Space: The New Frontier of Security Policy

The strategic value of outer space is increasing. Satellites have become vital, but also vulnerable infrastructures for modern societies. An unexpected failure of important satellite-based applications would create considerable damage on Earth. For Europe and Switzerland, too, a stronger appreciation of space systems as critical infrastructures is becoming a matter of urgency.

By Livio Pigoni

In 1957, the Soviet Sputnik was the first satellite to be launched into space. Since then, the number of space powers has increased from just two – the Soviet Union and the US – to over 50 countries that operate satellites. Together, they have sent more than 7,000 satellites to space, about 1,200 of which are still in active use today.

In the information age, satellites have become a core element of modern societies. Satellite-based communications and navigation systems help to improve traffic safety, disaster response, or weather forecasts. However, most of the technologies have a dual-use character and civilian satellites are increasingly being used for military purposes.

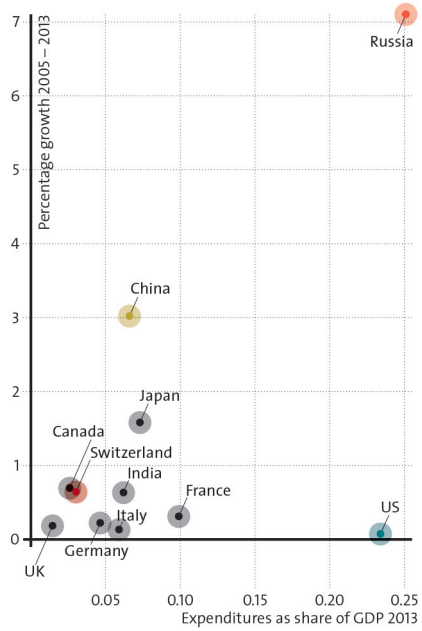
For modern armed forces Satellites have become indispensable, especially considering the irresistible advance of network-centric warfare since the war in Afghanistan from 2001 onwards. This involves the integration of information from various military platforms, such as tanks, vessels, or aircraft, into a jointly used information network that optimizes decisionmaking processes and navigation of forces. For conventional military operations, satellites thus serve as force multipliers. Besides this, the use of infrared and radar for increased accuracy in targeting facilitates avoiding collateral damage.

A NASA astronaut works outside the International Space Station (ISS). Space and space-based infrastructure become increasingly important for security policy. *A. Gerst / Reuters*

However, the benefits of space-based infrastructure must be weighed against certain developments in both the civilian and the military domains of aerospace that entail very serious risks. Events such as a Chinese anti-satellite (ASAT) test in 2007 or the collision of a Russian with a US satellite in 2009 have moved space-age risks into the focus of security-policy discourse. This reintroduction of ground-based ASAT weapons by China, as well as observations of a Russian satellite executing unusual maneuvers in November 2014, suggest that the introduction of orbital weapons capabilities, preparations for space-based warfare, and a new arms race in space may not be far off.

So far, there have been no direct military confrontations in space. But will it be possible to preserve this peace if human astro-

Comparison of Space Budgets



Source: OECD 2007; 2014

nautics advances at the current pace? The existing international norms are no longer sufficient for containing present-day space-based risks. However, in the absence of innovative long-term solutions, insecurity and threats in and from space will continue to grow.

Global Trends in Space Policy

Economic, scientific, and geopolitical changes on Earth also influence the relationship between states in space. The rise of China, India, and other countries has introduced a range of new actors in the use of space. Possible outcomes include tougher competition and clashes over the limited number of orbital paths and communications frequencies. On the other hand, satellites will continue to increase in importance. Global climate change and the concomitant increase of water conflicts and energy crises will further enhance the importance of satellites as means of information procurement and disaster response.

Therefore, the advancement of the information society will also create new vulnerabilities. The more societies depend on satellites, the more important it will be to protect them as critical infrastructures. For strategic reasons, the vulnerability of space-based systems used for collecting and relaying security-relevant information will increase. Today, there are two general developments jeopardizing the safe and peaceful use of space: First of all, increasing space pollution, and secondly, the reemergence of arms dynamics in space.

Space Junk

Satellite technology is no longer a prerogative of rich countries, but has also become affordable for less developed nations as well as for commercial providers and even private individuals. As a result, access to outer space has become increasingly "democratized". In 2014, about 150 standardized miniature satellites (CubeSats) were launched into space by a broad range of actors – as many as during the entire preceding decade. Consequently, the remaining free space in Low-Earth Orbit (LEO) is constantly shrinking. As small satellites have no propulsion systems of their own, they are frequently "parked" in orbit for long periods of time, creating a hazard for other satellites.

So-called "space junk" is another, more significant threat to satellites. In 2009, debris – ranging from non-functional satellites and the scraps of burnt-out rocket stages to snapped-off bolts and other tiny parts – accounted for over 95 per cent of all objects in orbit. There are currently more than 17,000 objects larger than 10 centimeters circling the Earth in LEO; all orbits together hold between 500,000 and 750,000 objects larger than one centimeter and several million particles in the millimeter range. Even such minuscule debris, travelling at very high relative speeds, can cause considerable damage to satellites.

It is difficult to track this clutter of objects reliably. However, all of the space junk must be catalogued in order to facilitate evasion maneuvers and avoid collisions. A catalog maintained by the US Department of Defense currently encompasses 23,000 LEO objects. Russia has similar capabilities, while the European Space Agency (ESA) is working together with the EU on expanding its radar systems. The International Space Station (ISS) was most recently forced to execute an evasive maneuver in November 2014 when it found itself in the path of a piece of debris 14 centimeters in diameter. Since 1999, the ISS has had to undertake such evasive maneuvers 21 times, including five times in 2014 alone.

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The more objects there are in orbit, the greater the risk of a chain reaction. In order to avoid a cascading effect – a series of collisions creating more and more smaller objects – it is important to heighten awareness of the problem and to strengthen regulations for the prevention of space junk. Furthermore, capabilities for removing the existing debris must be researched in the interests of enhancing the security of space-based infrastructure. This is politically sensitive, however, as the ability to "remove" a satellite, for instance with a gripper arm, could also be misused for military purposes.

Arms Dynamics in Space

Under the terms of the Outer Space Treaty of 1967, member states are forbidden from stationing weapons of mass destruction in orbit or on any celestial bodies. The Moon and other celestial bodies were declared demilitarized zones. However, "peaceful" use simply means "not aggressive", not "exclusively civilian". The treaty has therefore not contributed to keeping space free from military technology. Though the military use of outer space had diminished after the Cold War ended, it has in recent years experienced a renaissance.

It began after 2001, when the US under President George W. Bush increasingly pursued a doctrine of "space control". In 2006, this resulted in the implementation of the "U.S. National Space Policy" that calls for unrestricted US hegemony in space, to be defended by force if necessary. Since then, the US has returned to investing more resources in the development of military space technologies such as laser platforms or modified SM-3 missiles adapted for ASAT missions. However, China and Russia are increasingly challenging this US claim to supremacy.

In 2007, China shot down one of its own meteorological satellites, inaugurating a renaissance of ASAT weapons. The US, which had not conducted such tests since 1985, followed suit in 2008 with a demonstration of its capabilities. However, the use of such weapons for destroying a satellite in orbit is not really new: The US achieved its first targeted satellite kill in 1964, followed by many similar tests. However, the development of space weapons did not go beyond the test phase. China's de-

velopment of ASAT technology might pave the way for other states. India, Japan, Israel, and France also have latent capabilities for direct satellite shootdowns, which could be further expanded.

Also orbital weapons or so-called "killer satellites" are conceptually part of the military planning in major space powers. The Outer Space Treaty does not explicitly prohibit the stationing and use of such devices in space. While no such weapon has been used to date, there is speculation that Object 2014-28E, which was launched into orbit by Russia in May 2014 and has been observed to execute unusual maneuvers, could be a satellite with an orbital-weapon capability.

The embedding of space-based warfare in military doctrine and the possibility of power shifts have negative effects on stability in outer space. The mere threat of shooting down satellites has a big escalation potential. A state that believes its satellites to be under threat might decide in favor of a preemptive strike. Moreover, uncontrolled satellite kills create new scraps of debris that can orbit the Earth for decades and destroy further satellites.

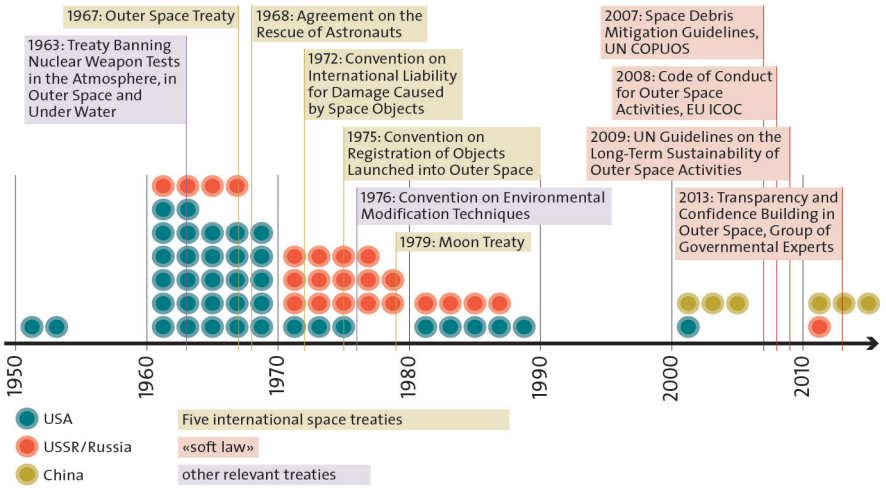
Rules of Conduct and Arms Control

The privatization and democratization of aerospace activities have created new legal gaps. The existing "traffic rules" on matters such as safety guidelines for rocket launches, use of radio frequencies, or avoidance of interference are inadequate and in urgent need of updating. Nevertheless, no new legal instruments on outer space with binding power under international law have been approved for several decades. Instead, the five space treaties of the 1960s and 1970s are complemented by "soft law", i.e., instruments that have no legally binding force.

Efforts to elaborate new guidelines are advancing mainly on two tracks. First of all, the UN Committee on the Peaceful Uses of Outer Space (UN COPUOS) was appointed to advance the development of international space law. It relies on confidence-building measures and voluntary undertakings by states. For example, the body has proposed new Space Debris Mitigation Guidelines in 2007.

On the other hand, the Conference on Disarmament is engaged in efforts to "prevent an arms race in outer space" (PAROS), mainly through the application of legally binding instruments. However, for political reasons, it has been stuck in a dead end for some time now. A joint Chinese-Russian proposal for banning all types of weapons in space was rejected in 2008 by the US, which feared that future weapons technologies might fall under this ban. The fact that China's ASAT tests were exempt from the treaty's provisions confirmed the US determiation to refuse the proposal. In June 2014, Moscow and Beijing introduced a new suggestion aimed at containing the US hegemony in space. However, the proposal enjoys little political acceptance, even though it has not yet been definitively rejected in the UN General Assembly. The intention is now to establish bridges between COPUOS and PAROS within the UN. A meeting has been scheduled for fall of 2015 between the first and the fourth committees of the General Assembly, which deal with disarmament and international security and with space, respectively.

Kinetic Anti Satellite Weapon Tests and most relevant Space Treaties



Source: Brian Weeden (2014), *Through a Glass, Darkly: Chinese, American, and Russian Anti-satellite Testing in Space*, Broomfield, CO: Secure World Foundation; Michael Krepon & Julia Thompson (eds.) (2013), Anti-satellite Weapons, Deterrence and *Sino-American Space Relations*, Washington, DC: Stimson Center; United Nations Office for Outer Space; EU External Action.

European Space Policy

In Europe, these global trends are viewed askance. Today, Europe has a broad spectrum of capabilities for aerospace technology. When it comes to scientific activities in space, the ESA even has a leading role. Nevertheless, although European states have military space capabilities of their own, they are opposed to the increasing securitization of outer space. But the new risks are also transforming European space policy.

The ESA, founded in 1975, has 20 member states today. By the end of 2015, they will be joined by Hungary and Estonia. According to its founding charter, it is devoted exclusively to peaceful purposes. However, in recent years, the notion of "peaceful use" has been given a new interpretation within the ESA. The agency may also become actively invovled with space applications that serve security and defense policy interests and thus also encompass military elements.

ESA member states have become involved in the military use of space to varying degrees. Germany, France, and Italy have notable spatial observation systems at their disposal – SAR-Lupe (radar), *Pléiades*, Helios 2 (optical, infrared), and COSMO-SkyMed – that can support their conventional forces.

The reinterpretation of the ESA's role is linked to the EU's development as a security-policy actor. Compared to the established military astronautic powers, the EU is a newcomer. The 1999 Kosovo War was a watershed, as the European NATO states involved discovered the limits of their ability to make assessments and act accordingly. Compared to the US, the EU had only very limited space-based capabilities at its disposal. Subsequently, therefore, the EU developed the security-policy component of its space policy. In 2007, this culminated in the approval of the European Space Policy, which states that space activities are a strategic asset that contribute to Europe's independence, security, and wealth. Since the 2009 Lisbon Treaty, moreover, space

policy is regarded as a "shared competence" of both the Commission and the member states, ensuring an overall more independent role for the EU in space policy.

Together with the ESA, the EU is engaged in important projects that add to its weight on the international stage. The *Galileo* navigation system and the *Copernicus* observation system are the most prestigious among these large-scale investments. Thanks to *Galileo,* which is under civilian control, but can be used for military purposes, the Europeans have succeeded, for instance, in becoming less dependent on the US government's *Global Positioning System* (GPS). Copernicus, for its part, facilitates global environmental monitoring and will also provide security-relevant services.

Europe is also making its voice heard internationally in the sphere of arms control and confidence-building measures. In 2008, the EU introduced the ICOC code of conduct, an important proposal for solving the problem of space junk and a refutation of remilitarizing space. While the great powers do not accept that the military use of space should be subject to binding international regulation, there is more potential for progress on managing debris. The US, which is the country most dependent on satellites, is aware of its vulnerabilities and has signalled the willingness to cooperate with the EU over the reduction of debris in orbit.

Space Security and Switzerland

For Switzerland, too, space is extremely important. The country was already part of the first Moon landing of 1969, contributing the only non-US experiment, a sail for measuring solar wind, to the Apollo 11 mission. In 1975, together with nine other states, Switzerland was a co-founder of the ESA, which it currently chairs together with Luxemburg. For the Swiss industry, access to the ESA is an excellent platform for innovation, the significance of which reaches far beyond the space sector.

Due to its involvement in European aerospace activities, Switzerland has always been interested in preserving the stability, security, safety and sustainability of outer space and fostering international collaboration in this area. However, the changing security-policy environment and the general increase of space activities also pose challenges for Switzerland.

The increase in ESA membership in the past 40 years, and Switzerland's non-membership in the EU, have caused Switzerland to lose ground as an actor in space, relatively speaking. In 2006, the Federal Council therefore called for revision of Switzerland's space policy. Subsequently, an investigation looked amongst other things at whether Switzerland's participation in security-related space activities was compatible with the country's perpetual neutrality. Switzerland's involvement in the *Galileo* project was regarded as permissible, since it was not a military asset. However, the Swiss Federal Department of Foreign Affairs (FDFA) recommended an exit clause that would allow the country to terminate its involvement in *Galileo* in the event of military use.

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In September 2008, the expert recommendations to the Federal Council on preserving Swiss interests in space were published. Among the core points were the strengthening of Switzerland's position within Europe and support for international processes advancing the peaceful use of space.

Today, Switzerland is engaged in preventing an arms race and the stationing of weapons in space. It therefore advocates new, binding legal instruments. Switzerland has signalled its willingness to discuss new proposals in the framework of the Geneva Disarmament Conference. On the other hand, Switzerland has since 2008 been a member of the UN COPUOS, where it also supports confidence-building measures and rules of conduct in space. The draft for an international code of conduct on space activities introduced by the EU in 2008 (EU ICOC) is also supported by Switzerland. COPUOS and ICOC are currently the two fora where tangible progress seems most feasible.

Another area of Switzerland's space policy is to build bridges between the disarmament community and the community advocating on behalf of the peaceful use of space. This should help to promote the coherence and complementarity of the various international legal instruments. Switzerland and the EU, as predominantly civilian space actors, aim to act as exemplars in countering the increase of space-based risk. The administration of US President Barack Obama seems more amenable to the European philosophy of "acting responsibly" with regard to space than its predecessor, and potentially more so than a successor government may be. This circumstance should be exploited to the full extent in the implementation of new guidelines for conduct in space during 2015 and 2016.

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CSS Analyses is edited by the Center for Security Studies (CSS) at ETH Zurich. Each month, two analyses are published in German, French, and English. The CSS is a center of competence for Swiss and international security policy.

Editors: Christian Nünlist and Matthias Bieri
Translation and lectorship: Christopher Findlay
Layout and graphics: Miriam Dahinden
ISSN: 2296-0244

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