



Accelerate-Collaborate-Defend: Delivering the Space Objectives of Canada's Defence Policy

Brigadier-General Kevin Whale
Director General & Joint Force Component Commander for Space
RCAF

June 2019

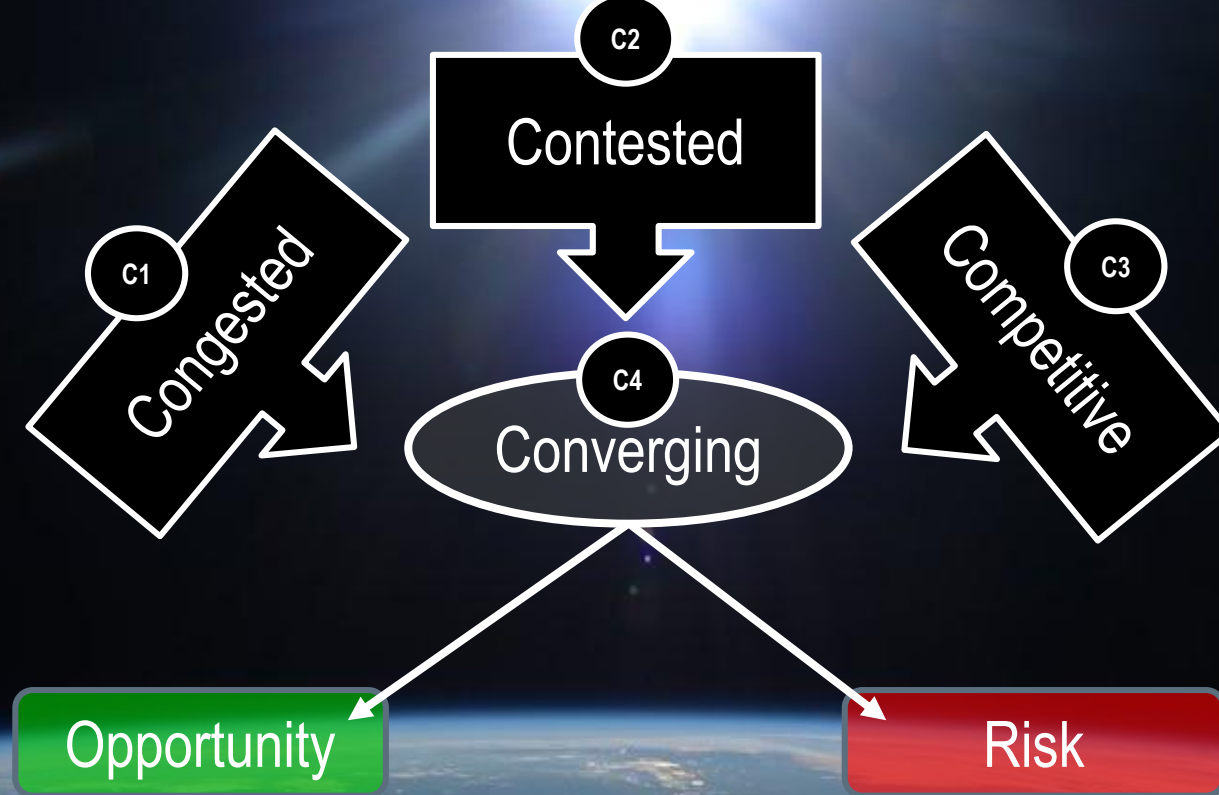
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Overview

- ~ The Four "C's": Cause for a Sense of Urgency
- ~ *Strong, Secure, Engaged*: Defence Space Objectives
- ~ CAF Joint Space Program: RCAF Functional Lead
- ~ Current Capabilities & Projects

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- Cost of entry dropping
- Disruptive innovation
- Socio-economic benefits
- Humanitarian/disaster monitoring
- Inter-planetary exploration
- We can see everything...

- Adversary access to space & data
- Innovation outpacing policy & procurement
- Collisions & counter-space activity
- Freedom of manoeuvre no longer guaranteed
- Untested treaties & norms
- They can see everything...



STRONG. SECURE. ENGAGED: AT A GLANCE

STRONG AT HOME

- Enhanced air and maritime surveillance and control, including Arctic
- Concurrent response to multiple domestic emergencies
- Support to counter-terrorism
- Search and rescue support
- Innovative defence sector

SECURE IN NORTH AMERICA

- Modernize NORAD with the US
- Expanded aerospace and maritime domain awareness and control
- Cutting edge defence research

ENGAGED IN THE WORLD

CAF prepared to conduct:

- 2 major sustained deployments
- 1 major time-limited deployment (6-9 months)
- 2 minor sustained and 2 minor time-limited deployments
- 1 DART mission
- 1 Non-combatant Evacuation Operation

DEFENCE FUNDING

Increase defence spending from \$18.9B in 2016-17 to **\$32.7B** by 2026-27

NEW INITIATIVES

Put our People First

New Total Health and Wellness Strategy

Reinvented transition of ill and injured to service/civilian life

Develop a comprehensive military family plan

Grant tax relief for deployed operations

Integrate GBA+ and meet gender & diversity targets

Increase of 3,500 Regular Force for key priorities

Increase of 1,500 Reserve Force – full-time capability through part-time service

Increase of 1,150 civilians to support operations

Invest in the Future Force

Rebuild core capabilities: 88 advanced fighter aircraft, 15 surface combatants, 2 joint support ships, 5-6 Arctic offshore patrol ships

Increase emerging capabilities in cyber, space, and remotely piloted vehicles to maintain effectiveness and interoperability with allies

Capability enhancements, including intelligence, satellite communications, surveillance and logistics

Modernize the Business of Defence

A transformative innovation agenda with defence research clusters linked to procurement

More accountable, transparent, and streamlined defence procurement process

Reduced carbon footprint through green infrastructure and focus on energy efficiency

Modernized infrastructure management through expanded partnership with the private sector

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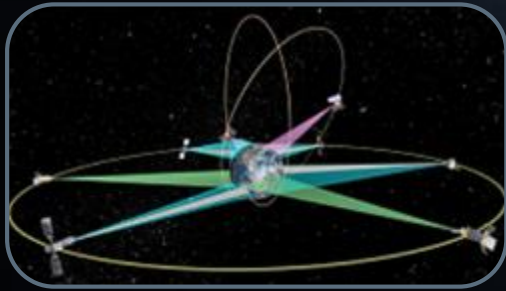


SSE SPACE OBJECTIVES

- Defend and protect space capabilities
- Invest in and employ a range of space capabilities
- Work with partners to promote Canada's national interests on space issues
- Provide leadership in shaping international norms for responsible behaviour in space
- Conduct cutting-edge R&D on new space technologies

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DEFEND AND PROTECT - WHAT?



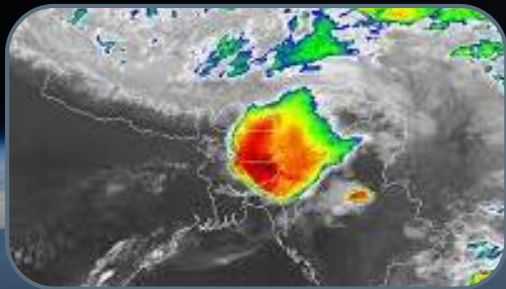
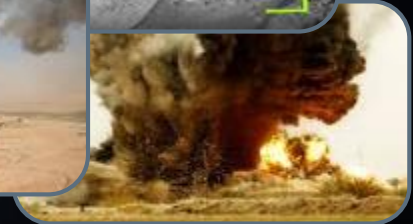
Missile Warning



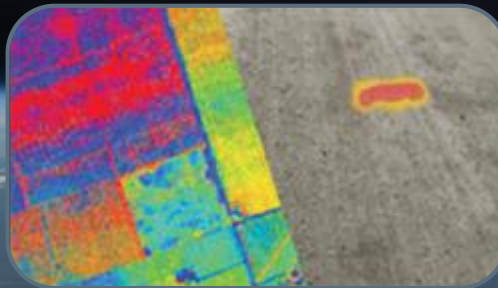
ISR



Precision Strike



Weather



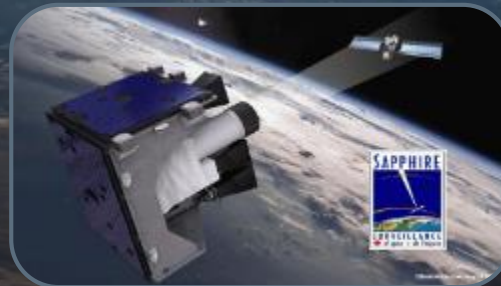
IED Detection



SATCOM



Position-Navigation-Timing
(PNT)



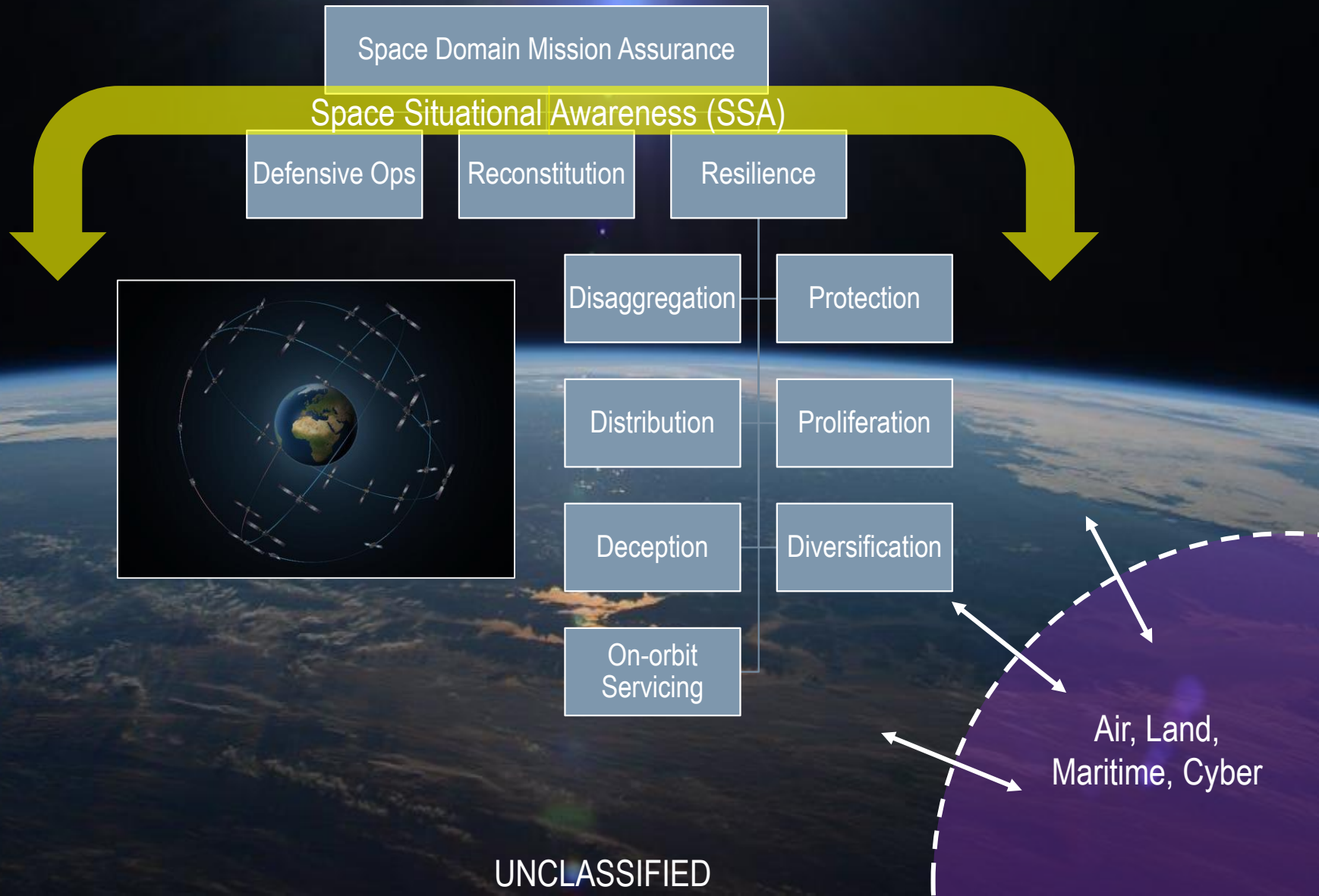
Surveillance of Space



C3 Systems

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DEFEND & PROTECT - HOW?



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POLICY-LEGAL-DOCTRINAL CONTEXT

Rule #1 = The Laws of Physics must be obeyed, plus...

UN “Outer Space” Treaty (1967)



- ☐ UN Guidelines on the Long-Term Sustainability of Outer Space Activities
- ☐ Treaty on the Prevention of Placement of Weapons in Outer Space
- ☐ Draft International Code of Conduct for Outer Space Activities
- ☐ UN Committee on the Peaceful Uses of Outer Space (COPUOS)

Government of Canada Regulations

- *Radiocommunications Act* – ISED
- *Remote Sensing Space Systems Act (RSSSA)* – GAC
- *Aeronautics Act* – TC
- *Canadian Space Agency Act* – ISED/CSA
- *National Defence Act* – DND



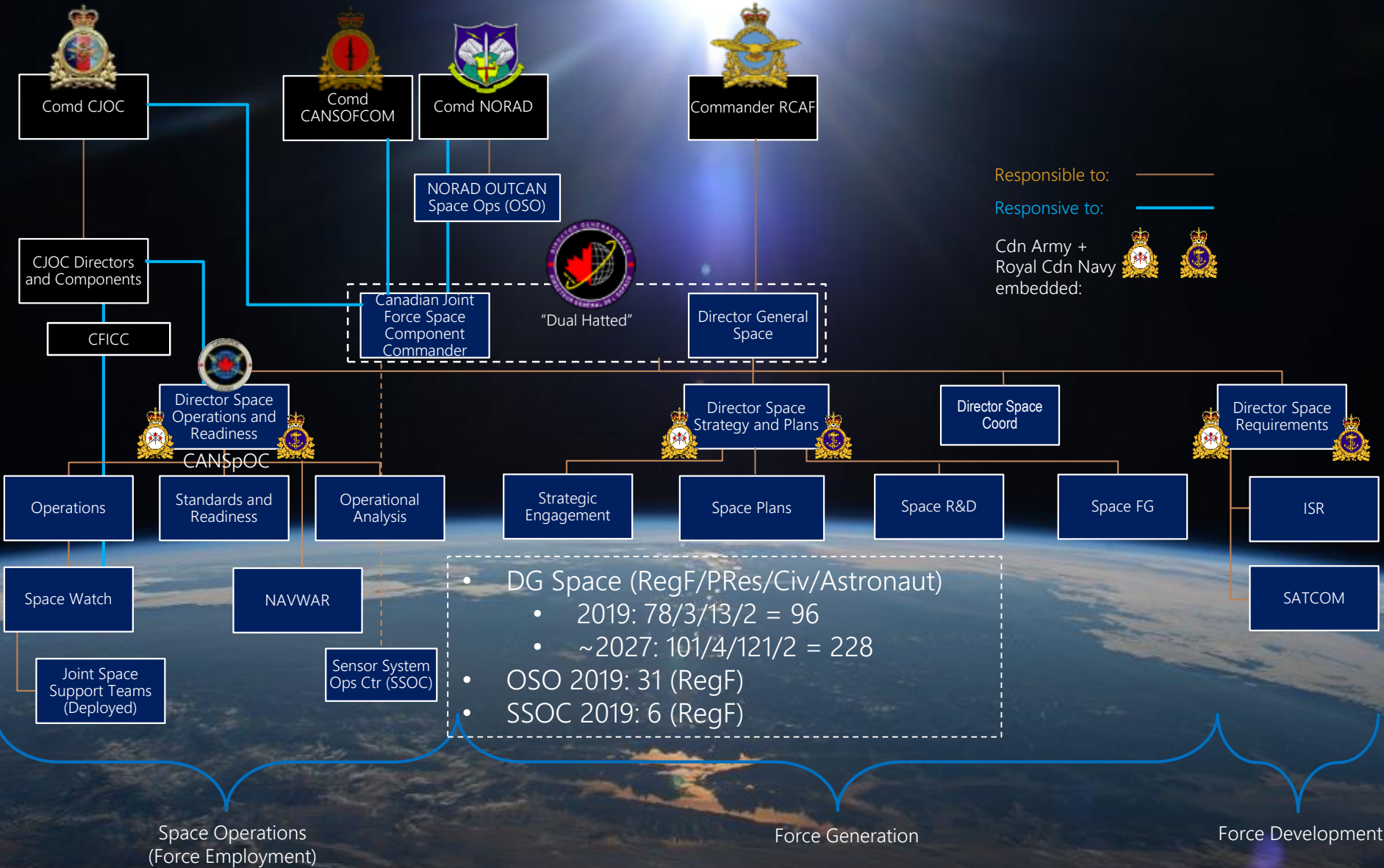
www.dontletgocanada.ca
www.spacematters.ca
www.spaceincmovie.com

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DG Space/Joint Force Space Component Commander (JFSCC) Mission

To maintain Space Domain Awareness, and to develop, deliver and assure space-based capabilities in order to enable the Joint warfighter at home and abroad.

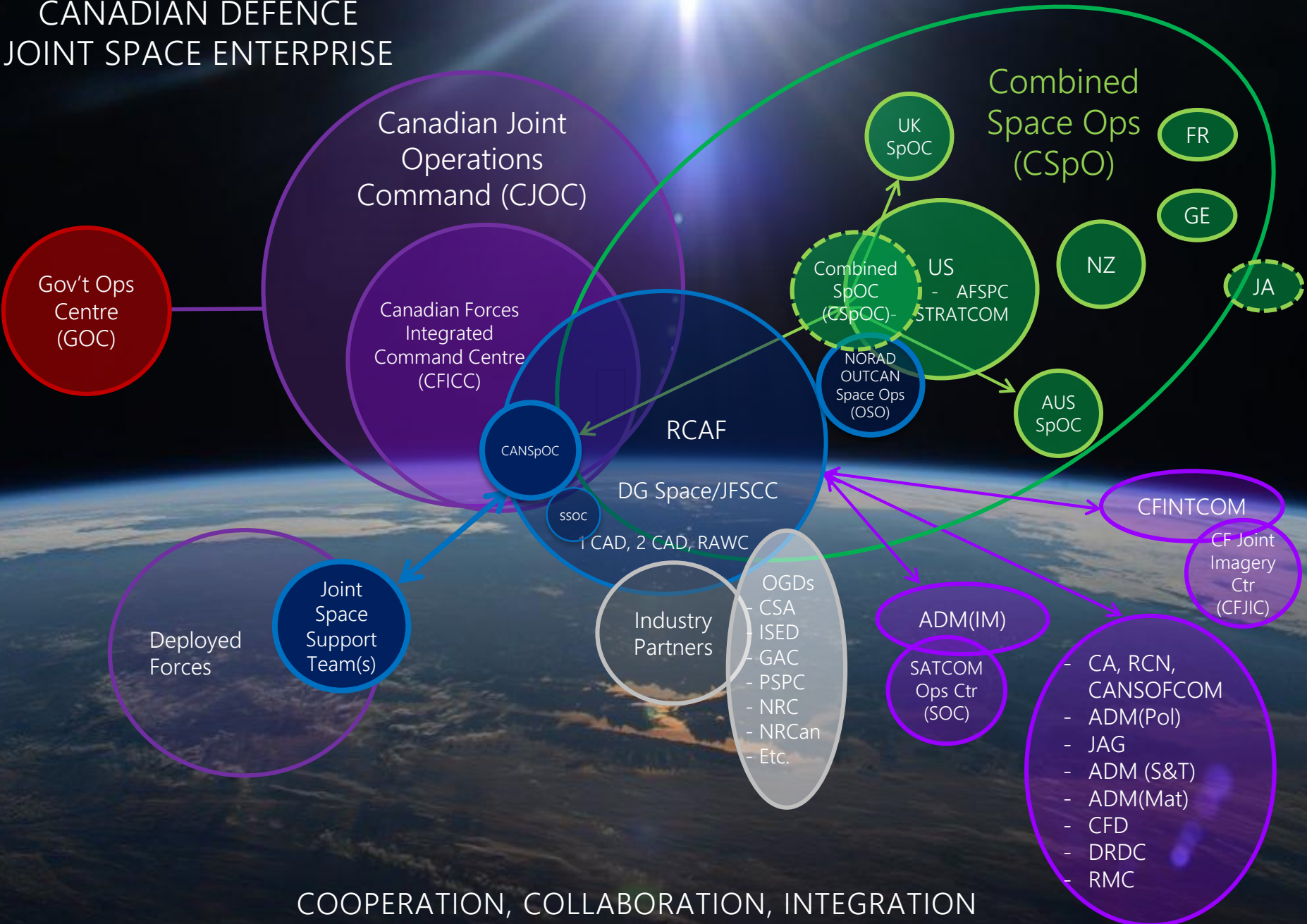
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CAF JOINT SPACE – RCAF FUNCTIONAL LEAD

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CANADIAN DEFENCE JOINT SPACE ENTERPRISE



COOPERATION, COLLABORATION, INTEGRATION

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COMBINED SPACE OPERATIONS (CSPO)

"...we unequivocally recognize the strategic importance the space domain has on our economy, technology, national security and defense. To that end, we collectively share the view that military cooperation concerning the space domain is vital to our countries' interests.

...We are actively coordinating to further our national interests through the Combined Space Operations (CSpO) initiative.

To enhance our space collaboration, we are also discussing operational concepts, personnel needs and infrastructure requirements to enhance multinational command and control of space forces in and through the Combined Space Operations Center and the other national Space Operations Centers.

...we are dedicated to identifying future capabilities to support our countries' common interests in and through space."



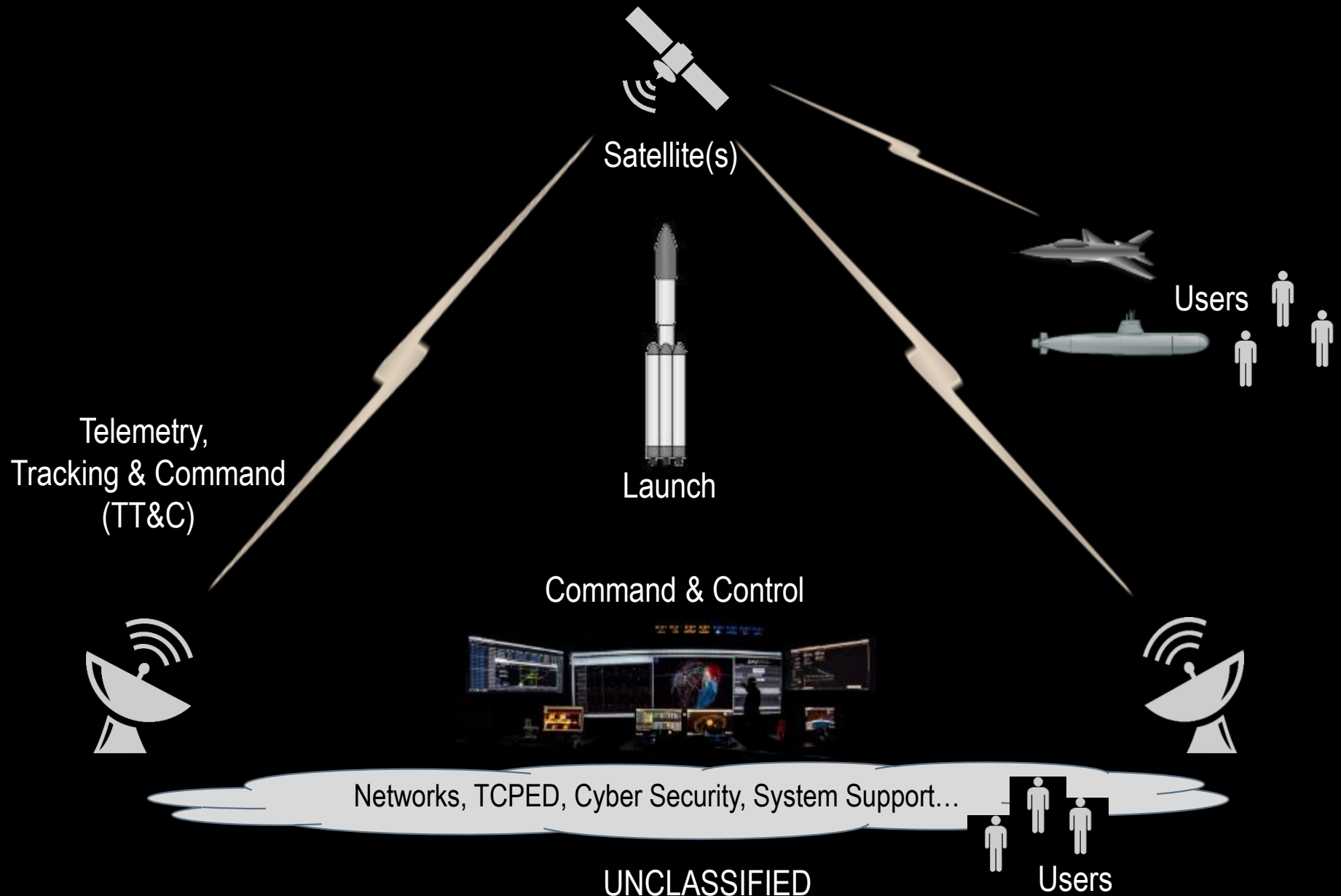
Air Chiefs and senior space officials from Australia, Canada, France, Germany, New Zealand, the United Kingdom, and the United States held a meeting at Headquarters Air Force Space Command to discuss the future of the Combined Space Operations (CSpO) initiative April 10, 2019.

A satellite view of Earth from space, showing the curvature of the planet and a bright sun in the upper center. The sun is positioned at the top center, creating a strong lens flare effect that radiates across the dark sky. The Earth's surface is visible below, showing a mix of dark blue oceans, lighter blue landmasses, and white cloud formations. The horizon line is clearly visible, separating the dark space from the illuminated Earth.

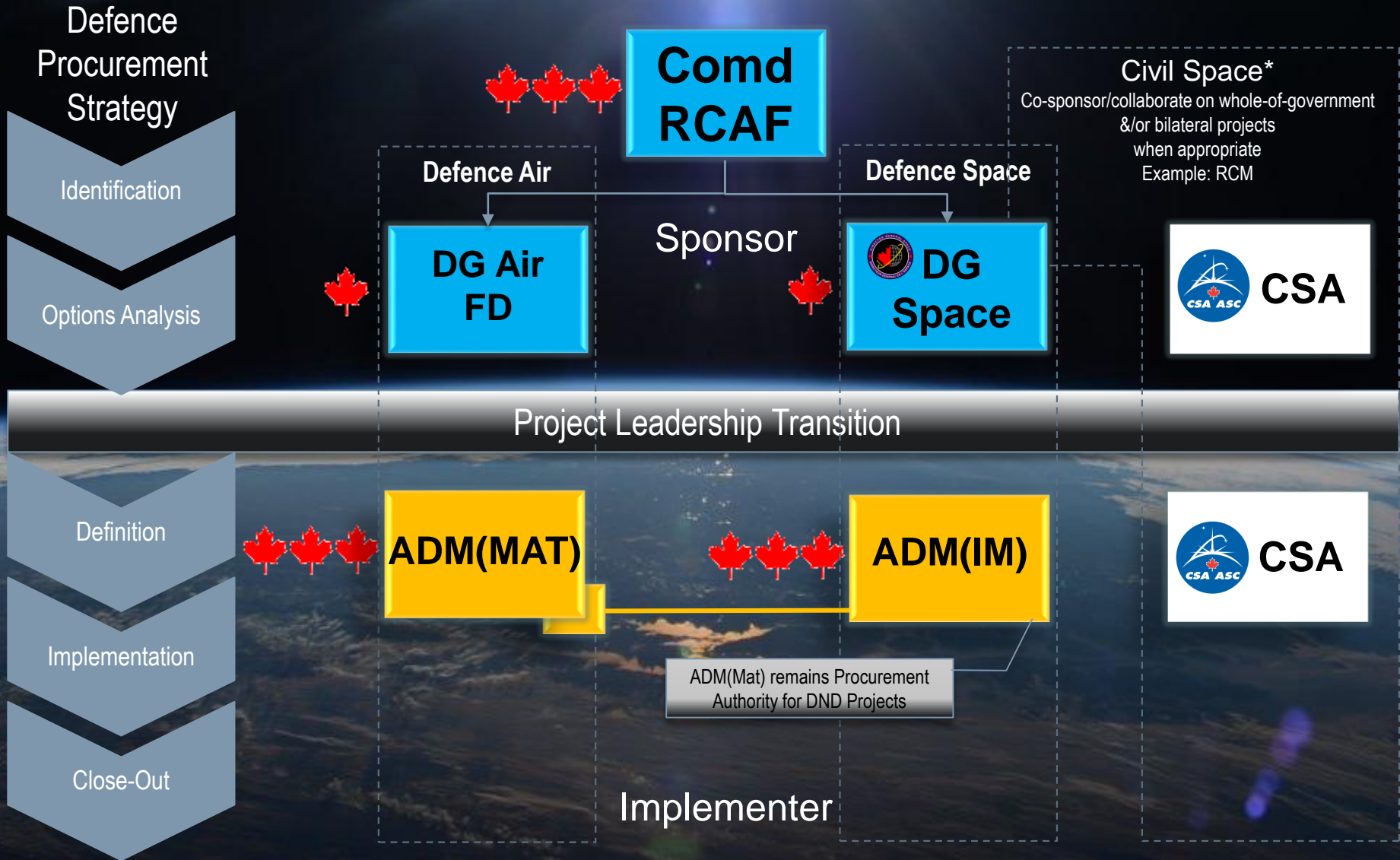
CURRENT CAPABILITIES & PROJECTS

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SPACE CAPABILITY PROJECT ELEMENTS



Project Framework



* ...all matters concerning space over which Parliament has jurisdiction and that are not by or pursuant to law assigned to any other department, board or agency of the Government of Canada. (Canadian Space Agency Act).

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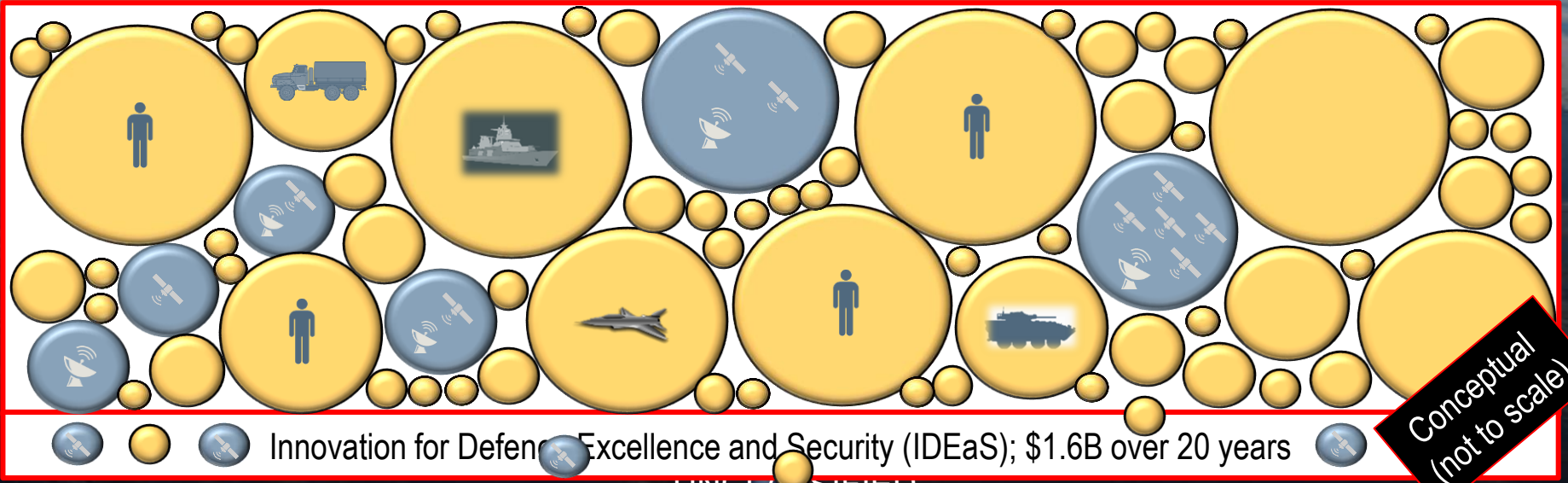
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Conceptual
(not to scale)

S&T Innovation for Defence Excellence and Security (IDEaS) Program



Space Example

Challenge #13. Identification and Characterization of Space Objects

- The Space Situational Awareness Graphical Environment (SSAGE)
- SPA2CE (Space Activity Analysis and Collection/Correlation Engine)
- ***Advanced Space Common Operating Picture (SCOP) System for Intelligent SSA...**
- Enhanced Space Surveillance using Star Trackers
- ***Watchguard Space-Based Proximity Monitoring System – HD Zoom Common Op Picture**
- High Resolution Tracking of Low Earth Orbit Space Objects
- **Space Common Operating Picture System (S-COPS)**
- Artificial Intelligence Driven Platform for Identification and Detection of Space Objects
- Holographic Display for Space Situational Awareness
- Space Object Identification Using Optronically-processed Synthetic Aperture Ladar...

**selected for follow on phase 1b*



<https://www.canada.ca/en/department-national-defence/programs/defence-ideas.html>

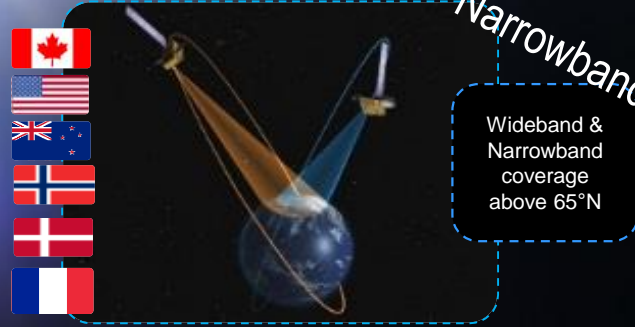
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Narrowband



Tactical Narrowband SATCOM – Geosynchronous Coverage (TNS-GEO)

Wide + Polar
Narrowband



Enhanced Satellite Communications Project – Polar (ESCP-P)

Projects

Today



Protected Military SATCOM (PMSC)

Narrowband (UHF) BLOS Comms $\pm 65^\circ\text{N\&S}$ (TACSAT + Commercial)



SATCOM Ops Centre (SOC)

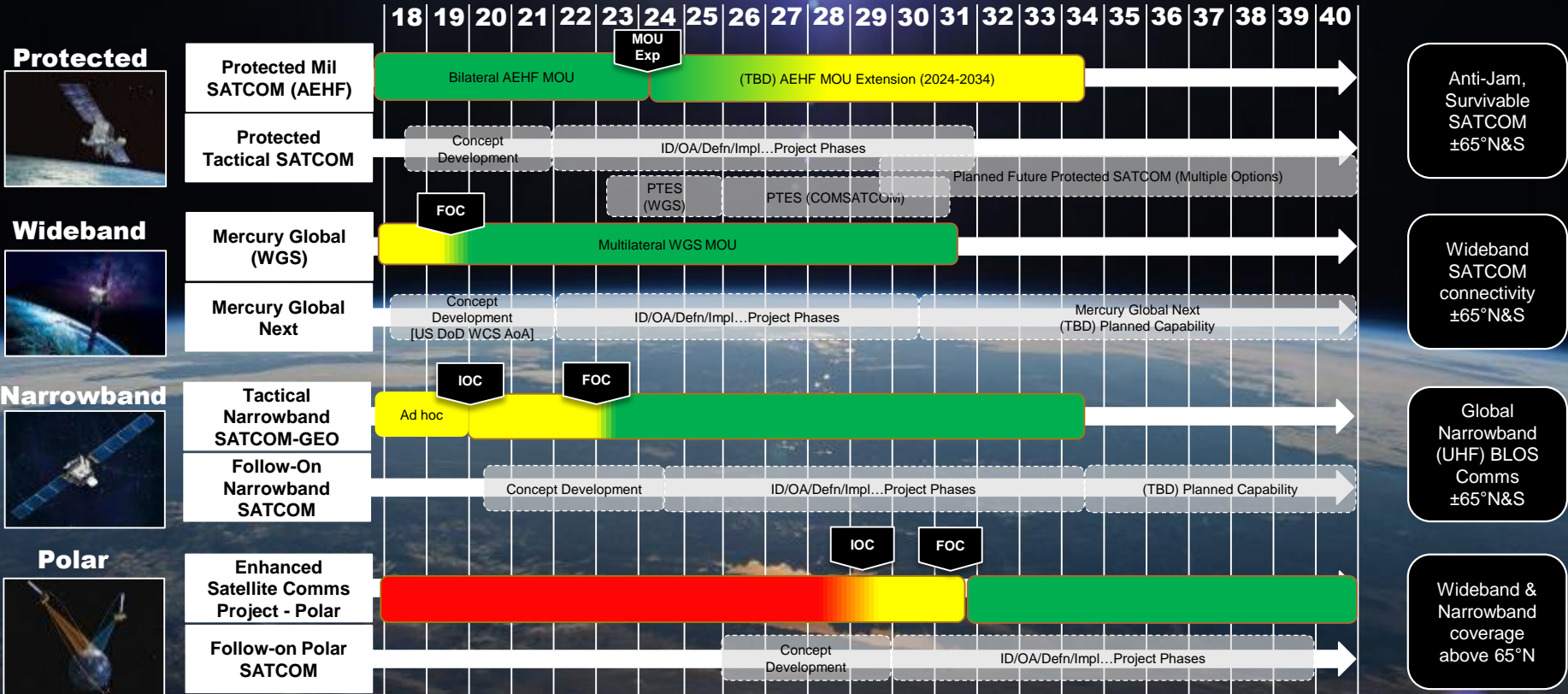


Mercury Global (MG)

SATCOM

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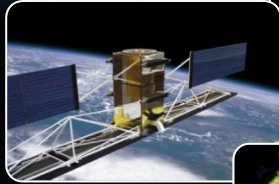
DEFENCE SATCOM PROGRAM 2040



	Capability in service
	Interim or limited capability in service
	No capability available / risk of gap

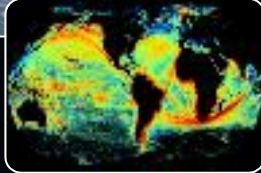
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RADARSAT-2



Surveillance from Space
(SAR, AIS,
etc.)

Space-Based
AIS Service



Contracted AIS



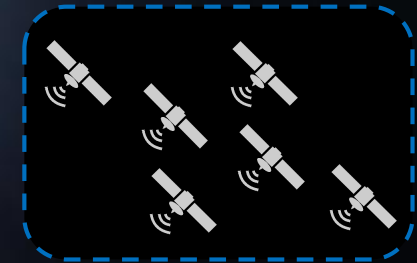
Polar
Epsilon
(PE)



RADARSAT
Constellation Mission
(RCM)



Polar Epsilon 2
(PE2)



Defence Enhanced
Surveillance from Space –
Program
(DESS-P)

SURVEILLANCE
FROM SPACE

Today

Projects



Medium Earth Orbit
Search & Rescue
(MEOSAR)



Enable
Search &
Rescue Ops
from Space



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EARTH OBSERVATION SATELLITE MISSIONS

RADARSAT-2



WORLDVIEW-1 and -2



SPOT 5-7



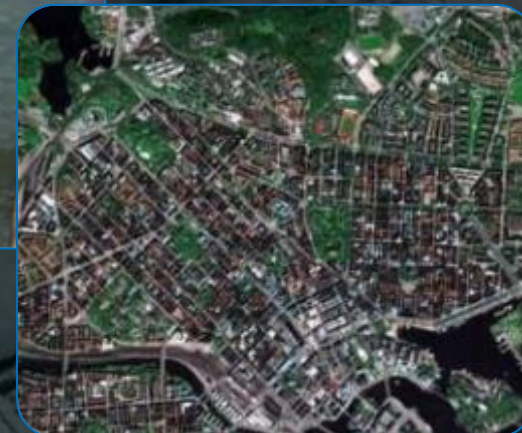
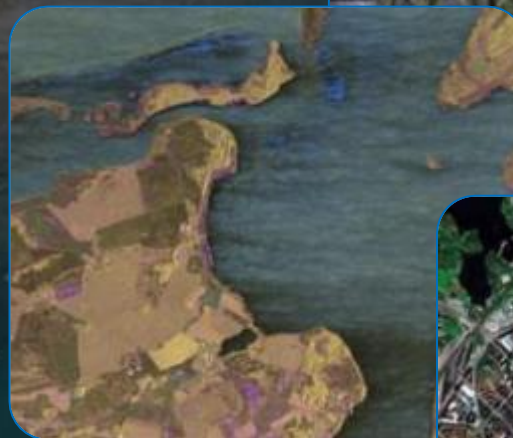
PLEIADES 1 and 2

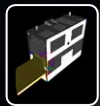


REMOTE SENSING URSA

(UNCLASSIFIED REMOTE-SENSING SITUATIONAL AWARENESS)

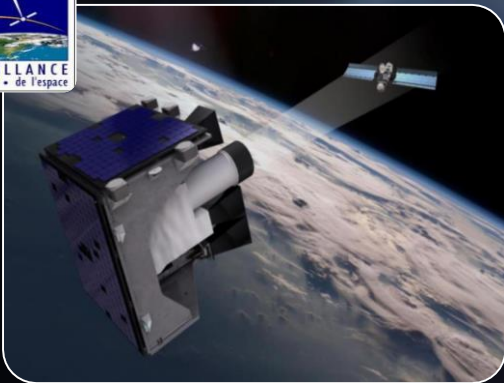
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S&T/SSA
MicroSat

(Near Earth Object
Surveillance Satellite)
(NEOSSat)



Sapphire



Space
Situational
Awareness
(SSA)



S&T/SSA
MicroSat
(NEOSSat-2)



Surveillance of Space 2
(SofS 2)



Today

Project

SURVEILLANCE OF SPACE

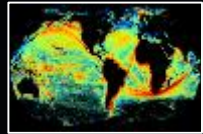
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DEFENCE ISR PROGRAM 2040

Surveillance From Space



AIS



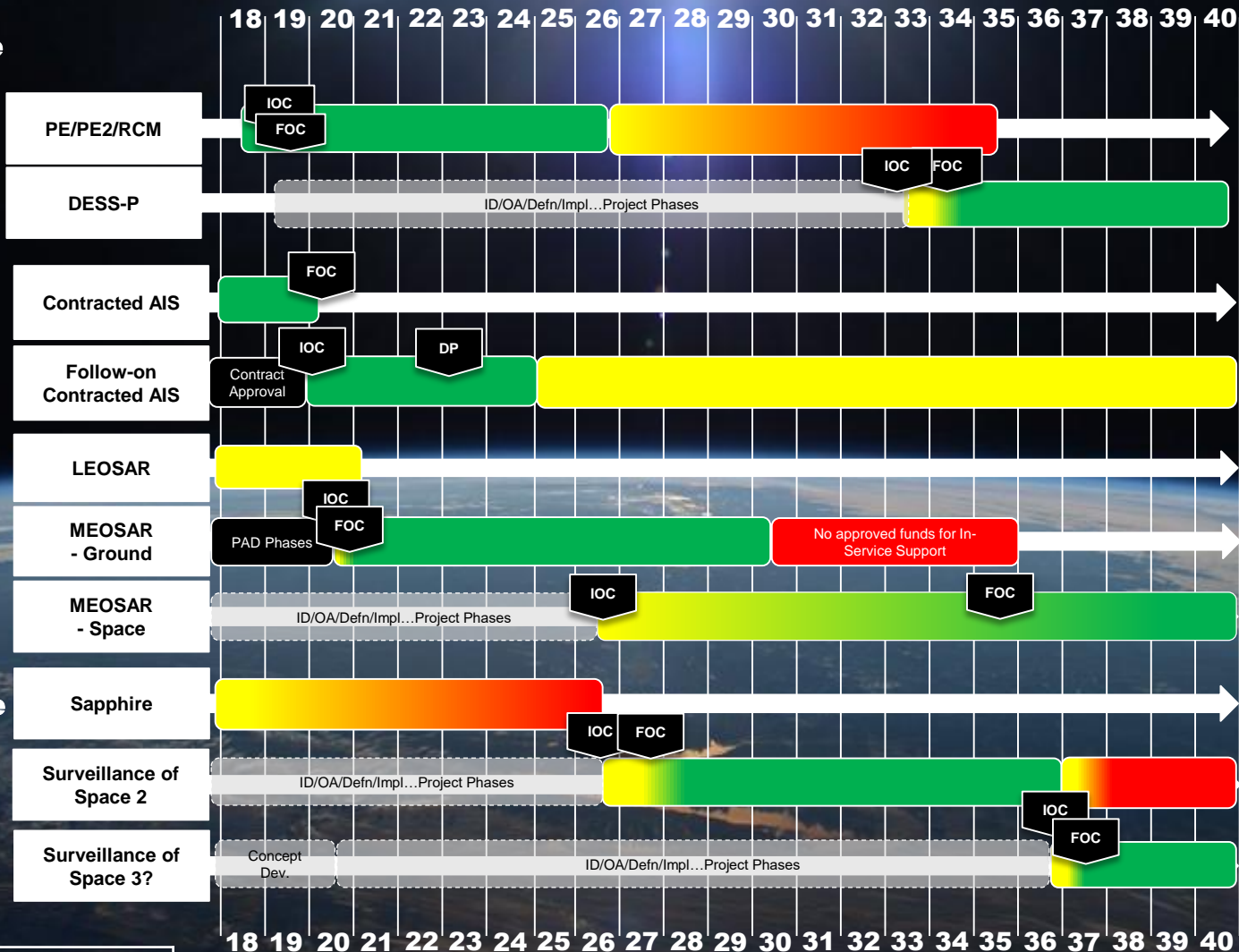
Search and Rescue



Surveillance of Space



	Capability in service
	Interim or limited capability in service
	Ad-hoc capability available when possible
	No capability available / risk of gap



Surveillance from Space (SAR, AIS, etc.)

Space-Based AIS Service

Enable Search & Rescue Ops from Space

Space Situational Awareness (SSA)

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Space Domain Awareness & integration of space-enabled effects in operations.

Today

- 24/7 Watch operations
- Joint Space Support Teams
- Operational Analysis (OA)
- Planning/Exercise/Wargame support
- Mission Assurance Assessments
- Standards and training

- Supported by Sensor System Ops Centre (22 Wing)
- Coord with ADM(IM) SATCOM Ops Centre

Future

- CSpOC Burden Sharing & Continuity of Ops
- CSpO Space common operating picture
- Expand NAVWAR capabilities and systems
- Expand OA modelling and simulation
- Satellite payload operations
- Commercial Integration



**GNSS
DENIED?**

- Position/Navigation/Timing (PNT)
 - Electronic Support
 - Electronic Attack
 - Electronic Protection
 - Direct Spt to Ops



NAVIGATION WARFARE / PNT RESILIENCY

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Accelerate-Collaborate-Defend

QUESTIONS?

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