



**Canada-ESA:  
25 Years of Space Cooperation**

A bridge has spanned the Atlantic since 1979 when Canada and the European Space Agency (ESA) signed their first Cooperation Agreement. Citizens, governments, and businesses on both continents have benefited ever since. Our long tradition of collaboration is based on a shared belief that science and technology breakthroughs will advance our understanding of the planet, the universe, and our place in it.

**Canada is a proud partner of ESA**

Between 1980 and 2004, Canadian industry received contracts from ESA worth \$420 million. Beyond the tangible benefits for business and the economy, cooperation with ESA partners has allowed Canada to advance its vision of the peaceful development of space through international policy development and strategic planning.

**Niche expertise and partnership**

As a cooperating member of ESA, Canada invests its contribution in niche areas where Canadians excel. The renewal of the cooperation agreement for 1999 includes a guarantee of return investment for a good part of Canada's annual contribution to ESA. This longstanding cooperation agreement continues to stimulate industrial competitiveness, strengthen scientific collaboration, and extend the reach of Canadian firms to help meet European space interests.

**Innovation and excellence**

Our collaboration on leading-edge space projects has demonstrated how powerfully space drives scientific and technological innovation and expertise to global success in the marketplace. Best business practices are shared between the partners, thus promoting the growth of the space industry on both sides of the Atlantic.

**Delivering critical services**

International cooperation greatly enhances the global vision and impact of the space agencies involved. By leveraging their concerted strengths and efforts, the Member States of ESA and Canada deliver outstanding benefits and services that respond to the needs of citizens, now and in the future.

**Telecommunications and Navigation**

Canada and Europe continue their long collaboration to develop a range of leading satellite-communications technologies and practical applications, in part, under the Advanced Research in Telecommunications Systems (ARTES) program.

**Olympus**

The Olympus program initiated in 1978 by ESA produced the Olympus satellite, which was launched in 1989.

Canada was involved in the solar-array subsystem, payload amplifiers, and microwave components. Final assembly, integration, and testing were performed at the Canadian Space Agency's David Florida Laboratory in Ottawa.

**REMSAT and emergency operations**

To manage emergencies effectively, satellite communications link command centres with large-scale operations in the affected region to air and other response vehicles, firefighting equipment, and handheld terminals. Canadian industry has worked closely with ESA on the real-time demonstrations of the REMSAT satellite technologies used to fight forest fires in Canada and Europe.

The REMSAT program provides technology to emergency response managers to make the best use of a variety of satellite services, marshalling a powerful network of telecommunications, global positioning, and Earth-observation satellites and services to fit their needs.

**Galileo and global navigation**

Galileo, Europe's global navigation satellite system currently under development and funded by ESA and the European Union, will be an open, global system under civilian control. Galileo is designed to be fully compatible with the existing American GPS and Russian GLONASS systems.

Canada contributed to the definition phase of the ESA-led space segment of Galileo by studying signal validation and receiver performance. Canada continues its participation with the development and validation phase.

**Artemis**

Artemis, launched in 2001, is no ordinary telecommunications satellite. In addition to being the first European satellite to use ion propulsion, Artemis has a unique relay system that uses lasers, allowing the satellite to communicate directly with other spacecraft.

Canadian companies contributed to the success of Artemis by providing surface acoustic wave narrowband filters and the radio-frequency front-end module.

**Telemedicine and ARTES**

Telemedicine provides patients living in remote locations with access to the very best health care and to specialists in metropolitan centres. TeLeCare, a Canadian telemedicine pilot project, uses satellites to provide targeted healthcare services for citizens living in rural and remote areas of Canada. Through this pilot project funded by ESA, all member countries are benefiting from the shared expertise and best practices.

**The future of telecommunications**

Broadband multimedia satellites are the next wave of telecommunication satellites providing end-users living in isolated communities with access to interactive, high-speed Internet services. The development of the digital video broadcasting DVB-RCS standard (return channel via satellite) is the first attempt at introducing a wide-scale satellite access standard. Canada has played a central role in its adoption and continues to play a key role in its development.

**Satellite clusters and the future of communications**

Are clusters reality or fiction? Imagine a cluster of four satellites traveling in one orbital slot, with each satellite supporting the others and communicating by laser. Canadian companies working under the ESA ARTES program are studying topologies that will, one day, make this possible.

**Earth and Environment**

Canada and Europe have worked together on Earth-observation technology for decades, developing radar satellites and commercial applications for satellite data. Earth observation has, from the outset, been a critical component of the Canadian Space Program.

**ERS satellites**

The ERS program of ESA established the international market for radar imagery. Launched in July 1991, ERS-1 was the first European satellite designed for coastal, sea, and ice observation applications. ERS-2 joined up with its predecessor for a tandem mission in 1995, and the resulting data has made a profound contribution to scientific research and disaster monitoring.

Canada contributed ground station development and support for receiving and processing ERS data. In particular, Canada provided the digital processor for the radar data, a technology originally developed in Canada and subsequently used for the Canadian RADARSAT-1 satellite launched in 1995.

**Envisat**

ESA's largest and most advanced Earth-observation satellite, Envisat, was launched in 2002. Envisat provides enhanced Earth-observation data to aid studies on climate, the atmosphere, ozone, oceans, ice mass, and other phenomena.

Canada contributed critical space technologies, instruments, and expertise to Envisat. ESA awarded Canadian industry contracts to design and develop the ground segment, advanced radar, the microwave radiometer, and the interferometer.

**Global Monitoring for Environment and Security (GMES)**

GMES is a joint initiative of ESA and the European Union. ESA's EarthWatch addresses GMES by delivering Earth-observation services to policy makers and other users.

The Canadian-led Northern View project is one of the services offered through EarthWatch. It brings together teams from Canada, Finland, Norway, Sweden, the United Kingdom, and Germany to focus on policy, development, and environmental preservation in northern regions. Northern View provides single-window access to data on ice and icebergs, snow and glaciers, land use/land cover, and other environmental features.

**Space Technologies**

The success of space missions depends on enhancing human expertise with precision-exacting specialized technologies. Whether it is controlling a small demonstration satellite or tracking an ESA science probe that is exploring deep space, Canada works with ESA to develop innovative space technologies that complement mission hardware.

**Planetary exploration program**

Aurora is the seed of Europe's program for space exploration. Currently in the preparatory phase are plans for robotic and manned exploration of the solar system, with Mars, the Moon, and certain asteroids as the most likely targets.

Canada is an active participant in these inspiring activities, contributing its robotics expertise and lidar technology.

**Proba**

ESA's Proba (Project for On-Board Autonomy) demonstrates how small satellites can advance scientific and Earth-observation missions.

Canada is contributing small reaction wheels and advanced software to guide and control the attitude of ESA spacecraft. A Canadian company will also demonstrate an innovative suite of optical sensors to measure key parameters of the satellite propulsion subsystem.

**Tracking interplanetary missions**

Tracking and control of current and future ESA missions in the solar system greatly depend on the performance of 35-metre antennas built by a Canadian-led industrial team. The team is meeting the challenge of communicating reliably with spacecraft that travel hundreds of millions of kilometres from Earth, such as Mars Express, currently orbiting the Red Planet. Built for ESA in Australia and Spain, the large antennas will also be used for future international exploration missions.

Milestones in Canada-ESA Cooperation	1975	1978	1979	1984	1989	1989	1989	1989	1991	1992	1995	1995	1995	1996	1998	1999	2000	2000	2001	2001	2002	2002	2003	2004	2004	
Canada-ESA cooperation traces its history back to the 1970s when the European Space Research Organization (ESRO), the precursor to ESA, provided Canada with critical elements for Hermes, an advanced communications satellite.	ESA Convention signed	Olympus program initiated	First Canada-ESA agreement signed	Second Canada-ESA Cooperation Agreement	Third Canada-ESA Cooperation Agreement	Legislation creating CSA adopted by Canada's Parliament	Launch of Olympus	Canada participates in development phase of the Hermes spaceplane program	ERS-1 launched	Canada participates in the Envisat Earth Observation Mission	ERS-2 launched	Canada signs Science and Technology Cooperation Agreement with European Union	RADARSAT-1 launched	Canada signs an Arrangement to participate in the General Support Technology Program (GSTP)	Canada becomes one of the first participants in the ARTES-3 (multimedia telecommunications) program	REMSAT successfully demonstrated	Ten-year extension of the Canada-ESA Cooperation Agreement signed; Canada's Prime Minister is present	Canada becomes the first country outside Europe to participate in Galileo	Artemis launched	PROBA technology demonstration satellite launched	Aurora program endorsed by ESA Council	Envisat launched	Canadian-built, 35-metre Deep Space Antenna begins operations	Canada signs Arrangements with ESA for the Aurora exploration program and GMES Service Element	Demonstration of the TeLeCare telemedicine system	Canada and ESA mark 25th anniversary of cooperation in space

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TELECOMMUNICATIONS AND NAVIGATION

EARTH AND ENVIRONMENT

SPACE TECHNOLOGIES