



Polar Communications & Weather (PCW) Mission



Guennadi Kroupnik, Canadian Space Agency



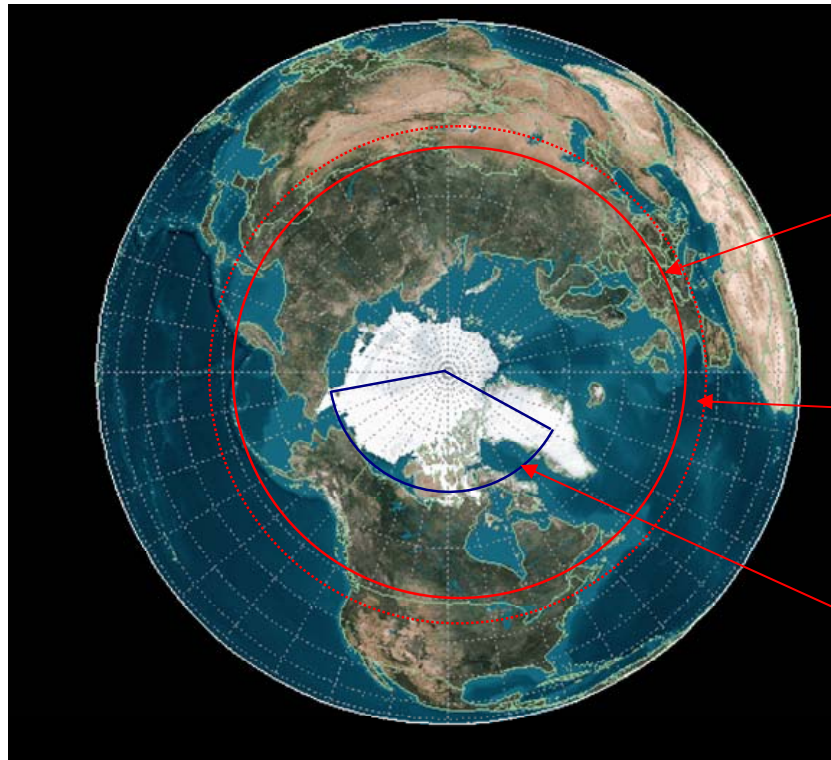
Canadian Space Agency
Agence spatiale
canadienne

Canada

Mission Objectives

- **Reliable communications and navigations services** in the high latitudes (North of 70°) to ensure:
 - Security
 - Sustainable Development
 - Support to Northern Communities
 - Safety of the Air and Marine Navigation
 - Arctic Science
- Provide **high temporal/spatial resolution meteorological data** above 50° N in support of:
 - Numerical Weather Prediction (short to medium range)
 - Environmental monitoring, emergency response
 - Climate monitoring

Areas of Interest



Meteorological Coverage Requirement (50°N)

Meteorological Coverage Goal (45°N)

Communications Coverage Requirement

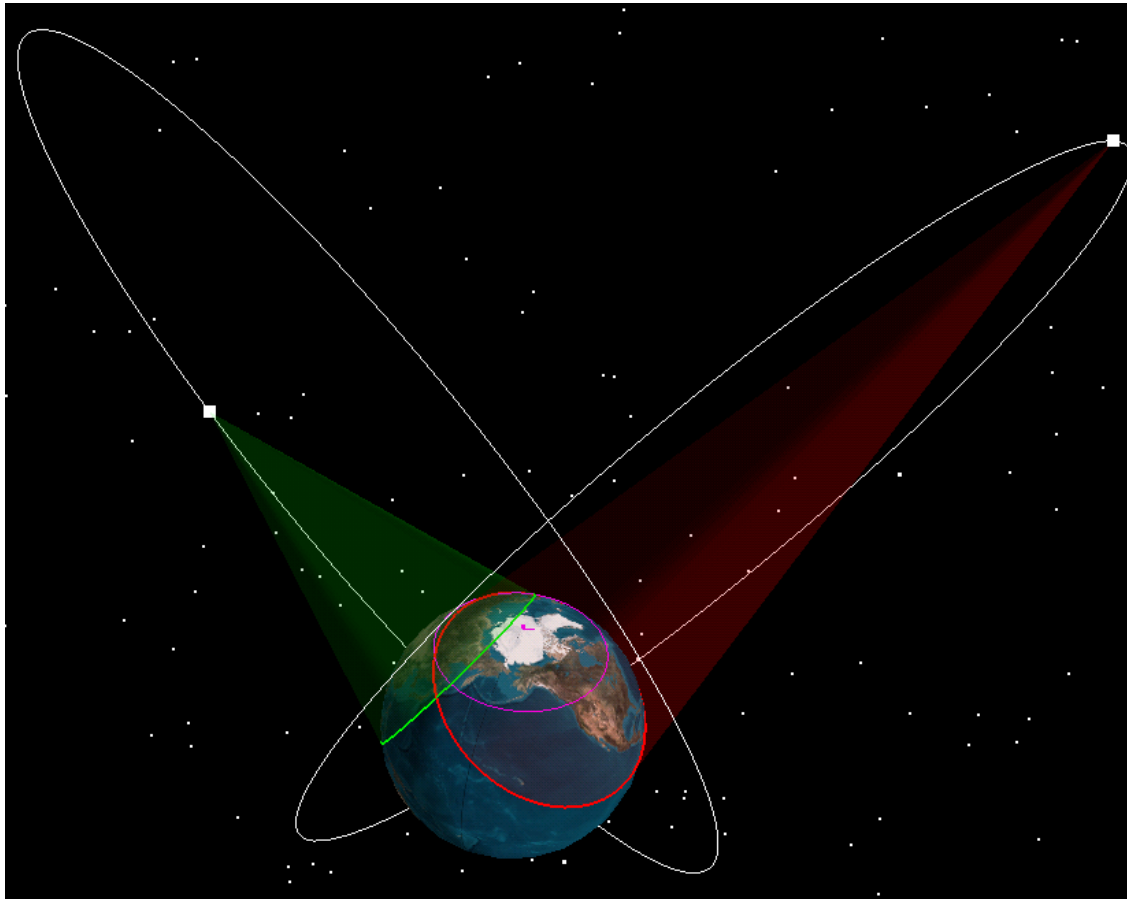


Meteo requirement pertains to the entire circumpolar domain

Products and Services

- 24/7 Broadband communications services everywhere in the AOI
- GNSS augmentation (TBC)
- ATM communications (TBC)
- Winds from sequences of images: high priority product
- Surface type analysis: ice, snow, ocean, vegetation and surface characteristics such as emissivity, albedo, vegetation index
- Surface temperature, detection of boundary-layer temperature inversions, diurnal cycle
- Mid-tropospheric humidity/temperature sensitive channels for hourly direct assimilation complementing GEO radiance assimilation
- Volcanic ash detection
- Smoke, dust, aerosols, fog in support of air quality models and environmental prediction
- Total column ozone
- Cloud parameters: height, fraction, temperature, emissivity, phase, effective particle size
- Broadband outgoing radiation: total, Vis, IR, window

Mission Overview



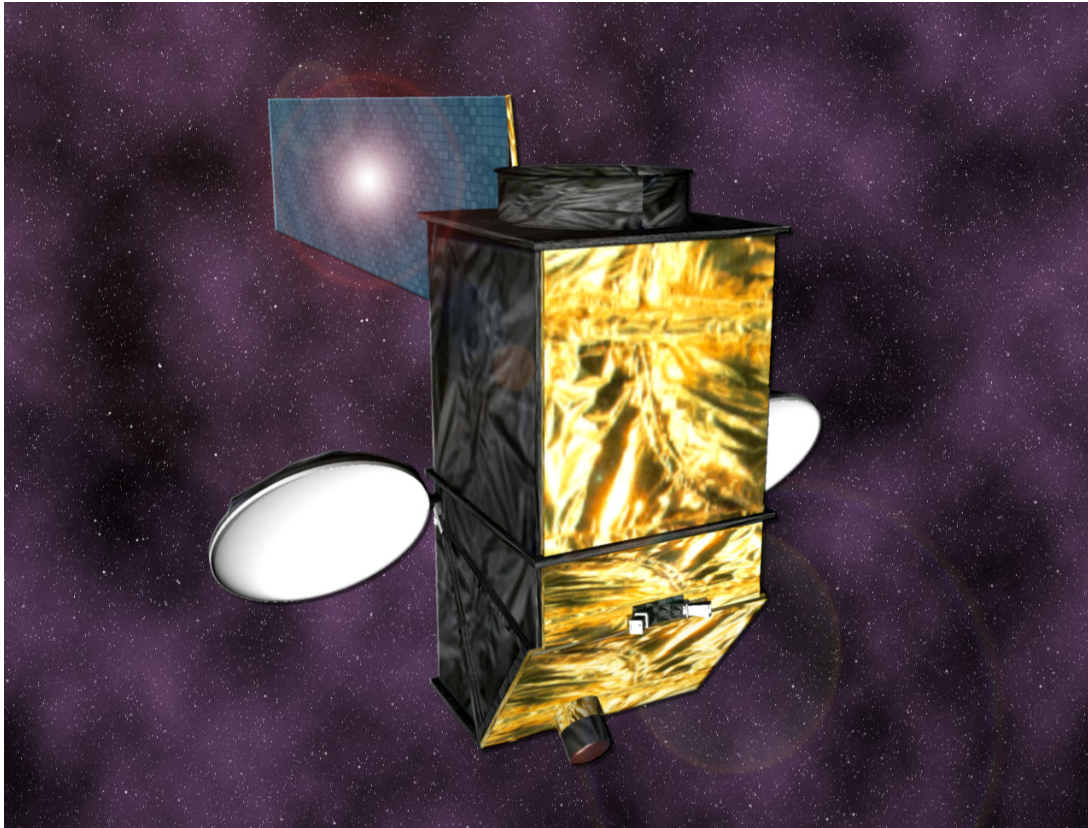
2 satellites in 2 orbital
planes to provide
continuous GEO-like
imagery 50-90 N

Ka-, and X-band
20 VIS & IR bands
0.5-1 km VIS
2 km IR

12-h period
63.4 deg. inclination

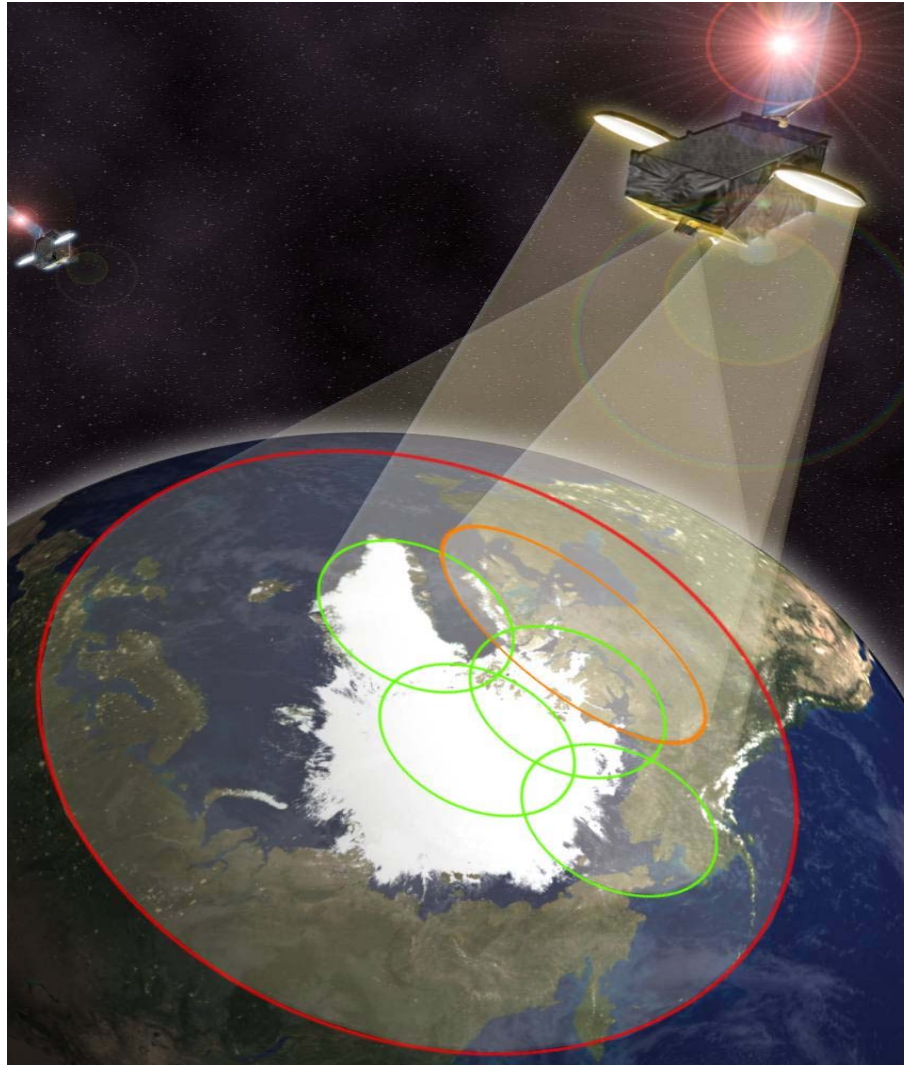
Apogee: ~39,500 km
Perigee: ~600 km

Preliminary Spacecraft Concept



Mass:	1319 kg
Power:	1233 W
Pointing Knowledge:	7.6 arcsec
Pointing Control:	55.1 arcsec

Preliminary Services Concept



Payloads

- Primary:
 - Ka – band 2-way High Data Rate communications payload (addition of X- and L-bands is being evaluated)
 - Imaging Spectroradiometer (20 channels, 0.5-1 μ m VIS, 2 μ m IR)
 - Space weather suite of instruments
- Secondary (Under evaluation):
 - GNSS augmentation payload
 - Air Traffic Management payload
 - Scientific instruments:
 - Broadband radiometer
 - Aurora Imager
 - Atmospheric composition instrument (UV-NIR)
 - Fourier Transform spectrometer (IR, similar to IASI)
 - Technology demonstration:
 - Software defined radio
 - V-band communications

Major Milestones

- Phase 0 completed: September 2008
- Phase A Approved: November 2008
- Phase A contract awarded: July 2009
- Phase A Major Milestones:
 - Phase A kicked-off: July 2009
 - Technology Readiness Assessment Review: October 2009
 - Critical Technologies Development procurement: December 2009
 - Mission Requirements Review: January 2010
 - Preliminary System Requirements Review: May 2010
 - Phase A contract close out: June 2010
- Critical Technologies development contracts award: April 2010
- Phase B/C/D contract award: February 2011
- Launch of Satellite 1: August 2016
- Launch of Satellite 2: November 2016
- Beginning of operations: January 2017

Partnership Opportunities

- Extension of membership in the Users & Science Team to the international partner organizations during Phase A.
 - Bi-lateral agreements
 - WMO IGEOLAB Focus on HEO WG
 - Second Workshop on Satellite Imaging in the Arctic (September 14-15, 2009)
- Joint Definition Study (Shall be completed before Phase B):
 - Via CSA: government and intergovernmental agencies
 - Via Prime Contractor: private/commercial entities
- Phase B and beyond: Possibility of a Partnership mission (International and/or PPP)

Potential Partnership Venues

- Contribution to the U&ST:
 - Refine observation and communications requirements
 - Identify new applications and products
 - Ensure compatibility with GEO data and services
 - Explore opportunities in the areas of overlap of GEO and HEO coverage
- Launch procurement
- Spacecraft/payloads subsystems and/or critical components
- Secondary communications, GNSS, meteorological, science or technology demonstration payload and it's data processing or service delivery
- Ground segment:
 - Back-up TT&C, data reception, and gateway stations
 - Data processing and applications
- Other???

Conclusion

- PCW represents an exciting opportunity to close the gap in communication services and meteorological observation coverage in the Arctic
- PCW is open for international collaboration!
- Phase A is a perfect time to identify and explore potential venues for a mutually beneficial collaboration