

***E4 Identify issues and opportunities arising from the application of space technology, identify alternatives involved, and analyze implications***

***E4.1 recognize risks and dangers associated with space exploration (e.g., space junk, fuel expenditure, satellites burning up in the atmosphere, solar radiation)***

# Risks and Dangers Associated with Space Exploration

There are many risks and dangers associated with space exploration. In space, there is no air, no food, and no water. Furthermore, there are deadly hazards such as solar and cosmic radiation, micrometeorites, and extreme temperatures.

Accidents related to space travel result in huge economic loss and after the loss of human life. In February 2003, the space shuttle *Columbia* sustained damage to the heat-resistant tiles on the underside of the craft. When it re-entered Earth's atmosphere, it exploded and burned up over Texas. The entire seven-member crew perished.

***E4.2 describe Canadian contributions to space research and development and to the astronaut program (e.g., Canadarm)***

# Canadian Contributions to Space Exploration

Canada's involvement with the space program started in 1962 with the launch of the satellite Alouette 1.

In 1972, Canada launched its first communications satellite Anik. The RADARSAT and Landsat satellites were later launched for the purposes of monitoring environmental changes on Earth's surface. Perhaps Canada's greatest contribution to the program has been the design and construction of the robot arms Canadarm1 and Canadarm2. Canadarm1 was designed for the space shuttle and has been used to repair the Hubble Space Telescope. Canadarm2 has been used for constructing the International Space Station. Canada was also responsible for making the ramp used during the Mars Pathfinder mission.

Some famous Canadian astronauts include Marc Garneau, who was the first Canadian in space, and more recently, Chris Hadfield, who became the first Canadian to walk in space in 2001.

***E4.3 identify and analyze factors that are important to decisions regarding space exploration and development (e.g., identify examples of costs and potential benefits that may be considered; investigate and describe political, environmental and ethical issues related to the ownership and use of resources in space)***

# Space Exploration Issue and Concerns

Space exploration helps to ensure that humanity can continue to grow and expand even beyond what the natural world here on Earth can provide. At some point in the future, Earth alone may not be able to provide sufficient resources to sustain life. Space contains many mineral resources such as gold, iron, and platinum that could be used. Scientists are also looking for ways to capturing solar energy in space and redirecting it to Earth.

The quest to explore space has led to many great technologies. Medical imaging, bar coding, vision screening, ear thermometers, cordless drills, lithium batteries, and robotic arms are some of the technologies developed from the space program. These technologies are used on Earth for the benefit of humankind. Global positioning systems, remote-sensing, weather forecasting, and satellite communication have opened a great avenue for future development.

Since space contains so many valuable resources, questions arise concerning the ownership of space and what countries these resources belong to. An ethical concern about space exploration is the money spent when worldwide poverty exists.

Environmentalists discuss the topic of protecting space from unnecessary alteration and who will ultimately be responsible for cleaning up space junk and pollution.