"Reaching Out: New Approaches to Security in Space"
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Introduction
Our use of outer space is at a crossroads. The combination of military action and diplomatic stalemate risks the transformation of space from a peaceful arena used for the benefit of all to a contested domain and flashpoint of war. The potential cost of such a shift would be devastating for rich and poor, developed and developing alike – all who increasingly depend on outer space for security in the broadest sense.

Acting responsibly in space requires a clear vision, sound plans, and cooperation from spacefaring nations. Each must reach out to the others in the international community with the intent to end diplomatic gridlock. The advent of a new US Administration has sparked optimism that the path of cooperation, peaceful uses, and mutual security will be followed. The Space Security Index (SSI) contributes to this process by offering a new vision of security in space and raising critical questions.

The Space Security Index is the only annual, comprehensive, and integrated report on activities in outer space and their impact on security, defined as *secure and sustainable access to and use of space, and freedom from space-based threats.* The purpose of the SSI is to improve transparency with respect to space activities. In supporting transparency, the project also aims to support the development of policy to ensure secure access for all and to facilitate dialogue on space security challenges and potential responses. Thus the annual report provides an indispensable tool for stakeholders and policymakers.

The Space Security Index is a project of Project Ploughshares, Secure World Foundation, the Institute of Air and Space Law at McGill University, the Simons Centre for Disarmament and Non-proliferation Research at the University of British Columbia, and the Space Generation Foundation, with support from the Government of Canada, the Ploughshares Fund, and The Simons Foundation. Annual reports containing more detailed information are available at www.spacesecurity.org.

Evolution of space security
The Government of Canada initiated the Space Security Index in 2003 in reaction to the stagnation of debate on PAROS and the weaponization of space. The hope was to change the nature of the debate into a discussion of information that could be objectively defined and evaluated.

The greatest contribution of the Space Security Index thus far is the growing acceptance of the definition of space security as the secure and sustainable access to and use of space and freedom from space-based threats for *all actors* in space. This understanding marks a shift in the use of the term "security" from narrow military perspectives to a more comprehensive approach. To evaluate this concept of space security, eight different indicators have been selected as measures. These indicators touch on three broad areas of security: the operating environment, actors and activities in space, and space technology.

Each year the indicators of space security are assessed based on activities and developments that took place the previous year. The goal is to gather accurate information, put that information in the context of space security, and then explore its significance. This process is participatory, with experts from around the world contributing their knowledge and expertise to the research and engaging in critical

dialogue. The final result is an annual report that brings much needed objectivity, transparency, and clarity of focus to debates surrounding security in outer space.

After five years of pursuing this approach to space security, the project has become many things to many people. It has been described by General Chilton, the former Commander of the US Air Force Space Command, as the Military Balance of space; by former Director of the Center for Defense Information Theresa Hitchens as a one-stop guide to understanding space security; and by Canada's Ambassador to the United Nations Marius Grinius as a "bible" to guide discussions at the Conference on Disarmament. Most importantly, however, it informs and shapes the research and opinions of people working on space security in Canada, the United States, Europe, Japan, India, Russia, China, and other countries, as is indicated by the number of references in research and conference presentations.

Much ongoing work is needed to ensure that outer space remains a safe, secure, and sustainable environment. The SSI is a key tool. First, it defines the problem: maintaining secure and sustainable access to and use of space and freedom from space-based threats. This approach is not just about debris, not just about space traffic, and not just about weapons. It is about all of these and their complex interactions. Second, the SSI identifies the stakeholders and sets the table for policy discussions to include civil, military, and commercial actors, as well as the billions of people around the world who rely on space applications every day. Finally, the SSI raises the questions that policymakers must ask if we are to create a path to sustainable security in outer space. I want to focus on these questions. To change our approach to space security, we must start by asking different questions.

The operating environment

The physical laws of space are a defining feature for security. Matter travels in orbits at tremendously high speeds, making debris a particular risk for the safe and sustainable operation of spacecraft. Imagine a busy highway in which many different vehicles travel at high speeds. Orbital debris is similar in effect to an accident on that highway, except that there is no way to clear the wreck off the road and drivers cannot slow down to avoid it. Too many accidents or too much debris make the roads and orbits unusable.

Significant international progress has been made in reducing the amount of debris created by individual space operations. However, the threat of debris is growing because more actors are moving into space, particularly in popular orbits. To continue to operate safely in this environment, information is key.

Gathering information on the space environment – the amount of debris, where it is located, and what other operators are doing – is a technical challenge that can be overcome with technical solutions. More difficult is governance of this information, particularly as the number of actors in space increases. Current data on the space environment is largely collected and controlled by the US Air Force, which provides monitored access to others. Questions in need of answers include: Who has the data? Who controls it? Who has access? Is it objective? How is it distributed? Is access to data sufficiently timely to enable adequate responses? The slow release of information after China destroyed a satellite in orbit, and the several close calls of debris and drifting satellites to other spacecraft demonstrates the growing importance of reliable access to accurate data.

Security in space is also affected by the legal and regulatory environment, which is currently marked by significant uncertainty. While many regulations and laws are being developed, it is clear that technological developments in outer space are outpacing the existing legal framework. Key questions emerged following the Chinese scientific experiment to destroy one of its own satellites with a missile in

outer space and the US engagement of the failed US-193 satellite with an anti-missile system. How the accumulation of treaties and customary space law over the past five decades applies to some of these troubling situations is not clear.

Also uncertain is the implication of the growing number of national military policies for outer space. In many cases, they draw on terminology developed for land, sea, and air. What do terms such as "freedom of action in space," "dominance," and "fighting in and through space" mean for others operating in the space environment?

Actors and activities in space

Outer space is chiefly valued for providing data and permitting an ever-growing number of technological applications. At one time military applications of the superpowers dominated outer space. Now many states large and small, developed and developing, as well as commercial actors, are accessing space directly to gain many social and economic benefits.

As more actors access space, the international community is faced with crucial decisions. A notable challenge is attached to the fair distribution of resources such as orbital slots and frequency spectrum, particularly to those who enter the game late. And how do we deal with laws and regulations that do not apply to all actors?

Space traffic management has emerged as a catch-phrase in discussions about space security, but it addresses one of the most basic problems with the growth in space activities. How do we determine the best practices in space for safe operations and how do we make sure that everyone is following the same rules? Coming back to the example of a busy highway, imagine trying to navigate it without a clear set of rules followed by all. On a highway, the result would be chaos, gridlock, and fender-benders. In outer space, the risks are much greater. There are of course many different ways to manage traffic; the important thing is that everyone on a particular road follows the same rules.

Another pressing question: How do we manage competition for security in outer space? As more states become dependent on access to and use of space for strategic and essential needs, how do we ensure that each actor has secure use of space without lessening the security of any other actor? Technology is a large driver of security in space. How do we manage the spread of potentially sensitive technology as more and more actors acquire the technical know-how to access and operate in space?

Space technology and security

The technology that allows access to and use of space is powerful and exciting. But the technology brings with it inherent vulnerabilities and threats. In particular, the SSI is concerned with technologies with the capability to better protect space systems, to attack or interfere with space systems, or to strike Earth objects from space.

Developments of the past few years send disquieting messages. Technologies able to interfere with or destroy satellite systems, including missile and laser technologies, are proliferating and outstripping the technologies that protect satellites. So far most of this proliferation has been vertical rather than horizontal, demonstrated most vividly by the Chinese scientific experiment that resulted in a missile intercepting one of its own satellites and the US engagement of the failed U-193 satellite via direct hit with an anti-missile missile.

While ground stations and communications links are the most vulnerable elements of space systems, the security of satellites in orbit is the dominant concern, because of the high cost of spacecraft, the difficulty in replacing them, potential collateral damage to the surrounding space environment should one be destroyed, and the difficulty in protecting them from Earth. Indeed, very little can be done to protect a satellite from a direct physical attack, aside from the passive defensive measures provided by distance, speed, and the laws of physics.

For the past 50 years, world powers have tried to determine their relative capabilities in space and have developed new, more potent technologies to stay on top. This approach buys time, but it does not buy security. Now it is beginning to produce a spiral of capabilities for negation and protection that are becoming indistinguishable from one another. More active measures are being pursued to monitor, inspect, and respond to potential harm on-orbit. One state's guardian is another state's ASAT.

More and more actors are gaining access to space and space technologies, either through trade (both legitimate and clandestine), government cooperation, or indigenous development. Efforts to control what are perceived as sensitive or threatening technologies will be unsuccessful over the long term. A different approach to security in space is needed.

We need to broaden the focus of hard security in space by asking different questions. Some of these questions relate to law: How do the laws of armed conflict apply in space? How does the accumulation of treaty and customary space law apply to the use of force in space? Some of these questions relate to behaviour: What is considered threatening behaviour in outer space? The BX-1 small monitoring satellite released from China's manned Shenzhou spacecraft in October 2008 reportedly flew "close" to the International Space Station. But what is "close"? And when does "close" become threatening? Some of these questions relate to transparency: How can we believe what we are told about the intended use of a spacecraft or capability in outer space?

These questions also apply to space-to-Earth strike capabilities. Current technological barriers will not provide a long-term solution to security.

New questions

Developing new, more appropriate policies for space depends on asking the right questions. Certainly, a shift from narrow conceptions of national security to a more encompassing understanding of global and space security that includes civil, military, and commercial users will initially raise many more questions than answers.

Any new space policy must address concerns about safety, sustainability, and security. These concepts are interconnected and must be treated together. None of them can be managed by one state. The way forward depends on international agreement and the cooperation of all major stakeholders and actors. Therein lies the basis of security in space.