ASSOCIATES LTD.
MDA is a global communications and information company providing operational solutions to commercial and government organizations worldwide.

MDA’s business is focused on markets and customers with strong repeat business potential. In addition, the Company conducts a significant amount of advanced technology development.

MDA’s well-established global customer base is served by more than 4,800 employees operating from 11 locations in the United States, Canada and internationally.

Leveraging over 20 years of experience in processing and delivering Earth Observation data, products and services to a global customer base, MDA is a recognized leader in the provision of satellite-based information, data products, and services.

CUSTOMER SATISFACTION
For more than four decades, MDA has worked with its worldwide customer base to provide information solutions that leverage advanced technologies and improve business efficiency.

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