

50
ANS • YEARS

VISION • PASSION • INNOVATION

Canada in Space

50 years

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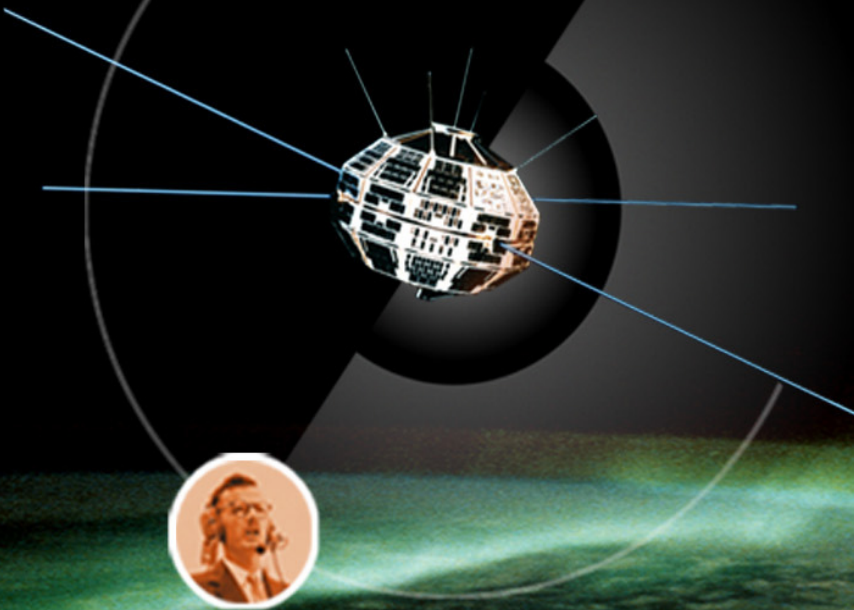
For every "future" there is a "past"



Canadian Space Agency
Agence spatiale canadienne



• At the heart of innovation in space
• Au coeur de l'innovation spatiale



Canada

In celebration of
Alouette-1
Un hommage

Alouette

- Alouette-1 was launched on 29 September 1962 and marked Canada as the third nation to have its own indigenous satellite in space.
- At a time when satellite lifetimes were measured in weeks, or at best months, Alouette-1 functioned for over a decade before it was switched off.
- Canada entered the space age with a very practical proposition – to use the advantages of space to help meet important domestic needs on Earth.

Space for Canada

- Use space science and technology for national needs and benefits for Canadians and humanity
- Develop and strengthen a national space industry
- Focus on innovation and exploitation of technological niches
- Build and maintain scientific capacity
- Work collaboratively and complementarily with international partners
- Improve knowledge and understanding of our planet and solar system and enhance the well-being of our citizens
- Inspire young Canadians

Northern Communications

- Alouette-1 was followed by three other Canadian-built scientific small satellites in partnership with the US (1965-71) including innovative optical instruments that imaged the aurora from above for the first time.
- These four pioneering satellites were built primarily in order to address communication challenges in the North.
- 1972: Anik A1 launched. Canada became the first nation with a national domestic communications satellite in geosynchronous orbit.
- 1976: Canadian satellite Hermes, a joint venture between Canada, NASA and ESA, launched. This was the first direct-to-home communications system utilizing small aperture receivers.

Earth Observation from Space



- **Canada's vast and forbidding territory**
 - Second largest landmass and longest coastline
- **Sustainable management of natural resources**
 - Forestry, agriculture, fisheries, oil and gas, mining
- **Minimize impacts of climate changes**
- **In 1995, Canada's Synthetic Aperture Radar (SAR) Radarsat-1 Earth Observation satellite is launched followed by the enhanced Radarsat-2 in 2007. Both satellites are still operating**
- **In 2013, Canada announces full funding for the Radarsat Constellation Mission, three follow-on C-band SAR satellites to be launched by 2018**

International Partnerships

- Since 1962, Canada has had a strong partnership with NASA in all areas of its space program.
- On 1 January 1979, Canada became an associate member of ESA – a cooperation that has now continued for over 34 years.
- Also in 1979, Canada joined with France, the United States and the former Soviet Union to establish the Cospas-Sarsat program.
- In 2000, Canada became one of the three founding charter members of the International Charter on Space and Major Disasters, along with ESA and CNES.

Human Spaceflight

A photograph of the International Space Station (ISS) in orbit above Earth. The station's complex structure, including the large white cylindrical modules and the long, white robotic arm (Canadarm2), is visible against the blue and white of the planet. Two astronauts in white space suits are seen working on the station's exterior. The background shows the curvature of the Earth and the blackness of space.

- In **1981**, NASA launched the iconic Canadarm aboard the Space Shuttle Columbia.
- In **1984**, Marc Garneau became the first Canadian astronaut in space and in **1994** Roberta Bondar became the first Canadian woman in space.
- In **1988** Canada became a full partner in the International Space Station program with responsibility for the robotic systems – Canadarm2 (2001), the Mobile Base System (2002) and Dextre (2008).
- Canada has had 16 astronaut missions to date.
- Canada has developed an ISS utilization program focussed on medical/health research that has a direct link to improved delivery of healthcare on Earth.

Space Exploration

- Canada has been particularly active in space astronomy missions, including international collaborations with: Japan (Halca, ASTRO-H), NASA (FUSE, JWST (with ESA)), ESA (Herschel, Planck) and ISRO (AstroSat).
- Canada has also launched its own small space astronomy missions – MOST (2003) and 2 BRITE nanosatellites to be launched next year.
- In the area of planetary exploration, Canada has concentrated on Mars, and has been a partner on the missions: Nozomi with Japan, Phoenix & MSL/Curiosity with the US, and will contribute to the ESA ExoMars program (2016-18) and to NASA's OSIRIS-REx (2016).

Space Science

- Since 1980, Canada has had a long history of successful international space science collaborations through major hardware contributions including space physics missions: Akebono (Japan), Viking & Freja (Sweden), Interball (Russia), THEMIS (NASA) and SWARM (ESA);
and atmospheric science missions: UARS, Terra & Cloudsat (NASA) and Odin (Sweden)
- In 2003, the small Canadian satellite, SciSat, was launched to study ozone depletion at high latitudes.
- In 2013, four further indigenous small satellites will be launched – CASSIOPE (space physics), M3MSat (AIS), SAPPHIRE (debris) and NEOSSat (NEOs & debris).

Meeting Canada's Needs in Human Spaceflight, Exploration and Space Science

- ✓ Use space science and technology for national needs and benefits for Canadians and humanity
- ✓ Develop and strengthen a national space industry
- ✓ Focus on innovation and exploitation of technological niches
- ✓ Build and maintain scientific capacity
- ✓ Work collaboratively and complementarily with international partners
- ✓ Improve knowledge and understanding of our planet and solar system and enhance the well-being of our citizens
- ✓ Inspire young Canadians

Conclusion

- Canada's space program responds to national priorities
 - Security, safety and sovereignty
 - Monitoring and management of natural resources and the environment
 - Response to natural disasters
- Canada's investment in space supports a strong domestic space industry, drives innovation in the commercial global market, and has produced a cadre of world-class scientists.
- Canada has built an enviable international reputation by forging collaborations with many strategic partners and has developed key niche technologies that have broad application.
- The Canadian Space Program has marked an important milestone after 50 years and is poised to leverage future partnerships both nationally and internationally to continue to meet Canada's future needs and drive innovation.