

Space Security

Fact Sheet



Background

Space is the only global commons that borders every community, providing an unprecedented potential nexus for scientific achievement, economic prosperity, and strategic stability. Space-based assets are rapidly becoming part of our critical national and international infrastructure. They support our medical systems, our public services, our police forces, and our militaries. As our dependency on space assets has grown, so have legitimate concerns about the security of these assets, stimulating an important debate over the nature and direction of space security and how best to balance our civil, commercial, and military uses of space.

Defining Space Security

A good starting point is reaching a common understanding of Space Security. It can be defined as:

- The secure and sustainable access to, and use of, space and;
- The freedom from space-based threats.

The key elements of this definition are informed by a range of considerations including consistency with relevant major international legal instruments, United Nations General Assembly resolutions, the laws of armed conflict, as well as key elements of relevant multilateral treaties.

Understanding Space Security

Because of the multiple uses of space and wide range of space actors, a comprehensive and holistic outlook is necessary to achieve a reasonable understanding of space security.

1. The Space Environment

Some of the gravest threats to space security are environmental. The number of objects in Earth orbit has increased steadily and, because of its extremely high speed in orbit, space debris can endanger space assets. In addition, satellites require an orbital slot and a portion of the radio frequency spectrum in order to effectively carry out their functions in orbit and ensure communication. The expansion of satellite applications is driving growing demand for scarce radio frequency spectrum. Similarly, the growing demand for orbital slots has resulted in increased competition between satellite operators.

2. Laws, Policies, and Doctrines

There has been a progressive development of the legal framework for outer space activities. At present there are five space-specific treaties in effect. However, there exists no legal instrument barring the use of conventional weapons in and from space. The Conference on Disarmament, the principal international institution mandated to discuss space security issues, agreed on a Program of Work in 2009 after a 12 year stalemate, yet it remains to be seen whether actual progress will be made towards the adoption of a legal regime on space security. While the policies of space-faring nations emphasize international cooperation and the peaceful uses of outer space, growing dependence on space assets has led several of these states to view these assets as national security critical infrastructure and to focus on the security uses of outer space.

3. Civil Space Programs and Global Utilities

Civil space programs are central to the sustainable access to, and use of, space. The number of actors with access to space is on the rise: by the end of 2008, there were at least 10 actors with an independent orbital launch capacity, and 49 states with indirect space access. International cooperation has been the hallmark of civil space programs, exemplified in the International Space Station. There has also been a renewed interest in manned missions to space, especially since 2003, when China joined Russia and the United States as the only space powers with demonstrated manned spaceflight capabilities. Moreover, a growing number of states such as Brazil, Nigeria and South Africa, are placing a priority on satellites to support social and economic development.

4. Commercial Space

Commercial space is a growing industry with increasing relevance in our daily lives. Space manufacturing, launch services, space products, and operating insurance accounted for an estimated \$2.1 billion in revenues in 1980, multiplying to \$97.2 billion in 2004, and growing to an estimated \$145 billion in 2008. Commercial space also accounts for roughly one-third of all space launches. The growth in the industry has been linked to decreasing costs for space access. For example, the price

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For more information contact:

Cesar Jaramillo, Project Ploughshares, (519) 888-6541 #708, cjaramillo@ploughshares.ca

of sending a satellite into geostationary orbit dropped from \$40,000/kilogram to \$26,000/kilogram between 1990 and 2000. Governments continue to play an important role in the commercial space sector through subsidies and export controls.

5. Space Support for Terrestrial Military Operations

Space systems provide key support for an ever-widening array of military function such as: communications, navigation, early-warning, reconnaissance, surveillance, imaging, and remote-sensing. These systems allow advanced militaries to carry out operations with speed, precision, and economy of force while limiting collateral damage. The US and Russia lead in the development of military space systems, with the US accounting for some 90 percent of world military space spending. In the past decades, more states, such as Canada, China, France, Germany, India, Israel, Italy, Spain, and the UK, have been developing military space capabilities, particularly in the area of surveillance.

6. Space Systems Protection

The ability to detect, to withstand, and to recover from attacks against Earth-based or space-based segments of a space system are crucial to their protection. The US and Russia lead in general capabilities to detect rocket launches, while the US leads in the development of advanced technologies to detect direct attacks on satellites. While protection of satellite communications links is poor but improving, protection of vulnerable satellite ground stations remains a concern. Protection of satellites against some direct threats is improving, largely through radiation hardening, system redundancy, and greater use of higher orbits. Russia and the US are leading in the development of capabilities to rapidly rebuild space systems following a direct attack on satellites.

7. Space Systems Negation

Space systems can be negated by means of deception, denial, disruption, degradation, and destruction by electronic, explosive, kinetic, or directed energy weapons. Capabilities to attack ground stations and communications links are increasingly available to a broad range of actors. Direct attacks on satellites require sophisticated capabilities not widely available. Enabling technologies for space-based negation capabilities are being pursued by several states in the context of civil and military programs. The US leads in the development of space situational awareness, an essential tool to support space negation.

8. Space-based Strike Weapons

Space-based strike weapons can potentially target objects on Earth or traveling through space through the projection of mass or energy. No space-based strike weapons have yet been tested or deployed, but this is a fragile threshold whose preservation is uncertain. For instance, the US continues to develop a space-based interceptor for its missile defence system, and a growing number of actors are developing precursor technologies outside of dedicated weapons programs.

9. Space Situational Awareness

The ability to methodically monitor and understand the rapidly changing space environment is crucial to the preservation of security in outer space. There are currently over 19,000 objects 10 centimeters in diameter or larger being tracked by the US Space Surveillance Network— over 90 percent of which are space debris. The enhancement of Space Situational Awareness capabilities can contribute to more efficiently tracking debris and supporting collision avoidance. Still, the sharing of data among different actors remains a sensitive topic, as the information gathered with Space Situational Awareness capabilities is often related to confidential information related to space-based military applications.

The Space Security Index

The Space Security Index is the first and only annual, comprehensive, and integrated assessment of space security. It provides background information and in-depth analysis on the key space security trends and developments of eight indicators of space security. The Space Security Index is informed by the views of over 130 space experts from 17 countries in the civil, commercial, and military space sectors. It can be accessed at www.spacesecurity.org.