Chapter 3

Space for Security in Europe

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Space for security: a narrow path for the European Union

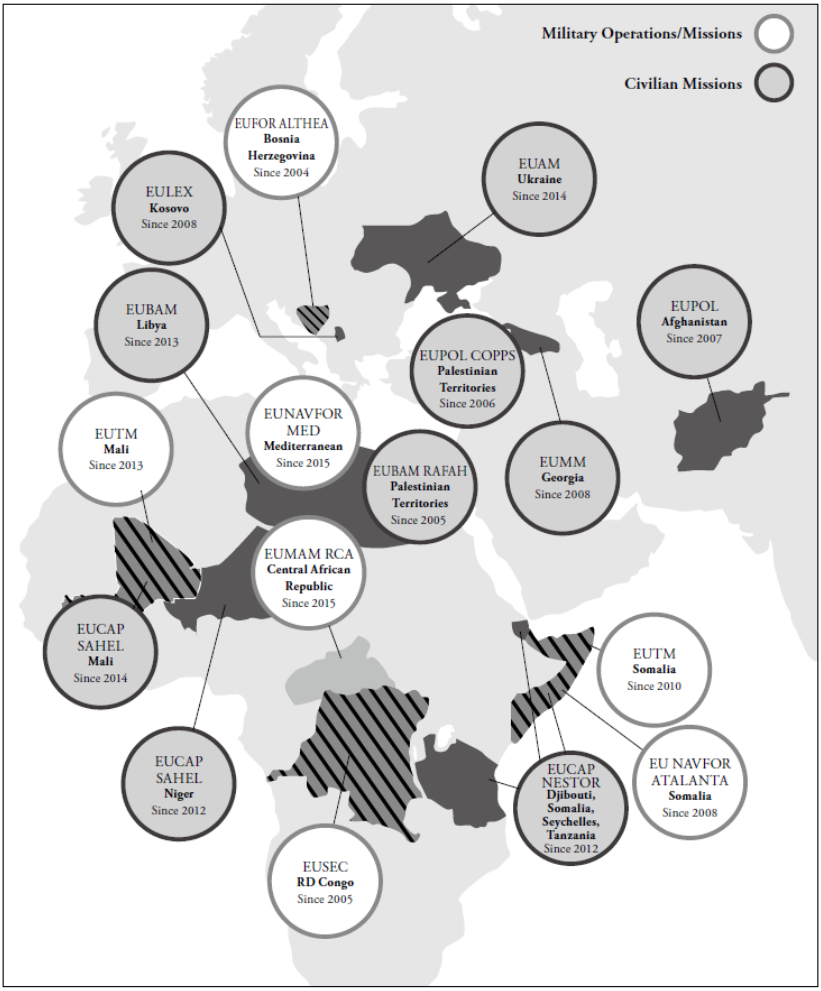
The European space strategy can be seen as a good indicator of the status of the political construction process that has been taking place for decades. While it has been recognized for long that only a collective regional effort would enable Europe to reinforce its presence in space, this effort has also been mainly devoted to exploration and science. Built in 1975, the European Space Agency has never been intended to provide the foundation for a future large-scale European military space effort. Space was first and foremost conceived as a federative undertaking allowing European countries to group around collective non-controversial goals. In this respect, science has traditionally been experienced as a good cohesive factor allowing Europe building its own identity though an image of excellence (examples of CERN or Euratom). Space has mainly been organized along the same lines and for similar purposes. It had to help Europe find its identity through cooperation and demonstrate that this original regional construction could work efficiently.

By contrast, there was no room for a genuine European military space policy. There was simply no consensus on any *European Security and Defense Policy* (ESDP later renamed *Common Defense and Security Policy* - CSDP) that could have supported such developments. Due to enduring national foreign and military policy differences, this has never happened. And it is fair to say that, given enduring national differences in policies and budgets, this perspective has remained very slow in showing clear changes.

Of course, this does not mean that Europe has not attempted to address larger common security issues. As a matter of fact, inter-governmental discussions have led to some limited agreements on security and defense between the Member States. Since the launch of ESDP in 1999, the EU has been involved in several crisis management operations that have progressively helped build a collective European awareness regarding the need for some level

of EU security and defence programmes. It remains the case today. As shown on the figures below, the EU has been currently involved in some 17 crisis, 10 being military in nature and 7 having a civilian dimension.

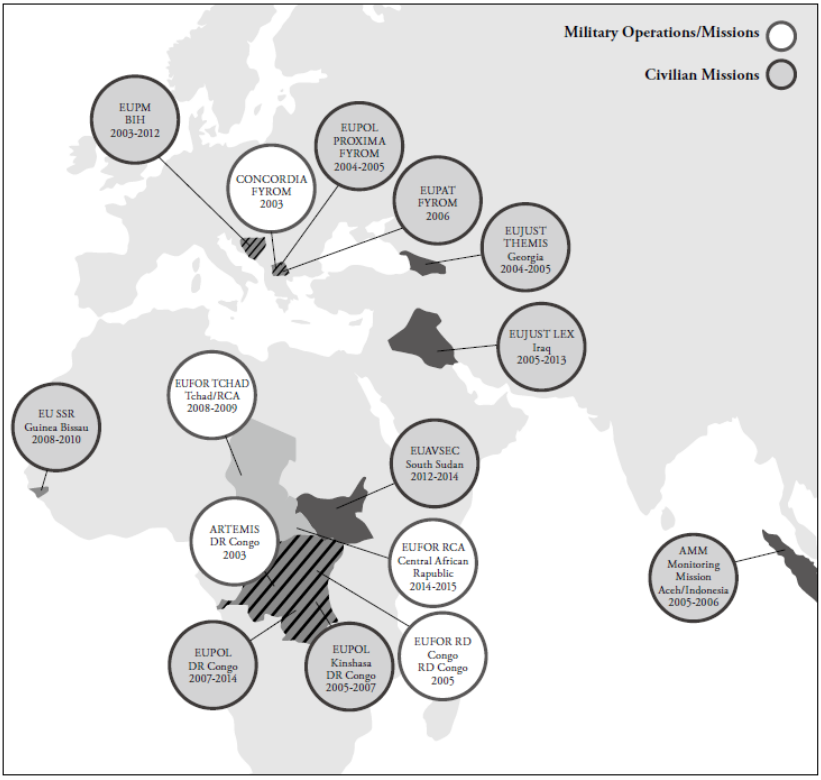
Current external actions managed by the European Union



Source: EEAS, Council of the European Union

In this respect, the EU has slightly increased its involvement in crisis management operations, if one compares with the history of such operation (see history figure below).

Past external actions managed by the EU



Source: EEAS, Council of the European Union

In 1992, so-called "Petersberg tasks" have helped defined the perimeter of the EU security and defense activities. The EU had to be able to cope with humanitarian and rescue tasks, peacekeeping tasks and the tasks of combat forces in crisis management, including peacemaking.[1] A "*European Security*

[1] See the Petersberg Declaration adopted at the Ministerial Council of the Western European Union (WEU) in June 1992.

Strategy" adopted one year later has identified terrorism, the proliferation of weapons of mass destruction, regional conflicts, state failure and organised crime as the most pressing threats to peace. The Lisbon Treaty that entered into force in 2009 has extended the Petersberg tasks to disarmament; humanitarian and rescue tasks; military advice and assistance; conflict prevention and peacekeeping, and combat forces in crisis management (including peace-making and post-conflict stabilisation) as well as the fight against terrorism.[2] Today, as it can be derived from the maps shown above, three types of interventions have been structuring the CSDP: the external actions of the EU; the maritime surveillance and border control. These three domains can be seen as structuring the European effort in the security domain, especially regarding the use of space assets. By contrast, several recent military operations, from Libya to Mali, or regarding the current situation in Iraq and Syria, have shown the absence of any consensus on the management of more military-oriented operations between the European Member States. That has clearly demonstrated how much the EU has focused on security matters rather than on purely military issues.

This situation has resulted in many differences between key member States and the European Union regarding their investment in military space.

Military space programmes run at national levels

Only a few member States (namely France, Germany and the United Kingdom) have developed military space assets. A few more (such as Italy and Spain) have focused on dual-use programmes.

IMINT

Military programmes:

In the field of Imagery Intelligence (IMINT), only France and Germany have developed dedicated military programmes with optical capacities for France (Helios satellite series) and radar capacities for Germany (SAR Lupe satellite series). Additionnally, Italy has developed the Cosmo-Skymed radar satellites that can be used both for military and civilian missions.

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[2] The Lisbon Treaty (Treaty on the Functioning of the European Union), articles 42.1 and 43.1.

These systems mentioned below are currently operated at multilateral or national levels:

- The HELIOS-2 system (led by France with participation of Italy, Spain, Belgium and Greece): Two optical and thermal infrared satellites, the first (2A) launched in 2004 and the second (2B) launched in 2009.
- The SARLupe system (Germany): Five radar imaging satellites, using X-band and providing a resolution of 0.5m. The first satellite was launched on December 2006, the second on July 2007, the third on November 2007, the fourth on March 2008 and the fifth on July 2008.
- The COSMO-SkyMed system (Italy): Four radar imaging satellites, also used for civil applications (dual use program).

In order to allow exchange of data derived from optical and radar images, specific agreements have been signed between France and Germany as well as France and Italy. For example, data coming from Electro-optical Helios and Radar SAR-Lupe satellites can be exchanged between France and Germany.

The definition of the next generation of these military systems has started but these systems remain national by nature even if they may envision bi-lateral cooperations. For example, the future French CSO (Composante Spatiale Optique/Optical Space Component) high-resolution optical system is going to have a common interoperability layer with the ground segments of the Italian COSMO-SkyMed Second Generation, so the two defense ministries will be guaranteed access to both systems through this common interoperability, providing them with multi-sensor observation capabilities to both SAR and high- and very-high resolution optical satellite capabilities, at the same time ensuring suitable mutual confidentiality requirements. Additionally a recent agreement between France and Germany has allowed the building of a third satellite to improve the use of a common capability.

It is also useful to mention the future Spanish X-Band radar satellite *Paz* with 1 m capacity and co-owned by the Spanish Ministry of Defence and the *Centro Para el Desarrollo Tecnologico Industrial* (CDTI), a government agency under the Ministry of Economy and Competitiveness of Spain. This capacity shall provide Spain and its potential partners with an increased all-weather capability. This capacity is explicitly devoted to addressing security

missions such as maritime surveillance

In this context, the European Union has struggle to set up a more multilateral cooperation scheme called MUSIS (MUltinational Space-based Imaging System for Surveillance, Reconnaissance and Observation). It is an international program including at first France, Italy Belgium, Germany, Greece, and Spain. Poland and Sweden have decided to join the program as well. MUSIS was approved in 2006 and intended to provide access to:

- CSO, the successor of HELIOS-2
- SARah, the successor of SARLupe
- COSMO Second Generation (CSG), the successor of COSMO-SkyMed

The aim of MUSIS is for the participating countries to share imagery from various military satellites through a common, generic user ground segment (UGS) according to agreed rules and quotas. The development of a "Common Interoperability Layer" (CIL) is at the heart of the broader MUSIS program, which calls for a federation of several national systems endowed with complementary observation capabilities. For example, Italy shall participate to this program by contributing, under the responsibility of the Italian Space Agency and the Ministry of Defence, the COSMO-SkyMed Second Generation satellites. Although primarily designed to meet Italy and France's program and operational needs, the development of CIL will also give other countries interested in the MUSIS program access to the CSG and CSO systems and possibly extend its functions to other federated space components.

It remains that MUSIS is based on the existence of capabilities run by national governments and cannot as such be considered as defining a genuine space-based European Union IMINT capability. In this respect, MUSIS cannot be considered as having achieved its initial goals.

Dual-use programmes:

Several other programmes currently operated or developed in Europe can be considered as dual-use capacities given their high level of performances. Again they must also be considered as mainly national in their development and in their use.

As already indicated, this is the case for the Italian satellites

COSMO-SkyMed. It has been funded by both the Italian Ministry of Research and the Ministry of Defense and it covers the needs of both communities. The COSMO-SkyMed system is a constellation of four radar satellites. The first satellite was launched in June 2007 and the fourth satellite was launched in November 2010. The complete constellation is operational. It is advertised that, for non military users, the system can satisfy a User Request in the case of the first level of SAR standard products in as little as 72 hours for the system working in routine mode, 36 hours for the crisis mode and 18 hours for the very urgent mode.

The French Pléiades optical constellation with two satellites respectively launched in December 2011 and 2012 is another case of dual-use system. The great agility of the platforms coupled with high performances in terms of resolution (0.70 m of resolution) has made it a key complementary capacity of French military satellites. Two different tasking channels are applicable, a priority tasking channel for defense applications with specific secure procedures, and a civilian tasking channel with exclusive license rights to Airbus D&S Geo-Information Services. The dual system convention between MoD and Airbus, foresees that the commercial operator may access to the defense priority channel under specific conditions. Again, it is worth recalling that the Pléiades satellite constellation is part of a collaborative Franco-Italian effort to operate satellites in the field of optical (Pléiades) and radar (COSMO-Skymed) imagery. A convergence of views led the Ministries of Research and Technology in the two countries to initiate in March 2000 a study for cooperation between the two national programs and has subsequently led to the "Torino Agreement" signed on 29 January 2001.

Contributing commercial programmes:

Besides those two specifically designed dual-use programmes, it is also important to underscore the existence of more commercial high-performance programmes that can contribute to the security of the European Union. In this category, TerraSAR-X has been the first German radar satellite built in a Public Private Partnership (PPP) between the German Aerospace Centre (DLR) and EADS Astrium GmbH (now Airbus defense and Space). TerraSAR-X was launched on June 2007 and was the first X-Band SAR VHR civil/commercial satellite. Depending on the data acquisition mode, TerraSAR-X can acquire

imagery with resolution up to 1m. The satellite is owned and operated by DLR, which performs the processing of basic data archiving and quality control of basic imagery. DLR also has the responsibility of its scientific exploitation. The commercial marketing of TerraSAR-X data and services is exclusively conducted by Airbus.

Conceived as a recent addition to TerraSAR-X, TanDEM-X is a twin satellite which was launched in 2010. The two satellites now circle the Earth as a satellite formation with a very close distance (down to a few hundred meters) and record data synchronously in order to produce a global Digital Elevation Model of unprecedented quality, accuracy and coverage.

SIGINT (Signal intelligence)

When it comes to space based signal intelligence the situation is even much more nationally oriented. Today no national satellite-based SIGINT resources has been fully developed or shared between European countries. The driving nation in this area is France with its two demonstration systems ESSAIM and ELISA both intended to prove the SIGINT concept used. A following operational and classified satellite system named CERES will be the first space based SIGINT capacity in Europe starting from 2020.

Again here, the building of such capacities on a European scale would rely on a clear acceptance of possible European military missions as such capacities are envisioned to help prepare purely military operations. In this regard, only France has demonstrated both some willingness and ability to conduct such operations over remote and large territories. This has not been the case for Europe and a SIGINT space-based system appears as an unlikely candidate for further EU developments.

Early warning

Early warning systems detect and warn for missile or spacecraft launches and they can contribute to the protection of targeted populations and can also provide intelligence regarding the proliferation of WMDs. The ground segment of the early warning system can also contribute to missile defence. In the European reality, and in a very similar case than for the SIGINT capabilities, such early warning capacities have been tested only in France to date. An experimental programme called *Spirale* (in French *Système Préparatoire*

InfRA-rouge pour l'ALErte) has been placed in orbit in February 2009. This experimental system was consisting in two microsatellites placed on an elliptic orbit and equipped with state-of-the art infrared sensors. After two years of data collection and technological investigations, the two spacecrafts have been de-orbited in February 2011. No operational successor system has been planned by France until now. Of course, such systems do not exist elsewhere in Europe today.

Military satellite telecommunications

In the field of telecommunications, again only several key European countries (France, Germany, Italy, the United Kingdom and Spain) have developed national space capacities until now, although the nature and the scale of the efforts have differed.

Apart from the United States and the former USSR, the United Kingdom is one of oldest military Satcom users. Relying since the 1960s on multi-satellite constellations, due to the scope of the geographical coverage required by its the armed forces, the UK has designed and built a significant number of fully owned, operated and dedicated communications satellites during the Cold War (Skynet-1, 2, 3 and 4 programmes). The establishment of the Skynet-5 programme in 2003 was a turning point in the landscape of Satcom systems, as for the first time military spacecraft were designed that were not owned by a government or an international organisation. Indeed, the UK Ministry of Defence (MoD) has decided to procure satellite communications services (including maintenance and operation of the ground infrastructure) in the framework of a Private Finance Initiative (PFI). The company Paradigm Secure Communications, a subsidiary of Airbus Defence and Space, was awarded the contract to provide services to the UK MoD, while EADS was responsible for building and deliver the spacecraft. After the expiration of the contract with Airbus D&S in 2022, the British government shall become the owner of the four-satellite constellation and open a call for tenders aimed at awarding service operations.

The French armed forces have first used the civilian satellite platform, Telecom-2, which was carrying military transponders. With the current Syracuse 3 (System for Radio Communications Using SatellitE 3) programme, France has shifted to a dedicated military system composed of two spacecraft,

owned and operated (until 2018) by DGA-General Directorate for the Armament, the procurement agency of the Ministry of Defence and built by Thales Alenia Space and. A third satellite was due to be ordered in 2007, but it was then cancelled to include the third Syracuse 3 payload on the Italian Sicral 2 satellite, with a view to establish new forms of co-operation between the two countries. Sicral 2 has been launched in April 2015, and is expected to operate for approximately fifteen years.

Covering a geographical area going from Brazil to Australia, Syracuse 3 system meets the encrypted and unprotected voice communications requirements of French armed forces headquarters and troops deployed abroad, in terms of voice, data and images. In addition, France signed in 2005 a so-called "ASTEL-S" contract with Airbus D&S, according to which it can lease commercial capacity for a wide coverage area at a fixed rate for a given period of time. In this case, although the capacity is supplied on an "as available" basis, the French military can benefit from the possibility to plan its budget in advance due to the stability of prices. In addition, a new generation of military dedicated Satcoms called COMSAT NG, will follow Syracuse 3.

Italy established its first dedicated military Satcom satellite in 2001 with the launch of the first satellite of the programme *Sicral 1* (Italian system for secure communications and alerts - *Sistema Italiano per Comunicazioni Riservate ed ALlarmi)*, aimed at providing interoperable satellite communications (voice, data and images) through terrestrial, naval and air platforms not only to the Italian armed forces in Italy and abroad (e.g.: in Afghanistan, Lebanon, Horn of Africa), but also to law enforcement and civil protection actors.[3] The spacecraft family is made of two satellites owned and operated by the Italian Ministry of Defence, the second of which was built under a "*Public-Private Partnership*" between the MoD and Finmeccanica. Sicral 1 is expected to be operating until 2019, while, as already mentioned, a third satellite built in co-operation with France, Sicral-2, is expected to operate until approximately 2030.

After relying on NATO assets, on intergovernmental agreements (with France) and on commercial leases for long time, Germany decided in 2006 to establish its own dedicated Satcom system, *Satcom Bw*, to support the needs in

[3] http://www.telespazio.com/sicral.asp.

terms of voice, data and communications of the limited but growing presence of German armed forces in peace support operations abroad. The programme entails two satellites, fully owned by the German MoD, and built by MilSat Services GmbH, a joint venture between Airbus and ND Satcom. However, it is this company (and not the MoD) that is also responsible for operating the spacecraft, maintaining the ground network and managing long-term leases of other commercial Satcom capabilities, when required (for instance from Intelsat).[4] The satellites that shall be operated until about 2025, offer a geographical coverage going from the eastern part of the American continent to Asia. Concerning future developments, unlike the United Kingdom, German authorities are considering to enhance the governmental presence in the Satcom domain, by including a dedicated military payload in the *Heinrich Hertz* telecommunications satellite planned by DLR in order to obtain more bandwidth capacity and to complement the services currently leased from commercial operators.

Last but not least, Spain has launched in March 2006 its own dedicated telecommunication military satellite, Spainsat, developed by the US firm Loral, and operated by Spanish the ministry of defence. It must be noticed that the contract with Loral implied the construction and the launch of a second Spainsat-class satellite as a possible back-up capacity. This second satellite, XTAR-Europe is operated by the Spanish operator Hisdesat in collaboration with Loral, today providing to the US and Spanish authorities (and other possible customers) additional capacities. This arrangement follows the Paradigm model already mentioned for the United Kingdom.

The French, Italian and British capabilities, pooled together, have been chosen by NATO to provide a first so-called "Satcom Post-2000" architecture for SHF communications. Again, the multiplication of national capabilities has ended up with a credible collective resource, giving birth with both a European and a NATO resource.

Nascent (but limited) European telecommunication programmes

Due to political divergences over the idea of sharing highly sensitive data, the members of the European Defence Agency (EDA) have decided to scale down

[4] http://www.astrium.eads.net/en/programme/Satcombw-comsatbw2.html.

from their original, far-reaching project of merging all European separate military satellite communications (MILSATCOM) systems into a more cost-effective single constellation (SECTELSAT), and have adopted a less ambitious, but more feasible solution concerning the pooling of less-strategic communications needs into pan-European systems,[5] namely GOVSATCOM and CIVSATCOM. GOVSATCOM have been defined by EDA as satellite communications "with assured access, relatively high throughput and secure but not hardened transmission [differently from the case of MILSATCOM]".[6]

A User-group on national governmental Satcom composed of the five member states operating Satcom systems (France, Germany, Italy, Spain and the UK) has been set up under the auspices of the European Defence Agency in order to exchange views and lessons learned, and to discuss future developments. Throughout the whole process, special emphasis has been placed upon military-civilian synergies.

To date, progresses towards Govsatcom have been very slow, mainly in reason of difficulties in justifying such a capability in front of already equipped interested EU member States. In the meantime, the EDA has proposed to establish a one-stop shop, the *European Satellite Communication Procurement Cell* (ESCPC) for helping EU getting access to existing commercial capabilities.

Security–related EU space programmes

Then, only two so-called "flagship" programmes, GMES/Copernicus and Galileo, can be considered as genuine EU programmes (i.e. managed by the European institutions) with some level of security-driven applications.

Copernicus

The European programme initially called "*Global Monitoring for Environment and Security* (GMES)" and renamed Copernicus in 2013 represents la large programme encompassing many type of activities and embracing a large array

5 http://www.spacenews.com/article/military-space/38368eu-backing-away-from-combining-milcom-constellations.

6 http://www.eda.europa.eu/docs/default-source/eda-factsheets/2013-11-19-factsheet_govSatcom.

of space and non-space systems and sensors to be federated and exploited at the EU level. While partially focusing on environmental monitoring (Ocean and atmosphere) or on civil security and humanitarian oriented activities, several EU originated documents have confirmed that GMES role would include security-related missions dealing with three main domains already mentioned:

- Support to EU Border Control policies (EUROSUR)
- Support to Maritime Surveillance activities
- Support to EU External Actions

As such, Copernicus will rely on an earth observation infrastructure, and in particular on a space-based segment (combining existing national satellites and new ESA "Space Sentinels" satellites, that will essentially work as "gap fillers"[7]) as well as on networks of in-situ environment sensors. The combination of national and European assets clearly requires a specific model of governance and an adapted data policy that takes into account national data policies in the collection phase as well as for the distribution/access in order to be compliant with national and international regulations. Such a model has not been developed yet, but some considerations can already be drawn, speculating over future options.

Two first "sentinel" satellites have been launched in 2014 and 2015, *Sentinel-1A* and *Sentinel-2A* , that provide respectively radar imagery and high resolution optical imagery. Other Sentinel type satellites will be launched over the next months and years to provide data about maritime, atmospheric or terrestrial environments.

The security part of Copernicus will be focused on the three areas mentioned above and have been prepared via research funds awarded by the European Commission. If many technical difficulties have been overcome

[7] Besides the sentinel, existing national satellite programs (or so-called *Contributing Missions*) will be integrated in Copernicus program, for example the Italian Cosmo-Skymed and the French Pleiades satellite programmes. The GMES project also envisions developing its own new "Sentinel" satellites, regrouped in four families: C-band radar satellites (Sentinel-1); High spectral sensitivity satellites (Sentinel-2); Maritime surveillance satellites (Sentinel-3); Atmospheric satellite satellites (Sentinel 4 and 5). In this sense, the planned Sentinels are essentially gap fillers for environmental monitoring.

during this preparatory research phase, again some governance issues remain to be solved when it comes to more security oriented usages. Indeed, the high performance so-called "contributing missions" are nationally managed programmes that cannot be fully controlled by the EU, especially when it comes to security matters. The main challenge thus appears to combine the project of a maximum openness of the Global Copernicus Data Policy and the necessary security involved by possibly reserved or restricted national sets of data.

Galileo

Galileo will consist in a constellation of some 30 medium Earth orbit (MEO) satellites aimed at providing the EU with an autonomous navigation and precision timing space based system. It is expected that this system shall reached the operational stage by 2017-18. It will provide a number of services such as the open service, safety of life, commercial service, *public regulated services*, and search and rescue. The access to PRS (for Public Regulated Services) will be limited to authorized governmental bodies. The PRS is going to have highly robust encrypted signals and could be used in crisis situations where it is important that emergency and security services continue to function even when other services have been cut as part of security measures. In the proposal for a decision on the use of PRS, adopted by the European Commission on 8 October 2010, the question of the nature of PRS use has been left to each member state to decide individually.

> *"Some applications of the PRS service may be very sensitive at a political and strategic level. However, the Commission's proposal does not aim to regulate the potential applications of the PRS per se, but rather the detailed rules for accessing this service. It is first and foremost technical in nature, rather than political*"[8]

Still, in the end, one could question whether the PRS service is going to be

[8] Proposal for a decision of the European parliament and of the Council on the detailed rules for access to the public regulated service offered by the global navigation satellite system established under the Galileo programme, European commission, Brussels, 8 October 2010, http://ec.europa.eu/enterprise/policies/satnav/galileo/files/prs-proposal-com-2010-550-final_en.pdf.

approved for usage in precision guided weapons during CSDP operations. As a matter of fact, while the system will remain owned by the European commission, it has been now widely accepted that any member State will have the ability to use the signal stemming from Galileo for any national use, including a purely military one. In this respect, even if this programme has been under EU control from its very beginnings, it is a fact that, due to the lack of a common defense and security policy in Europe, only member States will have a full usage of the Galileo constellation for security and military purposes.

Useful but still limited activities of the major EU dedicated operational structure

For many years already, the EU has created agencies dedicated to defense and security issues that can be users for space systems. Apart from the European Defence Agency (EDA), which was created to improve the EU's defence performance in various ways, the *European Union Satellite Center* (EUSC), located in Torrejón, Spain, has been the most important EU user-oriented institution since it is the primary body supporting the CSDP with space-based capabilities such as satellite imagery analysis.

The EUSC formally became an EU agency in 2001 and is owned by the Member States. After the Lisbon Treaty entered into force, the EUSC became part of the newly established *European External Action Service* (EEAS, the diplomatic arm of the EU) but with an independent status. The EUSC remains under the supervision of the PSC (*Political Security Committee*) and the High Representative. The *Crisis Management and Planning Directorate* (CMPD) provides operational direction to the EUSC.

Complementing the national capacities of the Member States, the EUSC can provide Member States with an "EU view" rather than a narrower national view. The EUSC often provides customized analyses of satellite imagery to support the EU's missions and operations. The EUSC produces city analyses, infrastructure analyses, analyses of illegal logging, border monitoring, air-field analyses, analyses of lines of communication, and so on. The EUSC receives requests for image analysis from several actors but its policy is to handle them in a certain order of priority: first, the High Representative, EUMS, CMPD, CPCC, the Situation Centre and the European Commission; second, EU Member States; third, Third Countries; and, last, other international

organisations, such as the UN, the Organisation for Security and Co-operation in Europe, NATO, etc. The EUSC works openly and every answer to any request from one state goes to all other 27 Member States.

Although the EUSC supports UN and NATO missions, the European Council remains the high priority customer for the EUSC. Of course, the EU also cooperates with third parties, most notably the USA, the candidate countries and NATO, when it comes to the use of space-based assets.[9] When third countries and other international organizations task the EUSC, they normally have to pay the costs of the images needed to create the end product. The payment is not always in money: it can take the form of exchanges of intelligence information.

However, it must be recognized that the EUSC cannot be considered as having the same status at its national sister organizations. Indeed, any data processed by the EUSC must be shared between the 28 Member States. It is fair to say that, in the context of an absence of a true EU defense and Security Policy and of an "EU ministry of Defense" so to say, the more military oriented-space data will remain in the hands of the member States and will ne be able to be shared on an EU level for some time to come.

As a whole, a lot of progress in the definition of a European Union defense policy will have to be made before any effective military space architecture can be envisioned on a collective basis. If CSDP has offered the first important steps towards a more efficient integration of key capabilities, more steps are required to better reconcile national military programmes and European Union ambitions in fully using space for the security and the defence of its citizens.

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[9] In 2003 the EU and NATO signed a permanent agreement on security of information. Since NATO and the EU may require to coordinate their response to crises they have signed an accord on information security. "*The principle of originator control*" means that information may only be released to states that are members of NATO or states that are members of the EU and participate in the Partnership for Peace. This means that information provided by NATO to the EU cannot be released to Malta or Cyprus.