An Overview of the RADARSAT Program

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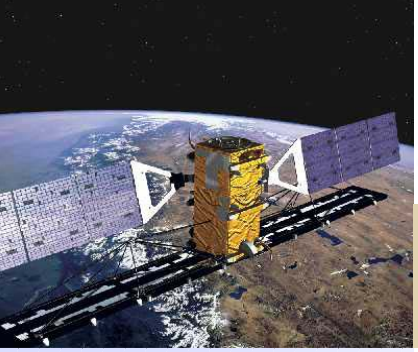
MDA Geospatial (GSI)

Presentation to Brazilian Remote Sensing Conference – April 23rd 2007



RADARSAT-2

Presentation outline

- **Mission description of Radarsat-2**
  - Mission Objectives
  - System Characteristics
  - Data Commercialization/Allocation
- **Program Update**
  - Spacecraft Assembly and Testing Status
  - Ground Segment Installation and Testing Status
  - Schedule to Launch
- **Commercial Update**
  - Radarsat 1 trends

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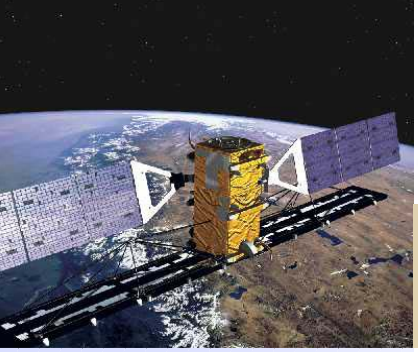

RADARSAT-2

Mission Objectives & Innovations

- One of the key priorities of the Canadian Space Program:
  - **Responding to the challenges of monitoring the environment, managing natural resources and performing coastal surveillance.**
- Objectives:
  - **Provide SAR data continuity from RADARSAT-1**
  - **Meet user needs for new applications opportunities**
  - **Maintain Canada's position in the commercialization, utilization and development of advanced operational SAR capabilities**
- Innovations
  - **Strong partnership with industry**
  - **Advanced imaging modes**

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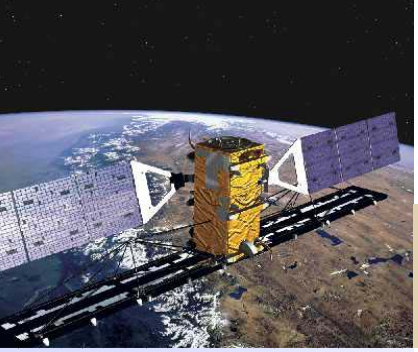

RADARSAT-2

CSA-MDA Public-Private Partnership

MDA

- Direct investment in mission costs
- Design Authority
- Will own and operate RADARSAT-2
- MDA-GSI has exclusive distribution rights

Canadian Space Agency

- Technical expertise and Interface with other Canadian Government Departments
- CSA's investment is returned as a data allocation that will allow access to the SAR imagery required by all parts of the Canadian Government

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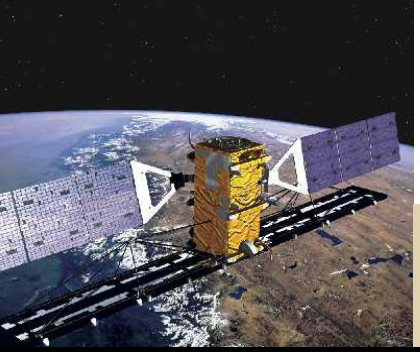
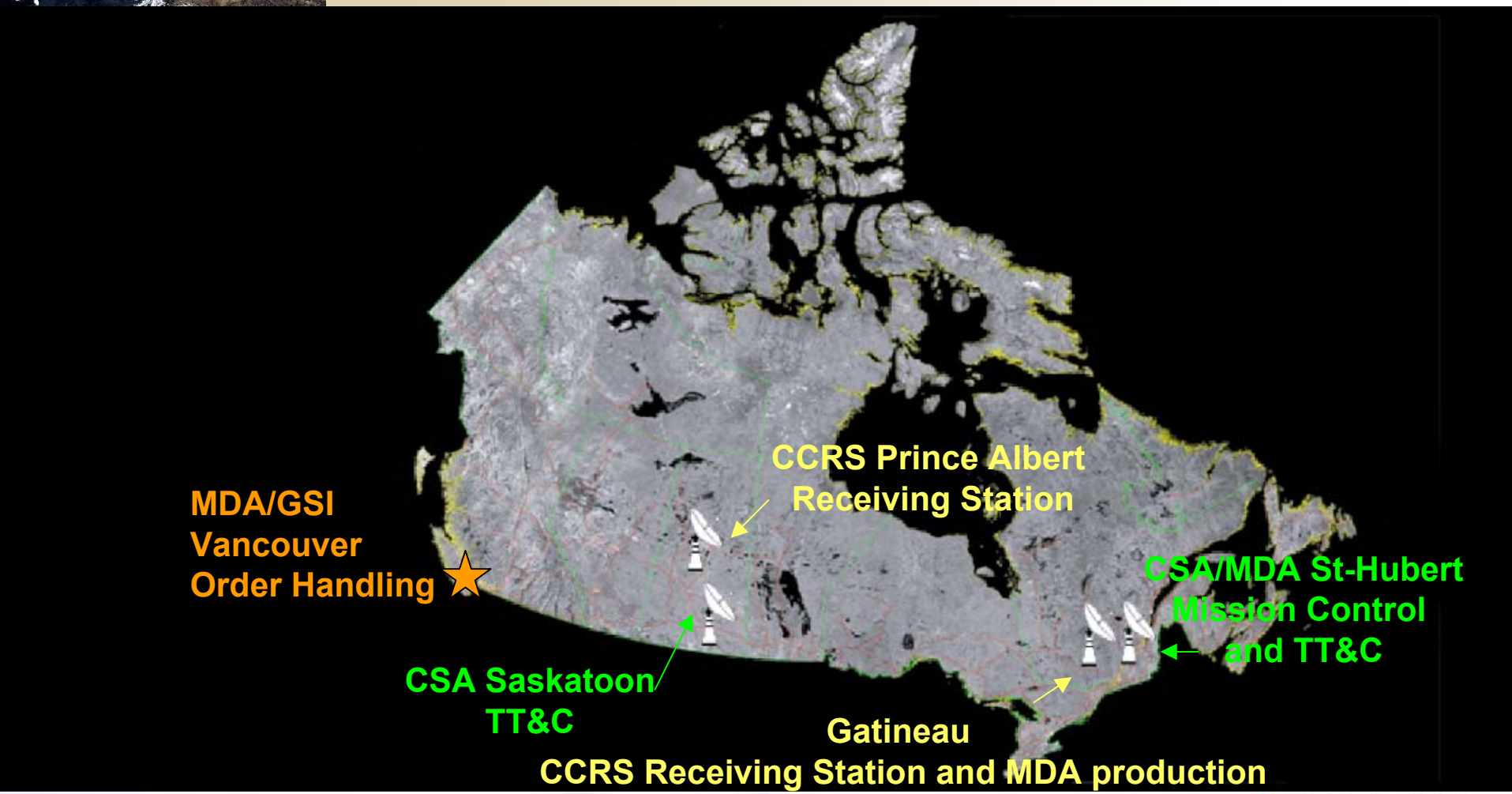
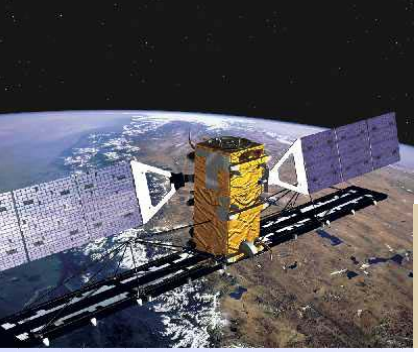


RADARSAT-2

Current Ground Station Locations





RADARSAT-2

Data Commercialization/Allocation

MDA-GSI

- Will commercialize and distribute RADARSAT-2 data worldwide
- Will develop data distribution agreements with regional partners around the world
- Will develop strategic partnerships with the value added sector to maximize the use of RADARSAT-2 improved capabilities

CSA

- CSA will manage the RADARSAT-2 data allocation within the Canadian Government
- All Canadian Government Departments and Agencies will be provided RADARSAT-2 data to support their mandate
- Data allocation can also be used for scientific, R&D and non-commercial institutional use

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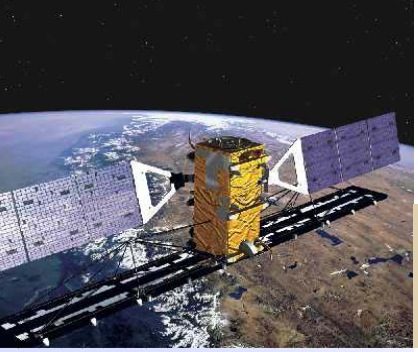
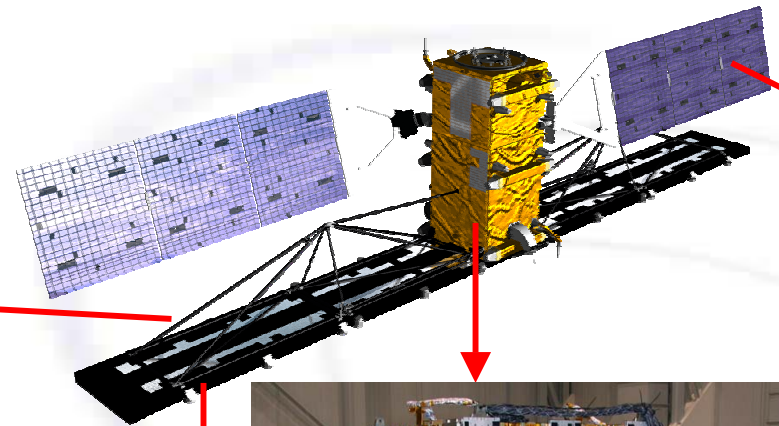


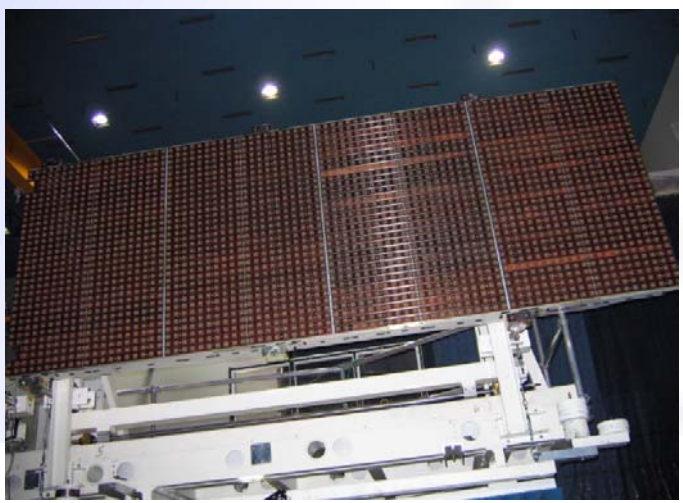
RADARSAT-2

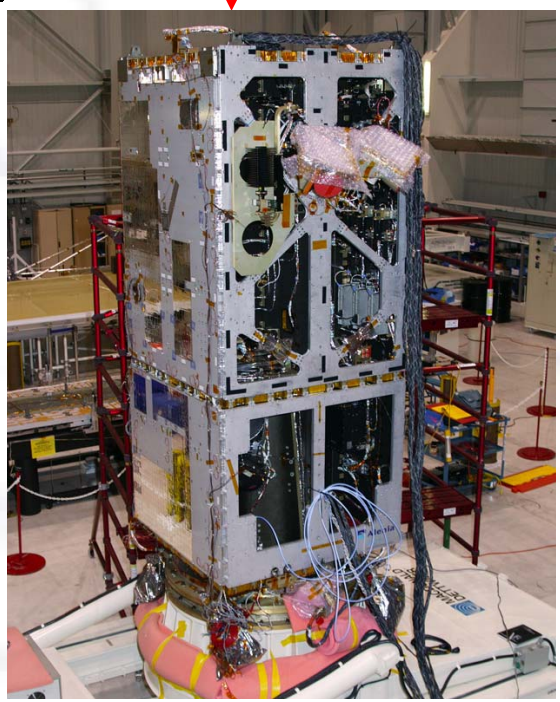
Spacecraft

ATK
Extendable Support Structure (ESS)



MDA
SAR Antenna and Sensor Electronics





Alenia
AEROSPAZIO
Divisione Spazio

Bus and Solar Arrays

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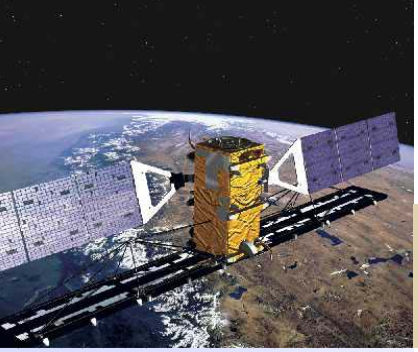


RADARSAT-2

The SAR Antenna

The SAR payload consists of the SAR antenna and specific support equipment required to perform timing and control of the payload, signal distribution, signal detection and thermal control.

The ESS is the mechanical interface between the bus and the antenna. Its function is first to deploy and then preserve the flatness and the attitude of the antenna

Status:

- Completed Testing of the 4 Antenna Panels at system level
- Completed integration and deployments of the SAR wings with the Extendable Support Structure (ESS) and the Bus

ABLE Engineering a PSI Company

MDA

Spacecraft level completed and upcoming tests at DFL

Hardware delivery

Integration

Tests

Bus Delivery

TVAC 1

Integration +Y Panel

SAR Delivery

IST 1

TVAC 2

SAR Integration

IST 2

Solar Arrays Integration

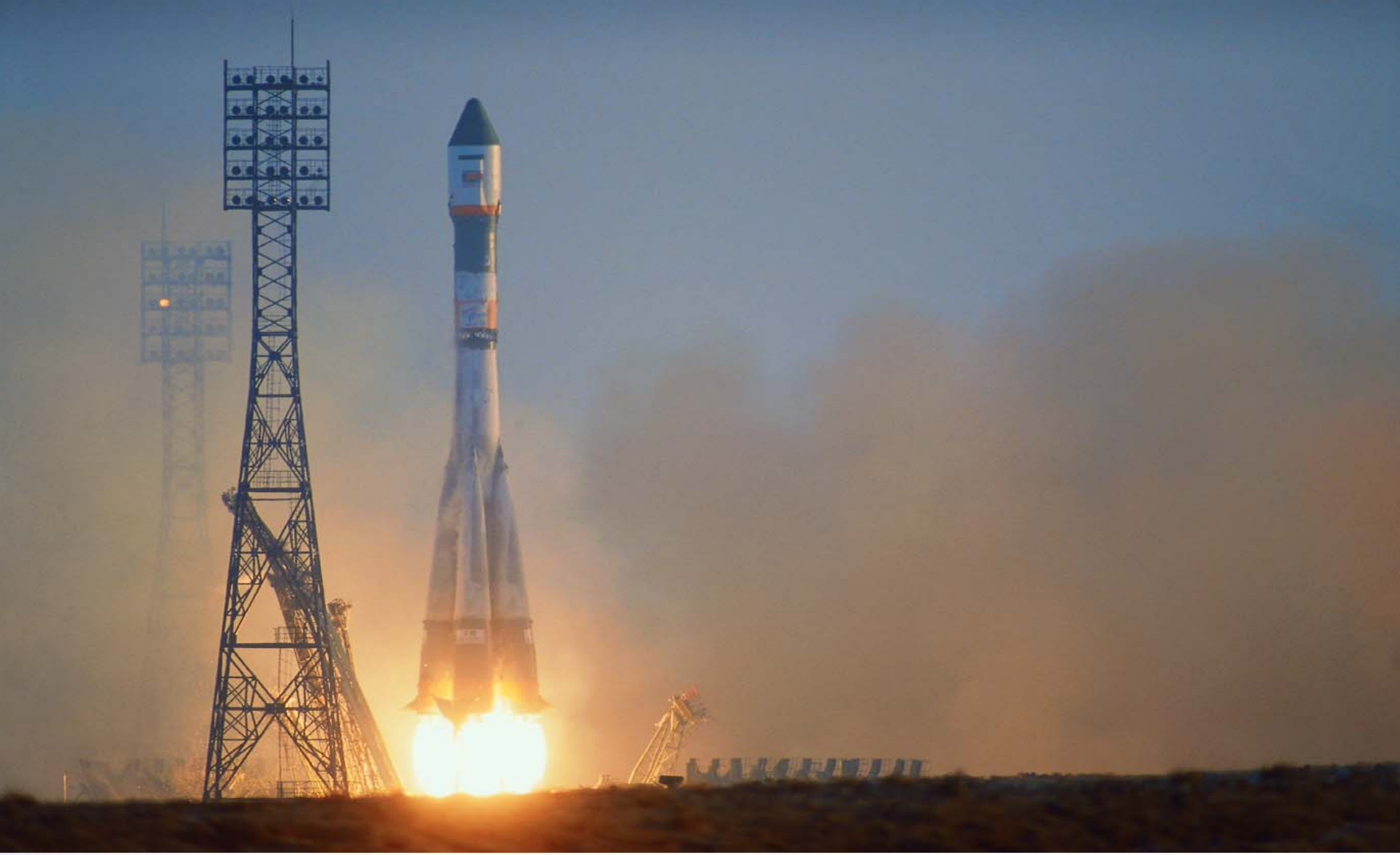
Vibration & Acoustic test

Appendage Deployments

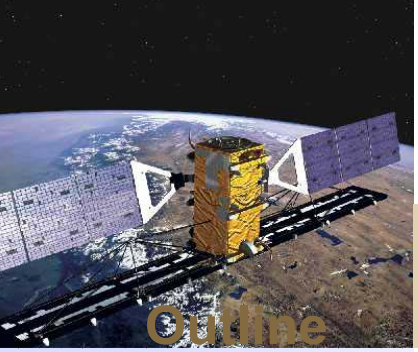
IST 3

S/C Ops Validation

Pack & ship to launch site

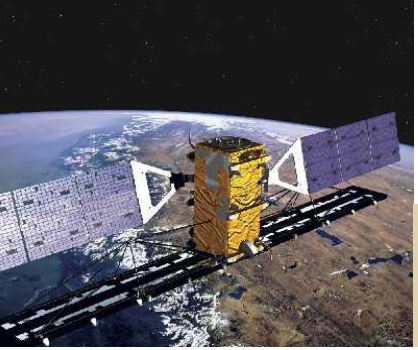


Launch on a Soyuz rocket from Baikonur Summer 2007



RADARSAT-2

- **Radarsat-2 Features and Benefits**



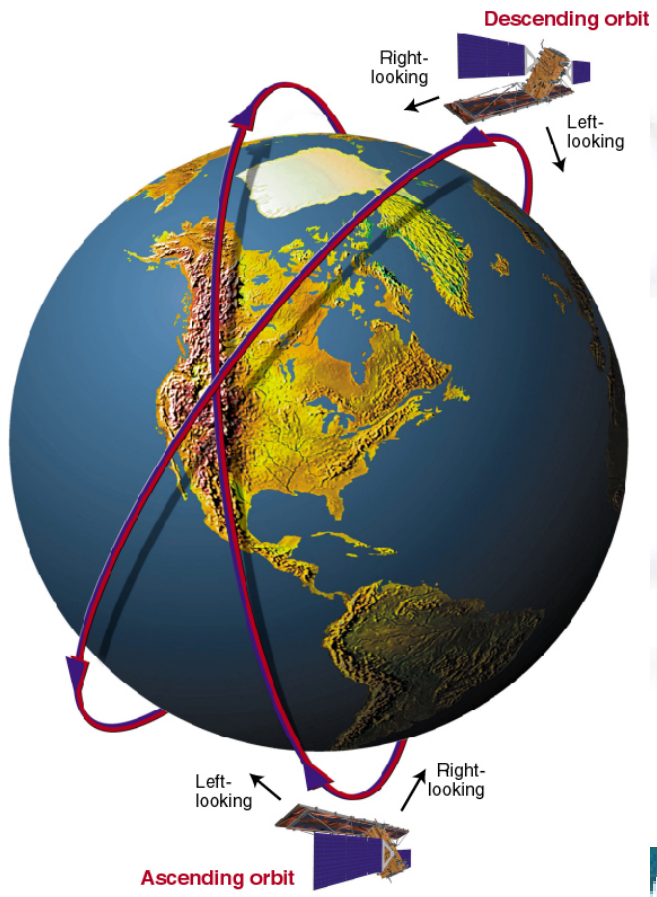
RADARSAT-2

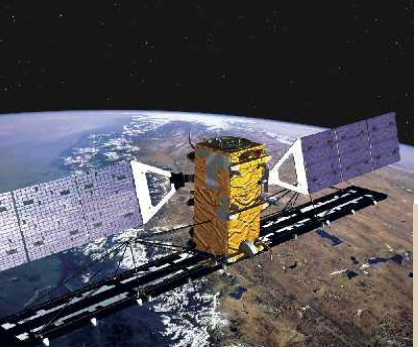
Orbit Parameters

ORBIT CHARACTERISTICS	
Altitude (average)	798 km
Inclination	98.6 degrees
Period	100.7 minutes
Ascending node	18 hrs (± 15 min)
Sun-synchronous	14 orbits per day
Repeat cycle	24 days

COVERAGE ACCESS USING 500 KM SWATH WIDTH	
North of 70°	Daily
North of 48°	Every 1-2 days
Equator	Every 2-3 days

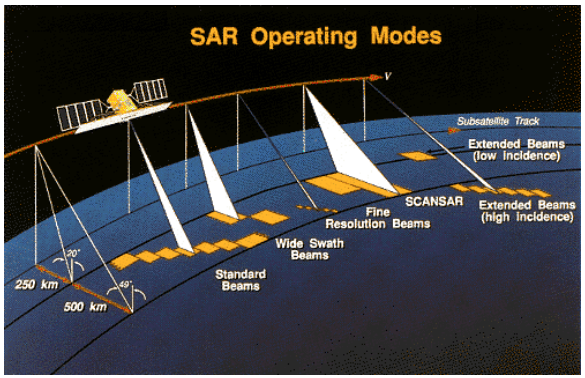
RADARSAT-2 will operate in an orbit identical as RADARSAT-1 except for an offset in time

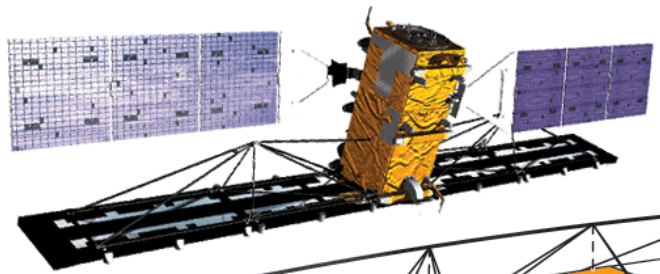


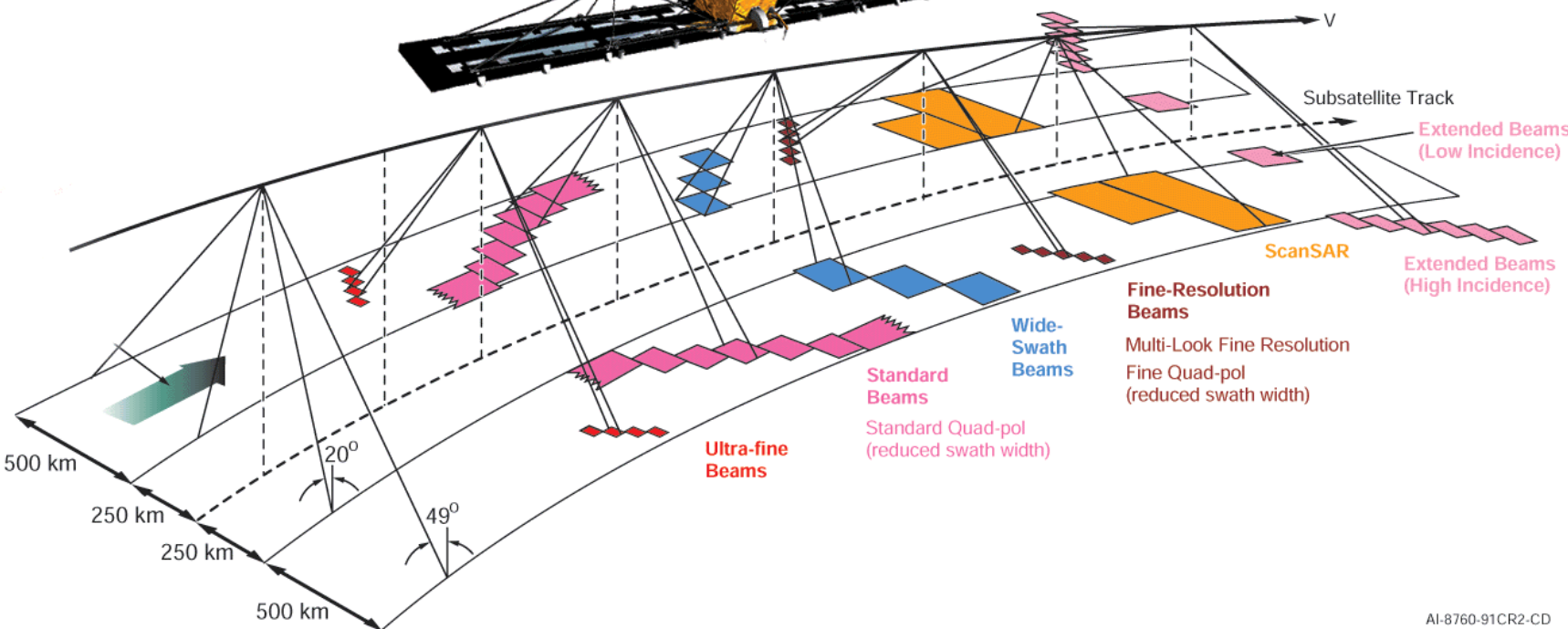


RADARSAT-2

RADARSAT-2 Imaging Modes







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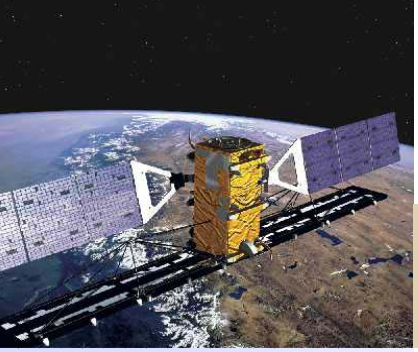

RADARSAT-2

RADARSAT-2 Innovations

Higher resolution: Spotlight (nominal 1 m) & Ultra-Fine (3 m)

Multi-look Fine: 8 m resolution

Polarmetric modes

- **single & dual/cross polarization**
- **quad-pol**

Faster satellite tasking

- **12 to 24 hours routine**
- **up to 6 hours emergency**

Left and right-looking capability

On-board solid-state recorders

Enhanced ground system providing faster data processing

Enhanced Data security through Downlink encryption

OPERATIONAL & COMMERCIAL FLEXIBILITY

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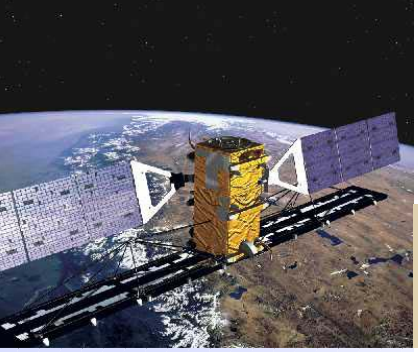


RADARSAT-2

RADARSAT-2 Key Applications

Defence

- target surveillance

Marine Surveillance

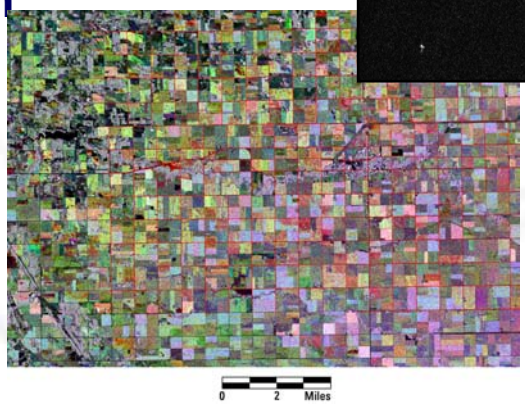
- oil pollution spill/slick detection
- ship detection/ fisheries monitoring
- sea ice mapping

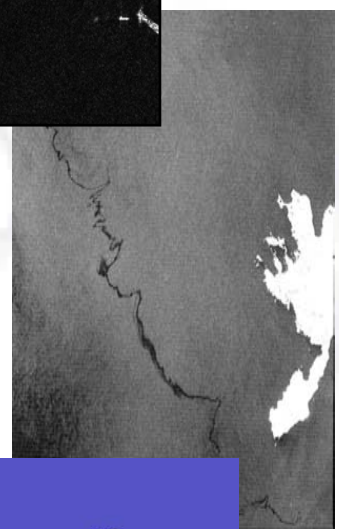
Agriculture

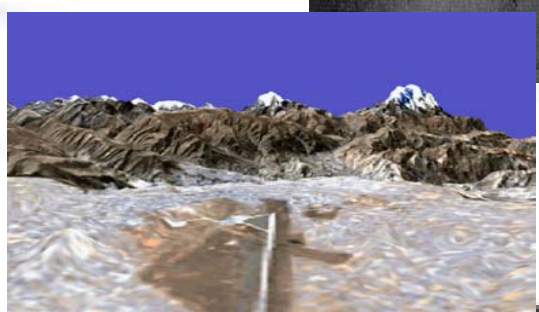
- crop type
- crop condition

Mapping

- feature extraction
- INSAR (Deformation and change)







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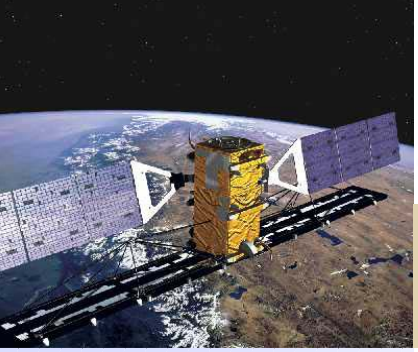
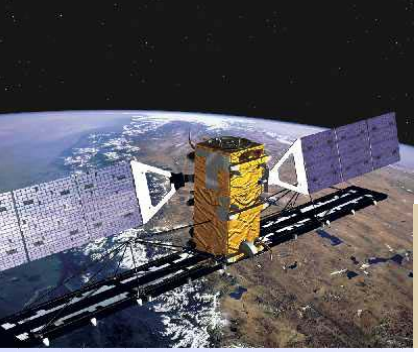


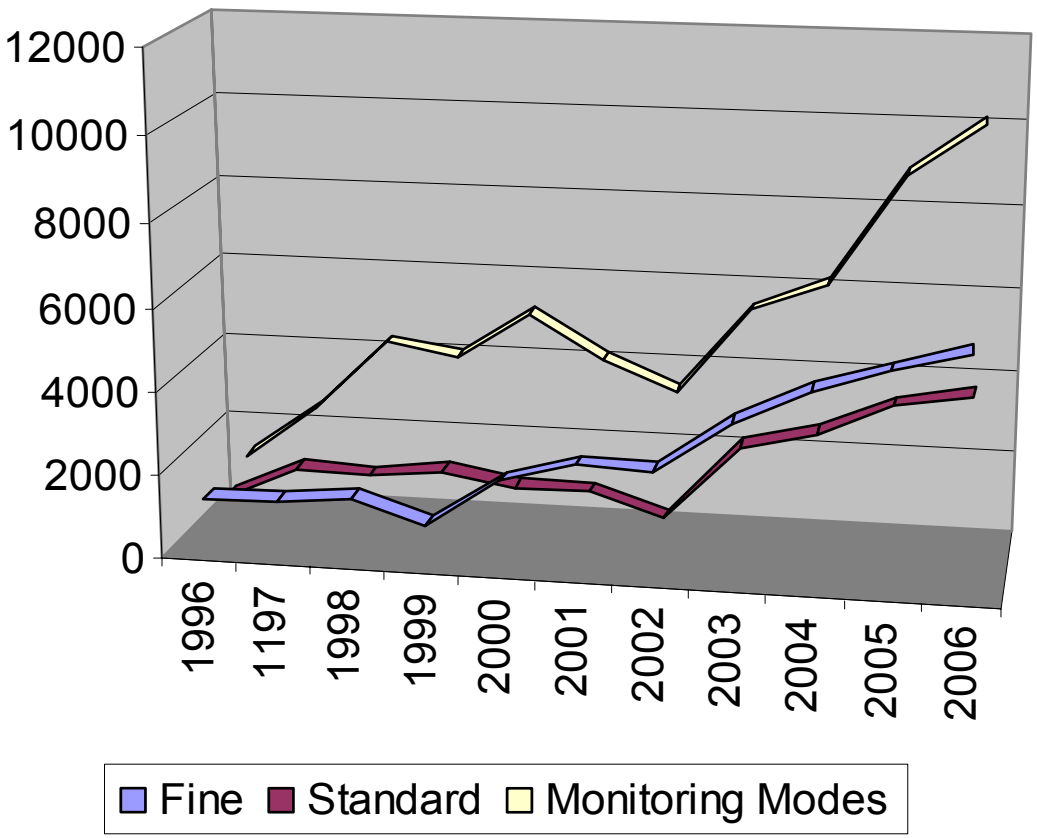
RADARSAT-2

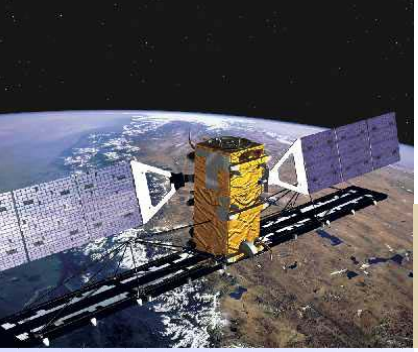
Radarsat Usage and Commercial Trends



RADARSAT-2

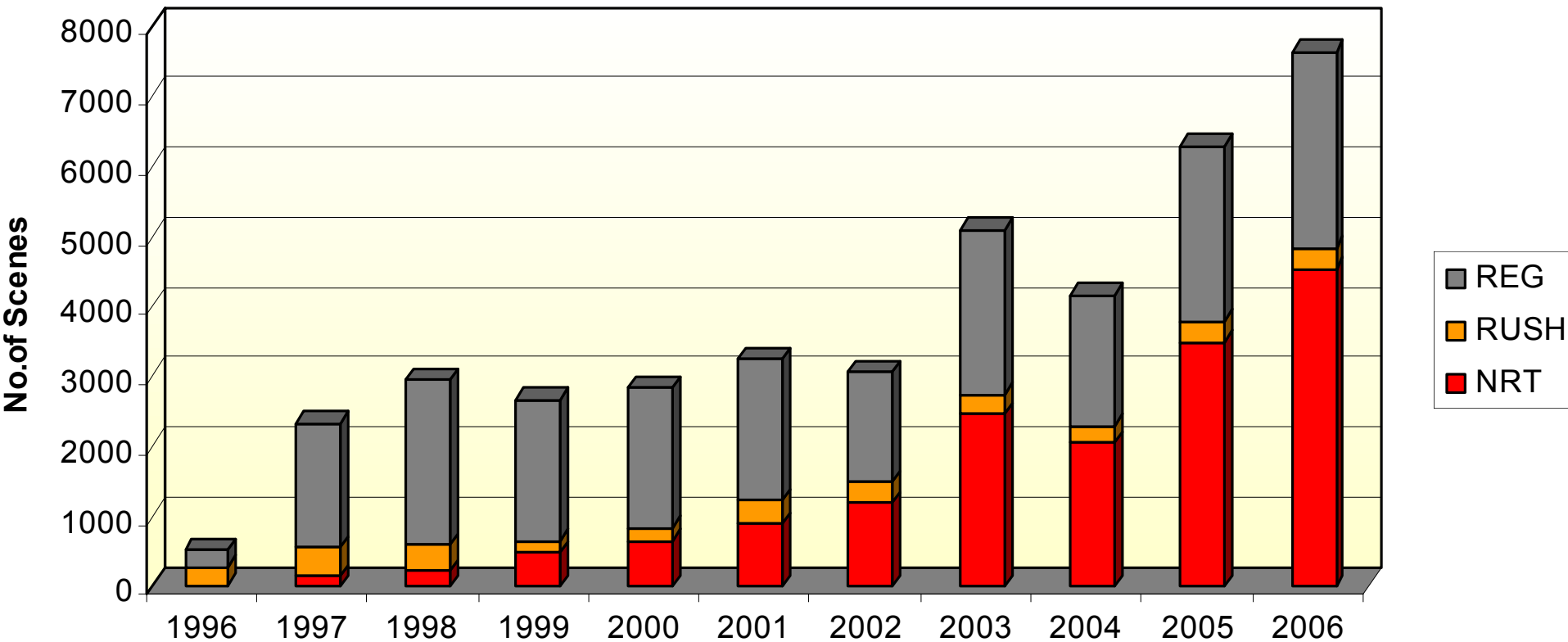
RADARSAT-1 Beam Usage Trend

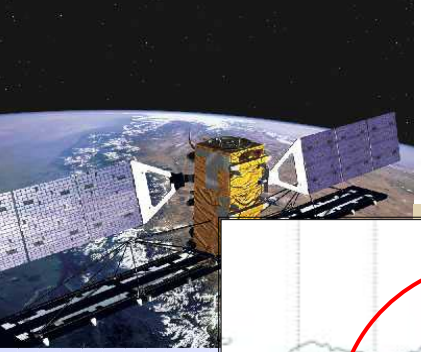




RADARSAT-2

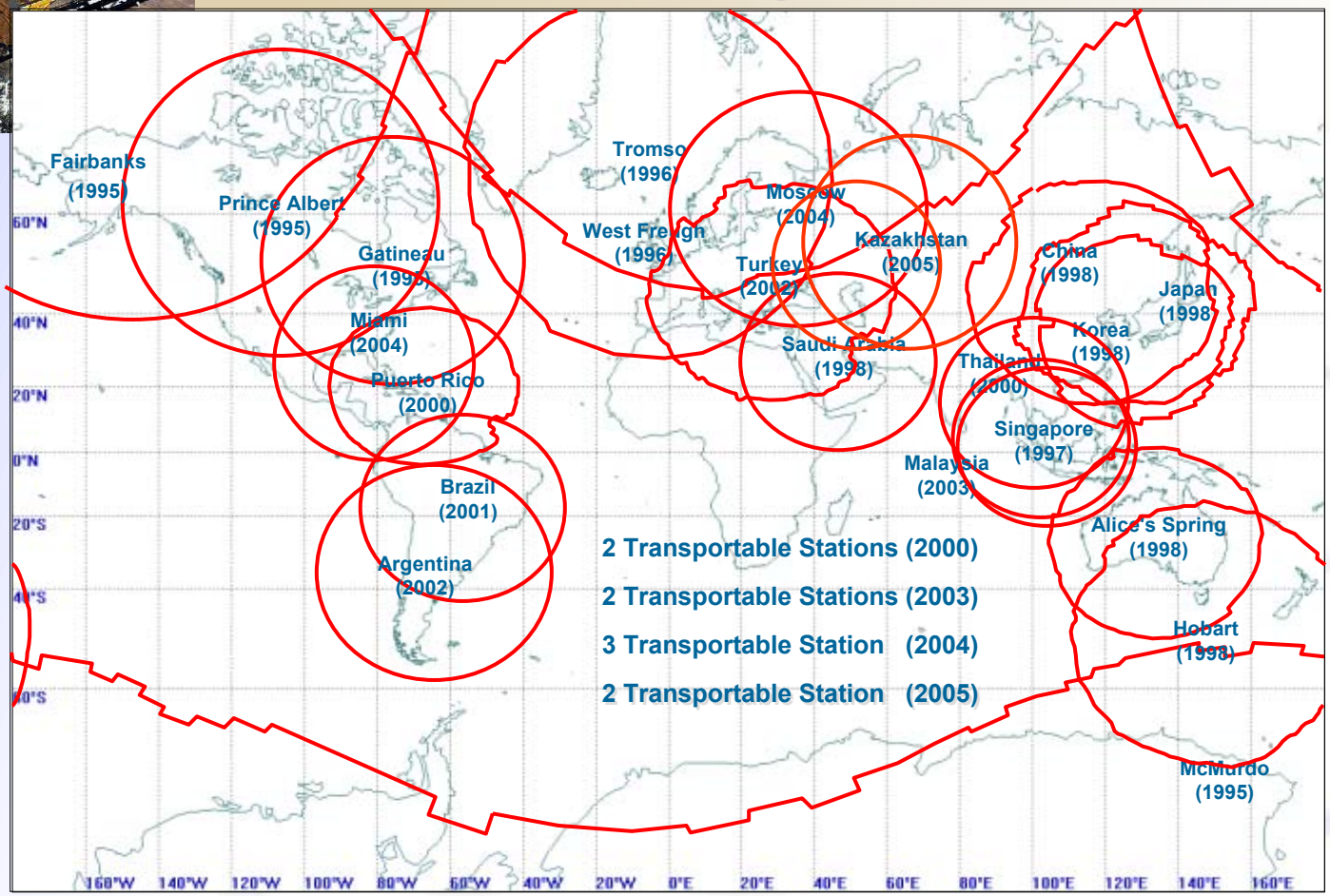
RADARSAT-1 Processing Trends (CDPF)





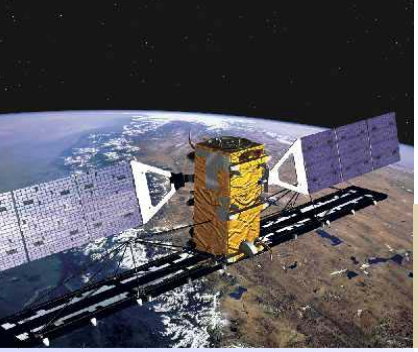
RADARSAT-2

Evolution of RADARSAT-1 ground stations



2005
2004
2003
2002
2001
2000
1999
1998
1997
1996
1995

- **Total Data Reception Facilities: 32 (including 9 transportable stations) with 4 under certification**
- **4 more expected in 2007**



RADARSAT-2

RADARSAT-1 Data Commercial Trends

- Continuing growth in lower resolution modes for maritime monitoring
- Continuing trend toward higher resolutions for defence/mapping
- Continuing trend towards faster and more reliable NRT
- Continuous growth of the network of ground stations

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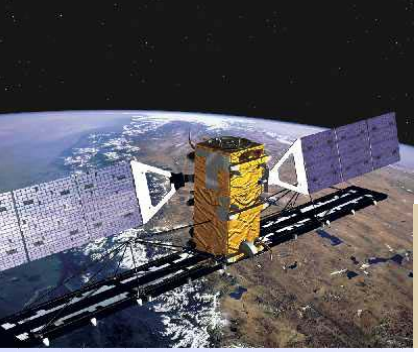

RADARSAT-2

RADARSAT-2 Commercial Response

- **Higher resolution modes to facilitate trend toward higher resolutions for defence/mapping**
- **RADARSAT-1 beam continuity but with improved revisit coupled with more flexible SSR and faster NRT turnaround to facilitate more growth in marine monitoring applications**
- **Continue policy of downlinks to international ground stations**
- **Value added development and information derivation is another growth area**
  - ***cross and quad pole data to help this sector grow***

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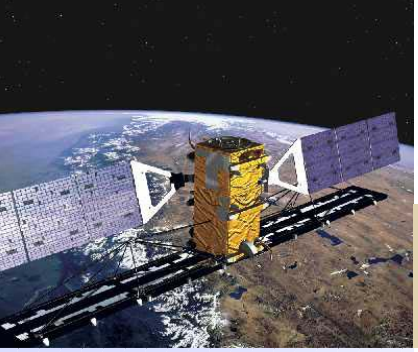
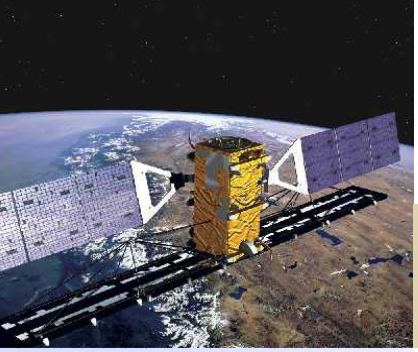


RADARSAT-2

Partners

- RADARSAT-1 success built on a solid group of international partners. Ground station Distributors, and value added partners have helped build a market
- Success also built on support from Canadian and international academic and research and Govt sectors programs
- RADARSAT-2 will continue the relationships and build new ones for new market sectors



RADARSAT-2

Brazilian Partners and Development– 10 year history

- Early institutional champion and Ground Station:
  - INPE
- Radar user development:
  - SAREX, GlobeSAR, Amazon Nations – with INPE, Cad govt and MDA
- Resource Centre for Training and R&D
  - Fed U of Rio (CBRR)
- Early adopter of technology for maritime applications
  - Petrobras – Cenpes
- Commercial Partner
  - Threetek

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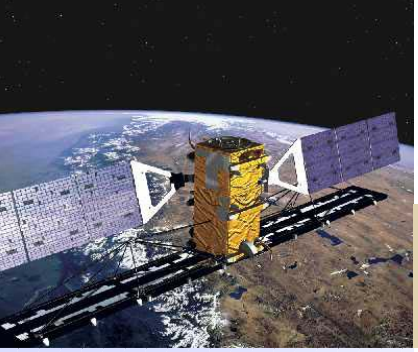

RADARSAT-2

Brazilian Programmes for Radarsat 2

- Continuing development of maritime surveillance programs with various clients
- Development of interferrometric techniques with partners such as Transpetro and Petrobras – Cenpes for pipeline monitoring
- Programme of workshops for use and understanding of polarmetric techniques
- Development of Amazonian programs
- SOAR Programme

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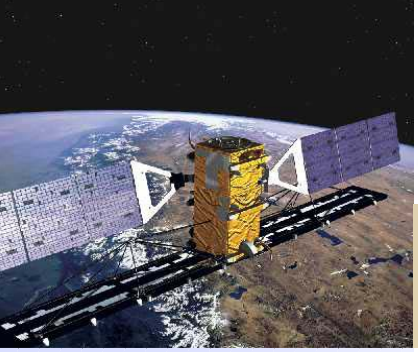

RADARSAT-2

Conclusions

- Make a commercial return on investment for MDA
- Fulfill commitment to provide the Canadian govt their allocation
- Continue growth of traditional business areas such as ice, maritime monitoring and mapping
- Build on successful development of defence and monitoring sector
- Grow new business areas by developing new value added information services
- Further continuity through the Radarsat-C future programme

MDA