

Technology Roadmaps for Space Exploration (09)  
Technology Development Concepts (2)

Author: Dr. Christian Lange  
Canadian Space Agency, Canada

Dr. Jean-Claude Piedboeuf  
Canadian Space Agency, Canada

Dr. Eric Martin  
Canadian Space Agency, Canada

Mr. Martin Picard  
Canadian Space Agency, Canada

OVERVIEW OF CSA CONCEPT STUDIES FOR SPACE EXPLORATION SIGNATURE  
TECHNOLOGIES**Abstract**

The Canadian Space Agency's Exploration Core Program is focusing on the development of advanced exploration technologies. The Concept Development activity is part of this program. Through Concept Development, the Exploration Core supports CSA's exploration planning activities and defines the science and technology developments most likely to be required in future space exploration missions of interest to Canada, and assesses potential contributions that Canada could make to such missions.

The outputs of this activity inform the decision process when selecting Canadian-led missions or contributions to international space exploration missions by providing: (1) Definition of mission science and/or technology goals; (2) User requirements; (3) Mission requirements; (4) System/payload requirements; (5) Assessment of the current technology maturity; and (6) ROM cost, risk and timeline to reach TRL 5-6 and 8.

This paper presents an overview of the Concept Studies that the CSA has awarded in 2011 related to Canadian Signature Technologies for space exploration: The Canadian American British Lunar Explorer is a low-cost lunar lander/microRover mission concept based on niche technologies. It will employ Canadian technologies in miniature spectrometers, robotics, semi-autonomous science-driven navigation and a highly capable microRover platform. The Canadian Space Telescope Mission team works on a design for a Canadian-led space telescope. Although smaller than the Hubble Space Telescope, it could survey the deep reaches of the Universe in unprecedented detail, and provide clues to dark energy, the formation of galaxies and the solar system. The Clear Sky Project will build on Canada's heritage in space robotic servicing to design a robotic vehicle to remove space debris and clear pathways for valuable orbital tracks for new satellites. The Mission for Orbital Debris Elimination will develop a mission concept for state-of-the-art Canadian robotics, visualisation systems, guidance, navigation and control technologies, and techniques to tackle the growing concern of space debris, which poses a risk to satellites. The Canadian On-Orbit Automated Servicing Experiment will prepare a concept for an experimental payload on the ISS to demonstrate the critical technologies and techniques required to capture a satellite. The Compact Fourier Transform Spectrometer for Space Exploration study will demonstrate a lightweight, low-cost, low-consumption science instrument to probe the chemistry of the Earth's atmosphere that might one day be used for planetary exploration. The Canadian Sweeping Energetic Particle Telescope study will propose technology for modelling radiation dose and more accurate measurement of radiation exposure on the ISS and for future missions to the Moon or Mars.