



May 12, 2015

The Hon. David Emerson
Chair,
Canada Transportation Act Review Secretariat
350 Albert Street, Suite 330
Ottawa, ON
K1A 0N5

Dear Mr. Emerson,

Telesat Canada is pleased to share its views in connection with the review of the *Canada Transportation Act*. Telesat notes that the review will examine the extent to which the national transportation system has the capacity and adaptability that will allow it, and its users, to respond effectively to evolving international and domestic conditions and markets. The Government also identified a number of specific issues to be addressed in the Review, including how to address rapid changes in the North and associated challenges for the continued safety, security, and sustainability of the northern transportation system, and specifically, the federal role in supporting the northern transportation system. The development of infrastructure to serve the North as well as measures to ensure Canada's security and sovereignty are of particular interest to Telesat as it is the principal provider of satellite communications in the North.

Telesat's comments, set out below, are organized as follows. The first section provides an overview of Telesat, and describes its role as well as the role of governments in meeting the needs of the North. The second section of the comments identifies the nexus that exists between transportation and telecommunications infrastructure and the role played by satellite technology. In the third section Telesat outlines some of the key infrastructure challenges in the North. Telesat's concluding comments are contained in the fourth part of the submission.

1. Introduction to Telesat

Telesat is a Canadian success story. Since its inception in 1969, Telesat has brought essential and innovative satellite services to every part of Canada. Today, Telesat is a leading global fixed satellite services operator – the fourth largest in the world – and provides reliable and secure satellite-delivered communications solutions worldwide to broadcast, telecom, corporate and government customers worldwide. Headquartered in Ottawa, with offices and facilities around

the world, Telesat employs approximately 450 people, more than 80% of whom are in Canada, with a large proportion working in specialized high tech positions. Privately held, Telesat's principal shareholders are Canada's Public Sector Pension Investment Board and Loral Space & Communications Inc.

In order to increase its scale and enhance its competitive position in the highly competitive global market for satellite communications services, Telesat has invested billions of dollars in its state-of-the-art satellite fleet and ground facilities and is continuing to invest in both replacement and expansion satellites for our fleet. Telesat's revenues in 2014 were over \$920 million (approximately 50% of which were derived from Canada) and it has an asset value of in excess of \$6 billion.

Telesat has been a leader in providing telecommunications services for more than four decades and remains strongly committed to maintaining and expanding the services available in Northern and rural Canada. Over the years Telesat has been a partner in, and has made significant investments towards, such initiatives as Connecting Canada, Schoolnet, the National Satellite Initiative, Smart Communities, and the Community Access Program, among others. Telesat has contributed satellite capacity for technology demonstrations, application trials, and service ramp-ups, including telemedicine applications. In addition, Telesat has provided long term satellite capacity for government sponsored programs throughout the North as part of its own public benefit commitments to the Government of Canada. Telesat's satellites also play a vital role maintaining Canada's security and sovereignty. For example, Telesat supports the High Arctic Data Communications System (HADCS) – the world's northern most satellite link providing broadband connectivity to Eureka at almost 80 degrees North latitude. As well, Telesat's Anik F2 and Anik F3 relay data from all of the Canadian sites and seven of the US sites that comprise the North Warning System. Today, more than half of Telesat's satellite fleet has dedicated coverage of the full Canadian land mass up to 76 degrees North latitude – serving all permanent communities in Canada.

The needs of the North and other remote areas, however, have changed and continue to grow. When Telesat launched its first Anik satellite in 1972, it provided reliable access to basic communications services to all Canadians, including Northerners. However, in 1972 basic communications meant distribution of the French and English services of Canada's public broadcaster, the CBC, as well as ensuring that there was at least one telephone line per community of 500 people or more. What is required today in terms of bandwidth and connectivity is very different. Services that rely on broadband communications provide not only entertainment and information services, they also form part of the critical infrastructure that ensures Canada's security and sovereignty. The same bandwidth and connectivity also underlies other critical infrastructure, including the transportation sector, as described below.

2. Satellite Services and the Transportation Sector

As noted in the *Discussion Paper: Canada Transportation Act Review*, (hereafter, the *Discussion Paper*), Canada's transportation sector is profoundly influenced by global trends. Alongside Canada's traditional major trading partners, emerging economic powers are driving increased global competitiveness in many sectors, including transportation. In response, Canada's transportation systems will need to be globally competitive. In today's digital economy, this means that the logistical systems and the infrastructure supporting global supply chains need to be managed, monitored, secured and utilized to increasingly higher levels of performance and sophistication. Satellite based technology and applications are already playing a critical role, but there is much more that can and should be done. This is particularly important in the North where massive challenges are emerging involving the environment, climate change, navigation, ice conditions, security, and search and rescue to name a few. As noted in the "Message from the Chair" accompanying the *Discussion Paper*, it is timely "to again consider the role of transportation as a developmental catalyst, particularly for the massive, varied and remote geography that comprises northern Canada." If Canada's sovereignty and security in the North is to be ensured, it will require investment in satellite and transportation infrastructure.

Today, Canada has key industrial capabilities related to space that in turn have application within the transport sector. Canada is a recognized world leader in a number of areas including: satellite communications services and technologies; radar-imaging earth observation satellites and ground stations; space robotic technology (manipulators, mobility, autonomous systems, cameras and sensors); micro and nano-satellites; and optical and scientific instruments. Many of these technologies have spin-offs in terrestrial markets such as industrial production, medicine, mining, energy, security, navigation and, of course, transportation. The strategic importance of space related technology to the transportation sector, and to Canada more broadly, is beyond doubt as aptly demonstrated by our dependency on GPS for both commercial and consumer applications. In a country as vast and sparsely populated as Canada, satellite technologies play a unique and vital role in communications and to help monitor our territory for both opportunities and threats.

Geographically, Canada is the second largest country in the world with the world's longest coastline, and protecting and managing such an enormous zone is a major challenge. Seventy-five percent of our population lives within 160 km of the US border, leaving the majority of our landmass scarcely populated and difficult to access. Our northern territory comprises more than 40% of our total landmass. This Canadian geography and demography make it extremely challenging for governments to provide the infrastructure critical to our economic and social growth and to manage our national and international responsibilities for security and safety.

Today, space applications and services are often taken for granted. But virtually every aspect of modern life in Canada is dependent on space to one extent or another. Satellite technology is intricately woven into the socio-economic infrastructure of the nation providing essential communications systems, air and ship traffic management, weather analysis, resource management, search and rescue, environmental monitoring, and a whole host of security and intelligence services. A safe and efficient transportation system is increasingly dependent on a space-based infrastructure that provides the necessary communications, navigation and earth observation services. This is true throughout Canada, but it is especially true in remote and northern regions.

What follows are several examples of how satellite systems support transportation systems in general, and how satellite technologies uniquely meets the increasing demands of a strong transportation system, particularly in remote areas.

- *Maritime Transportation* – In maritime transportation a key concern relates to what is known as Maritime Domain Awareness. Essentially this means having accurate and timely information about everything on, under, related to, adjacent to, or bordering a sea, ocean or other navigable waterway. Such information contributes to the security, safety and prosperity of Canadians. Surveillance satellites that use radar imagery such as RADARSAT can detect the presence of large ships through an analysis of the reflection of radar signals off ships and the water. The next generation of this technology, RADARSAT Constellation Mission (RCM), is currently being implemented by MDA.¹ RCM will advance this technology further by having on board a secondary payload, provided by COM DEV², which can receive Automatic Identification System (AIS) messages transmitted from ships greater than 300 tons. The fusion of this AIS data with the radar image data will enable the Government of Canada to more quickly identify ships as targets of interest. While the emphasis of this technology is on security, such data will also be important for the safe management of marine traffic, especially in the Arctic where there is not the terrestrial infrastructure in place.

¹ MDA Corporation (Macdonald Dettwiler and Associates) is a global communications and information company providing operational solutions to commercial and government organizations worldwide. In the communications sector, MDA offers space-based solutions for global delivery of a range of services, including television and radio distribution, broadband Internet, and mobile communications. MDA is also a supplier of communication satellites, satellite antenna subsystems, and associated ground infrastructure and support services. In the Surveillance and Intelligence sector, MDA is a supplier of space-based and airborne surveillance solutions, imaging satellite ground systems, geospatial information services, and associated support services.

² COM DEV International is a leading global provider of space hardware and services with facilities in Canada, the United Kingdom and the United States. COM DEV designs manufactures, and integrates advanced products, subsystems and microsatellites that are sold to major satellite prime contractors, government agencies and satellite operators, for use in communications, space science, remote sensing and defence applications.

- *Air Transportation* – Satellite technology also plays an increasingly important role in air transportation. While the use of GPS is almost ubiquitous, it is not widely known that the accuracy and integrity of GPS signals are being increased by payloads such as the one on Telesat’s Anik F1R satellite. Known as WAAS (Wide Area Augmentation Service), this satellite-based system broadcasts signals which supplement the GPS satellite signals and improves accuracy from 100 meters to 7 meters. Supported by the Federal Aviation Administration in the US, WAAS provides service for all classes of aircraft in all phases of flight - including en route navigation, airport departures, and airport arrivals - thus improving the safety and efficiency of civil aviation. This technology permits precision approaches by aircraft at airports throughout Canada and the US, obviating the need for expensive ground-based navigation aids at smaller, remote airports. Other modes of transportation also benefit from the increased accuracy, availability, and integrity that WAAS delivers. Another example of space systems having a beneficial impact on air transportation can be found in the area of air traffic control, which relies on voice communications between the pilot and the air traffic controller. Air traffic control is evolving to satellite-based air traffic management in which data links are the primary means of communications, making aviation safer and more efficient. With continuous and precise real time tracking of the aircraft, air traffic control has been significantly improved.
- *Ground Transportation* – Satellite technology is also used extensively in ground transportation. For example, SkyWave Mobile Communications’³ Machine- to- Machine (M2M) communication terminals and network services enable applications that provide the capability to track, monitor, and remotely manage their fixed and mobile equipment. Satellite and satellite-cellular terminals and applications are designed to enable cost-effective, near real-time truck tracking and driver monitoring. This technology helps ensure vehicle security and keep fleet managers informed of the operational status and location of carriers, as well as valuable cargos, containers, and hazardous materials. They also provide invaluable, low-cost data communications links for driver monitoring and other fleet management requirements. This results in increased productivity, streamlined operations and enhanced security as well as ensuring compliance with transport regulations. Similar terminals and applications are provided by Skywave for maritime marine tracking, providing effective and efficient data messaging between all sea-going vessels and maritime buoys anywhere in the world.

³ SkyWave Communications is a global provider of wireless satellite and satellite-cellular data communications. Some examples of SkyWave products in use include government vehicles in USA, tuna buoys in the Pacific, truck tracking in the jungles of Brazil, and the oil & gas industry in North America. (<http://www.skywave.com/en/about-skywave>)

- Search and Rescue* – Satellite technology plays an important role in search and rescue activities. The international Cospas-Sarsat program was established by Canada, the United States, France, and Russia in the mid-1970s to provide global search and rescue system. Since 1982, the Cospas-Sarsat system has helped to save over 33,000 lives around the world. In Canada the national search and rescue system is called upon to respond to more than 15,000 calls and provides assistance to over 25,000 people each year. Canada's Joint Rescue Coordination Centres coordinate responses to an annual average of more than 9,000 incidents. The next evolution of the Cospas-Sarsat system is MEOSAR, which will provide faster and more accurate detection of emergency distress signals on a global basis ensuring that search and rescue systems will continue to be effective now and in the future. The MEOSAR space segment is being developed through a Canada-U.S. collaborative effort. It is expected that 24 repeaters will be hosted on the satellites of the GPS III constellation which orbit at an altitude of approximately 20,200 kilometres. The repeaters will receive signals from emergency beacons and retransmit the signals to earth stations called local user terminals (LUTs). LUTs process these emergency messages and send distress alerts to Mission Control Centers (MCCs) and national Rescue Coordination Centers (RCCs) which can then investigate and launch a rescue mission as required.
- Satellite Communications* – Satellite communications is the largest and most mature space-related activity, and by its very nature lies at the root of a modern information-based economy and plays a vital and ever increasing role in transportation. Satellite communications technologies and services have evolved over decades to meet commercial and government demands for higher bandwidths, greater coverage and lower costs. Future systems will incorporate even more efficient technologies, with flexible payloads to enable communications satellites to adapt to changing market conditions or operational requirements. The almost insatiable demand for bandwidth, particularly in the emerging area of Communications on the Move (COTM), is being met by exploiting new frequency bands and orbits, making available much needed spectrum and enabling more advanced networking. In addition, while satellites in geostationary orbit connect every permanent community in Canada, mobile platforms such as ships, aircraft, UAVs and land vehicles are demanding similar improvements in data throughput capacity and cannot be served by geostationary satellites when operating north of 70° latitude. These growing requirements for high bandwidth mobile services will be met by new and innovative satellite systems operating in both geostationary and non-geostationary orbits as described below. Equally important, the development of these new satellite constellations to satisfy emerging civilian and military requirements will provide a major opportunity for Canadian industry.

3. Infrastructure Needs in the North

An issue that will require considerable attention from the Review Panel is how to address rapid changes in the North and associated challenges for the continued safety, security, and sustainability of the northern transportation system. Over the next twenty years, changes in Canada's Arctic region will present a unique set of challenges and opportunities for the federal government. As noted in Part 6 of the *Discussion Paper*, the effects of climate change are having significant impacts on the transportation sector in the North. It is well understood that with the reduction in polar ice, Canada's Arctic will be open for navigation for more and more of the year resulting in the opening of Northern sea routes and the prospect of dramatically increased levels of commercial shipping. A related impact is the improved access this provides to the resource wealth of the region – hydrocarbons, minerals, and fish – allowing industry to exploit the resource potential of Canada's Northern territories.⁴ This increased activity creates a need to be able to monitor, manage and control what transpires in Canada's North. Furthermore, the management and control of Canada's claimed exclusive economic zone is becoming increasingly urgent and contentious as a result of geo-political developments. In order to exercise its sovereignty, the Government will be faced with further challenges in providing our northern regions with the critical strategic infrastructure, essential services, and security and safety enforcement that these expanded activities will demand. All of this will necessarily involve a greater dependence on space-based services since no other technology can provide the required wide-area communications, weather information and situational awareness required to support transportation and other critical infrastructure. Satellite technology will become even more important to the ongoing development of Canada than it is today and the need for an independent capability to monitor and protect the North will be more critical than ever.

While the need may be clear, much of this infrastructure does not yet exist and the Arctic remains not only deficient in terrestrial telecommunications infrastructure but also in its access to space-based infrastructure. Satellites in geostationary orbit, 36,000 km above the equator, can reach only a portion of the Arctic, limited to 70°N for mobile communications and 60°N for weather imaging. As a result, there is no continuously-available broadband network for secure, highly-reliable and high capacity telecommunications in the High Arctic that will adequately service the expected growth in activity in this area. For example, the WAAS payload mentioned above is in geostationary orbit and cannot provide the Arctic with improved air navigation as it is able to do throughout the rest of Canada. That means there are no navigation services for ships, aircraft (military and commercial) or Unmanned Aerial Vehicles (UAVs) over the polar areas – and the lack of telecommunications infrastructure also makes rapid response in the case of disasters nearly impossible. Similarly, weather satellites do not cover Canada's polar region

⁴ The US Geological Survey estimates that the Arctic contains up to 30 per cent of the world's undiscovered gas and 13 per cent of the world's undiscovered oil resources. See Kenneth J. Bird, et al, *Circum-Arctic Resource Appraisal: Estimates of Undiscovered Oil and Gas North of the Arctic Circle*, 2008, U.S. Geological Survey Fact Sheet 2008-3049 (2008), <http://pubs.usgs.gov/fs/2008/3049/>

above 60°. Not only is it a significant problem for shipping and resource extraction activities to not have timely access to weather data, but the ability for our meteorologists to predict weather in southern Canada is hampered, as many weather systems originate in the North. This lack of infrastructure also has implications for Canada’s international commitments. As noted in the Discussion Paper, as a member of the International Maritime Organization (IMO) Canada has “assumed responsibility for “navigational warning and meteorological services to facilitate the safe management of marine traffic Arctic area” and in 2011 an international treaty on Search and Rescue was concluded among the members of the Arctic Council. The need for a search and rescue agreement comes as shrinking sea ice has opened up Arctic waterways to more marine traffic, including shipping vessels and cruise ships. Arctic Council nations have agreed to coordinate with each other in the event of a plane crash, cruise ship sinking, big oil spill or other major disaster.

In response to these deficiencies, the Government of Canada has been studying a satellite-based solution. Certain government departments, particularly DND and Environment Canada, are considering the implementation of a Polar Communications and Weather (PCW) satellite system. Among other things, PCW would support the provision of broadband communications above 70° North latitude to ships, transport and fighter aircraft, and UAVs/drones performing critical missions such as interceptions, surveillance, and search and rescue as well as to support all other governmental communications requirements in the region, including for permanent and temporary installations (*e.g.*, deep water ports, forward operating bases). The meteorological capability of PCW would permit continuous monitoring of the weather and other atmospheric conditions in the North – information which is vital for both governmental and civilian activities in the region – as well as to allow for the development, working in conjunction with allied governments who operate meteorological satellites in other parts of the world, of a comprehensive global weather model.

In addition to the requirements of the Government of Canada, a number of allied governments have expressed a strong desire to have a broadband communications and meteorological capability in the Arctic. In this regard, these governments likely would make substantial financial contributions to support the deployment of PCW. The PCW initiative could also support the commercial requirements in the North of a range of important sectors, including the resource, maritime and aeronautical sectors. Revenues derived from these commercial applications could also be used to underwrite in part the cost of deploying the PCW constellation.

4. Conclusion


As noted above, Telesat is a leading global supplier of satellite communications services and has provided access to critical communications in all parts of Canada for more than four decades.

Satellite-based technology and applications are already playing a critical role in today’s digital economy providing essential communications systems, air and ship traffic management, weather

analysis, resource management, search and rescue, and environmental monitoring. A safe and efficient transportation system is increasingly dependent on space-based infrastructure. This is true throughout Canada, but it is especially true in remote and northern regions. As the Review Panel considers the role of transportation as a developmental catalyst, particularly for the North, it should recognize that it will require investment in not only transportation infrastructure, but also in complementary satellite infrastructure.

The PCW initiative currently under consideration by government will address many of these needs, fills a wide range of government policy objectives and will enhance the safety, security and the efficiency of northern transportation by providing continuous reliable communications and weather imaging to the entire circumpolar region. For these reasons, Telesat urges the Review Panel to recommend that the Government of Canada to move forward with this important initiative as soon as possible.

Sincerely,

A handwritten signature in black ink, appearing to read 'Ian Scott', written over a light blue horizontal line.

Ian Scott
Executive Director
Government and Regulatory Affairs