The RADARSAT Constellation Mission (RCM), a constellation of three C-Band Synthetic Aperture Radar (SAR) satellites, follows the success of RADARSAT-1 and RADARSAT-2. Launches are planned for 2018.

Mission Objectives
MacDonald, Dettwiler and Associates Ltd. (MDA), the mission’s prime contractor, started developing RCM’s payload and ground segment in 2005. Major subcontractors are Bristol Aerospace, responsible for the bus, and COM DEV, which is developing the payload’s central electronics.

The mission objectives are to provide C-band SAR data continuity to existing RADARSAT users and to enhance operational use of C-band SAR data for maritime surveillance, disaster management and environmental monitoring.

Maritime surveillance includes ship detection, ice monitoring, oil pollution monitoring and marine wind measurement. RCM’s primary requirements for maritime surveillance are over large areas up to 2,200 kilometers off Canada’s coasts. Disaster management includes disaster mitigation, warning, response and recovery. RCM will support disaster management by providing global access and rapid revisit with a wide variety of imaging capabilities. Ecosystem monitoring includes monitoring forestry, protected areas and wildlife habitat; agriculture; wetlands; and coastal change.

RCM Modes
To meet its mission objectives, RCM is required to support a wide variety of imaging modes. These modes range from wide-area surveillance with 500-kilometer imaging swaths to spotlight modes with resolution of 1 meter in azimuth and 3 meters in range, as well as a large number of modes between these extremes.

Furthermore, RCM will have a full set of multipolarization capabilities. Like RADARSAT-2, RCM will support single, dual and quad-polarization capabilities. In addition, RCM will provide a new multipolarization capability called Compact Polarization.

RCM Imaging Capacity
The Canadian Government has requirements for daily imaging coverage of large areas off Canada’s coasts. With three satellites with wide-swath imaging, it will be possible to collect images covering all of these maritime areas of interest daily. There are additional government requirements for covering Canada’s land mass on a weekly basis. Only a constellation can meet all these coverage requirements.

The imaging capacity of individual satellites in the constellation has been sized to exceed all the Canadian government imaging needs by a factor of two. Thus, the constellation has the ability to frequently image large areas anywhere on the globe.

Innovative Capabilities
RCM’s mission configuration of three spacecraft and unique imaging modes will allow the constellation to address future requirements with greater flexibility.

Application-Specific Imaging Modes
RCM is required to support a wide variety of applications. In cases where a particular image is acquired for one purpose, such as ship detection, it makes sense to design imaging modes that are optimized for that purpose. In other cases, images may be required for multiple applications, such as ship detection and ice monitoring. In those cases, general-purpose imaging modes suitable for multiple applications are needed. Thus, the RCM design includes application-specific and general-purpose
and rapid image delivery (10 minutes from downlink to delivery). To meet the 5-hour commanding timeline requires northern ground stations that see the satellites on every orbit. Real-time downlink requires ground station masks covering areas of interest. Finally, 10 minutes from downlink to product delivery requires near-real-time SAR processing.

**Compact Polarization**

RADARSAT-2 can transmit and receive any combination of horizontal or vertical linear polarizations. RCM will have an additional capability to transmit circular polarization. Using this, in Compact Polarimetric mode, the system will transmit circular polarization and receive dual linear H and V polarization. This mode is designed to provide many of the advantages of quad-pol, without the disadvantage inherent in quad-pol, which is reduced swath width. RCM will be the first SAR satellite system in the world to implement this type of Compact Polarimetric mode.

**Expanding Capabilities**

RCM is part of the trend in satellite remote sensing toward smaller satellites that are interoperable, powerful, robust and flexible. An increased number of satellites will bring increased revisit and support a broad number of new applications. Most importantly, the program represents a significant new capability for maritime domain awareness, arctic surveillance, multipolarization imaging and broad-area change detection.
For over four decades, we have worked closely with our worldwide customer base to provide them with information solutions that leverage advanced technologies and allow them to conduct their business more efficiently.

RADARSAT-2 is a fully polarimetric system, providing all combinations of H and V polarization on both transmit and receive. Like RADARSAT-2, RCM is a fully polarimetric system. RCM will also support compact polarization by transmitting circular polarization and receiving dual linear polarization.

CUSTOMER SATISFACTION

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