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The EU, Space Security and a European Global Strategy

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The EU, Space Security and a European Global Strategy

Space is everywhere. It is wired into most modern technology. The societies and armed forces of the developed world are highly dependent on the hundreds of satellites which orbit Earth. Mobile phones, the Internet, credit cards, road tolls, television broadcasts and weather forecasts are but a few examples of everyday life functions which partially or wholly rely on satellites. Other more strategic functions include for example farming, monitoring of ocean and wind currents, navigation for ships and aircraft, monitoring of emergencies, pollution, climate and the environment. In addition, the growth of private actors in space has contributed to make space technology and services more affordable and accessible, which has enabled states without national space programmes and developing states to gain from some of the benefits that space endows.

The broader application of space activities and the increased strategic value of space have resulted in a heightened focus on security in the space environment. Satellites provide strategic advantages but they are also vulnerable. Therefore, protecting space assets has become a paramount security concern.

The purpose of this paper is to introduce the concept of space security, provide an overview of the contemporary state of European space security and some of the key challenges the EU faces. The paper will also consider reasons for including space security in a global strategy for the EU.[1]

Europe established a presence in space shortly after the US and the Soviet Union, but its approach to space differed from that of the two superpowers. The strategic and security aspects of space were more or less neglected in Europe which focused on

[1] See http://www.euglobalstrategy.eu/.

science, technology and research. It is not until recently that the strategic value of space and its connection to security have been formally acknowledged. The EU is hence a nascent actor in space security and the notion of security in space has mainly been related to specific space functions rather than to society and the EU as a whole.

The EU faces several challenges in space security. Resolving these will require synchronized efforts, improved governance and political endurance. Below are seven suggestions for responses to the space security challenges discussed in this paper:

- Establish an operational European space situational awareness and link up with partners.

- Formulate and implement a cohesive European space security strategy.

- Improve governance of space issues in the EU to consolidate resources and outreach.

- Establish institutional bonds between space security policies and other EU-frameworks.

- Develop the EU's various diplomatic initiatives in space issues, both in bilateral and multilateral contexts. Consider the space component in negotiations in other issue-areas.

- Take lead in policy and technology initiatives to remove space debris in order to gain additional credibility in space security issues.

- Enhance governance and facilitate development of the European space industry.

Space security

Essentially, space security concerns the free access to, and use of space as well as freedom from space-based threats. However, space security is not limited to security policy in space. Space assets are crucial in a multitude of civilian and military services and functions, and are affected by developments on both Earth and in space. This on-going and increasing integration of space in society means that space security extends to security policy in other areas such as communications, critical infrastructure, emergency monitoring and response, financial systems, transportation etc.

It is beyond the scope of this paper to analyse every dimension of space security but some of its key aspects will be briefly discussed, including: the militarization and weaponization of space, the institutionalization of space, space situational awareness and space debris. These dimensions of space security provide a backdrop for the subsequent analysis of the contemporary state of European space security and reasons for including space security in a global strategy for the EU.

The militarization and weaponization of space

The very first human space activities had a military dimension. The primary purpose of the satellites launched by the Soviet Union and the United States in the 1960s was military reconnaissance and to bolster their respective positions in the arms race. Since then, the militarization of space has continued and today satellites are used for various key military tasks such as navigation, communication, meteorology, geodesy, targeting and mission planning. While these functions are not offensive in nature, they constitute a force enhancement.[2] A modern military force is to varying degrees dependent on space assets to function properly in the field. Without satellites it cannot fight at full capacity. For example, during a joint exercise between US and Taiwanese troops off the coast of Taiwan, China disturbed the exercise by purchasing satellite

[2] Space is also referred to as a "military force multiplier".

bandwidth from private companies. With less satellite bandwidth available than expected, some of the American forces were unable to partake in the exercise. Hence, China managed to incapacitate some of the US forces by denying them access to satellites, rather than physically obstructing or attacking them.[3]

The militarization of space is detrimental to space security since it risks creating or reinforcing distrust between actors and facilitate an arms race which may lead to a weaponization of space. The weaponization of space is a contested issue since one might argue that space is already weaponized. For example, it is possible to crash one satellite into another, thereby turning it into a weapon. However, a more narrow definition of space weapons which focus on purpose rather than technology allows a closer examination of the weaponization of space and its implications for space security. Consequently, space weapons are here defined as any space-based device deliberately designed to damage or destroy an object that is in orbit or attack targets on Earth.[4]

Presently, the increased militarization of space, the military posturing of major spacefaring nations, initiation of new weapons programmes, the proliferation of missile technology and the incentives to defend vulnerable space assets indicate that the risk for a weaponization of space has increased. For example, while the United States does pursue cooperative strategies in space, it has also stepped up its military efforts to protect its space assets. Since the US military is highly dependent on satellites, a successful attack on US space infrastructure could severely cripple it. In anticipation of that, the United States seeks to reinforce deterrence and, should deterrence fail, have the capacity to respond in kind to any aggression. This is

[3] Joan Johnson-Freese, *Space as a Strategic Asset*, New York, Columbia University Press, 2007 p. 95

[4] Max M. Mutschler, ”Keeping Space Safe”, *PRIF-Report No. 98*, Frankfurt am Main: Peace Research Institute Frankfurt (PRIF), 2010, p. 3.

evidenced by on-going development of several weapons systems[5] which may be used to counter threats to the American space infrastructure.[6]

Other major space actors display similar patterns. China has successfully tested anti-satellite (ASAT) weapons and is in the process of deploying its own global satellite navigation system (known as Compass or BeiDou-2). India has demonstrated interest in space weapons technology and is also in the process of deploying a regional satellite navigation system named the Indian Regional Navigational Satellite System (IRNSS). Russia has no known active space weapons programmes but possesses a considerable knowledgebase on ASAT-weapons and satellite technology since the Cold War. For example, the anti-ballistic-missile (ABM) system that was deployed around Moscow in the 1960s had an inherent ASAT capability. In the United Nations, Russia has been advocating that no offensive space weapons should be deployed, and has stated that it will not accept the deployment of space weapons by another state without reaction.[7]

A weaponization of space could have serious consequences for global peace and stability. Should one state deploy space weapons it is likely that others would follow suit. An arms race in space would increase the risk of military confrontations in space, possibly escalating to war on Earth. War in space would also generate more space debris which is negative for all spacefaring countries.[8]

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[5] These include for example laser technology that can be used against space objects, micro-satellites that can be used against other satellites and various missile systems with the capacity to hit satellites in orbit (like the sea-based Aegis-LEAP system).

[6] Michael Sheehan, *The international politics of space*, Abingdon, Routledge, 2007.

[7] Max M. Mutschler and Christophe Venet "The European Union as an emerging actor in space security?", *Space Policy*, 28(2), 2012, p. 119.

[8] Toby Rider, Michael Findley and Paul Diehl, "Just part of the game? Arms races, rivalry, and war", *Journal of Peace Research*, 48(1), 2011.

The institutionalization of space

The institutionalization[9] of space, meaning the political and juridical processes and structures which regulate it, is relatively limited and few advances have been made since the Cold War. The lack of a political structure with rules, processes and institutions that regulate the use of space is a security problem since it enhances insecurity between actors in space. It also makes other security issues more difficult to handle since these typically require a political and/or legal framework which can facilitate collective solutions.

During the Cold War, both the United States and the Soviet Union realised that an armed confrontation in space would severely reduce or destroy the strategic advantages their space capabilities gave them. Therefore both parties made efforts to institutionalize limits to military activities and weapons in space. Their status as superpowers and their undisputed dominance in space issues allowed them to more or less control what the treaties regulated and what was left unregulated.[10]

The key treaties agreed upon during the Cold War included the Outer Space Treaty[11] from 1968, the Rescue Agreement from 1968 (concerns the rescue of persons in

[9] Institutionalization is the process through which laws, rules and procedures are developed. It also includes the development of organizations to legitimatize, implement and control laws, rules and procedures. The process of institutionalization creates a political (sometimes legal) structure which facilitates interaction in a given issue-area. This may include for example standards for behaviour, norms for what is expected and can be demanded of actors involved in the issue-area. For further reading on institutionalization see for example Rhodes, R. A. W., Binder, Sarah, and Rockman, Bert, A. (eds.) (2008) The Oxford Handbook of Political Institutions, Oxford: Oxford University Press.

[10] Nancy Gallagher "Towards a Reconsideration of the Rules for Space Security" in John M. Logsdon and Audrey M. Schaffer (eds.) *Perspectives on Space Security*, Washington D.C., Space Policy Institute, 2005, pp. 6–7. James Clay Moltz, *The Politics of Space Security*, Stanford, Stanford University Press, 2008, pp. 29–30.

[11] As of September 2012, 99 states are states-parties to the treaty, while another 26 have signed but not yet completed ratification. The treaty forms the base of space law and its principles address the right of all states to freely explore outer space. It also bars states from placing nuclear weapons or any other

space), the Liability Convention from 1972 (addresses space objects and liability rules), the Anti-Ballistic Missile Treaty from 1972 (regulates space-based weapons systems), the Registration Convention from 1975 (concerns the registration of space launches) and the Moon Agreement from 1979 (which prohibits the use of force on the Moon, other celestial bodies and orbit). These treaties comprised the framework for cooperation and dialogue concerning the regulation of space and space-related defence and security issues.[12]

After the end of the Cold War the institutionalization of space has decreased for several reasons:

- Space issues have become more complex as more states and private actors have increased their space activities and want a say in the regulation of space.

- The fast-paced development of space technology, new actors in space and emerging aspects of space security are not sufficiently addressed by the Outer Space Treaty and other agreements.[13]

- In 2002 the United States withdrew from the Anti-Ballistic Missile treaty which eroded important restrictions for American and Russian nuclear warheads and opened up for increased militarization of space. The US also integrated USSPACECOM, the combat command responsible for space operations, with USSTRATCOM. This created one command responsible for the United States strategic nuclear forces, space operations

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weapons of mass destruction in orbit of Earth, installing them on the Moon or any other celestial body, or to otherwise station them in outer space. However, it does not forbid placement of conventional weapons in orbit.

[12] Moltz, *The Politics of Space Security*, 2008, pp. 149–150, 174–175.

[13] Gallagher "Towards a Reconsideration of the Rules for Space Security", 2005, pp. 2–3. Moltz, *The Politics of Space Security*, 2008, p. 31.

and cyber operations. The new command signalled an increased US military posture in space.[14]

• The development of a UN treaty[15] to control arms in space has been blocked by persisting disagreements between primarily China, Russia and the United States. Since the 1980s there have been discussions on a treaty to regulate arms in space, Prevention of an Arms Race in Outer Space (PAROS), but a deadlock between the US, China and Russia has hindered any real progress. In 2002, China and Russia presented a modified treaty without any success. During the Bush administration (2001-2009) the US resistance to a treaty increased since the administration viewed it as a threat to its plans for a national missile defence and space-based weapons. In 2008, a treaty proposal dubbed Prevention of Placement of Weapons in Space (PPWT) was presented by Russia and China. The treaty focused on the placement of weapons in space rather than the use of weapons. It also included a number of key definitions which were absent in the PAROS discussions. The United States dismissed the new proposal and other spacefaring countries kept a relatively low profile in the discussions.[16]

The decreased institutionalization of space is linked to other global security issues. For example, the global disarmament process was negatively affected by the decreased institutionalization of space. In 2002, the United States withdrew from the

[14] Gallagher "Towards a Reconsideration of the Rules for Space Security", 2005, pp. 18–19.

[15] The Conference on Disarmament (CD) is the main forum for discussions concerning the regulation of space weapons. The UN General Assembly first tasked the CD to develop a proposal for arms control in 1985 but the responsible committee made no real progress and was dissolved in 1994. Nonetheless, the CD's mandate to discuss a treaty is renewed annually by the UN General Assembly.

[16] Wade L. Huntley, Joseph G. Bock and Miranda Weingartner "Planning the unplannable: Scenarios on the future of space", *Space Policy*, 26(1), 2010, p. 27. Nina Louisa Remuss, "Space and security" in Christian Brünner and Alexander Soucek (eds.), *Outer Space in Society, Politics and Law*, Vienna, Springer-Verlag, 2011, pp. 524–525.

Anti-Ballistic Missile Treaty in order to continue development on a national missile defence system and space weapons. In response, Russia withdrew from the START II[17] treaty which impeded the global disarmament of strategic nuclear weapons.[18]

Despite the weakening of the institutionalization of space during the last two decades, there are some developments which may break the negative trend. For instance, as more states and private actors gain access to space technology the risk for conflict involving space capabilities increases. Since a military confrontation or an arms race between two parties would threaten the interests of all other space actors, regardless of their involvement, the incentives to regulate arms in space may become stronger as more actors gain access to space-based military capabilities. In particular for the major space powers since they have more to lose given their advanced and extensive space capabilities. Further, in contrast to the Bush administration's opposition to arms control agreements or other legal regimes, the Obama administration has adopted a National Space Policy (NSP)[19] which accentuates the importance of international cooperation and confidence building measures in space issues. This has not resulted in any radical developments in the arms control deliberations but the United States has become more active in the PAROS discussions in the CD. In addition, the inclusion of new cooperative perspectives such as sustainability and transparency in the NSP indicates that the US acknowledges the need for multilateral solutions to some of the key space security challenges. It remains to be seen if (and to what extent) that will impact US space and security policy.[20]

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[17] The START II (Strategic Arms Reduction Treaty) between the US and Russia was signed in 1993 and banned the use of multiple independently targetable re-entry vehicles (MIRVs) on intercontinental ballistic missiles (ICBMs). In short, MIRVs made ICBMs more effective since it allowed them to carry 3-12 warheads and deliver them to separate targets.

[18] Moltz, *The Politics of Space Security*, 2008, p. 272.

[19] The National Space Policy was adopted by the Obama administration in June 2010. See http://www.whitehouse.gov/sites/default/files/national_space_policy_6-28-10.pdf

[20] Moltz, *The Politics of Space Security*, 2008, p. 272. The White House, "National Space Policy of the United States of America", Washington DC, The White House, 2010, pp. 1–4.

Space situational awareness

There are many natural and manmade objects of various sizes drifting around in space, especially in Earth's orbit. Space situational awareness (SSA) concerns the ability to view, understand and track the physical location of natural and manmade objects in orbit around the Earth, with the primary objective of avoiding collisions. SSA is crucial to understanding what is happening in orbit around Earth and provides an overview of the myriad of objects circulating Earth. Put differently, it renders an image of the objects which constitute the "whole" and the "whole" itself. SSA has both a defensive and offensive nature. It can be used to protect space assets (i.e. from impending collisions) but it can also be used to unveil the structure of an opponent's space capabilities, thus giving the actor with superior SSA a strategic advantage.[21]

As with many other space capabilities, the US and the Soviet military were for a long period of time the only sources of SSA information. During the Cold War the number of spacefaring states was low and there were few commercial satellites in orbit, hence there was no real need to coordinate SSA data. However, the number of satellites and other space objects has increased dramatically since the Cold War and space assets have become part of the critical infrastructure in many states. Therefore, many actors are now in need of a comprehensive, updated and accurate SSA in order to ensure the security of critical assets on Earth and in orbit.[22]

[21] Kai-Uwe Schrogl, "Space and its sustainable uses" in Christian Brünner and Alexander Soucek (eds.), *Outer Space in Society, Politics and Law*, Vienna, Springer-Verlag, 2011, p. 607.

[22] Brian Weeden, "Space Situational Awareness Bigger Than U.S. Military", *Defense News*, Springfield, Va., Gannett Government Media Corporation, 2012.

The US Space Surveillance Network (SSN)[23] is the primary source of SSA information for most other states and private actors, but as space activities and objects steadily increase a more comprehensive SSA system is needed. An expanded SSA system is more than one country can handle due to the costs, geographic coverage and need for coordination between various actors. For example, data from many different sources (owner-operator positions and planned manoeuvres on active satellites) need to be merged and the data as well as the analytical techniques used have to be trusted by all users of the system. For these reasons, some form of cooperation is necessary to provide an enhanced SSA that can cater to the security needs of states, commercial interests and a sustainable use of space.[24]

Essentially SSA concerns all states, including those who do not actively pursue any space activities since they are likely to depend on space services in some form. Developing SSA requires collective solutions and distribution of responsibilities and costs. One important aspect of SSA is that it is the states which have the largest investments in space that stand the most to lose if the development of SSA is stalled. Consequently, the security stakes for states like the United States, Russia and China are high when it comes to SSA. There are several obstacles to achieving a common SSA. For example, additional sensors need to be built in developing countries in the southern hemisphere and the Russian and Chinese systems need to be integrated. Also, military systems for early warning (of nuclear missiles) need to be integrated with other states' military, civilian and commercial systems. States also need to submit information on their military satellites which means that a new common SSA system needs to be able to handle various levels of confidentiality and access. Sharing that type of information will most likely require confidence building measures and

[23] SSN is operated by USSTRATCOM's Joint Functional Component Command for Space (JFCC-Space). It is a worldwide network of 29 space surveillance sensors (radar and optical telescopes, both military and civilian) which observe, identify and track manmade objects in space.

[24] Weeden, "Space Situational Awareness Bigger Than U.S. Military", 2012.

"leaps of faith" since most states do not share such information and may have deeply rooted suspicions against each other.[25]

The issues of governance and financing of the development of new SSA resources and the subsequent operation of the system must also be resolved. Since states are most likely unwilling to completely surrender control of their SSA resources to an intergovernmental SSA body, the technical solution has to take this into account. Similarly, states which contribute more than others in terms of SSA resources and money may demand more influence over the system than others. It is important to define and regulate whether certain levels of contribution should net more influence and/or benefits. It will help avoid disagreements and discourage freeriding in the system (i.e. states not contributing to the system but reaping all the benefits from it).

Space debris

Space debris is manmade objects in space that are no longer in use. These objects are a growing problem for space security since they may damage space equipment, contribute to the crowding in critical orbits and ultimately threaten the use of space services. There is a vast number of space debris orbiting Earth, from large pieces of rockets to small fragments of satellites. Even though small pieces of debris would seem harmless, they can inflict substantial damage due to the very high speeds of collisions at high altitudes. Presently (January 2013) it is estimated that there are around 21,000 objects larger than 10 centimetres, 20,000 objects larger than 1 centimetres and about 600,000 objects larger than 1 millimetres. The presence of this huge, and growing, amount of space debris in Earth's orbit is a considerable threat to the present and future use of space for all states.[26]

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[25] Christer Andersson, Lisa Rosenqvist, Eva Bernhardsdotter and Maths Persson, "SSA – Behöver Sverige en rymdlägesbild?", *FOI-R--3087--SE*, Stockholm, FOI, 2011, p. 34.

[26] Michael O'Hanlon, *Neither Star Wars Nor Sanctuary*, Washington D.C., The Brookings Institution, 2004, p. 42. NASA, "Orbital Debris Quarterly News", 17(1), Houston, National Aeronautics and Space

Space debris is generated in several different ways. For example, it may come from decommissioned satellites, parts of launchers that remain in space, shrapnel from ASAT-tests, waste from space missions and fragments from satellites.

Not only is the amount of space debris increasing but its rate of decay is also slow due to the conditions in space. The higher the altitude of the debris, the longer it will remain in Earth's orbit. Space debris below 600 kilometres typically falls back to Earth within several years. At altitudes of 800 kilometres it can take decades and above 1,000 kilometres more than a century. Hence, space debris is piling up since it is generated faster than it decays. Presently there is no method to manually remove space debris on a large scale.[27] What can be done is to move satellites out of orbit before they are decommissioned. Some are moved to lower altitudes to induce re-entry and "natural" destruction. Others are moved to higher altitudes, so called graveyard orbits, to minimise the risk of collision with active satellites.[28]

Space debris has both long-term and short-term implications for space security. Since space debris can damage satellites, it can disrupt the various services they provide for the states whose societies and militaries depend on them. A collision between a satellite and space debris may also be interpreted as an act of aggression if there is insufficient information about the objects involved in the crash. Similarly, when there are technologies in place to remove space debris, that may also be misinterpreted as an act of aggression (if one state removes another state's satellite) and hence lead to unwarranted tensions. Therefore it is important to establish rules and regulations

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Administration, 2013, p. 8. European Space Agency, "Space Debris – Frequently Asked Questions", Darmstadt, ESA, 2013.

[27] Technology to remove space debris is under development. For example, the Phoenix program at the US Defense Advanced Research Projects Agency (DARPA) is developing a technology to harvest dead satellites for still-usable parts. A demonstration mission is planned for 2016 to evaluate how the technology works on an actual satellite in orbit.

[28] Moltz, *The Politics of Space Security*, 2008, pp. 53–54. NASA Orbital Debris Program Office, "Frequently Asked Questions", 2013.

concerning the removal of space debris, which among other things include agreeing on a legal definition of space debris, create a general international agreement and transparency on which objects that are selected for removal, develop data sharing models and clarify liability issues.[29]

In the long-term, the growing amount of space debris will make it more difficult to complete space launches and place new assets in space. It will contribute to the overcrowding of popular satellite orbits which will increase the risk of collision and make it more difficult to place new satellites in orbit. Space debris needs to be addressed in a comprehensive and coordinated manner in order to secure the future use of space. The space debris problem is thus associated with both the need of an improved institutionalization of space and an enhanced global space situational awareness. The former is required to regulate space debris and find common solutions which can reduce it, build trust and transparency between the involved parties while the latter is required to enhance tracking of space debris and prevent collisions which generate additional space debris. A related problem is the persistent distrust between some states and the secrecy that is maintained concerning the positions of certain satellites. States that are keeping the positions of their satellites secret also take on the responsibility to avoid collisions. Since not all states that maintain high levels of secrecy have the SSA capacity to fully monitor space, collisions are bound to happen.[30]

[29] Brian Weeden, "Overview of the Legal and Policy Challenges with Orbital Debris Removal", presentation at 61st International Astronautical Congress, Prague, 2010, pp. 3–12.

[30] Mutschler, "Keeping Space Safe", 2010, p. 10. Weeden, "Overview of the Legal and Policy Challenges with Orbital Debris Removal", 2010, pp. 3–12.

The EU and space security

European cooperation in space began in the early 1960s as different multilateral projects and organizations, independent of other economic and political cooperation in the Europe. In 1975, the European Space Agency (ESA)[31] was founded and became the main body for European space collaboration. However, ESA was not the only forum for European space activities. Various European states pursued national space programmes and as European integration broadened and intensified, space became part of the work of the EU.[32]

During the Cold War the European space agenda was considerably different from that of the United States and the Soviet Union. For the two superpowers the strategic value of space was evident right from the start of the space age. The superpowers used space as a prestigious foreign policy tool, both in terms of competition and cooperation. Space was intimately linked to military and technological prowess, two crucial aspects of national security considerations as well as facilitating factors for global power projection. In contrast, the political and military relevance of space was more or less neglected on a European level. ESA's main focus was research and space exploration and there was limited connection to political agendas pertaining to security. It was predominantly via national space programmes that European states connected space with national/international security, but space security was not a priority the same way it was for the United States and the Soviet Union.[33]

[31] The European Space Agency was the result of a merger between two other intergovernmental collaborations: the European Launcher Development Organization (ELDO) and the European Space Research Organization (ESRO). Both were founded in 1964, the former with the purpose to develop a European space launch vehicle while the latter was dedicated to space research.

[32] Alain Gaubert and André Lebeau, "Reforming European space governance", *Space Policy*, 25(1), 2009, pp. 37–44.

[33] Christophe Venet "The economic dimension" in Christian Brünner and Alexander Soucek (eds.) *Outer Space in Society, Politics and Law*, Mörlenbach, SpringerWienNewYork, 2011, pp. 73–74.

With the end of the Cold War, the role of space in politics started to change. Space activities were increasingly viewed as integral to achieving key objectives in a broader range of issue-areas, including for example economic development, environmental monitoring and protection, information, security and technological development. In addition, new space applications were developed which typically had capacities far beyond those of the Cold War. Improved space technologies facilitated new notions of the utility of space and therefore contributed to increase the political relevance of space. The number of actors, countries as well as private companies, engaged in space activities also grew which in turn increased the strategic importance of space. Space was not only strategic in terms of the various civilian and military enhancements it could provide, it was also a symbol of military and economic strength which previously had been more or less monopolized by the two superpowers. Therefore, developing space capabilities had a strategic value from both a practical and a symbolical perspective.[34]

It is in this context that the EU finds itself searching for a cohesive space security strategy which allows it to maintain a secure and sustainable access to space, continue to build and develop space capabilities and effectively utilize existing space assets to help it achieve its goals in key policy areas.

Space security challenges for the EU

In 2007 the EU adopted a European Space Policy (ESP), jointly drafted by the European Commission and the Director General of ESA, which outlined goals for current space programmes, enhanced coordination, securing free and independent access to space etc.[35] The security dimensions of the ESP were highlighted in September 2008 during the Council of the EU's meeting on "Taking forward the European Space Policy". For example, the resolution from the meeting mentioned the

[34] Mutschler and Venet "The European Union as an emerging actor in space security?", 2012, p. 118.

[35] See http://ec.europa.eu/enterprise/newsroom/cf/_getdocument.cfm?doc_id=6400 for a summary of the issues covered by the ESP, its purpose, priorities and beneficiaries.

need to "define the way and means to improve the coordination between civilian and defence space programmes in long-term arrangements".[36]

The Treaty of Lisbon (2009) gave the EU legal grounds to directly negotiate international space agreements. It also formally recognised the three tiers of space actors in the EU (member states and their national space programmes, ESA and the EU) and by calling space policy a "shared competence" of the EU made way for a greater political role for the EU in space issues. Further, in 2010 the European Commission acknowledged that space should be considered a top security concern when it stated that "space infrastructures are critical infrastructures which contribute to citizens' well-being and security and they need to be protected".[37] Still, the EU lacks a coherent space security strategy, which is crucial if the EU is to successfully address the key space security challenges, reinforce internal security and strengthen its global presence.[38]

One of the primary challenges for the EU with regards to space security concerns the EU's ability to consolidate its resources and enhance its capacity in space security issues. A first step towards this is choosing common approaches to the various space security problems. For example, should the EU address the militarization of space by developing space weapons or should it focus on promoting certain norms? To each space security challenge there are different opportunities.

Further, through the Lisbon Treaty, the development of the ESP and the Code of Conduct for Outer Space Activities (CoC) initiative the EU has established itself as the leading European institution in space security. The CoC consultations with other

[36] Council of the European Union, "Council Resolution Taking forward the European Space Policy", 2891st Competitiveness, Internal Market, Industry and Research Council meeting, Brussels, 26 September 2008.

[37] European Commission, Enterprise & Industry magazine, 2010.

[38] Mutschler and Venet "The European Union as an emerging actor in space security?", 2012, p. 118.

spacefaring nations, in particular the US, did much to establish the EU's presence in space security. However, since space security issues are often overshadowed by sovereignty issues in the EU, there is a risk that the EU's position is undermined by conflicting interests between the various stakeholders and interests involved.[39]

Due to the EU's complex governance structure of space issues, identifying priorities and formulating policies have often been a complicated process. While there is a broader agreement on the principles and values on which the EU's space policy should rest (basically those enshrined in the Lisbon Treaty and the Council resolution on the ESP), transforming those into actual strategy and policy have proven to be difficult. There is a lack of common strategies and policies for the interests and interaction of the various stakeholders in European space security. Although the EU can negotiate international space treaties it still needs to coordinate with ESA and member states. This arrangement adds to the complexity of space security since the quality and coverage of the legal framework for space activities varies widely in member states.[40]

Despite that the EU have gained influence in space issues, member states will remain central to the orientation of the EU's space policy because it is the individual member states that run the key national space programmes and have the critical scientific and industrial capabilities. France and Germany is particularly important in this respect. They are the leading national space actors in Europe and are both partners and competitors. The success for the ESP and the EU's ability to steer Europe towards

[39] Christophe Venet, "2012, a turning point for Europe in space", *Actuelles de l'Ifri*, Paris, French Institute of International Relations, 2012, pp. 3–4. Mutschler and Venet "The European Union as an emerging actor in space security?", 2012, p. 121.

[40] Christophe Venet, "European space governance: The outlook. Report from the annual space conference organised by French Institute of International Relations and Secure World Foundation, Brussels, September 2011", *Space Policy* 28, 2011, pp. 59–60.

common approaches is thus partly dependent on the French and German positions in the EU and their relationship with each other.[41]

Considering that the EU is active in space politics, its member states very dependent on space and in possession of a substantial amount of space assets and technology, it is a major weakness that there is no coherent space security strategy and no formalised link between space security and the Common Security and Defence Policy (CSDP). While there are distinctive EU policy initiatives in space security issues, these are not organised in a cohesive strategy which is linked up with security strategies/frameworks in other areas. Strategically connecting space security to both military and non-military security aspects of the EU's responsibilities is considerably important since space already interface with these in practice.[42]

The militarization and possible weaponization of space is another key challenge for EU's space security. This is a complex dimension of space security which involve high stakes and the most powerful spacefaring nations like the US, Russia and China. The militarization of space is detrimental to space security. It risks creating or reinforcing distrust between states and facilitate an arms race which may lead to a weaponization of space when states build up capacities to defend their space assets and respond to the military posturing of other states. While there have been attempts at resolving the situation through negotiations in the UN, these have repeatedly failed.

In 2008 the EU introduced a CoC[43] which it may be able to use as a first step towards curbing the militarization and potential weaponization of space. A revised draft of the

[41] Venet, "2012, a turning point for Europe in space", 2012, pp. 3–4. Venet, "European space governance: The outlook. Report from the annual space conference organised by French Institute of International Relations and Secure World Foundation, Brussels, September 2011", 2011, pp. 59–60.

[42] Nina Louisa Remuss, "Space and security", 2011, pp. 544–545.

[43] The work with the CoC was initially handled by the Council Working Party on Global Disarmament and Arms Control (CODUN) but after the Lisbon Treaty it was transferred to the European External Action Service (EEAS).

CoC was released in September 2010 and adopted by the Council of the European Union on May 29, 2012.[44] Though the CoC is not a legally binding treaty the states that choose to subscribe to it politically wove to adhere to its principles.

The CoC is a comprehensive take on space security guided by the principles of freedom of access to space for all peaceful purposes, protection of the security and integrity of space objects in orbit. The CoC also notes the importance of respecting the legitimate defence interests that states have in space. Voluntary participation, transparency and confidence building measures are other central features of the CoC. By engaging states in cooperation and data sharing in issues such as orbital debris and SSA, the CoC aims to build trust and reinforce norms of cooperative behaviour. In the long-term, establishing cooperative norms and a spirit of trust may function as a stepping stone to expand the CoC to also address more sensitive issues such as the militarization and weaponization of space, potentially breaking the deadlock on the discussions about arms control in space.[45]

Although the CoC helped established EU as an actor in the international space debate, the EU has failed to gather lasting support for its initiative from the major spacefaring nations. The initial draft of the CoC had backing from several major space powers, most notably the US, but the revised draft lost support from the most important states. For example, the US opted out and instead proposed its own International Code of Conduct on January 17, 2012. Russia, China, India, and Brazil also dismissed the revised CoC. Especially India was discontent with that the CoC was non-binding and that the EU did not consult with Asia-Pacific nations when drafting it.[46]

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[44] Council Decision 2012/281/CFSP.

[45] Aman Pannu, "Space Security and European Union - Leader, Decision Maker or Enabler?", *Frost & Sullivan White Paper*, London, Frost & Sullivan, 2011, p. 13.

[46] Michael Listner, "EU takes the next shot in the battle of the codes", *The Space Review*, 2012.

The CoC is important for the EU since it reflects key European values and is designed to preserve and promote the security of European space assets. Therefore it is crucial that the EU continues to develop the CoC and lobby for it, in bilateral talks with the major space powers as well as in various multilateral meetings on different levels (expert meetings etc.). However, the CoC does not on its own represent a cohesive European space security strategy. In order to improve its legitimacy in space security matters the EU should follow up the CoC with other initiatives, integrate these with each other and establish links to existing EU-institutions and strategies such as the CSDP. In addition, it is important that member states keep in line and refrain from uncoordinated actions. Since other major space powers have launched their own codes of conduct, it is vital that the EU acts as one in an increasingly competitive and complex political landscape.[47]

Another challenge for the EU is the development of a SSA system that can fulfil both civilian and military needs and can be integrated with other SSA systems, like the American SSN, to improve the overall performance of SSA. At an ESA Ministerial Council in November 2008, the decision was made to start preparations for an independent European SSA system (Space Situational Awareness Preparatory Programme). Hence, it is ESA and not the EU that has the principal responsibility for developing a European SSA system. The first phase (2009-2012) of the programme encompassed development of a SSA architecture and information policies while the second phase (2012-2019) includes setting up an operational SSA system capable of space surveillance and tracking of space objects, near Earth objects[48] and survey space weather.[49] This involves incorporating existing sensors and applications

[47] Mutschler and Venet "The European Union as an emerging actor in space security?", 2012, p. 122.

[48] According to NASA, near Earth objects are "comets and asteroids that have been nudged by the gravitational attraction of nearby planets into orbits that allow them to enter the Earth's neighborhood".

[49] Space weather refers to changes in the ambient plasma, magnetic fields, radiation and other matter in space. Space weather affects technology in orbit around Earth but also on the ground. For example, bursts of energy from the sun may cause radiation hazards for satellites and magnetic disturbances on the surface of Earth which can damage power grids.

available from ESA member states in a backbone integration framework for all European SSA ground data systems. Also, to get a fully operational European system, it is likely that additional space assets will be necessary further down the road, like for example satellite-based sensors.[50]

The development of the SSA system highlights some of the problems of the EU's complicated space governance structure. While ESA holds the main responsibility for the development of the civilian parts of the system, the European Defence Agency (EDA) handles the military aspects. In addition, the European Commission and member states are also involved which adds to the complexity of the development process and contributes to blur the areas of responsibility. The EU's involvement in what is essentially an ESA project has raised concerns regarding governance and financing of the development process (the plan is to establish a separate organisation which will be responsible for the SSA system once it is completed).[51]

The heightened focus on the security dimensions of space in the EU is reflected by the development process of the European SSA system. One of the fundamental motives to the project explicitly stated in a Council resolution[52] is that the EU cannot remain dependent on the good will of other states for SSA information. It puts EU's security at risk, restricts its policy options in international affairs and is not a sustainable long-term solution. Establishing an independent European SSA system is therefore fundamental to meeting present and future space challenges pertaining to both the civilian and military dimensions of the EU.

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[50] Cesar Jaramillo (project manager), "Space Security Index 2012", Space Security Index, Waterloo, 2012, pp. 49–50.

[51] Eva Bernhardsdotter and Lars Höstbeck, "Rymden – arbetsplats eller slagfält?", *FOI-R--3295--SE*, Stockholm, FOI, 2011, pp. 75–76.

[52] Council of the European Union, "Council Resolution Taking forward the European Space Policy", 2008.

The development of a European SSA system is intrinsically linked to space debris and the threat it poses to the EU's space security. Like all other spacefaring actors, the EU must deal with the increased risk of collision, increasingly crowded orbits and potential long-term consequences such as reduced access to space if space debris is allowed to continue to grow unchecked.

One way the EU is addressing space debris is through its CoC. Space debris is addressed directly and indirectly in several of its chapters. For example, chapter 4 of the code instructs states to minimise the risk of collisions, which generate space debris and interfere with other actors' space operations, when conducting space operations. Chapter 5 declare that states should "refrain from the intentional destruction of any on-orbit space object or other activities which may generate long-lived space debris".[53]

Although the CoC specifically addresses space debris it is so far difficult to determine if the code has had any impact on the generation of space debris. The institutionalization of measures to prevent space debris is undoubtedly a necessary step, the question is if the CoC, with its limited number of subscribing states and non-binding status, will make any noticeable difference to the current situation. Also, the space debris issue is covered by other international bodies, like the Inter-Agency Space Debris Coordination Committee (IADC), that have set guidelines for space debris and achieved wider international recognition than the CoC. This means that the principles concerning space debris in the CoC are already covered by other agreements and the key problems persist regardless of the CoC.

Apart from the CoC, the EU has taken some policy initiatives and practical steps to address space debris. To some extent the Seventh Framework Programme concerns certain aspects and required technologies for space debris removal. Also, ESA is

[53] Council of the European Union, "Revised draft: Code of Conduct for Outer Space Activities", Brussels, Council of the European Union, 2010, pp. 7–8.

pursuing a "Clean Space" initiative which among other things includes research on active debris removal (ADR) technologies. Amongst EU member states, Germany is considering adapting technologies developed under the Deutsche Orbitale Servicing Mission (DEOS),[54] which was intended for on-orbit servicing of satellites, to space debris removal technology.[55]

The space debris problem aptly illustrates the need for collective security in space. No one state have the capacity to substantially reduce space debris nor can a single state set up a safe haven free of space debris due to the conditions in space. For the EU, space debris is indeed a security problem but may also be an opportunity to take a lead in a key space security issue. First, the EU can press on with diplomatic initiatives to build trust between the involved parties, encourage cooperation, dialogue and transparency. The goal for such diplomatic measures should be to reach agreements on the key legal issues concerning space debris. In order to accomplish this, the EU may use both the existing framework of the CoC and other political and scientific fora to push for increased cooperation, transparency and institutionalization. Second, the EU can spearhead development and deployment of ADR-technologies. Deploying such technology would not only reduce space debris, it would also fortify EU's position in this aspect of space security and strengthen the European space industry. Also, chances are that operational ADR-technology will put additional pressure on the parties in space debris negotiations to reach an agreement on the fundamental legal issues. The EU should also aim to keep its space debris operations transparent and use confidence building measures in order to minimise distrust in lieu of a comprehensive agreement on space debris.

[54] See http://www.research-in-germany.de/main/research-areas/space-technologies/2-nr-2-research-projects/43000/3-nr-3-deos.html for more information on the DEOS project.

[55] Personal correspondence with Dr. Heiner Klinkrad, Head of Space Debris Office, ESA, February 2013.

The governance and the development of the European space industry is another important challenge for the EU's space security. The governance problem is primarily a political and organizational problem whereas the development of the industry is primarily a structural problem.

The governance problem originates from the EU's complex relationship with the ESA and adhering difficulties in establishing coherent procurement procedures and an industrial policy for the space industry. Before the EU started to take an interest in space issues, ESA handled the major European space programmes and activities. Now, the EU is initiator, owner and operator of several large space programmes such as the Galileo[56] system and the Copernicus[57] system. Consequently, governing the procurement of space technology and the development of a competitive and specific industrial policy for space have become important concerns for the EU since good governance in these areas is likely to enhance economic development and security. In the long-term it may also strengthen the EU's global influence if the EU becomes a more attractive region for the space business and more spacefaring countries become dependent on space technology and knowledge developed in the EU.

The differences between the EU and ESA have made it difficult to outline a common policy for procurement of space technology and an industrial policy for the space industry. Whereas ESA is an expert organisation, the EU views space as an instrument to fulfil its policy goals in a range of areas (but lacks the expertise to do

[56] Galileo is Europe's own global navigation satellite system. Presently there are four operational satellites in orbit. The Galileo system is expected to be fully deployed by the end of this decade and will then consist of 30 satellites (27 operational and 3 active reserves).

[57] The Copernicus system, previously known as Global Monitoring for Environment and Security (GMES), is a programme which intends to build a European capacity for Earth observation. It will address six areas: land monitoring, marine monitoring, atmosphere monitoring, emergency management, security and climate change. The system is comprised by sensors at ground, in the sea, in the air and in space. Five different satellite groups are planned for the system with the last group being launched in 2020.

so). When it comes to procurement the EU follows a market integration logic whereas ESA's procurement often is tailored to adapt to the specifics of certain programmes or activities through frame contracts and nurture the evolution of an industrial base in a specific member country. In other words, the EU promotes a level playing field and elimination of multiple systems of national preference in contrast to ESA which procurement policies often have catered to the needs and wants of individual countries. In order to address some of the differences between the EU and ESA and to create standards for cooperation a framework agreement was signed in 2003. The main result of the agreement was the establishment of a Space Council, a joint meeting between the ESA Council at Ministerial Level and the Competitiveness Council from the EU.[58]

While the framework agreement has facilitated cooperation between ESA and the EU, it left out two key areas: an industrial policy for the space industry and procurement. The lack of an agreement in these areas is manifested in the Galileo project where both the EU and ESA are involved. In this particular case procurement has been done according to what Hansen and Wouters (2012) calls "an EU-compatible but ESA-inspired industrial policy". Applying this approach to new projects is not a sustainable long-term strategy since it would hamper both efficiency and transparency.

Deeming from recent communications from the Commission,[59] an industrial policy and procurement procedures for the space industry is taking form. One measure likely to be included in such a policy is the ability to tailor procurement instruments to the chosen policy objectives. Nonetheless, it remains unclear what those objectives would

[58] Rik Hansen and Jan Wouters, "Towards an EU industrial policy for the space sector – Lessons from Galileo", *Space Policy* 28(2), 2012, pp. 94–95.

[59] European Commission, "An Integrated Industrial Policy for the Globalisation Era Putting Competitiveness and Sustainability at Centre Stage", COM 614, Brussels, European Commission, 2010, p. 23. European Commission, "Towards a space strategy for the European Union that benefits its citizens", COM 152, Brussels, European Commission, 2011.

be and what form the procurement instruments may take. Also, it is uncertain whether an industrial policy will have any impact on the large on-going space programmes.[60]

In addition to the governance difficulties, the European space industry suffers from structural problems. The predominant problem is that it is highly reliant on European institutional markets in a time of increasing global competition, uncertain futures for new major public space programmes and ambitions to open up wholly or partially protected European markets such as space and defence.

The European space industry is embedded in the greater European Aerospace and Defence industrial complex and is dominated by four large corporations: EADS, Finmeccanica, Safran, and Thales. In 2010, the space industry directly employed 34,334 people and its final sales amounted to 6,146 million euros. The main focus of the industry is the design, development and manufacturing of satellites for operational applications, such as telecommunications systems and Earth observation systems. The second area of business is launchers, mainly the Ariane system operated by Arianespace, which is principally used to deliver satellites to orbit. In 2010, Ariane completed 6 dual satellite launches for a combined mass of 45 tons.[61]

Traditionally, the primary market for the European space industry has been institutional customers in Europe. In 2010, 78% of final sales were located in Europe whereas exports amounted to 22%. Of the final sales in Europe in 2010, ESA accounted for almost half (44%). Though the space industry was relatively unharmed by the financial crisis in 2008, institutional customers are now starting to reduce budgets. For example, in 2011 ESA approved a plan to cut its internal operating costs by 25% until 2015. Budget cuts are also more frequently put forward in the discussions on the ESP's future orientation. In light of the recent Euro crisis and the

[60] Hansen and Wouters, "Towards an EU industrial policy for the space sector – Lessons from Galileo", 2012, p. 100.

[61] ASD Eurospace, "The European space industry in 2010", Paris, ASD Eurospace, 2011, p. 4, 15.

economic pressure it has put on several of the major spacefaring countries, including France, Germany and Italy, the European space industry may also face reduced civilian and defence spending on space applications in these key countries.[62]

Moreover, the global competition on commercial space markets is increasing. New actors emerge in both the satellite and launcher markets. NASA's shrinking budget is also likely to lead to increased competition from American companies. When considering European space planning beyond 2010 there are few new major civil and defence programmes except for maybe launchers. These challenges for the European space industry thus put European governments and companies in a complicated position. The ESP is to some extent dependent on the European space industry, which in turn is dependent on institutional backing from ESA, the EU and member states. The EU and ESA thus have to strike a balance between supporting the European space industry to sustain the ESP while also cutting back on costs. The European space industry on its part has to diversify its customer base and increase exports. Since the export of space technology often is restricted due to national security reasons and/or its dual use nature (civilian and military), the European space industry will likely need cooperation and incentives from ESA, EU institutions and member states in order to adapt to changing global business conditions. For example, the EU could facilitate the outreach of the European space industry by improving access to the US market. Improved governance and strategic planning by the EU and ESA would also benefit the space industry since it would enable companies to determine which strategic niches to prioritise in a time of budget cuts and tough global competition.

[62] ASD Eurospace, "The European space industry in 2010", pp. 8–9. Venet, "2012, a turning point for Europe in space", 2012, pp. 2–3.

Conclusion

Space is an important dimension of European security, both because of the unique advantages it offers and because of its many interfaces with cyber, economic, environmental, infrastructure and military security concerns within the EU as well as globally. Also, deeming from the development of space technology and the way it is embedded in various civil and military functions, the strategic value of space is likely to increase. Space security is also an important factor when it comes to the EU's ability to independently establish a global presence and project influence.

Despite that Europe has a long-standing space tradition in terms of science, technology and research, it is only until recently that Europe have started to emerge as an actor in space security. The notion of space security has mainly been related to specific space functions rather than to society and the EU as a whole. The ESP from 2007 addresses this but it is still a problem that the ESP lacks institutional bonds with other key frameworks, such as the CSDP.

What then should be included in a European space security strategy? Essentially, it should address three thematic questions:

(1) How should the EU adapt to and counter existing space security challenges?

(2) What are the concrete plans for the next ten years with regards to existing capabilities, interests and capacity building?

(3) What is the strategic vision for space security?

More specifically a European space security strategy should consider EU's key partners (the US for example) in space security, how to best utilise the security advantages from current and planned European space programmes, how to adapt to

the fast-paced changes in space policies in the world, which areas that are best suited for international cooperation (SSA for instance), how to integrate space security with other security concerns and which areas where the EU have an opportunity to take a lead and/or leverage its capabilities to obtain results in line with the EU's values and interests.[63]

As demonstrated in this paper, there are a number of space security challenges that the EU is in the process of adapting to, including the militarization and potential weaponization of space, the institutionalization of space, space situational awareness, space debris and the development of the European space industry. However, the lack of a cohesive space security strategy and persistent governance and coordination problems has hindered the EU's ability to respond and adapt to these challenges. The world will not stop and wait for the EU to get its policies and resources in order, and if the EU is too slow on meeting the challenges of space and grasping its opportunities, it may prove difficult to catch up with the rest of the world.

Considering that space pervades most aspects of modern societies, interconnects a number of strategic challenges for the EU (for example the economy, energy and the environment), and is vital for both military and non-military security, it should also be included in a wider framework of a European global strategy. Space is an arena of global competition and if the EU intends to reinforce its global presence, it cannot neglect space. In addition, space functions as a force multiplier, not only for the military but also for other functions like global climate monitoring etc., and can therefore be used to secure the EU's independence and strengthen its power projection in other contexts.

In closing, the EU faces several critical challenges in space security and it will take synchronized efforts, improved governance and political endurance to formulate and

[63] Bertrand de Montluc, "What is the state of play in European governance of space policy", *Space Policy* 28(2), 2012, p. 76.

implement adequate responses to those challenges. Below are seven suggestions for responses to the space security challenges discussed in this paper:

• Establish an operational European SSA. Work towards linking it up with partners such as the US to achieve greater overall performance.

• Formulate and implement a cohesive European space security strategy.

• Improve coordination between the three levels of space governance; ESA, the EU and member states. Work to include member states without a tradition of space activities (i.e. primarily Eastern and Central European countries).

• Establish institutional bonds with the CSDP and EU-institutions concerned with non-military security.

• Develop the CoC further and follow up with new policy initiatives, both in bilateral and multilateral contexts. Consider the space component in negotiations in other issue-areas.

• Encourage development of space debris removal technology. Take lead in policy and technology initiatives to remove space debris in order to gain additional credibility in space security issues, which in turn may provide political capital that can be leveraged in other space issues. Keep process transparent to other actors to minimise distrust in lieu of global agreement on space debris.

• Enhance governance of the European space industry. Allocate support for the industry without adventuring the ESP and necessary budget cuts. Facilitate export of European space technology by improving access to new export markets.

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