NEOSSat
Near Earth Objects Surveillance Satellite
Canadian Space Agency – Defense Research & Development Canada
Project Scope
To demonstrate that the surveillance of space can be performed effectively at a lower cost and potentially more responsively utilizing micro-satellite platforms.
Project Objectives

CSA objectives of the NEOSSat mission are to:

• Discover and monitor near-Earth asteroids and comets and quantify their trajectories.
• Enhance and develop the Canadian scientific community in research related to solar system small bodies.
• Enhance and develop a Canadian capability in micro-satellite missions.

Near Earth Space Surveillance - NESS (CSA)
NEOSSat Mission

**Micro-satellite:**
- < 75 kg
- Approx. 1 m x 0.8 m x 0.4 m
- Approx. power 30 W
- Reaction wheels
- No propulsion
- ACS: sun sensor, star tracker, magnetometers, solar cells

**Satellite Bus**
- 1 arcsec pointing stability
- S-band up/downlink CCSDS
- 1 GB/day downlink capacity
- On-board Pre-processing

**Payload**
- 15cm reflecting telescope
- Space-quality CCD 1k x 1k
- 0.85 deg field-of-view
- High performance baffle

**Features:**
- Compatible with multiple launch vehicles
- Generic subsystems and ground support equipment
- On-Orbit re-programmable
- Consistent with CSA microsatellite philosophy
  - Tailored PA and COTS parts
  - Emphasis on test versus analysis
  - Use of flatsat to demonstrate functionality
NESS - Near Earth Space Surveillance

- Search for Near Earth asteroids
  - Atens, Apollos, Amors, IEO, (& comets)
  - Ground based telescopes limitations, biases
  - Difficult for Atens, very difficult for IEO
- Understand NEA population
- Dynamically close to Earth, opportunity for exploration
- Solar system primitive objects
- Understand interaction of the NEO population with the planets
- Improve modeling: understand orbital distribution, physical characteristics, composition, origin, and history of NEO
- Societal goals (impact hazards)
Asteroid Search Regions

Search patches each 0.86x 0.86 deg

“Ecliptic West” Region

“Ecliptic East” Region

Search each patch 4 times each, once per month

+/-45 deg

+/-55 deg

+/-40 deg
Known Asteroid Fields
(Boattini and Carusi, 1997)
NEOSSat Operations

MOC, ground station (CSA)

MPS OPS Center

Tasking Centers
U of Calgary & DRDC

Defence Research and Development Canada

Canadian Space Agency

Recherche et développement pour la défense Canada

Agence spatiale canadienne
MOST Asteroid Imaging Test
2693 Yan’an main belt asteroid

Verified instrument magnitude sensitivity
Project Status

Project in Phases:

- Heritage from very successful MOST astronomy microsatellite [in operation since 2003 (NASA GO mission)]
- Phase A completed in 2005
- PDR held April 2008
- Currently in Phase C
- CDR in March 2009
- Launch planned for Mid-2010
- Operations - minimum 1 year
- Launcher TBD (contractor supplied)

- Principal Contractor, MSCI / Dynacon Ltd, Toronto
- Main sub-contractors:
  - Spectral Applied Research (payload)
  - Routes Astro-Engineering (power)
Conclusion

For CSA, the NEOSSat mission will:

• Contribute to the international body of knowledge relating to NEO populations and their threats
• Successfully implement the world's first space-based NEO detection and tracking mission
• Develop Canadian capacity in NEO science
• Enhance Canadian micro-sat capabilities
• Train the next generation of scientists and engineers in leading-edge space systems
• Enhance the close collaboration in the space sciences with international partners through invitations for international membership on the NESS science team