

A Framework for Collaborative Space Activity – Australia / Canada

BN02-08
12 May 2008

The information which appears herein is private and confidential and the property of COM DEV Ltd. It is submitted for the sole purpose of enabling assessment thereof by the recipient and must be maintained in confidence, protected and not disclosed to any person or used for any other purpose without the prior written consent of COM DEV Ltd.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	4
1. INTRODUCTION.....	5
2. SPACE PROGRAM IN CANADA.....	6
3. SPACE APPLICATIONS	7
4. COM DEV PROPOSAL.....	8

EXECUTIVE SUMMARY

Canada and Australia share many common attributes in addition to language. Both countries encompass large landmasses with low population densities, which are distributed within specific regions. Both countries are surrounded by waters, which are critical for trade but also provide a challenge for security and safety of life at sea situations. The effective management of natural resources and monitoring of climate and atmospheric changes are areas of significant interest to both countries. Each nation also has interests and activities reaching into the Polar Regions - Northern for Canada and Southern for Australia. In addition Canada and Australia share common values in security, trade and economic development for its citizens.

Space is a highly effective, and in many cases, the singular option for conducting the surveillance or monitoring of wide regions of land, sea and air. Space provides a convenient location for the collection of information to support the management of natural resources, monitor environmental changes and ensure the safety and security of a nation and its maritime regions.

The common interests and similarities in large land and maritime regions support the development of a collaborative space concept between Canada and Australia. Canada has committed to developing a strategic capability in small and micro-satellites which are a highly cost effective means of providing solutions which require a space element. Australia has a broad range of capabilities which support solutions utilizing space assets. A solution that combines these capabilities and shares the data provides a highly cost effective option for both nations.

COM DEV is committed to and currently engaged in, developing a capability to satisfy Canada's strategic thrust in micro-space for a range of applications. COM DEV's approach focuses on identifying global and regional needs that can best be satisfied from space and provides cost effective solutions based on a micro-space approach with a cost per spacecraft in the range of 15-20 Million Canadian Dollars.

Based on similar economic, security and natural resource management issues, COM DEV believes that it would be feasible to establish missions where the industrial capabilities of both nations could be used and the cost of the mission partitioned between the two countries. The same spacecraft, in the appropriate orbit, would be able to service Canadian and Australian needs on a non-competitive basis. This approach would result in reduced mission costs for each nation, with no reduction in capability. In addition the high technology industries in each country would be used to satisfy national requirements and, based on the demonstrated capability, would be able to compete for export opportunities on a global scale.

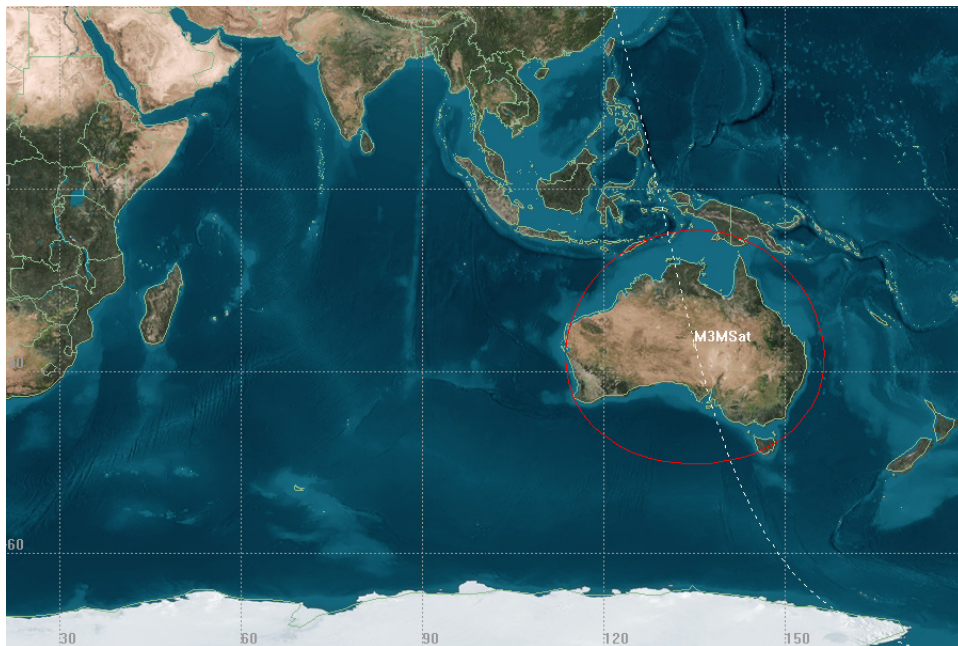
Such an approach would satisfy national requirements, strengthen industrial capability and develop a strategic and mutually beneficial partnership between Canada and Australia.

1. INTRODUCTION

Space resources have been used for many years to provide a number of services for commercial, military and scientific applications. Geostationary spacecraft, located at a distance from earth such that they appear stationary with respect to a point on the earth, are used extensively for communications purposes.

Orbiting spacecraft, flying at an altitude of 600 to 800 km, are generally used to conduct missions which require some characteristic on the earth to be monitored or measured. Spacecraft which are polar orbiting, that is orbiting over the North and South Pole, provide a capability to monitor any point on the earth. The spacecraft will orbit the earth once in approximately 90 minutes. The time to return over any specific point on the earth will depend on the number of spacecraft and their spacing in various orbital planes (the orbits they are arranged in).

Low Earth Orbit, or LEO spacecraft are particularly well suited for applications which require a wide area to be observed. As shown in the figure below the field of view from a single spacecraft (depicted in red) can encompass virtually the entire region of Australia, depending on type of instrument or application.



Apart from the wide area surveillance solution which LEO spacecraft can provide, spacecraft in a polar orbit will pass over all regions of the earth, including northern and southern Polar Regions. Both Canada and Australia have interests and activities in these regions, which can be supported by spacecraft flying in a polar orbit.

2. SPACE PROGRAM IN CANADA

The Canadian Space Agency (CSA) is the Federal Agency tasked with managing and implementing space programs in Canada. The CSA provides funding for technology development in specific technology areas related to planned future missions. The mission areas supported by Canada include:

- Earth Observation Missions for the collection of data related to the land, sea and ice environment
- Space Astronomy
- Atmospheric Monitoring - mechanisms governing the atmosphere and its interaction with the oceans, the ecosystem and cosmic radiation
- Solar – Terrestrial Missions - An understanding of the Sun-Earth interaction to enable an assessment of the impact on communications and the environment
- Space Exploration

To support these missions the CSA funds a number of technology development programs to ensure that the technology to support the mission objectives is developed within Canada.

Canada has also initiated a program to develop a strategic capability in the micro-satellite and small-satellite sector as it has been determined that these platforms can support a range of missions which can satisfy national and international requirements at a price that is affordable to a mid-sized space nation such as Canada.

The CSA has a number of international agreements with agencies around the world related to the development of technologies and the implementation of space missions. A specific example is the European Space Agency, to which Canada contributes financially and participates in missions in return for access to the mission data. Similar agreements are maintained with a number of international space agencies including NASA, JAXA (the Japanese space agency) and others. The CSA maintains an international development branch which works to facilitate agreements and memorandums related to collaborative space missions and programs. Such an agreement could be negotiated between Canada and Australia with a framework that takes advantage of the industrial and research capabilities within each country.

3. SPACE APPLICATIONS

As previously mentioned LEO satellites are particularly well suited for a number of applications requiring the monitoring of or collection of data from wide areas of land, ocean or ice masses in addition to the atmosphere and environment above or even below the earths' surface.

COM DEV's approach is to focus on existing requirements that need to be satisfied and assess if a solution utilizing a space based asset provides an efficient and effective solution. The distinction is that COM DEV does not seek to promote space missions per se but rather COM DEV seeks to identify solutions to requirements, which can be best satisfied using a space asset or assets. Several examples are listed below.

Wide Area Surveillance – The surveillance of large areas of land, air or sea regions using Radar, Optical, Lidar, Multi-Spectral or passive RF instruments. These systems can be used to detect vessels, vehicles, aircraft or even personnel entering or transiting through specific regions.

Environmental Monitoring / Resource Management – the monitoring of the environment can be achieved in a wide variety of methods through the use of dedicated instruments. In addition sensors can be installed across wide land regions to monitor rainfall, water flow or quality or any other environmental data. The data can be stored and up-linked to a spacecraft every time it passes overhead. Similar applications apply to sensors distributed in the ocean to monitor water currents, temperature, salinity, pollution or other attributes. A single spacecraft can be used to collect data from thousands or tens of thousands of sensors distributed across land or sea regions where no communications links exist. Polar Orbiting spacecraft can be used to collect data from Arctic and Antarctic data sources.

Atmospheric Monitoring – Various sensors can be flown on spacecraft to monitor atmospheric conditions and determine the effect of natural or man made influences. These can be related to pollution emissions, forest fires, climatic changes or large scale natural disasters. Such systems can be used to monitor, plan for or predict activities which have impacts on the economy as well as safety of life.

Safety and Security – A range of sensors and instruments can be launched to support safety and security measures in national areas or areas where nationals are located or military forces are deployed. These include sensors to detect maritime vessels in distress, intentional or unintentional interference of national communications, detection of various emitters or the collection of data from distributed sensors on land or at sea. A range of options is available to satisfy the issues associated with data latency and coverage time including the use of multiple satellites to provide persistent coverage, or the use of sensors connected to data logging devices to provide 24 hr per day / 7 day a week monitoring capability.

4. COM DEV PROPOSAL

COM DEV has been actively engaged in monitoring the requirements situation within Australia for several years, due in part to the similarities between Canada and Australia in the areas of environmental concerns, resource management, safety and security. During this period COM DEV has held discussions, directly or indirectly through Asia Pacific Aerospace Consultants, with a number of Australian Agencies including CSIRO, the Department of Industry and Tourism (Space Policy and Services), Geoscience Australia, Bureau of Meteorology, Australian Maritime Safety Agency, Department of Defence, Australia Border Protection Command and the Australian Customs Service. In addition COM DEV has visited or conducted meetings with various universities, research agencies and companies.

What has become evident is that Australia has many requirements and needs which are similar to those in Canada, particularly in the areas of environmental monitoring, security and polar station data monitoring to name a few. COM DEV has also been impressed with the range and depth of research and industrial capability in all sectors of space missions including spacecraft technology, ground stations and data processing. All of these factors combine to indicate that a collaborative approach to satisfy national needs using space assets holds significant potential.

In addition preliminary discussions with the Canadian Space Agency have indicated a willingness to explore options related to collaborative missions with Australia.

Based on the factors detailed above, COM DEV proposes the following course of action in order to assess the potential for a collaborative mission or missions between Canada and Australia.

- COM DEV to work with an Australian Entity to identify various national requirements that exist within Australia
- Compare these requirements with national requirements within Canada
- Select a common primary and secondary requirement which can be satisfied through the use of a micro-space asset
- Establish a solutions concept which makes use of industry and research resources within each country with a goal of 50% participation by each nation
- Conduct a funded Phase 0 Feasibility study collaboratively with Australian Industry to establish a mission concept, timeline and budget
- Submit the study to the appropriate agencies in Canada (CSA) and Australia for consideration and implementation
- Secure a Government to Government Memorandum of Understanding which supports the mission and provides a framework for future missions
- Proceed with Mission implementation which results in shared funding and data

5. SUMMARY

The various similarities between Canada and Australia result in the potential to utilize the industrial and R&D capacities of both countries to satisfy similar requirements, enhance industrial competitiveness and increase export potentials while retaining highly skilled personnel.

COM DEV proposes to work with Australian industry to develop a solution to a selected national requirement, which can be satisfied cost effectively through the use of a space asset in the range of 15-20 Million Canadian Dollars. By establishing a co-funded collaborative approach, the solution can be developed for half the cost to each country with the funds being invested back into the national economy and industry. This approach will not only result in the investment of the funds back into the economy as opposed to funding an offshore solution, but will also enhance the competitiveness and export potential for industry.