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SOLICITATION AMENDMENT
MODIFICATION DE L'INVITATION

The referenced document is hereby revised; unless otherwise indicated, all other terms and conditions of the Solicitation remain the same.

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Title - Sujet Surveillance of Space 2 RFI	
Solicitation No. - N° de l'invitation W8474-187639/A	**Amendment No. - N° modif.** 004
Client Reference No. - N° de référence du client W8474-187639	**Date** 2019-03-29
GETS Reference No. - N° de référence de SEAG PW-$$ST-047-33735	
File No. - N° de dossier 047st.W8474-187639	**CCC No./N° CCC - FMS No./N° VME**
Solicitation Closes - L'invitation prend fin at - à 02:00 PM on - le 2020-01-15	**Time Zone** **Fuseau horaire** Eastern Standard Time EST
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Canada

ROYAL CANADIAN AIR FORCE

AVIATION ROYALE CANADIENNE

Surveillance of Space 2

Industry Day Briefings

October 2, 2018

AIR POWER IN FORMATION

AGILE · INTEGRATED · REACH · POWER

DIRECTOR GENERAL SPACE

DIRECTEUR GÉNÉRAL DE L'ESPACE

UNCLASSIFIED

ROYAL CANADIAN AIR FORCE

AVIATION ROYALE CANADIENNE

OPENING REMARKS

Colonel Cam Stoltz, CD, MEng, PEng, MBA

Director Space Requirements

AIR SPACE POWER IN FORMATION

AGILE • INTEGRATED • REACH • POWER

DIRECTOR GENERAL SPACE

DIRECTEUR GÉNÉRAL DE L'ESPACE

Industry Day Briefings:
Agenda

Time	Item	Name
09:00	Welcome	PD SofS 2, Maj. D. Bédard
09:00 – 09:05	Opening remarks	DSR, Col C. Stoltz
09:05 – 09:15	SofS 2 Team presentation and administration	PD SofS 2, Maj. D. Bédard
09:15 – 10:00	SofS 2 Project Overview	PD SofS 2, Maj. D. Bédard
10:05 – 10:25	Procurement process	Contracting Authority, A. Chan
10:30 – 10:45	ISED explanation on ITB and VP	
10:45 – 12:00	Vender networking	

Surveillance of Space 2:
GoC Team

ISR Section Head:	LCol Trevor Antifave
Project Director:	Major Donald Bédard
Deputy Project Director:	Captain Mart Einer
Project Manager:	Susan Harvey
Deputy Project Manager:	Brad Fitzsimmons
DND Procurement Authority:	Nadya Lukey
PSPC Contracting Authority:	Alan Chan
Sapphire LCMM:	Colin Currie

Industry Day Briefings:
Questions

Electronic copy of the briefings:

- Will be posted to the Buy & Sell site shortly.

Questions:

- Industry Day Participants are asked to reserve all questions to the one-on-one briefings.
- Q&A report will be complied and posted on Buy & Sell site:
  - This report will not contain any proprietary information.

Recordings:

- All meetings will be recorded by the GoC Team.
- Recordings will be used to ensure that the records of discussion is accurate.

ROYAL CANADIAN AIR FORCE

AVIATION ROYALE CANADIENNE

SURVEILLANCE OF SPACE 2: Project Overview

Major Donald Bédard, CD, PhD

SofS 2 Project Director

AIR SPACE POWER IN FORMATION

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DIRECTOR GENERAL SPACE

DIRECTEUR GÉNÉRAL DE L'ESPACE

Outline

Background:

- Space situation pre-2007
- Sapphire mission
- Space situation post-2007

SofS Project:

- Project scope
- Project deliverables
- High-level mission requirements (HLMR)
- Schedule
- Cost

SofS gap mitigation

BACKGROUND

Canada

Background:
The space situation: Pre-2007

Number of nations operating in space were fewer in number than today:

- Mostly limited to national governments

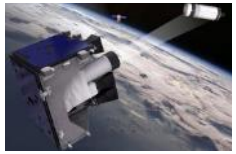
Notwithstanding the harsh physical environment, Earth orbit environment was considered benign:

- Adversarial behaviour in space was not observed

Emphasis for space surveillance was focussed on catalog maintenance to maintain accurate orbits in support of:

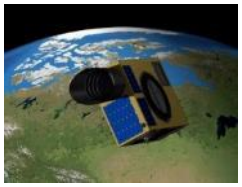
- Keeping informed on objects in Earth-orbit
- Space mission support (ie. Pass management, antenna pointing)
- General space mission planning
- Collision avoidance

Background:
SSA Partnership: Canada and US

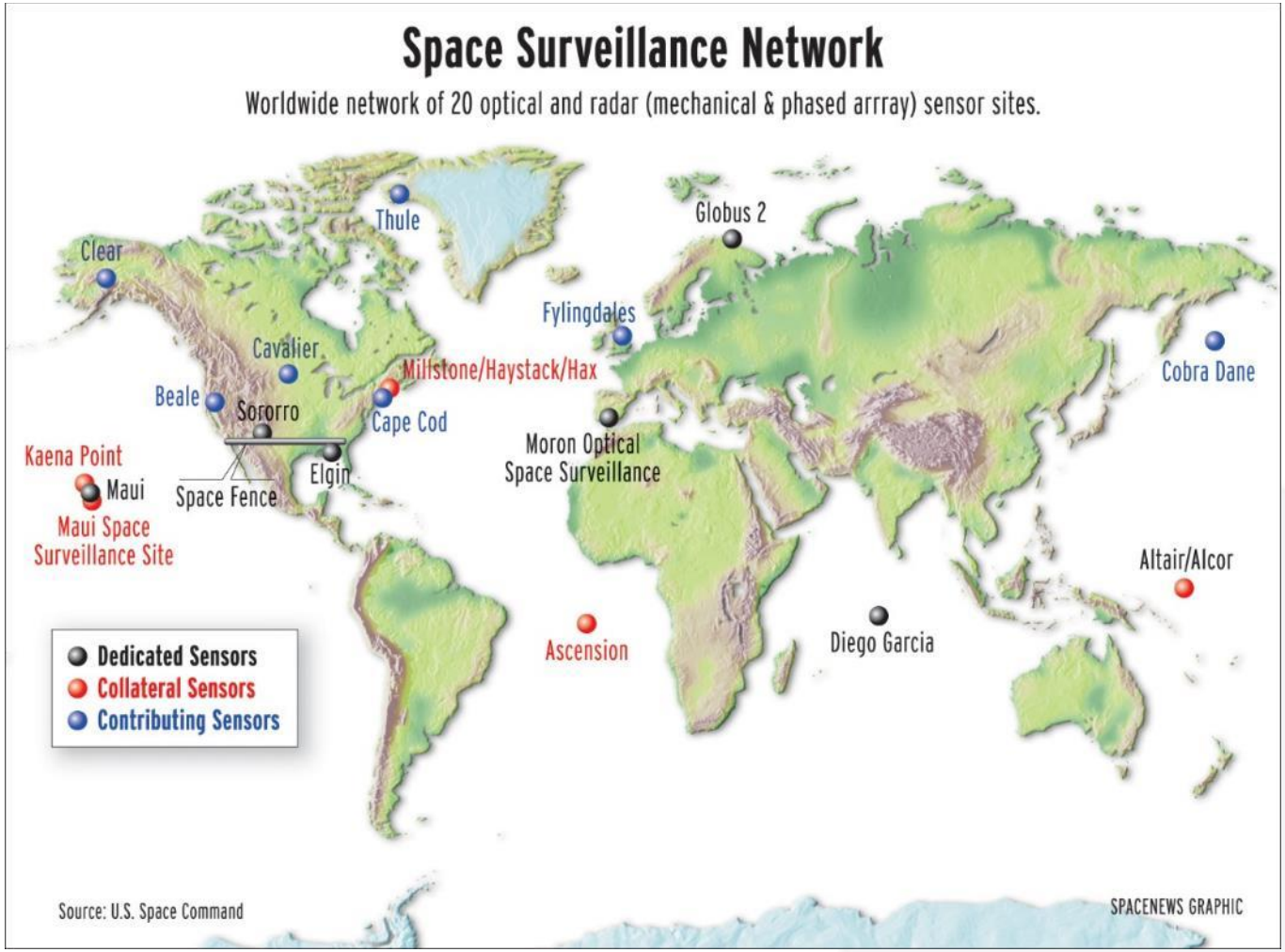


Sapphire
(Contributing sensor)

SBSS
(Dedicated sensor)

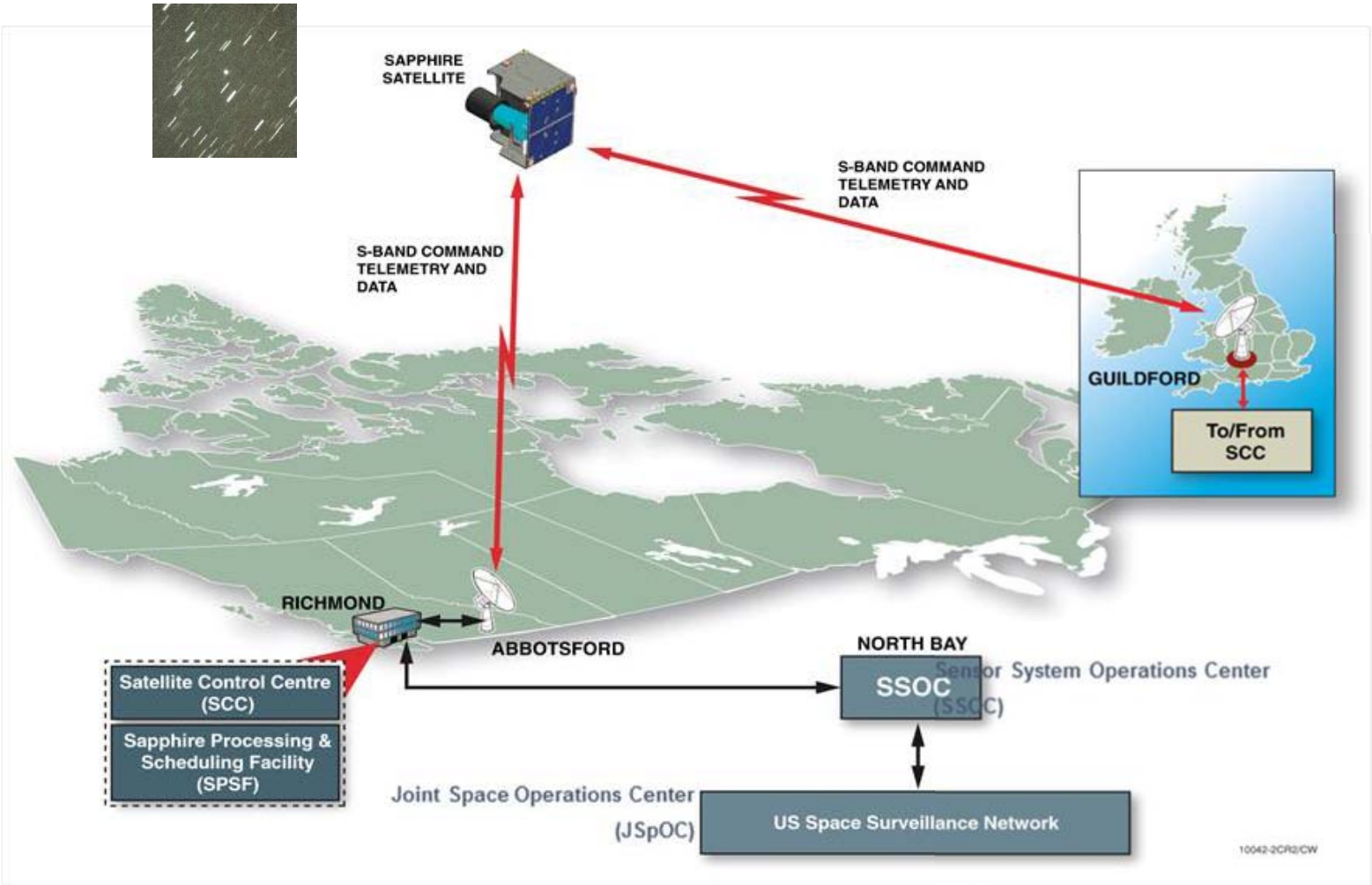


NEOSSat
(Experimental sensor)



Canada

Background:
Canadian Space Surveillance System

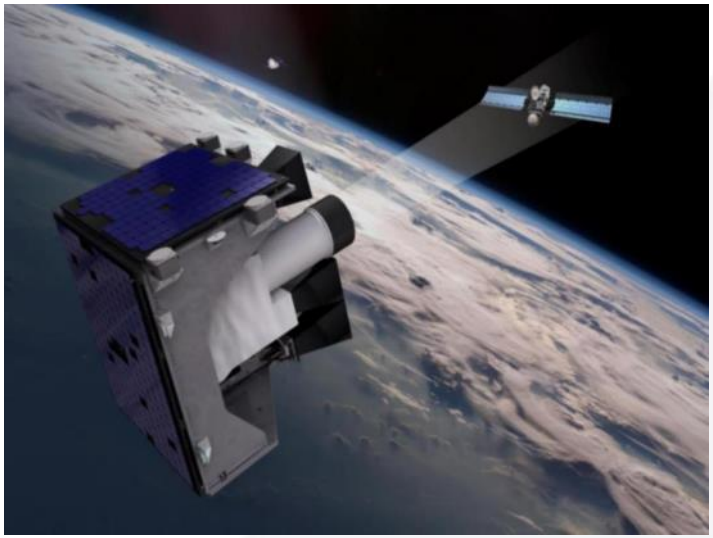


Canada

Background:
CSSS: Space Segment

An operational Canadian space surveillance system:

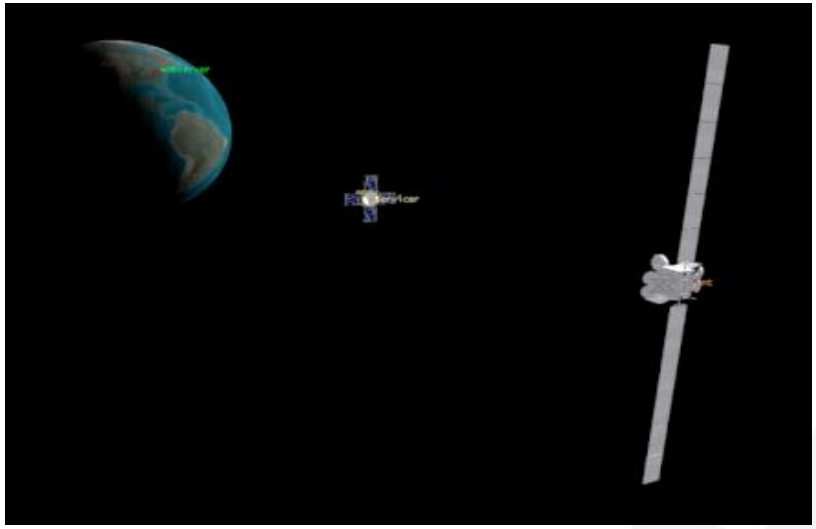
- Launched 25 February 2013
- Mass: ~ 148 kg
- Dimensions: ~ 1 m^3
- Orbit: 784 km sun-synchronous
- Track capacity: ~ 2700 observations/day
  - Tracks deep space objects (orbits > 6000 km altitude
- Design life: 5 years

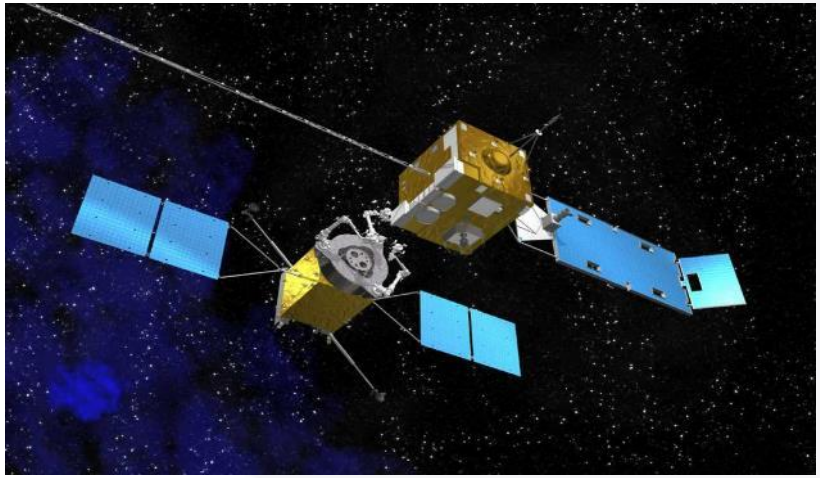


Background:
The space situation: Post-2007

New space technologies are changing the way we need to perform space surveillance

- Smaller satellites are appearing at all orbital regimes
  - Detection problem is becoming more complex
- Multiple satellites flying in tight co-located clusters are expanding in GEO orbit
- All-electric satellites are demanding more precise tracking data to maintain orbit custody
- On Orbit Servicing technologies are appearing which are straining classical space surveillance systems





Background:
The space situation: Post-2007

Space-threat is evolving:

- Kinetic and co-orbital ASAT
- Orbital stalkers
- On-orbit servicing

Since 2013, commercial sector is taking a larger role in collecting observations for catalog maintenance

As the threat evolves and become greater, the US DoD is focussing its SSA activities towards more traditional ISR-type functions.

Canada needs to provide a space surveillance systems that is applicable to this new reality.

Canada

SofS 2 Project

Canada

Surveillance of Space 2

Project scope

The aim of the SofS 2 is to:

Improve the Space Situational Awareness (SSA) capability delivered by the CSSS.

The mission focus of the SofS 2 capality remains the deep space Earth orbit environment:

Orbital altitudes between 5,000 to 40,000 km

Surveillance of Space 2

Defining « improve »

Adapt the Canadian contribution according to:

- Evolving commercial SSA sector
- Evolving space threats
- Evolving military SSA missions

Surveillance of Space 2:
Project deliverables

Canada is seeking an end-to-end space situational awareness solution that will:

Acquire, track and report on RSOs, delivering data outputs in a format compatible for ingestion by the SSOC.

The SofS 2 capability **will be provided and supported for a minimum period of 10 years.**

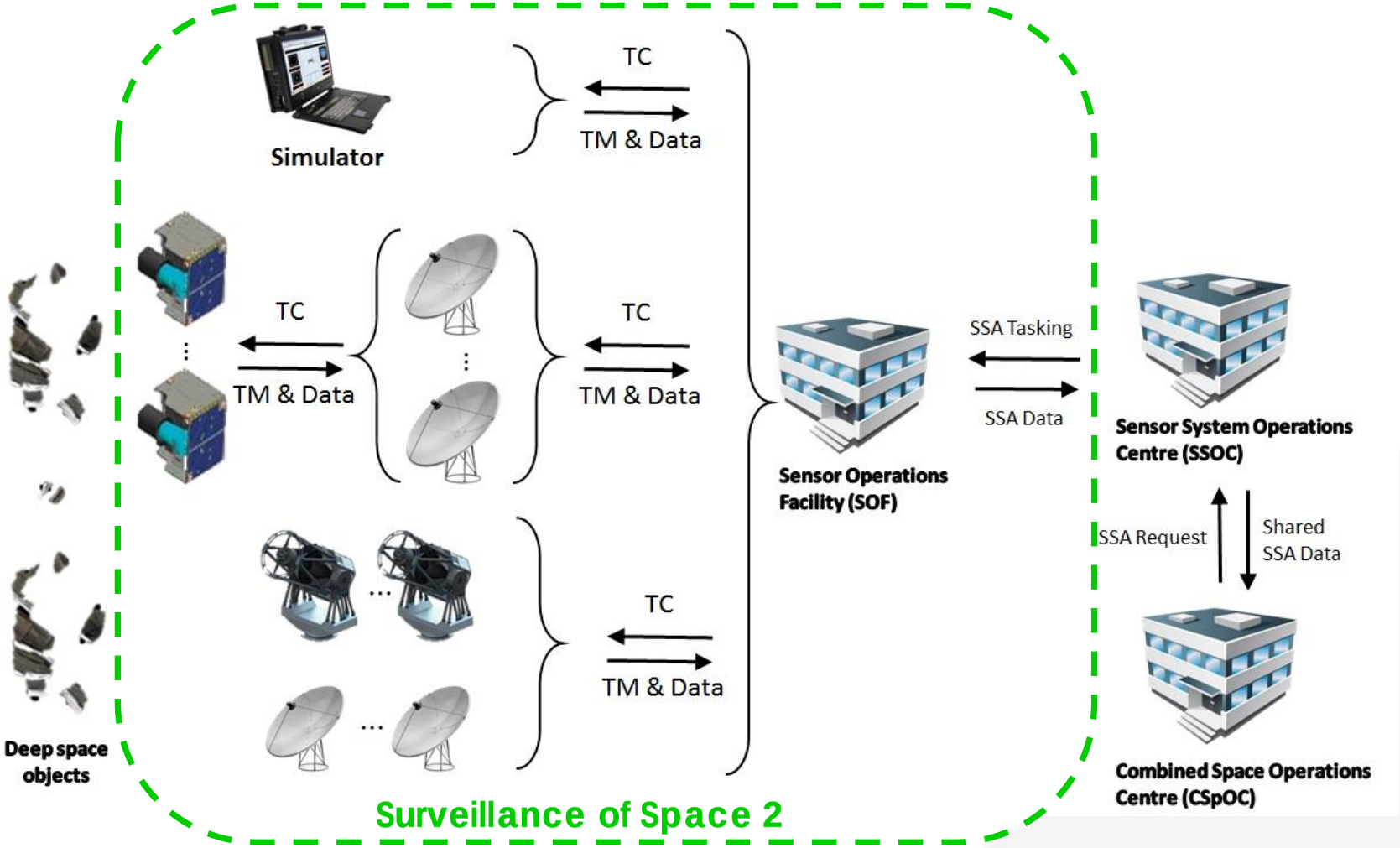
Below is a list of planned deliverables, with several potential sensor options identified:

- A Space-Based Optical (SBO) sensor in Low Earth Orbit (LEO);
- A Space-Based Optical (SBO) sensor in Geostationary Orbit (GEO);
- A small Ground-Based Optical (GBO) sensor (<1m telescope);
- A large Ground-Based Optical (GBO) sensor, similar to US SSN Space Surveillance Telescope (SST); or
- Multiples and/or combinations of SBOs or GBOs.

It is important to note that respondents may offer a different solution than the ones mentioned above.

Surveillance of Space 2

Conceptual capability



Surveillance of Space 2:
Project deliverables

Canada intends to release a competitive RFP for the delivery of the SofS 2 capability.

Canada is seeking an end-to-end space situational awareness solution that will:

Acquire, track and report on RSOs, delivering data outputs in a format compatible for ingestion by the SSOC.

The SofS 2 capability will be provided and supported for a minimum period of 10 years.

Below is a list of planned deliverables, with several potential sensor options identified:

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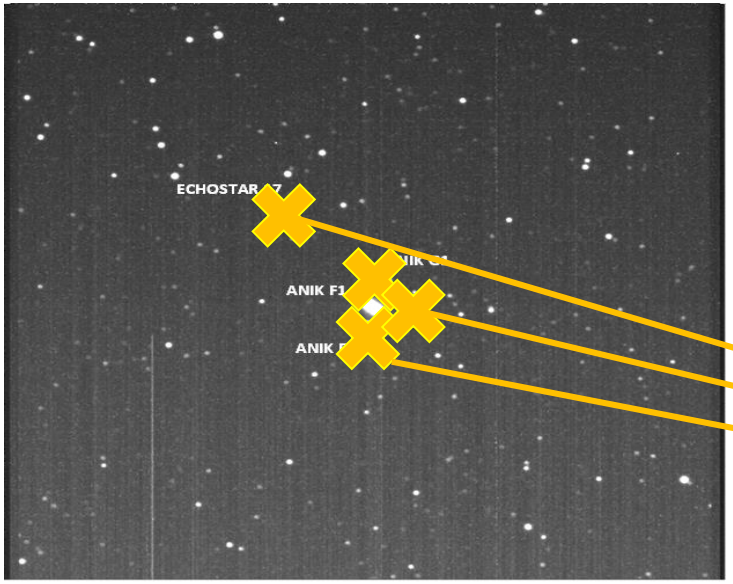
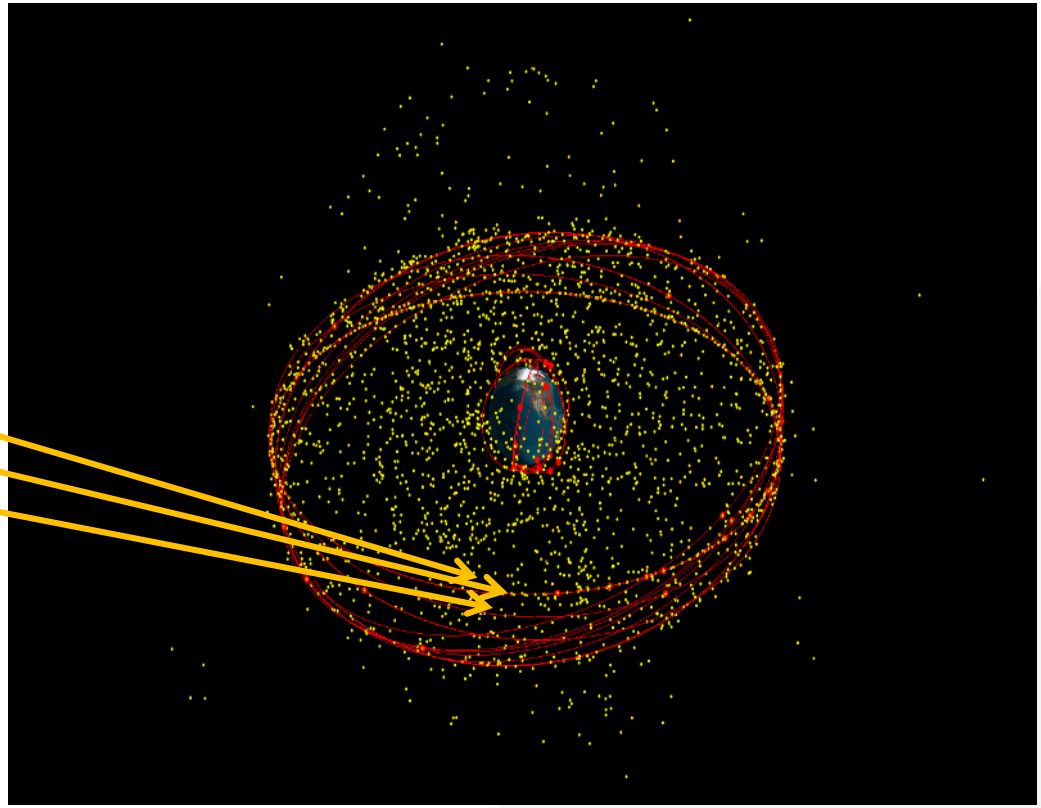
- A large Ground-Based Optical (GBO) sensor, similar to US SSN Space Surveillance Telescope (SST); or
- Multiples and/or combinations of SBOs or GBOs.

It is important to note that respondents may offer a different solution than the ones mentioned above if they demonstrate that their solution is competitive:

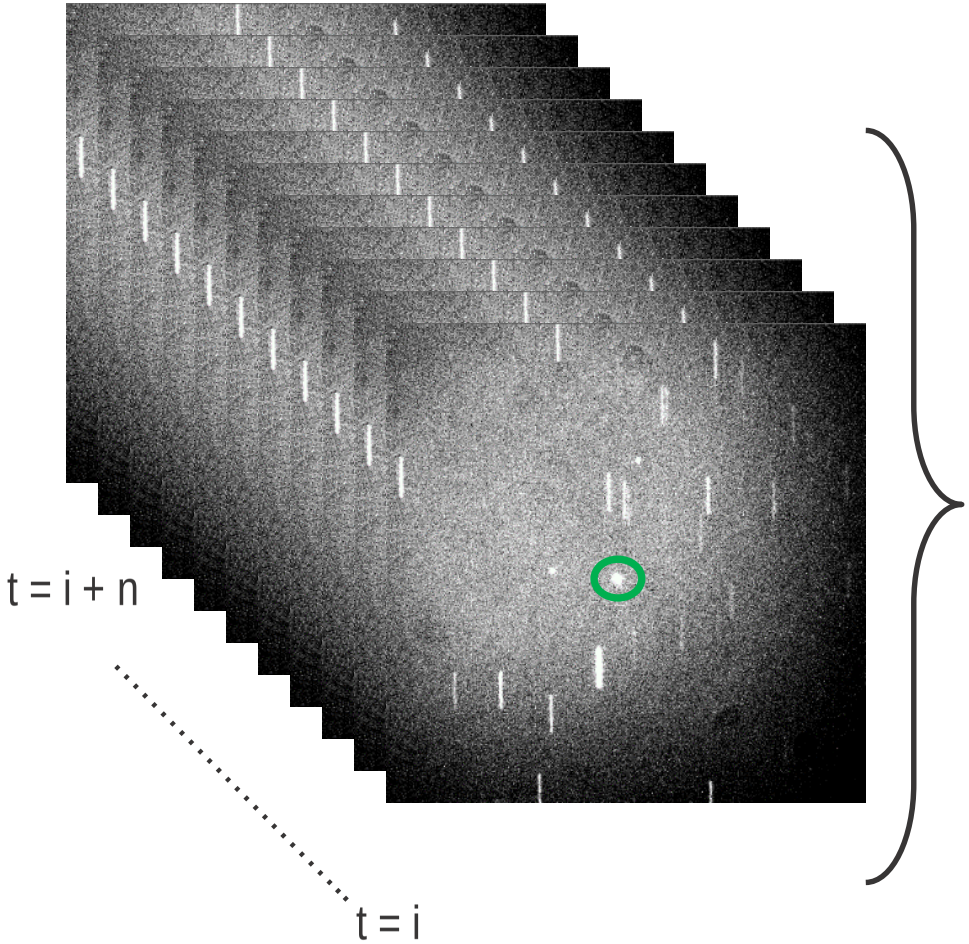
Astrometry:
Orbit determination

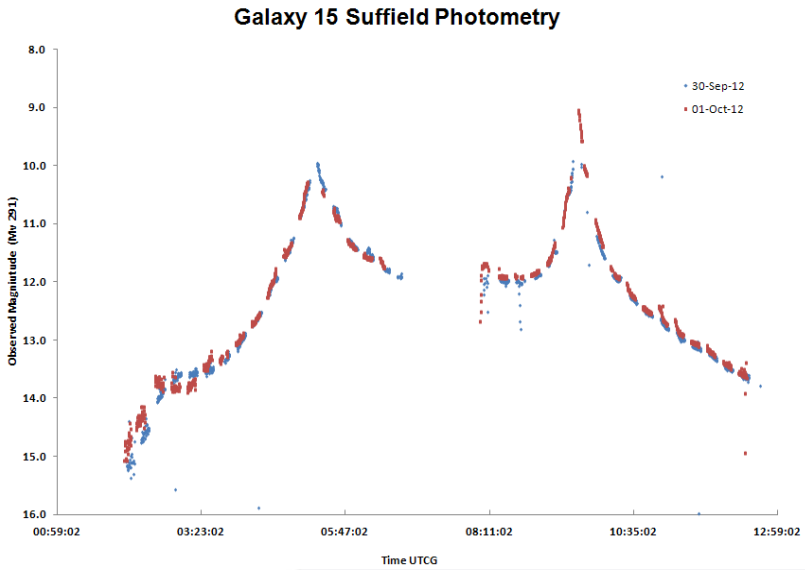




Canada

Photometry:
Satellite status

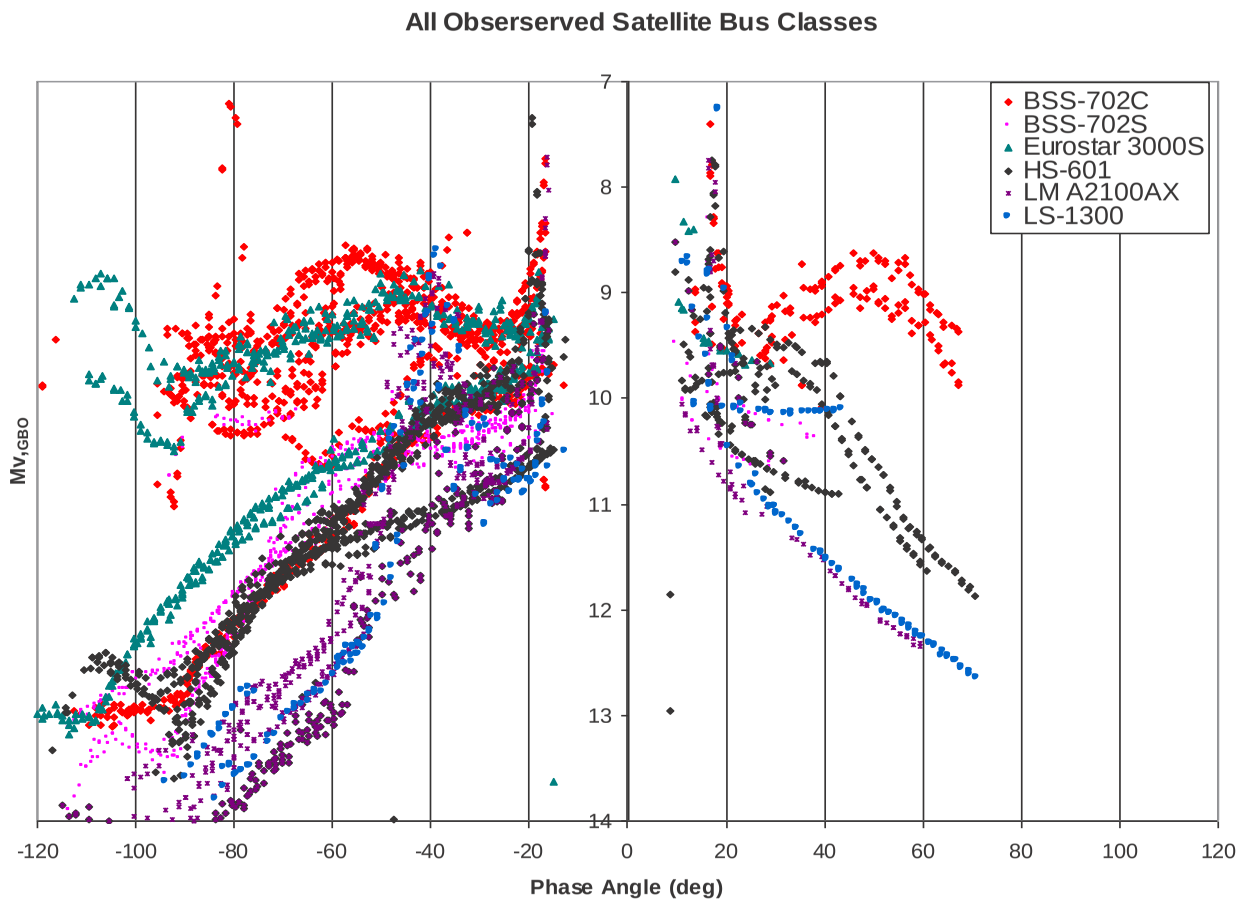




Canada

Photometry:

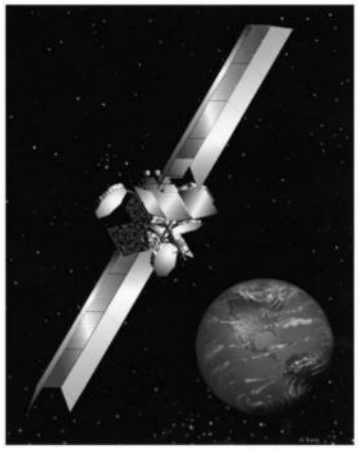
Satellite characterization

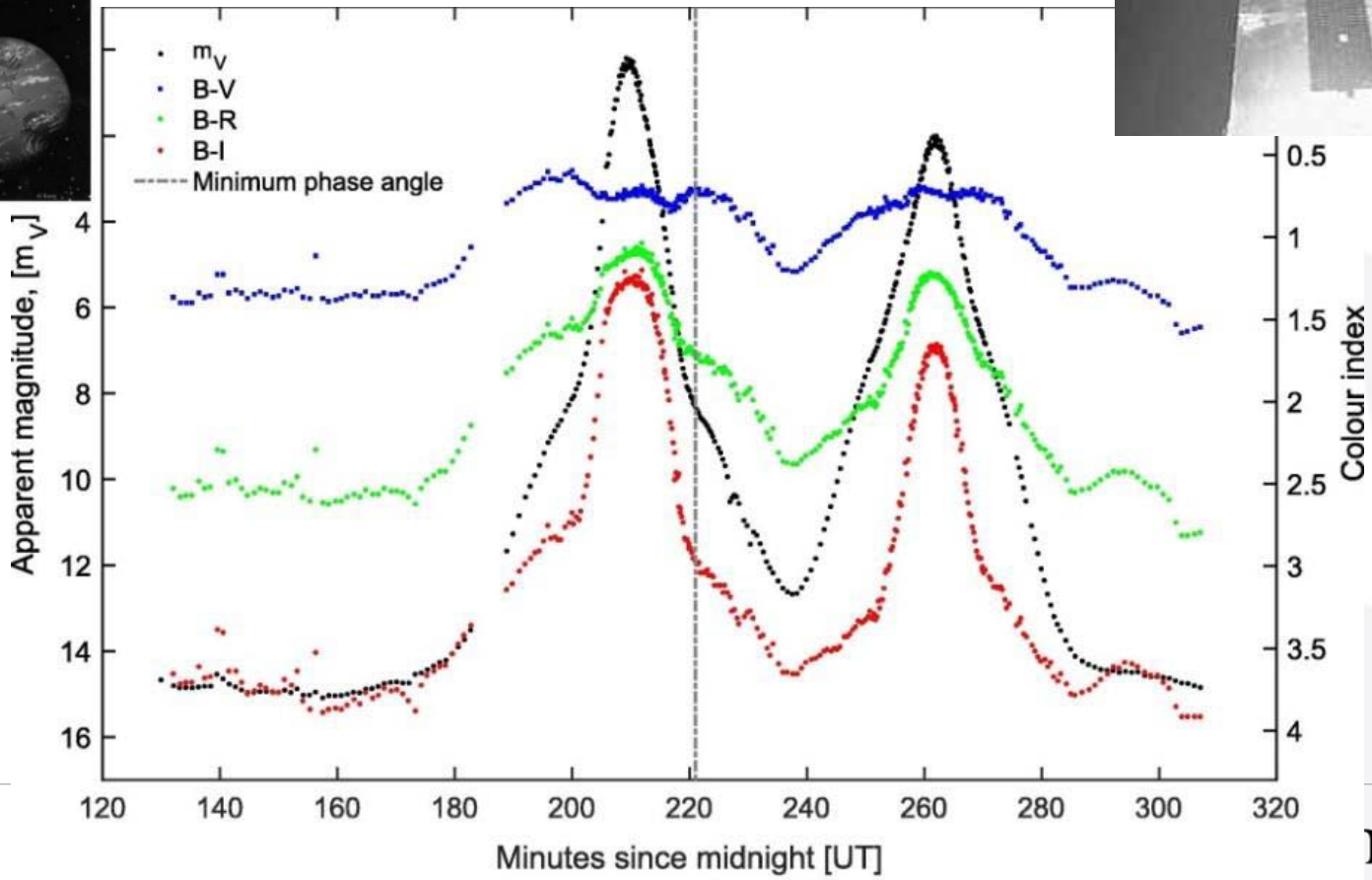


Canada

Colour photometry:

Satellite characterization and identification





Surveillance of Space 2

High level mandatory requirements (1)

HLMR	Requirement	Target
1 – Sensitivity	Be able to detect objects in space of a minimum specified size of a 30-cm sphere at 40,000 km, or equivalent brightness[4].	The goal is VisMag 18.0.
2 – Accuracy	Be able to determine a space object's position to a specified degree of precision measured as one sigma angle precision less than 1 arc second.	The goal is 0.5 arc-seconds.
3 – Capacity	Be able to obtain a minimum of 35 tracks per hour for space based sensors and 40 tracks per hour for ground based sensors.	The goal is 50 tracks per hour for both. Please see Annex B – Definitions of Terms Used in this Document for additional explanation of capacity and definition of a track.
4 – Availability	Be able to collect observations of space objects, at least 90% of the time during viewing conditions commensurate with the capability and available 98% of the time over a ten-day period.	The goal is 95% availability during viewing conditions commensurate with the capability.
5 – Interoperability	Be able to communicate with the SSOC, the SSN, the CANSpOC and the CSpO network by using common command and telemetry protocols, formatting and interfaces.	No target identified at this time.

[4] Equivalent to visual magnitude 17.5 at a viewing angle of 90 degrees (optimal viewing angle).

Surveillance of Space 2

High level mandatory requirements (2)

HLMR	Requirement	Target
6 – Protection	Be able to communicate within the entire CSSS and with the SSN at a security level that is consistent with DND SA&A guidelines.	Unclassified; Secret-level under consideration by DND.
7 – Latency	Be able to report space object position data no later than 4 hours from the time of observation.	The goal is near real-time. Please see Annex B – *Definitions of Terms Used in this Document* for definitions of data and system latencies.
8 – Control	Be able to maintain national operational control over planning, monitoring, operation, and management of the capability in support of CAF operations. This includes being able to adjust the number and rate of observations as well as observe specific orbital regimes and/or objects of national interest and determine the scheduling of routine maintenance of the sensor(s).	No target identified at this time.
9 – Orbit Debris Mitigation	For space-based sensors, must be able to conform to the Peaceful Uses of Outer Space[5] guidelines for space debris mitigation.	No target identified at this time.
10 – Mission Life	Be able to maintain full capability for a minimum of 10 consecutive years.	No target identified at this time.

[5] EUnited Nations Office for Outer Space Affairs, "Space Debris Mitigation Guidelines of the Committee on the Peaceful uses of Outer Space", www.unoosa.org/pdf/publications/st_space_49E.pdf.

Surveillance of Space 2

HLMR under consideration

The following potential HLMR are under consideration as a system mission assurance measure, pending assessment and approval by DND.

HLMR	Requirement	Target
6 – Protection	Be able to communicate within the entire CSSS and with the SSN at a security level that is consistent with DND SA&A guidelines.	Unclassified; Secret-level under consideration by DND.
11 – Maneuverability	Be able to maintain orbit parameters within a certain tolerance, and change orbit parameters to avoid collisions with space debris and other satellites.	

Surveillance of Space 2

SECRET-level operational security

Impacts to consider to operate at an operational security level of SECRET:

- CSE-approved high assurance cryptographic products (HACP) to secure communications links:
  - Example of a satellite HACP: Raytheon's Gryphon KI-55
  - Example of a ground HACP: KIV-7M
- CSE COMSEC accounts:
  - Required to receive and hold HACP
- Infrastructure requirements:
  - Facilities
  - Processes
  - IT and communications network

Surveillance of Space 2

Project schedule

Milestone	Planning Date
Project Approval (Definition)	2020 - 2021
Project Approval (Implementation)	2023 - 2024
Initial Operating Capability	2026 - 2027
Full Operating Capability	2026 - 2027

Table 1 – Current Project Milestones and Schedule

Note: The dates provided in Table 1 are subject to change.

Surveillance of Space 2

Funding ranges

The Defence Capabilities Blueprint* provides the following information regarding funding:

Funding Ranges
$100 million to $249 million

The SofS 2 PMO will use Industry responses to review their own budgetary figures.

* http://dgpaapp.forces.gc.ca/en/defence-capabilities-blueprint/project-details.asp?id=1039

Surveillance of Space:
Potential Capability Gap

SofS 2 IOC currently scheduled for 2026.

Sapphire reached its 5-year design life in Feb 2018:

- All spacecraft subsystems are operating nominally
- Assuming that Sapphire will not operate until 2026

Capability gap mitigation:

- RCAF is assessing a wide range of options
- One obvious solution: accelerating SofS 2 project

Questions

?

Canada

Respect • Integrity • Excellence • Leadership

Serving GOVERNMENT, Serving CANADIANS.

Procurement Process

Presented by:

Alan Chan

Public Services and Procurement Canada

Procurement Process Overview

- Industry Engagement
  - Industry Day Oct 2-4, 2018;
  - One-on-one meetings following immediately after;
  - Request for Information (RFI) process to assist DND with Options Analysis
  - Future engagement activities, including one-on-one meetings if required, will be identified on the buyandsell.gc.ca website
  - SofS2 is subject to the National Security Exemption
  - Fairness Monitor is used for this procurement

- Communications

  - All communications must go through PSPC including:
    - Questions and information from Industry
    - Distribution of engagement summaries and draft documents; and
    - Additional questions and answers from Canada

One-on-One Meetings

- Meetings may be recorded by the SofS 2 Project Team in case clarification of information is required
- All substantive and non-proprietary information, questions and answers discussed during these meetings will be noted and made available to all vendors participating in the engagement process. Questions may be edited so that the proprietary nature of questions is eliminated, as required
- Participation is not required in order to submit a response to any future solicitation
- Additional one-on-one meetings may occur later in the engagement process

Request for Information

Objective:

- To give industry the opportunity to:
  - review Canada's requirement;
  - have direct discussions at the one-on-one meetings; and
  - present their capabilities and considerations via their response to the RFI.

Request for Information

Use:

- To aid DND in performing their Options Analysis;
- To assist in the development of the Statement of Work and future solicitation; and

Review of Draft Solicitation Documents

- Draft versions of solicitation documents, including the Statement of Work and Evaluation Criteria will be posted on buyandsell.gc.ca when they become available (estimated 2020)
- Vendors will be invited to provide comments and respond to specific questions from Canada
- All questions and answers discussed during the review process will be made available to all vendors participating in the Industry Engagement Process. Questions may be edited so that the proprietary nature of questions is eliminated, as required
- Participation is not required in order to submit a response to any future solicitation

Distribution of Solicitations

www.buyandsell.gc.ca

- Government tendering website will continue to be used as the main notification and distribution mechanism for SofS 2 notices and solicitations (including any additional RFIs, draft solicitation documents, etc.)
- Contact the SofS 2 Contracting Authority if you require any assistance with the service

Point of Contact

The PSPC Contracting Authority is the only point of contact for the SofS 2 requirement

Alan Chan
Public Service and Procurement Canada
Acquisition Branch
Telephone: 613-858-9358
E-mail: Alan.Chan@tpsgc-pwgsc.gc.ca

Questions?

Surveillance of Space 2

Industrial and Technological Benefits Policy

October 2, 2018

Outline

- **Objective**
- **Industrial and Technological Benefits Policy including Value Proposition**
- **Market Analysis**
- **Next Steps**

Objective

- The Government of Canada is consulting with industry in order to understand the economic leveraging opportunities for the Surveillance of Space 2 project:
  - Present highlights of market analysis
  - Seek input from industry- RFI questions
  - Feedback from industry provided during this engagement process, along with research and analysis, will be used to inform the development of a Value Proposition Strategic Objective.

Industrial and Technological Benefits Policy

Companies awarded defence procurement contracts are required to undertake business activity in Canada equal to the value of the contract

This includes a commitment to undertake work in Canada that:

- Involves minimum values of Canadian work directly on a procurement and;
- Includes work with small and medium-sized businesses across Canada

WHEN DOES IT APPLY?

- All eligible defence and Canadian Coast Guard procurements **over $100 million**
- All eligible defence procurements with contract values between **$20–100 million** will be reviewed for the application of the ITB Policy

HOW DOES THE ITB POLICY BENEFIT CANADA?

Leverages high value investments

- Weighted and rated factor in selection
- Criteria tailored to each project
- Streamlined Policy features and processes
- Supports leading Canadian industrial capabilities and emerging technology areas

Reinforces Government Policies

- Reinforces government policies such as *Canada's Innovation and Skills Plan*, and *Strong, Secure, Engaged: Canada's Defence Policy*

Results have included defence sector growth and major spill- Over benefits to the broader economy

ITB PORTFOLIO *at a glance* 1986 – 2017	144 Contracts	$43.8 B in Obligations	$31.8 B Completed	$8.8 B Activities in Progress	$3.2 B Future work opportunities

WHAT IS THE VALUE PROPOSITION?

- *A bidder's economic proposal to Canada*
- *The rated and weighted element of contractor selection along with technical and cost elements*
- *Designed through market analysis, industry engagement and third party consultation*

A VP proposal contains:

- **Plans**
- **Commitments**
- **Identified business activities (transaction sheets)**

OBJECTIVES OF THE VALUE PROPOSITION

1. **Support the long-term sustainability** and growth of Canada's aerospace and defence sectors
2. **Support the growth of prime contractors and suppliers in Canada**, including small and medium-sized enterprises in all regions of the country
3. **Enhance innovation** through R&D in Canada
4. **Increase the export potential** of Canadian-based firms
5. **Promote skills development and training** to advance employment opportunities for Canadians

RECENT ENHANCEMENTS

Key Industrial Capabilities (KIC)

A strategic approach to leveraging economic outcomes through upcoming National Defence and major Canadian Coast Guard procurements with a continued focus on innovation, supplier development, exports, and economic growth for the defence industry and associated commercial applications

Skills Development and Training Pillar

On a procurement-by-procurement basis bidders will be encouraged to identify skills development and training opportunities for Canadians. This pillar may also consider under-represented groups (e.g. women, Indigenous Canadians) in the defence industry and other economic sectors.

Gender and Diversity Plans

A non-rated addition to the required ITB planning documents that describes the prime contractor's approach to achieving gender balance and increasing diversity within Canadian corporate structures and broader supply chains in Canada

Key Industrial Capabilities (KICs)

EMERGING TECHNOLOGIES

- Advanced Materials
- Artificial Intelligence
- Cyber Resilience
- Space Systems
- Remotely-piloted Systems and Autonomous Technologies

LEADING COMPETENCIES & CRITICAL INDUSTRIAL SERVICES

- Aerospace Systems & Components
- Armour
- Defence Systems Integration
- Electro Optical / Infrared Systems
- Ground Vehicle Solutions
- In- Service Support
- Marine Ship-Borne Mission and Platform Systems
- Munitions
- Shipbuilding, Design and Engineering Services
- Sonar & Acoustic Systems
- Training & Simulation

Market Research and Analysis

Market research and analysis is conducted to better understand domestic industrial capabilities and global market in relation to SofS2.

Findings provide information on leveraging opportunities and inform the development of Value Proposition framework.

Key sources of information

- Internal research and analysis
- Regional Development Agencies and Other Government Departments' industry capability analysis
- Third Party consultation and analysis of market trends
- Industry engagement

Canadian Space Systems Industry

Canada has developed robust capabilities across most of the space value chain.

World-class SATCOM and other **spacecraft components** that are **widely exported**

Canadian industry does maintain **some integration heritage**, but **primarily through Canadian Government-funded projects**

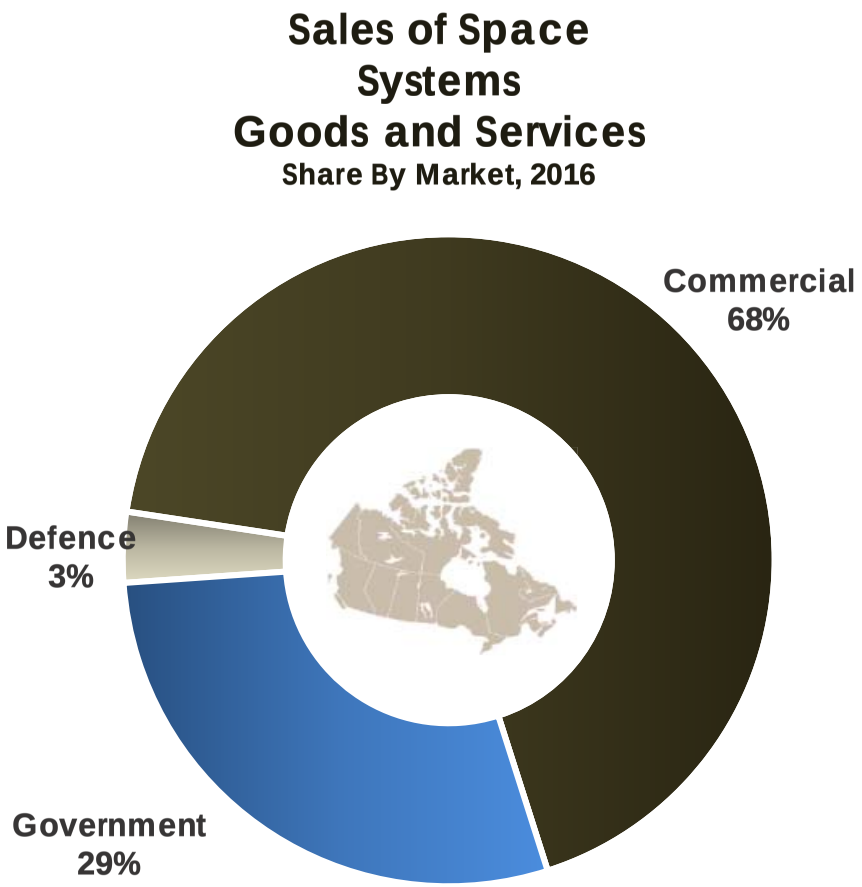
Canadian launch industry is still very nascent, but **polar launch potential** could boost local industry

Canada has robust ground network capabilities, particularly in **satellite terminal electronics** and other subsystems

Canada has **a leading satellite operator** as well as **several competitive EO services, data analytics**, and other space service companies

Source: *Avascent Analytics 2017, and Canadian Defence, Aerospace and Commercial and Civil Marine Sectors Survey (2014), 2016*

Canadian Space Systems Industry

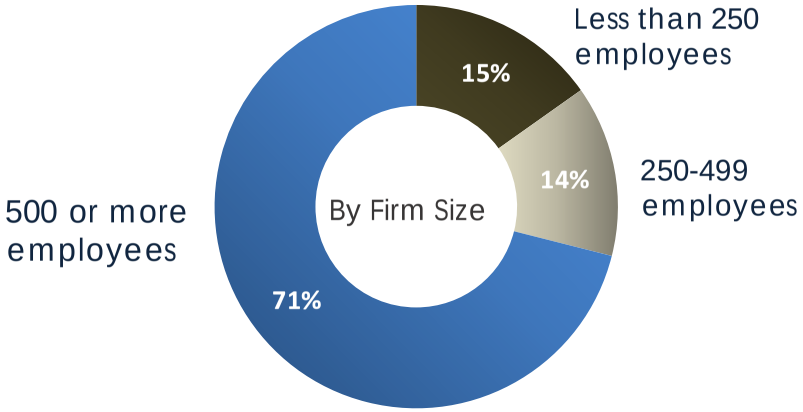


- Canadian space systems industry activity in 2016 was mainly commercially oriented
- Government related sales were close to a third, and Defence represented 3% of sales in 2016.

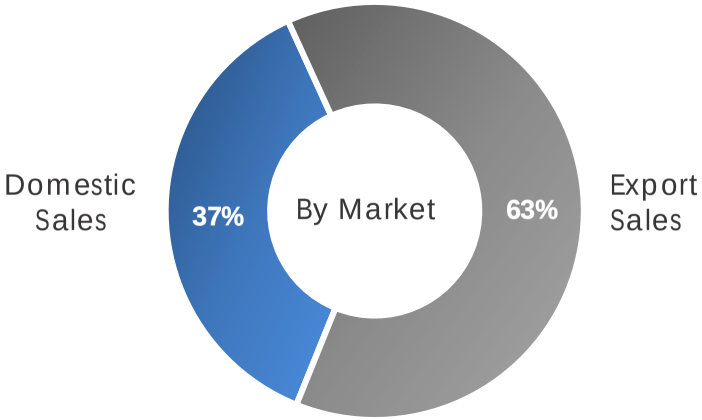
Source: Statistics Canada Canadian Defence, Aerospace and Commercial and Civil Marine Sectors Survey (2014), 2016

Canadian Space Systems Industry Sales 2016

Sales, 2016



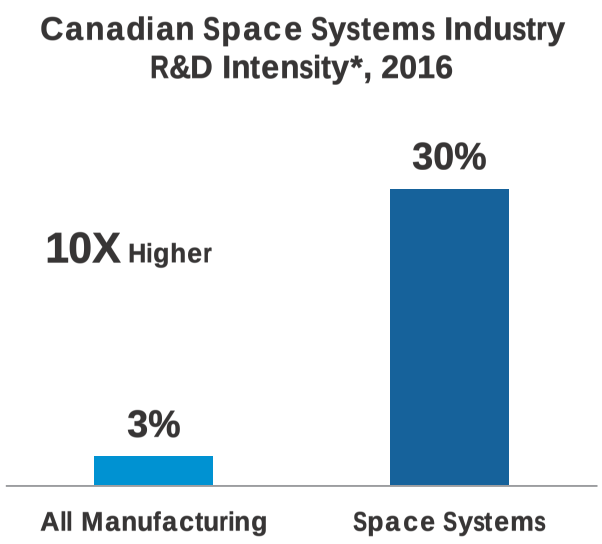
- More than 65 firms generated over $500M
- Large firms continue to dominate sales with the top 4 generating 82% of total sales
- Share of sales by small firms has more than tripled since 2014.

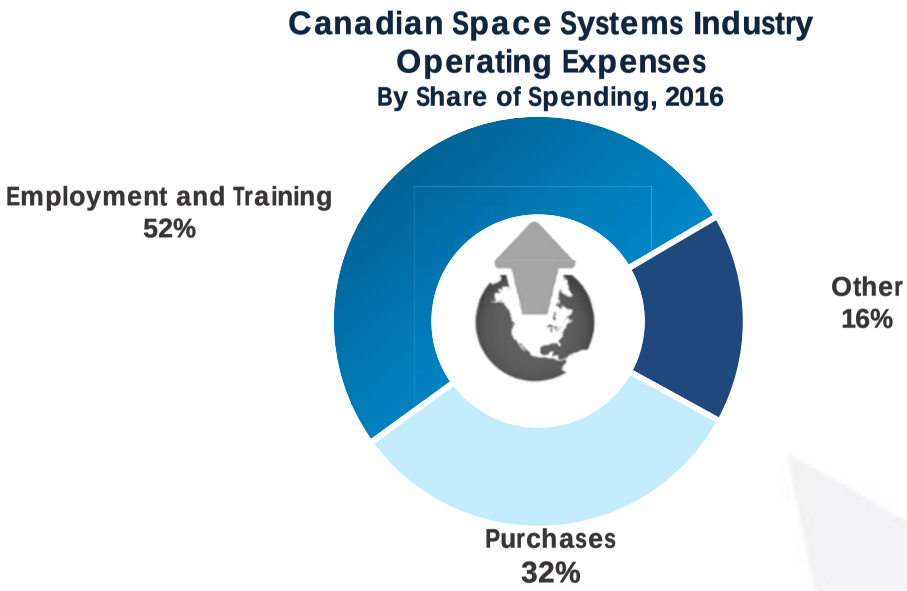


- Export oriented industry with over 60% of sales to global market
- The United States was the largest export market at 64% followed by Europe at 28%
- The Canadian government represented 67% of domestic sales

Source: Statistics Canada Canadian Defence, Aerospace and Commercial and Civil Marine Sectors Survey (2014), 2016

Canadian Space Systems Industry- Innovation





- Highly R&D intensive compared to other sectors
- Higher share of engineers, scientists and technicians compared to other manufacturing sectors

- Jobs focussed on innovation activities
- Skills focused with over half operating expenses related to employment/training

* R&D intensity for the space industry is measured as the ratio of total R&D expenditures to space systems industry GDP. R&D intensity for total manufacturing industry is measured as the ratio of total business enterprise in-house R&D expenditures to total manufacturing GDP, based on Statistics Canada's CANSIM tables
Source: Canadian Defence, Aerospace and Marine Industries Survey (2016), 2018

Value Proposition Key Points

- SofS2 falls within the Key Industrial Capability of space systems and features emerging technologies that are of strategic industrial importance to Canada.

- Canada has capacity along the space systems value chain and within SofS2 related activities, including capabilities in developing space based optical solutions, space systems integration, satellite operations, components and sub-systems including robotics and data analytics.

- Our space industry is innovative, highly collaborative, R&D and export intensive.

- Development of emerging technologies including those pertaining to SofS2 requirements can position Canadian industry for future growth and export opportunities.

KEY RESOURCES & ADVICE

1

Understand the ITB Policy and Value Proposition

More information on the ITB Policy is available on Innovation, Science and Economic Development Canada's website
→ ***www.canada.ca/itb***

2

Connect with the Regional Development Agencies (RDAs)

RDAs have key knowledge of their respective regions, and can assist in making connections between Canadian industry and suppliers
→information about RDAs

3

Connect with Potential Suppliers and Post-Secondary/Research Institutions

Gather additional intelligence and make contacts through trade associations, industry days, conferences and trade shows, including through CADSI and AIAC
→ https://www.defenceandsecurity.ca/
→ http://aiac.ca/

CONTACT INFORMATION

For more information on economic benefits contact:
Linda.Piovesan@canada.ca

To get in touch with a Regional Development Agency, contact:

Atlantic Canada Opportunities Agency (ACOA)
Elyse Mistry – elyse.mistry@canada.ca

Federal Economic Development Agency for Southern Ontario (FedDev)
Craig McClelland – craig.mcclelland@canada.ca

Federal Economic Development Agency for Northern Ontario (FedNor)
Natalie Brabant - natalie.brabant@canada.ca

Western Economic Diversification Canada (WD)
Stewart Campbell - stewart.campbell@canada.ca

Canada Economic Development for the Quebec Region (CED-Q)
Mathieu Trudelle - mathieu.trudelle2@canada.ca

NEXT STEPS

- ISED will review industry feedback on leveraging opportunities and continue to engage industry to further refine the Value Proposition Strategic Objective.

- ISED is open to questions and feedback throughout the engagement process.

- All questions regarding this RFI should be sent through the Contracting Authority.

Annex: ISED/Statistics Canada Survey Space Systems Industry Categories

Military Systems Deployed in Space, Space Launch Vehicles, Land-based Systems for the Operation, Command and Control of Space Launch Vehicles or Systems Deployed in Space; and Related Components.

This category includes sales related to production as well as research, development, design, engineering, testing and evaluation services:

Relating to primarily military systems deployed in space (e.g., satellites, spacecraft, and space robotic systems) and their sub-systems and components; as well as space launch vehicles.

Related design, engineering and production of earth-based systems used for the operation, Command & Control of military systems deployed in space and space launch vehicles (e.g., ground stations, satellite tracking systems, and launch facilities).

Commercial Systems Deployed in Space, Space Launch Vehicles, Land-based Systems for the Operation, Command and Control of Space Launch Vehicles or Systems Deployed in Space; and Related Components.

This category includes sales related to production as well as research, development, design, engineering, testing and evaluation services for primarily commercial clients and applications, of systems deployed in space (e.g., satellites, spacecraft, and space robotic systems) and their sub-systems and components; as well of space launch vehicles. Also included are related design, engineering and production of earth-based systems used for the operation, command and control of space launch vehicles and systems deployed in space (e.g., ground stations, satellite tracking systems, and launch facilities).

Government Non-Military Systems Deployed in Space, Space Launch Vehicles, Land- Based Systems for the Operation, Command and Control of Space Launch Vehicles or Systems Deployed in Space; and Related Components.

This category includes sales to government organizations relating to production as well as research, development, design, engineering, testing and evaluation services for systems deployed in space for primarily Non-Military civil applications (e.g., satellites, spacecraft, and space robotic systems) and their sub-systems and components, as well of space launch vehicles. Also included are related design, engineering and production of earth-based systems used for the operation, command and control of space launch vehicles and systems deployed in space (e.g., ground stations, satellite tracking systems, and launch facilities).

Canada