



Agence spatiale
Canadienne

Canadian Space
Agency



Implementation of the UN Space Debris Mitigation Guidelines in Canada

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Canada 



Background

■ Canada:

- ⌚ Third nation to have a satellite in orbit (1962); today extensively relies on space infrastructure to meet socio-economic, environment and security objectives
- ⌚ Large landmass with vast maritime and polar regions
- ⌚ Well aware of risks for its population (incident in 1978) and space assets (increasing occurrence)



Background

■ Canada:

- ⑧ Actively participated to discussion on Space Debris at UN COPUOS and has joined the Working Group at the early stage
- ⑧ Carried broad national consultations in 2007 and 2008 on the draft UN Space Debris Mitigation Guidelines
- ⑧ Strongly supported the adoption of the UN Space Debris Mitigation Guidelines

Policies and Regulations

- Canadian Remote Sensing Space System Act, *implementation led by the Department of Foreign Affairs and International Trade*
- Radiofrequency license requirements, *administered by Industry Canada*

Policies and Regulations

■ Canadian Remote Sensing Space System Act (1 of 2)

Requirements to address disposal of Remote Sensing satellites

- ④ the **method of disposal** that is proposed for each satellite and the reliability of that method;
- ④ the **estimated duration** of the satellite disposal operation;
- ④ the **probability of loss of human life** and how it was calculated;
- ④ the **amount of debris expected to reach the surface of the Earth**, the size of the impact area expressed in square metres, and how they were calculated;

Policies and Regulations

■ Canadian Remote Sensing Space System Act (2 of 2)

Requirements to address disposal of Remote Sensing satellites

- ④ the **geographic boundaries of the likely debris re-entry impact area**, the confidence level of the determination of the boundaries and how the boundaries and confidence level were calculated;
- ④ the **identity and quantity of hazardous material and dangerous goods contained** in each satellite at the end of its mission life, the quantity expected to reach the surface of the Earth on re-entry and how the quantities were **calculated**;
- ④ the **orbital elements and epochs** of the proposed disposal orbits for each satellite;
- ④ an **assessment of space debris expected** to be released from each satellite during normal operations by explosions, by intentional break-ups and by on-orbit collisions, and the measures proposed to mitigate the production of space debris.

Policies and Regulations

■ Radiofrequency License

Requirements to minimize potential space debris at the end of the satellite mission

🔑 Compliance with:

- the *International Telecommunication Union (ITU) Radio Regulations*,
- the *Radiocommunication Act*,
- the *Radiocommunication Regulations*,
- and Canada's spectrum utilization policies pertaining to the licensed radio frequency bands.

🔑 Consistency with:

- Recommendation ITU-R S.1003 *Environmental Protection of the Geostationary Satellite Orbit*.
 - "that as little debris as possible should be released into the geostationary orbit during the placement of a satellite in orbit",
 - "a geostationary satellite at the end of its life should be transferred, before complete exhaustion of its propellant, to a super synchronous graveyard orbit".
 - The recommended minimum re orbiting altitude is given as 300 km.

Operational Practices

CSA Satellites



■ Post-mission Disposal Plans

🔦 Remote Sensing satellite RADARSAT-1

- Removing the energy stored in the satellite propellant tanks, wheels and batteries (compliant with Guidelines 5)
- Using the remaining fuel to lower the orbit in addition to orienting the satellite in such a way that drag is maximized aiming to reduce its orbit life to the lowest possible (compliant with Guidelines 6)

🔦 Scientific satellite SCISAT

- Since SCISAT has no propellant subsystem and has the shape of cube, its post-mission disposal plan is guided by Guideline 5 only for removing the stored energy in the wheels and the batteries

Coordination

■ International

- 🔗 Data : USSSN (two lines elements – TLEs)
- 🔗 Conjunction Analysis: Joint Space Operations Centre (JSpOC)
- 🔗 Other: ESA ESOC, DLR

■ National

- 🔗 Consultation, coordination or regulation for the implementation of the Guidelines:
 - Industry
 - Other Canadian departments
- 🔗 Research on Space Debris
 - Industry and Universities
- 🔗 Conjunction analysis
 - DND/NORAD

■ CSA Level: CSA-ODWG

- 🔗 Forum to share technical information, know-how and expertise in the area of OD (e.g. debris damage mitigation technologies implemented through novel spacecraft technical designs, debris deflection and collision avoidance measures).
- 🔗 Communication channel with the Canadian space communities, governmental organizations and international partners.

Consultation

- Draft UN COPUOS Space Debris Mitigation Guidelines : 2 national consultations
 - 🔗 Most organizations are supportive of the COPUOS Guidelines;
 - 🔗 Companies (manufacturers, operators) are well aware of the IADC Guidelines and are implementing these in the procurement process and the operational practices
 - Avoidance of collision with controlled or uncontrolled objects;
 - Post Mission disposal
 - 🔗 Concerns expressed on:
 - Little focus on Disposing current Space Debris;
 - Liability to recover Space Debris;
 - Non peaceful context;
 - Non legally binding aspects (perceived as a competitively disadvantage while some foreign competitors do not have to comply with regulations);
 - Definition of LEO region.

The Way Forward

- Canada is participating to consultation on:
 - 📄 Long Term Sustainability of Space Activities
 - Informal Working Group Meetings
 - Input to the Outline document being prepared
 - 📄 European Union draft Code of Conduct for outer space activities.
 - Comments coordinated and provided by the Department of Foreign Affairs and International Trade
- Better coordination and collaboration with international partners
- Possible framework at the national level