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THE USE OF SPACE IN THE CONTEXT OF CSDP

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DIRECTORATE-GENERAL FOR EXTERNAL POLICIES OF THE UNION

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POLICY DEPARTMENT

STUDY

SPACE AND SECURITY:

THE USE OF SPACE IN THE CONTEXT OF THE CSDP

Abstract

Space applications are best suited for dealing with an increasingly expanding concept of security. If, on the one hand, traditional customers are military users, on the other, a wider security and civilian community benefits from space services which are being developed in Europe in line with the evolution of Common Security and Defence Policy (CSDP) civilian and military missions.

The study includes a twofold analysis. First, an analysis of CSDP missions and their operational context to be matched with the main space-based applications. Of course, the EU flagship programmes GMES and Galileo are taken into consideration.

Second, an overview of the state-of-the-art of the different space programmes in Europe based on their compatibility with CSDP missions is provided. Building on this analysis, conclusions on the use of space in the context CSDP are drawn, focusing on strengths and weaknesses emerged. Finally, some recommendations addressed to the European Parliament are provided.

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LIST OF ACRONYMS

ATC	Air Traffic Control
CDP	Capability Development Plan
CERES	Capacité de Renseignement Électromagnétique Spatial
CFSP	Common Foreign and Security Policy
CIL	Common Interoperability Layer
CMPD	Crisis Management Planning Directorate
COP	Common Operational Picture
CPCC	Civilian Planning and Conduct Capability
CSDP	Common Security and Defence Policy
CS	Commercial Service
CSG	Cosmo (SkyMed) Second Generation
CSO	Optical Space Component
C2	Command and Control
C4ISTAR	Command, Control, Communication, Computers, Intelligence, Surveillance, Target Acquisition and Reconnaissance
DDR	Disarmament, Demobilization and Reintegration
DoD	Department of Defence (US)
DG ECHO	Directorate-General for Humanitarian Aid and Civil Protection
DG RELEX	Directorate-General for External Relations
EC	European Commission
EDA	European Defence Agency
EDRS	European Data Relay Satellite
EEAS	European External Action service
ELINT	Electronic Intelligence
EO	Earth Observation
EP	European Parliament
ESA	European Space Agency
ESDA	European Security and Defence Assembly
ESDP	European Security and Defence Policy
ESS	European Security Strategy
EUSC	European Union Satellite Centre
EUMS	EU Military Staff
FOC	Full Operational Capability

FP6	Sixth Framework Programme
FP7	Seventh Framework Programme
GEOINT	Geospatial Intelligence
G-MOSAIC	GMES services for Management of Operations, Situation Awareness and Intelligence for Regional Crises
GMES	Global Monitoring for Environment and Security
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
IMINT	Imagery Intelligence
IFR	In-flight Refuelling
IfS	Instrument for Stability
IOC	Initial Operational Capability
ISR	Intelligence Surveillance and Reconnaissance
ITAR	International Traffic in Arms Regulations
JTF	Joint Task Force
LIMES	Land and Sea Monitoring for Environment and Security
LoI/FA	Letter of Intent/Framework Agreement
MFF	Multi-annual Financial Framework
MIC	Monitoring and Information Centre
MoD	Ministry of Defence
MS	Member States
MUSIS	Multinational Space-based Imaging System
NASA	National Aeronautics and Space Administration
NEC	Network Enabled Capability
NPT	Non-Proliferation Treaty
NCW	Network Centric Warfare
OCCAR	Organisation Conjointe de Coopération en matière d'ARmement
ORFEO	Optical and Radar Federated Earth Observation
OS	Open Service (Galileo)
PFI	Public-Finance-Initiative
PPP	Public Private Partnerships
PRS	Public Regulated Service (Galileo)
PSC	Political and Security Committee
R&D	Research and Development

SAFER	Services and Applications For Emergency Response
SAR	Synthetic Aperture Radar
SAR	Search and Rescue service (Galileo)
SATCOM	Satellite Telecommunications
SIGINT	Signal Intelligence
SoL	Safety of Life (Galileo)
SSA	Space Situational Awareness
SSR	Security Sector Reform
ULA	United Launch Alliance
UAS	Unmanned Aerial Systems
UAV	Unmanned Aerial Vehicle
UN OCHA	United Nations Office for Coordination of Humanitarian Affairs
VP/HR	Vice President/ High Representative
WEU	Western European Union

EXECUTIVE SUMMARY

Space applications and technologies are best suited for dealing with an increasingly expanding concept of security. If, on the one hand, traditional customers are military users, on the other, a wider security and civilian community benefits from space services which are being developed in Europe in line with current requirements of Common Security and Defence Policy (CSDP) civilian and military missions.

The study includes a twofold analysis. First, an analysis of CSDP missions as envisaged by the Lisbon Treaty and their operational context to be matched with space-based applications: the three established categories, Earth Observation, telecommunication and navigation and positioning, but also emerging technologies such as electronic intelligence (ELINT) and space situational awareness (SSA). Of course, the security applications of EU flagship programmes GMES and Galileo are taken into consideration, given their dual use nature and, therefore, their services tailored at both defence and civil users.

Second, an overview of the state-of-the-art of the different space programmes in Europe based on their compatibility with CSDP missions is provided. These include both national and EU space systems and cover the whole spectrum of the abovementioned applications. Moreover, bilateral and multilateral intergovernmental agreements, for defence and security space data sharing and assets development is explored. In fact, this pooling and sharing of capabilities, which eventually might be brought into a wider European framework, provides additional and optimized resources to support CSDP missions. Moreover, it is given account of the concerted action in the space and security domain of the main European institutional actors: the European Commission, the European Space Agency, the European Defence Agency and the European Union Satellite Centre.

Building on this analysis, conclusions on space in the context CSDP are drawn, focusing on strengths and weaknesses emerged. Finally, some recommendations addressed to the European Parliament are provided.

1. INTRODUCTION

The Treaty of Lisbon has brought new competencies for the EU in terms of space matters and has reinforced the European security and defence policy framework. In fact, on the one hand, the Treaty establishes a specific and shared competence for the EU in space, while also guaranteeing the power to hold relations with the European Space Agency (ESA) (arts. 4(3) and 189 TFEU). On the other hand, the same treaty (art. 42 TEU) has made of the former European Security and Defence Policy (ESDP) a Union policy as well as an integral part of the Common Foreign and Security Policy (CFSP), thereby renaming it Common Security and Defence Policy (CSDP). In addition, it has widened the definition and scope of CSDP missions (art. 43(1) TEU)[1], while envisaging the development of an operational capacity drawing on civilian and military assets. Eventually, CSDP should allow for the progressive framing of a common Union defence policy.

These and other provisions of the Lisbon Treaty can also be directly and indirectly tied to both space and security and defence. Specifically, the Treaty explicitly refers to a European space policy that promotes, among other things, the implementation of EU policies (art. 189(1) TFEU). The EU external action, and in particular CFSP/CSDP, make of course no exception. In this context, the role of the European Parliament (EP) is clearly defined: in the pursuit of the European space policy goals it shall jointly act with the Council by ordinary legislative procedure to establish specific measures, which may take the form of a European space programme (art. 189(2) TFEU). In addition, the Union may encourage joint endeavours, support research and technological development and coordinate activities for the exploration and exploitation of space (art. 189(2) TFEU). In this sense, space could then be at the centre of work conducted by the European Defence Agency (EDA) as provided by the Treaty (arts. 42(3) and 45(1) TEU), with the contribution of the EC when necessary (art. 45(2) TEU). Another specific and innovative framework for collaboration among Member States (MS) in the field of CSDP is the permanent structured cooperation (art. 42(6) and 46 TEU) which could involve the development of space-based military capabilities. Similarly, the provisions on enhanced cooperation (art. 20 TEU), which allow MS under specific conditions to further the goal of integration, could be applicable to space and security and defence.

From these developments in space policy and CSDP emerge some important trends. Indeed, they do not only witness a potential growth of EU policies and responsibilities, but they also imply a cross-cutting, or even integrated, approach, which bears a European strategic interest. The latter can be closely related to CSDP and space policy.

CSDP is *per se* a strategic concept, as it offers a comprehensive approach towards EU security and defence challenges. Nevertheless, it should be recalled that common defence is still under construction and, traditionally, consensus-building over military operations under the CSDP umbrella is very difficult. The uncoordinated European approach to the recent Libyan crisis (2011) only stands as a reminder of such complexity, which in the past already prevented a coherent EU response to international crisis (for instance in Iraq, 2003). The Libyan case clearly showed strong divergences among EU MS, with some countries playing a leading role on their own, like France and the UK, and others denying support, even

[1]The article lists the following tasks: humanitarian and rescue tasks, conflict prevention and peace-keeping tasks, tasks of combat forces in crisis management, military advice and assistance tasks, peace-making and post-conflict stabilisation (peace-building), joint disarmament operations, fight against terrorism, including support to third countries in combating terrorism in their territories.

on diplomatic basis, as Germany. With such heterogeneous positions among EU MS, it is difficult to forecast if a strong and unique defence policy will ever take shape. In terms of capabilities development, the recent bilateral agreement between France and the UK on defence cooperation (November 2010) has generated contrasting perceptions in Europe. On the one hand, it has appeared at odds with the European approach to defence integration, with the Lisbon Treaty envisaging permanent structured cooperation, and with other multilateral frameworks, especially EDA, that could have been taken into consideration for some of the objectives set by the Franco-British entente. It seems that the same countries that supported and launched enlarged defence cooperation programmes more than a decade ago[2], while laying the basis for the European Security and Defence Policy (ESDP) in Saint Malo (1998), are seeking today an exclusive and leading role in European defence. On the other hand, the agreement has raised the hope that it will stimulate further progress in European defence capabilities, by encouraging further cooperation among MS in a time of declining defence budgets[3].

Space has also a strong strategic value, as it increasingly allows the EU to gain independence, scientific and technological prestige, and the capacity to act as a global actor. In fact, the development of space technologies has been often linked to a vision of worldwide strategic posture: that was the case, starting from the 1950s, in the US, Russia, and France, where launchers and space assets were historically conceived as key elements of nuclear dissuasion. But even if nuclear dissuasion is put aside, space is synonymous of a whole chain of strategic technologies and activities: from launching to the establishment of satellite telecommunications, from meteorology to navigation, space assets appear as a strategic set of infrastructures, meaning that they cannot be backed up by other types of ground networks, and that their disruption would be critical to the whole society. Space assets should therefore be considered as "critical infrastructures", as their disruption would endanger both civilian and defence activities.

In fact, a basic preliminary consideration is that "Space and Security" for Europe should be appreciated as a twofold concept: not only in terms of space applications for defence and security, but also of security and reliability of space technologies themselves, as key parts of a European critical infrastructure network. Maintaining and ensuring space infrastructure's integrity and resilience entails an autonomous access to space and the protection of the deployed assets. In this context, technological non-dependence is needed to master all the relevant technologies. A sound European space policy should include a clear strategy for guaranteeing security *in* space through space situational awareness (SSA). The concept of SSA has been developed to take into consideration several security needs in space, also through the federation of different sets of technologies and assets. SSA allows the monitoring of objects orbiting in space, from satellites to minuscule space debris. The latter, which are constantly increasing in quantity due to the expansion of space activities, represent a threat for the integrity and well functioning of space systems, along with potential aggressive attacks against space assets. Protection of space-based assets also involves a concept of redundancy and of capabilities replacement in case of disruption.

[2] For instance, the Organisation Conjointe de Coopération en matière d'ARmement (OCCAR) was founded in 1996 by France, Germany, Italy and the UK. Belgium and Spain joined respectively in 2003 and 2005. Finland, Luxemburg, the Netherlands, Poland, Sweden and Turkey are participating in OCCAR-managed programmes, without being members of the organisation. In 1998, France, the UK, Germany and Italy signed a Letter of Intents (LOI), completed by a Framework Agreement (FA) in 2000, and were joined by Spain and Sweden.

[3] See for instance the Council conclusions on Military Capabilities Development, 9 December 2010 http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/esdp/118348.pdf

Given this brief and preliminary account on security for space, the study takes into consideration the evolution of CSDP missions and analyses those space-based technologies and applications which can contribute to their operational effectiveness.

CSDP missions overview

An analysis of the past and ongoing EU missions highlights that the EU primarily engages in civilian operations rather than in military ones, therefore in "low intensity" tasks, rather than "high intensity" ones; and it mostly intervenes in its "extended neighbourhood area", namely the Balkans/Eastern Europe, Africa, and Middle East. The focus on civilian operations can be ascribed to different factors: the longstanding experience of NATO, more defence-oriented and traditionally involved in military and combat operations; the difficulty for MS, as already recalled, to find political consensus on the launch of military operations, which also witnesses the different strategic cultures characterizing their defence policies. In addition, civilian operations are part of a wider and comprehensive approach adopted by the EU in its external action that includes and associates further instruments and policies (i.e. Instrument for Stability (IfS), development policy, humanitarian aid, support to state-building, etc.) and makes of the Union a unique global actor. In particular, civilian missions mostly deal with the rule of law and the security sector reform (SSR), with training missions for judges, customs officers and the police, and with monitoring missions in support of security, stabilization, and respect of agreements in force. On the contrary, military operations are way less numerous and seem to be more limited in both time and tasks. As a matter of fact, since the EU launched its first operation in 2003 it carried out 17 civilian missions and 7 military operations4. As for the geographical focus, it can be considered that although some operations are still ongoing in the Balkans, the region is acquiring more importance in terms of EU enlargement, rather than of CSDP. There remain Africa and the Middle East, where however the EU has not a clear strategy for interventions which still depends on MS' specific national interests and availability of resources.

Although the Lisbon Treaty has introduced institutional changes that should reinforce both CFSP and CSDP, two years on its entry into force these have not had an impact on the content and strategy of CSDP and its missions. As a matter of fact, in 2010/2011 CSDP lost momentum, probably due to the extensive effort put in the establishment of the EEAS and to the international economic and financial crisis. With respect to this lack of a clear orientation in CFSP/CSDP, the EP has recommended in several occasions that the Council defines both a foreign policy strategy and a White Paper for security and defence5, but the call has remained unheard. The sort of White Paper proposed by the EP would be

[4] The EU civilian operations include: police missions (**EUPOL RD Congo**, EUPOL Kinshasa, **EUPM in Bosnia-Herzegovina**, EUPOL PROXIMA and EUPAT in Macedonia, **EUPOL Afghanistan** and **EUPOL COPPS in the Palestinian Territories**), rule of law missions (**EULEX Kosovo, EUJUST LEX for Iraq** and EUJUST THEMIS in Georgia), monitoring missions (**EUMM in Georgia**, EUMM in Former Yugoslavia and EU AMM in Aceh), EU border assistance missions (**EUBAM Rafah** and **Moldova and Ukraine border mission**), EU security sector reform (EUSEC RD Congo, EU SSR Guinea Bissau). The EU support to AMIS (Darfur) was characterized by military and civilian tasks and components. Military missions include: **EUFOR Althea**, Concordia, EUFOR Chad/RCA, Artemis, EUFOR RD Congo, **EUTM Somalia**, **EUNAVFOR Atalanta**. 12 missions are still ongoing and here are indicated in bold.
See *Overview of the missions and operations of the European Union as of October 2011*, http://www.consilium.europa.eu/eeas/security-defence/eu-operations.aspx?lang=en

[5] See European Parliament Resolution on the implementation of the European Security Strategy and the Common Security and Defence Policy, 10 March 2010,
http://www.europarl.europa.eu/sides/getDoc.do?type=REPORT&reference=A7-2010-0026&language=EN;

developed and discussed by all EU stakeholders and would be based on security and defence reviews conducted by MS individually, but following common criteria. This methodology would allow for an effective comparison of strengths and gaps in available capabilities, including space capabilities, while providing the basis for realistic investment and planning assumptions. For the time being the development of both civilian and military capabilities has been based on the Headline Goals, while the Capability Development Plan (CDP) drafted and recently updated (March 2011) by EDA covers military requirements only, from the short to the long term (beyond 2025).

In general, for CSDP, the Treaty envisages the development of an operational capacity drawing on civilian and military assets provided by MS (art. 42(1) TEU). This principle fits very well in the development of space technologies, which are by nature dual use, thereby stimulating civil-military synergies. In fact, in Europe, there exist space systems for both civilian and military purposes, while some interesting dual use initiatives are taking ground. The dual use model represents a significant opportunity, not only to widen the use and lower the costs, but also to allow different communities to access services. For this reason such principle has been embedded in the European flagship programmes Galileo and GMES (see section 2.7).

European Parliament Resolution on Development of the common security and defence policy following the entry into force of the Lisbon Treaty, 11 May 2011,
http://www.europarl.europa.eu/sides/getDoc.do?type=REPORT&language=EN&reference=A7-0166/2011

2. SPACE-BASED APPLICATIONS IN SUPPORT OF CSDP

Considered this range of missions[6] and requirements, an overview of space applications and their utility is provided. Existing and emerging space applications, namely, Earth observation (EO), satellite telecommunications, navigation and positioning, among others, can provide an added value in the context of CSDP missions highlighted above. In addition, the two EU flagship programmes, Galileo and GMES, are taken into consideration. Finally, a reflection is drawn on the NATO operation in Libya, as an instance of possible future CSDP missions and of the support these space applications can offer in contemporary military operations.

2.1 Earth observation for intelligence and surveillance

The development of EO capabilities is clearly linked with the need for an autonomous intelligence and effective surveillance. Out-of-area operations have produced new paradigms of action for EU civilian and military forces: extended duration; widened tasks; multiple, geographically spread, and remote areas of intervention; diversification of the type of operations, deployment of both civil and military forces. This expanded dimension of the EU external operations, symbolically reflected in the evolution of the Treaty of Lisbon, calls for a multi-layer approach in intelligence. For instance, in the recent intervention in Libya, characterized by air operations also conducted by EU MS' forces under the NATO flagship, Europeans partly relied on the US for the surveillance of the territory[7]. Although in Libya the US did not take the command of the operation, a degree of European dependence still persisted and is not a new element. As already mentioned, it was also the case during the Balkan interventions. In light of the limits encountered in these earlier operations, some EU MS have started developing their own military EO systems, so as to not rely only on the data provided by the US.

Starting with the French Helios programme, some European countries, such as Italy and Germany, have acquired EO capabilities (see below). Monitoring and surveillance from space are used for both civilian and military purposes, from mapping during/after a crisis to assess hot spots, critical infrastructures' conditions, populations flows/border migration, and damages, to the definition and targeting of military objectives during combat operations.

The development of several programmes and constellations in Europe clearly indicates that there is a growing need for EO systems, both optical and radar, together with new observation platforms such as UAVs.

Today, in a CSDP context, space capabilities for monitoring, surveillance and intelligence are proving essential, for instance, in the framework of EU NAVFOR Somalia (Operation Atalanta) to observe with regularity and continuity wide land (i.e. pirates' basis, ports) and maritime (i.e. coastal and off shore) areas in order to prevent and detect pirate attacks. But EO capabilities are also useful in civilian

[6] Past missions and tasks envisaged by the Lisbon Treaty (art. 43(1) TEU), see section1 and footnote 1.

[7] For intelligence, surveillance and reconnaissance (ISR) in general, but also for in-flight refuelling (IFR), munitions, electronic warfare, etc., which means there are still capabilities gaps of diverse nature to be filled pertaining to the field of Command, Control, Communication, Computers, Intelligence, Surveillance, Target Acquisition and Reconnaissance (C4ISTAR). See further.
See C. Jean, *Il futuro della Libia tra NATO e UE*, in AffarInternazionali, 9 September 2011, http://www.affarinternazionali.it/articolo.asp?ID=1849;
A. Marrone, *La NATO dopo la Libia*, AffarInternazionali, 10 October 2011, http://www.affarinternazionali.it/articolo.asp?ID=1878

operations and have been indeed used for a wide range of EU missions. In fact, satellite images were provided by the European Union Satellite Centre (EUSC) to the EU Council and its bodies for police missions (EUPM in Bosnia-Herzegovina, EUPOL-COPPS in Palestine, EUPOL DR Congo); for rule of law missions (EUJUST THEMIS in Georgia and EUJUST LEX in Iraq); and for border monitoring missions (EUBAM Rafah)[8]. This demonstrates that all typologies of missions, military and civilian, need both geospatial intelligence (GEOINT) to obtain essential and detailed geographical indications (maps of remote or urban areas and morphological information) as well as imagery intelligence (IMINT) to detect human activities and their consequences (conditions of/or damages to critical infrastructures, construction/destruction of facilities, etc.).

2.2 Satellite telecommunications

In the domain of security and defence, satellite telecommunications (SATCOM) are essential because of their capacity to cover most of the world and to replace services that are not available or destroyed (ground networks, mobile phones, etc.). In addition, they constitute the backbone of Command and Control (C2) functions, making them more efficient and secure through encryption. In a CSPD context where increasing amount of data is required and where multinational and joint forces are involved, satellites are used to transmit data, multimedia and phone calls over considerable distances as well as to disseminate information on the theatre to different commands and areas of responsibility. Moreover, today, information technology plays a vital role in providing and sharing a "Common Operational Picture" (COP), in order to create a "shared situational awareness" among all elements deployed by the armed forces in a certain theatre. The effort now should be to develop and deploy telecommunications systems able to share the COP among hundreds if not thousands of interconnected nodes in an efficient, secure, rapid and comprehensive way.

In recent years major European countries, including the UK, France and Italy, have undertaken procurement processes to transform their Armed Forces, partly or completely, into "Network Enabled Capabilities" (NEC)[9]. The basic idea is to exploit the potential of information technology to upgrade the current and future military equipments in order to improve the "shared situational awareness" at all levels, from the infantry unit to the headquarter. This will in turn speed up the military decision making process, and make the Armed Forces more efficient and effective in performing the whole spectrum of military operations. In this respect, SATCOM constitute the necessary communications' infrastructure for NEC capabilities at strategic level, and also play an important role at tactical level.

SATCOM are the most developed space applications worldwide and they are developed and managed by both public and private entities. In Europe, for defence purposes, France, Germany, Italy, Spain, and the UK have developed their own national satellite communication systems (see below), and some of them are also used in the NATO framework (Italy, France, UK)[10]. Other European countries, which do not

[8] See *The Centre's Uses*, official website of EUSC, http://www.eusc.europa.eu/index.php?option=com_content&task=view&id=7&Itemid=15

[9] The NEC concept has been developed by Europeans in a slightly different way from the American concept of "Network Centric Warfare" (NCW), and has been adopted by NATO in early 2000s.

[10] These countries followed different paths of development also exploiting different models such as the Public-Finance-Initiative (PFI) used by the UK to realize the new Skynet V generation of satellites. See X. Pasco, *Space capabilities for crisis management*, FRS Recherches et Documents with the contribution of IAI, 5/2010, http://www.isn.ethz.ch/isn/Digital-Library/Publications/Detail/?ots591=0c54e3b3-1e9c-be1e-2c24-a6a8c7060233&lng=en&id=119376

dispose of such systems, normally rely on commercial services. In the context of CSDP, the combination of commercial and institutional services can ensure both resilience and flexibility.

Beside the innovative concept of NEC, applicable in the military domain, some other initiatives are taking ground in Europe to enhance the capacity of data and information transmission. The European Data Relay Satellite (EDRS) system, under development in the framework of ESA, will contribute to overcome the delays in the delivery of time-critical data to users. The satellites will be able to rely data from/to other satellites and spacecrafts, as well as ground stations and antennas[11].

2.3 Unmanned Aerial Systems

Tightly related to SATCOM and to the NEC concept is the development of Unmanned Aircraft Systems (UAS), platforms that require indeed to be network enabled. The extensive use of Unmanned Aerial Vehicles (UAVs) by the US in its military operations, most recently in Afghanistan and Libya, for both surveillance and air strikes, has raised the Europeans' interest, thereby highlighting another capability gap. In terms of surveillance, UAS allow for sustained and extended situation awareness during crisis operations, thereby generating a wide range of information. But the development of such unmanned systems, as any other mobile platform, also entails the enhancement of communications and satellite bandwidth. In fact, the remote piloting of UAS and the use of onboard sensors and/or weapons, make SATCOM vital for the C2 of these unmanned aircraft operations. The same can be said for safe and secure Air Traffic Control (ATC) for UAS air traffic integration as well as for payload communication. In all these respects, ESA and EDA have conducted parallel feasibility studies on the integration of satellite services into UAS. As for payload data-link, it is considered that UAS missions will be able to rely on the abovementioned EDRS. Given the positive results of the feasibility studies, specific parallel projects funded by EDA and ESA will shortly follow providing demonstration of reliability and quality of service of UAS missions supported by space systems[12].

2.4 Navigation and Positioning

Navigation and positioning is a key technology to support CSDP missions of both military and civilian nature. Today, the US GPS signal is embedded into many aspects of European armed and security forces, especially armaments systems, aircrafts, and vehicles. The development of Galileo will enable European military and civilian users to rely on an independent capability providing services of higher quality, reliability, continuity and integrity compared to GPS. Such services will allow for better performances in the conduct of operations (air sorties and strikes, launch of paratroopers, in-flight refuelling, etc.).

2.5 Space-based electromagnetic intelligence

Electronic and signal intelligence (ELINT/SIGINT) allows to acquire and record radio and radar transmissions. In other words, it can be useful to pick up communications and/or emissions from defence systems. These capabilities can prove extremely useful in out-of-area operations, for instance

[11] See *EDRS*, official website of ESA, http://www.esa.int/esaTE/SEM5GGKTYRF_index_0.html

[12] See EDA official website, http://www.eda.europa.eu/Otheractivities/UAStrafficinsertion/EDAesacooperation/Readmore

by transmitting data directly to military personnel's mobile devices, and for anti-terrorism activities, for example by intercepting relevant communications. The question of SIGINT/ELINT is obviously extremely delicate, due to the sensitivity of data. It could represent both a challenge and an opportunity for further European cooperation, considered that such systems are today only mastered by the US, Russia, and China.

2.6 Early warning

Connected to SIGINT and ELINT is early warning, a space-based capability allowing to detect and locate ballistic missile launches (intercontinental and medium range), provide impact area previsions, diffuse alerts, and monitor threatening proliferating countries. This capability has therefore a permanent value, that increases during crisis operation for defence on the theatre. Currently, only the US and Russia dispose of an operational space-borne early warning system, though in Europe France has successfully developed and tested a demonstrator.

2.7 Importance of the EU flagship programmes: Galileo and GMES services

As said, the two European flagship programmes are examples of the dual use rationale, as they will provide added value for both civilian and defence users.

The most significant Galileo services for CSDP will be the Public Regulated Service (PRS) and the Search and Rescue (SAR), which are planned to be available by 2014[13]. The PRS signals will be encrypted and highly precise, allowing both a civilian and military use of the system to enhance the effectiveness of operations[14], while SAR will not only be of use to CSDP missions, but will also represent Europe's contribution to the international cooperative effort for humanitarian search and rescue activities worldwide.

In GMES, the services related to security, the "S" of the programme, will naturally be those of interest to CSDP. The main application areas that such services should cover are border security, maritime surveillance, and support to EU external action[15]. In this last respect, preliminary indentified areas for support[16], which can be directly linked to CSDP tasks, are:

- support to peacekeeping operations,
- monitoring of country recovery,
- crisis aftermath and monitoring for reconstruction and rehabilitation,
- humanitarian action and civil protection,
- treaty monitoring/non-proliferation

[13] See Report from the Commission to the European Parliament and the Council, *Mid-term review of the European satellite radio navigation programmes*, 19 January 2011,
http://ec.europa.eu/enterprise/newsroom/cf/_getdocument.cfm?doc_id=6321

[14] See Xavier Pasco, Galileo: the cornerstone of the European space effort, 2003
http://www.frstrategie.org/barreCompetences/espace/doc/GALILEO.pdf

[15]European Commission GMES Bureau, *GMES Security Applications*, Presentation given at the FP7 and GIO Symposium, Lisbon, 26-27 May 2011,
http://www.gppq.mctes.pt/fp7space-gio-symposium/_docs/27_1630_RuiMeneses.pdf

[16] The *ad hoc* Working group GMES-Security in support to EU External Actions will provide by the end of 2011 a final report with recommendations on requirements and prioritization of actions.

In this context, the civilian and military users of GMES security services will be also able to exploit synergies arising from the environmental part of the programme, the "E" of GMES, which includes applications related to land, ocean, atmosphere, and emergency. The added value of synergies among services pertaining to the "E" and the "S" of GMES has already emerged during natural disasters and crisis occurred over 2010 and 2011. In fact, the products developed by some projects within the Seventh Framework Programme (FP7), namely G-MOSAIC[17] and SAFER[18], were simultaneously activated by European institutions[19] in the event of the earthquake in Haiti (2010) and during the recent Libyan crisis (2011)[20]. For the latter, G-MOSAIC provided some products for contingency plan preparation, rapid geospatial reporting, and damage assessment. In turn, SAFER provided geographic reference maps that were integrated with the specific knowledge of G-MOSAIC[21]. As baseline products of different projects evolve and mature towards pre-operational and operational services, more of such synergies may arise, going in the direction of an effective EO integrated system for complex needs. This synergetic aspect of GMES services is absolutely coherent with the EU comprehensive approach in the field of CSDP.

The abovementioned products were also activated in many other different occasions by national users, such as ministries of defence (MoD) and of foreign affairs. For instance, the Italian MoD requested G-MOSAIC products in the event of the civil unrests in Egypt (2011), in particular for the rapid assessment of logistic infrastructures on given locations to support potential evacuation operations[22]. In the same way, the Italian MoD demanded G-MOSAIC rapid geospatial reporting for Libya, so as to analyse the conditions of infrastructures in Benghazi and Tripoli (airports, seaports)[23].

These initial and positive experiences with GMES products highlight that the programme represents an important common asset at the disposal not only of the EU institutions, but also of single MS. In fact, even if political agreement over a common EU position and approach on the Libyan crisis, including a CSDP operation, was not reached, MS could still count on EU instruments to meet their operational needs. It clearly indicates that the availability of EU space services like GMES can contribute to the shaping of a common Union defence policy, even if not strictly used in every circumstance under a CSDP flag.

2.8 The Libyan experience

Although intervention in Libya was eventually carried out by NATO, the Council decided that an EU military mission - EUFOR Libya - could be launched in support of humanitarian assistance operations on the request of the UN Office for Coordination of Humanitarian Affairs (OCHA)[24]. Though in light of the most recent developments such demand is only a remote possibility, the Libyan crisis surely did, does

[17] GMES services for Management of Operations, Situation Awareness and Intelligence for regional Crises
[18] Services and Applications For Emergency Response
[19] Former Directorate-General for External Relations (DG RELEX) and the European External Action service (EEAS) activated GMOSAIC and the Directorate-General for Humanitarian Aid and Civil Protection (DG ECHO) and its Monitoring and Information Centre (MIC) activated SAFER
[20] G-MOSAIC presentations given at the Let's Embrace Space Conference, Budapest, 12-13 May 2011, http://ec.europa.eu/enterprise/newsroom/cf/itemlongdetail.cfm?item_id=4845&lang=en&tpa_id=1004
[21] *Ibid*; official website of SAFER, http://www.emergencyresponse.eu/gmes/en/event/Civil-Unrest-in-Libya_105.html
[22] G-MOSAIC presentations given at the Let's Embrace Space Conference, Budapest, 12-13 May 2011
[23] *Ibid*
[24] Press Release, *Council Decides on EU military operations in support of humanitarian assistance operations in Libya*, 1 April 2011, http://register.consilium.europa.eu/pdf/en/11/st08/st08589.en11.pdf

and will represent an interesting potential case for a CSDP operation in terms of tasks and geographical area, and of short-to-long period perspectives, based on a variety of reasons:

- provided the tasks envisaged by the Lisbon Treaty, the EU could have performed the intervention taken over by NATO under the CSDP umbrella, it could still provide humanitarian assistance, and could participate in the pacification and reconstruction process, along with disarmament, demobilization and reintegration (DDR) tasks;
- Africa, for a number of motives that cannot be treated here, is an area of interest to, and commitment of, the EU and some of its MS;
- the latent and ongoing conflicts in the continent (i.e. Somalia, Sudan, DR Congo, Chad, Egypt) as well as the current political changes and turmoil within the Arab world (i.e. Syria), suggest that new and similar crisis could emerge or old ones revamp, requiring action by the EU.

From an operational point of view, space assets proved essential in the Libya intervention for:

- intelligence, surveillance and reconnaissance (ISR) and monitoring (EO capabilities) for strategic and tactical planning, for the conduct of operations, and for situational awareness on the ground;
- planning strike sorties (navigation and positioning capabilities , GPS);
- communications among allies and between them and the rebels (SATCOM capabilities).

These same capabilities would also support eventual humanitarian assistance and reconstruction operations.

The US has proved an operational and technological advantage in the intervention in Libya, also in light of the experience gained in Afghanistan[25]. Although the EU MS involved in the NATO intervention have carried out the largest part of the operations and sorties, US capabilities turned essential for their success and sustainability, especially in terms of of Command, Control, Communication, Computers, Intelligence, Surveillance, Target Acquisition and Reconnaissance (C4ISTAR)[26]. As a result, there emerge capabilities gaps for EU MS with respect to the US, and space technologies are part of this weak side.

As a matter of fact, the current international economic and financial crisis imposes heavy budget constraints that cannot lead to an increase of defence spending in any country of the EU. However, in pragmatic terms it could be dangerous to rely too much on the US capabilities, given also its relative disengagement from "European affairs", partly demonstrated with the (apparent) secondary role played in Libya. This is the reason why EU institutions should maintain a political priority for space investment linked to CSDP, for any typology of operation - from high to low intensity - in line with the ambitions set in the Lisbon Treaty as well as with the quickly evolving strategic environment.

[25] See J. Barry, *America's Secret Libya War*, in Newsweek, 30 August 2011, http://www.thedailybeast.com/articles/2011/08/30/america-s-secret-libya-war-u-s-spent-1-billion-on-covert-ops-helping-nato.html

[26] *Ibid*

2.9 State-of-the-art of the different space programmes in Europe relevant to CSDP

2.9.1 Earth observation

As it already emerged, EO data, also integrated with other kind data (both space and non-space), provide useful information for CSDP, supporting policy design as well as civilian and military operations. In Europe a number of space faring nations have developed their own EO systems for both civil and defence purposes, while private actors are gradually entering the market which however, to date, remains fairly limited. Civil systems are becoming important also for defence actors as the amount of data required in military operations makes it impossible to obtain them solely from few dedicated systems.

France has a very comprehensive space programme and was the first space faring nation in Europe engaging in the development of EO systems for military uses. It was subsequently followed by Italy and Germany, most recently by Spain. With these and other countries, namely Belgium and Greece, France established cooperation in the development and exploitation of EO capabilities for defence purposes (see further). France privileged optical and infrared technologies, while Germany and Italy developed synthetic aperture radar (SAR) capabilities. Spain is currently committed to the completion of an innovative satellite system combining both technologies. In addition, some of these MS also dispose of satellite systems for civil use and engaged in new forms of partnership with private companies. Finally, the EU launched the abovementioned flagship programme GMES, which envisages the development of a generation of new satellites, while also exploiting existing national missions.

Defence systems

COSMO-SkyMed, Italy: first dual use system for EO in Europe, is composed of four SAR satellites. The second generation (CSG) is under development.

Helios II, France: second generation of the first EO military system (Helios) developed in Europe

Pleiades, France: dual use system composed of two optical satellites, planned to be launched at the end of 2011 or the beginning of 2012[27].

SAR Lupe, Germany: military system composed of five SAR satellites.

PAZ, Spain: military SAR satellite planned to be launched at the end of 2012 and to be coupled with the optical INGENIO civil satellite (end of 2013)[28].

As said, a number of agreements tie these systems, also involving other countries. In particular, France separately agreed with Italy and Germany the exchange of images between HELIOS II and COSMO-Skymed and SAR Lupe respectively, so as to bring together optical and radar capabilities that distinguish the systems. Based on specific rules, every partner individually and confidentially plans its daily image captures to be received by its own ground station. In Helios I, Italy and Spain participated in

[27] See *Pleaides*, official website of CNES, http://www.cnes.fr/web/CNES-en/3236-pleiades.php

[28] *Paz satellite in Madrid* , official website of EADS Astrium, http://www.astrium.eads.net/en/news2/el-satelite-paz-a-madrid.html

the development programme, joined by Germany and Belgium in Helios II, thereby gaining access to a share of data.

Moreover, Italy and France are parties to the bilateral agreement ORFEO (Optical and Radar Federated Earth Observation), in which Pleiades and COSMO-SkyMed are the optic component and radar components respectively. However, the envisaged cooperation has yet to be implemented as the French system is not operational.

Based on these positive cooperative experiences, France, Italy, Belgium, Germany, Greece and Spain, more recently joined by Sweden and Poland, agreed to participate in a joint intergovernmental effort, the Multinational Space-based Imaging System (MUSIS), which should replace the existing systems in a common framework. Indeed, the cooperation envisages the interoperability of all ground segments involved for a straightforward mutual access to the assets, while the partners continue to develop their own space components on national basis. In particular,

- Italy will contribute with CSG (SAR),
- France will contribute with the Composante Spatiale Optique (CSO, optical space component),
- Germany will contribute with Sarah (SAR),
- Spain will contribute with INGENIO (wide-swath optical).

EDA is also involved in MUSIS, with the responsibility of finding new partners to join the programme and of coordinating the project with other ongoing European projects and activities. At the same time, OCCAR was entrusted with the realization of the programme starting in 200929. The combination of different technologies in MUSIS will enhance surveillance, reconnaissance and observation capabilities, day and night, in all-weather conditions, on shorter revisit time, and with higher resolution.

Civil systems and GMES

Many MS have developed civil EO systems, originally for meteorological services, then for the exploration and study of the Earth, its resources and phenomena, along with the effects of climate change. On the same grounds the EU launched its ambitious flagship programme GMES in cooperation with ESA. Initially envisaged for environmental challenges only, the initiative was subsequently extended to include security. As a matter of fact, the added value of GMES in the security domain is strictly related to the evolution of the concept of security itself and to the increasing blurring of the "border" between security and defence. Such an evolution is reflected both in strategy papers at the European level, among which the European Security Strategy (ESS) and the Report on the Implementation of the European Security Strategy, as well as in CSDP operations.

GMES is based on existing EO systems, namely GMES Contributing missions, and on a specific space segment under development in the framework of ESA. Contributing missions are numerous (about thirty among existing and planned) and characterized by different technologies for a variety of scopes (i.e. SAR missions, optical missions, altimetry missions, atmospheric missions)[30]. They are provided by MS (i.e. Italy, Germany, France, and Spain), third countries (i.e. Canada), international organizations

[29] Helios 2B, Press Kit, Ministère de la Défense Français, http://www.defense.gouv.fr/content/download/17280/150054/file/dp_helios_2b_english

[30] *GMES Contributing Missions*, offial website of ESA, http://www.esa.int/esaLP/SEMWX6EH1TF_LPgmes_0.html

(EUMETSAT, ESA itself) and private companies (SpotImage). This variety of missions also witnesses the evolution of development and business models applied in the field of EO, which is slowly shaping a market, though still in need of public support.

As for the new space segment specifically designed for GMES, ESA is developing five different kinds of satellites (pairs), the Sentinels, which should be launched starting in 2013 and functional to a variety of different missions today supported by Contributing Missions.

GMES Security services

GMES services have been developed and funded through FP6 and FP7 R&D projects and have been focused on the core areas of atmosphere, land, ocean, emergency and security31. In the domain of security, the main research projects, LIMES (Land and Sea Monitoring for Environment and Security, FP6) and G-MOSAIC (FP7, close to end), have paved the way for pre-operational services. These projects addressed different groups of applications summarized below. It is important to underline that most applications are supported by additional space technologies (i.e. SATCOM, navigation and positioning) and non-space data (i.e. aerial images), signalling the need for increasingly integrated and interoperable systems.

LIMES services and applications:

- Maritime surveillance: monitoring of vessel and cargo movements over coastal and open ocean areas. Open, coastal water and sensitive cargo surveillance.
- Land and infrastructure surveillance: land border monitoring, critical infrastructure surveillance, support to event planning and to the Non-Proliferation Treaty (NPT) monitoring.
- Humanitarian relief and reconstruction: risk analysis and disaster preparedness (i.e. population distribution monitoring, water resource monitoring), humanitarian crisis operational support (i.e. damage assessment), reconstruction planning and monitoring

G-MOSAIC services and applications:

- Natural resources and conflicts: exploitation of natural resources; population pressure; land degradation; illegal mining, timber logging and crops;
- Migration and border monitoring: border area monitoring; monitoring of settlements.
- Nuclear and treaties monitoring: monitoring of nuclear decommissioning sites; continuous surveillance of nuclear facilities
- Critical assets: critical assets monitoring, critical assets event assessment
- Crisis management and assessment: contingency plan preparation; rapid geospatial reporting; damage assessment for post-conflict situations; support to reconstruction missions after conflicts

To date, among GMES services as a whole, those related to security are the least developed, and will therefore be substantially supported under the 5th Call of FP7 so as to bring them to operations. Future

[31] In FP7 projects such as MACC, Geoland2, MyOcean, SAFER and G-MOSAIC respectively.

projects will draw lessons learned from these initial capacities in order to develop operational services, with an eye on synergies to be fostered between emergency response and crisis management as well as with services related to land, atmosphere and marine where possible. Finally, benefits from the integration of defence and civil space capabilities will be further explored.

The role of EUSC

Established in 2001 by a Council Joint Action (2001/555/CFSP), incorporating elements of the structures of the Western European Union (WEU), the centre has the mission of supporting "[..] the decision-making of the Union in the context of the CFSP, in particular of the ESDP, by providing material resulting from the analysis of satellite imagery and collateral data […]" (art.2). EUSC's activities and operations are supervised by the Political and Security Committee (PSC) of the Council. The Vice-President (VP)/High Representative (HR) of the EU gives operational direction to EUSC based on PSC guidance. Given such role of the VP/HR, and the establishment of the EEAS merging CSDP bodies, EUSC is today strictly tied not only to the EEAS itself, but also to the crisis management structures, namely the EU Military Staff (EUMS), the Crisis Management Planning Directorate (CMPD), and the Civilian Planning and Conduct Capability (CPCC). As highlighted above, the centre has provided images and products for a number of ESDP/CSDP missions, most recently for EUNAVFOR Somalia. In addition, EUSC is participating in GMES projects related to the security dimension (i.e. G-MOSAIC) as the interface between GMES services and users32. As a result, debate among the relevant EU institutions (EEAS, Council, EC) and MS in ongoing on the possible role of EUSC in GMES for security services. There exist different options, stretching from a role strictly related to CFSP/CSDP only to the coordination of data access in the field of security beyond CFSP/CSDP 33.

EUSC has currently access to both commercial and governmental imagery, however the share of the first is significantly wider. EUSC mostly relies on commercial systems such as QuickBird, WorldView, Rapid-Eye, GeoEye, Spot and Radarsat34. Concerning governmental systems, EUSC has an agreement in force with France to access Helios II data, while it is close to the signature of other similar agreements with Italy and Germany to access data from COSMO-SkyMed and SAR Lupe respectively35. EUSC growing operational activity is however constrained by a limited budget, mostly financed by MS, of which the largest share (over 70%) covers personnel and general operating costs36. If a growing role of EUSC in GMES were to be established, then MS will have to grant adequate financial and political support, also in line with the current increase of demanded tasks.

The existing defence and civil EO systems in Europe are today well established, but still evolving towards more advanced technologies and performances. These capabilities are however difficult to integrate and federate for both defence and civil purposes. On the defence side, MUSIS is barely

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[32] *EUSC support to the European External Action Service (EEAS)*, Presentation given at the FP7 and GIO Symposium, Lisbon, 26-27 May 2011,
http://www.gppq.mctes.pt/fp7space-gio-symposium/_docs/27_1630_DennisBruckert.pdf

[33] *Ibid*

[34] See EUSC Annual Report 2009, http://www.consilium.europa.eu/uedocs/cms_data/docs/mailing/file904.PDF

[35] As of May 2011

[36] This percentage does not include mission operating costs, also tied to imagery purchase. In 2010 the approved budget was 16.384.802 million euro, of which 12.333.393 funded by MS. See EUSC Annual Report 2010, http://www.eusc.europa.eu/images/stories/eusc%20annual%20report%202010.pdf

progressing as partners cannot come to terms on a common ground infrastructure37, considered the sensitivity of information to be shared and the technical complexity of the project. This hesitancy has pushed Italy and France to continue for the moment on a bilateral path with the study of a new concept of common interoperability to guarantee mutual access to the Italian CSG and the French CSO systems38. On the civil side, a governance framework for GMES (beyond 2014) able to bring together all the capabilities and actors highlighted above, has yet to be defined by the EC. In addition, its funding is at risk in the next Multi-annual Financial Framework (MFF) as the EC has proposed to set the programme outside the EU budget, leaving financing to MS on voluntary basis. Such an option is quite unviable, considered that MS are undergoing significant budget austerities and that GMES was envisaged to serve European institutional and commercial users on a free and open access basis.

2.9.2 Satellite communications

The main space faring nations in Europe have developed their own SATCOM systems for defence purposes based on different, and still evolving, development, business and ownership models. A brief account is provided here:

Skynet 5, UK: developed within a Private-Finance-Initiative (PFI), whereby MoD procures SATCOM services from Paradigm (subsidiary of Astrium, purposely created), while Astrium designed and built the satellite system. Paradigm is the prime contractor of the MoD, but can provide spare service to other governments and organizations.

Syracuse 3, France: dedicated French military system composed of two satellites. France is exploring the possibility of adopting a PPP model for by selling two Syracuse 3 satellites and the French payload (Syracuse 3C) of Sicral 2 to a private operator[39].

Sicral 1 and 2, Italy: the first generation is composed of two satellites, of which the second was built under a PPP between the MoD and Finmeccanica. Sicral 2 is a collaborative project with France, the first cross-border cooperation in military SATCOM in Europe.

Spainsat, Spain: two satellites are financed, built and operated by Hisdesat for the MoD. The private company can provide services also to other governmental customers[40].

Satcom BW, Germany: two satellites owned by the MoD, but operated by Milsat Services (Astrium and ND Satcom). Additional services are provided using commercial satellites.

Athena-FIDUS, Italy-France: new cooperation to built a dual use satellite that will complement Syracuse 3 and Sicral 2 (2014).

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[37] P. De Selding, *Helios 2B launch lessens pressure finding MUSIS solution*, in Space News, 11 January 2010, http://www.spacenews.com/civil/100111-helios-launch-lessens-pressure-finding-musis-solution.html;
P. De Selding, *France reluctant yet hopeful on cooperative military space programmes*, in Space News, 5 April 2011, http://www.spacenews.com/military/110405-questions-euro-coop-milspace.html

[38]Common Interoperability Layer (CIL), press release official website of Thales Alenia Space http://www.thalesgroup.com/Press_Releases/Markets/Space/2011/Thales_Alenia_Space_Italia_and_the_MUSIS_Program/

[39] See P. Berager, *PPP: an innovative way for governmental outsourcing*, presentation given at Agenzia Spaziale Italiana, 28 May 2009, http://www.asi.it/it/news/pubblico_e_privato_lunione_fa_la_forza_0

[40] See X. Pasco, *Space capabilities for crisis management*

As said, other European countries completely rely on commercial operators for their military SATCOM since these are providing increasingly secure services. In addition, there emerges a clear trend towards the PPP form of procurement based on service provision rather on asset purchase. Such trend reflects not only the maturity of SATCOM applications and services, but also the need for governments to prioritize resources in a critical time of shrinking defence budgets. In addition, the French-Italian cooperation in the field of military SATCOM could pave the way for other pooling and sharing initiatives in Europe.

From an operational point of view, these ranges of SATCOM capabilities are able to meet the requirements of both CSDP and NATO operations[41]. However, in perspective, the complex needs arising from military operations in remote areas of the globe will require additional capabilities and integration of these systems with other space applications, namely EO and navigation and positioning. The concept of EDRS clearly illustrates the case (refer to sections 2.2 and 2.3).

2.9.3 Navigation and positioning

To date the only truly global navigation satellite system (GNSS) is the American GPS, though Europe, China, Russia, Japan and India are operating or developing their own systems on global or regional basis. The EU engagement in the Galileo programme reflects the need for strategic autonomy in economic, technological and operational terms, by reducing the overdependence vis-à-vis the American GPS system managed by the Department of Defence (DoD). Though cost overruns and delays have characterized the ambitious European endeavour, Galileo is today on the right path, the first two operational satellites having been launched in October 2011. The complete constellation includes thirty satellites to be deployed by 2020, but eighteen of them will provide the first services starting in 2014[42].

Through this Initial Operational Capability (IOC) Galileo will deliver three services:

1. The **Open Service** (OS), similar to that provided by the American GPS for mass-market applications, therefore free of charge, addressed to the general public, and requiring reduced accuracy. It will be sufficient to dispose of a receiver to catch the signal, however integrity is not guaranteed.
2. The **Public Regulated Service** (PRS) for the needs of both security (civil protection, police, coast-guard and customs) and military forces. The decision as to use or not the PRS for defence needs is left to EU MS. The signals will be highly secure, encrypted and precise. Contrary to the US, civil institutions will control the access to the service.
3. The **Search and Rescue** (SAR) service is Europe's contribution to the international cooperative effort for humanitarian search and rescue activities worldwide.[43]

The Full Operational Capability (FOC) will provide two additional services:

4. The service **Safety of Life** (SoL), for the safety of air and maritime transportation using certified dual-frequency receivers.

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[41] *Ibid*

[42] See Report from the Commission to the European Parliament and the Council, Mid-term review of the European satellite radio navigation programmes

[43] Description of services drawn from the official website of ESA, http://www.esa.int/esaNA/SEMTHVXEM4E_galileo_0.html

5. The **Commercial Service** (CS) for market applications requiring higher precision than compared to the OS. The service will therefore come on payment. The signals will be protected through commercial encryption, which will be managed by the service providers and the future Galileo operator[44].

As said, the most significant services in the context of CSDP will be the PRS and the SAR. GPS and Galileo signals will be interoperable, thereby complementing each other and providing a degree of redundancy in case, for national security reasons, the US jams or switches off their signals and vice-versa.

2.9.4 SIGINT/ELINT

In Europe, only France has been developing, since the 1990s, such capability through experimental programmes and satellites[45]. The ESSAIM technology demonstrator, preceded by programmes such as CERISE (1995) and CLEMENTINE (1999), is being used to develop an ELINT capability. Another French demonstrator, ELISA, will be launched at the end of 2011 for the surveillance of radar emissions. The results of these experimental initiatives are laying the basis for the launch of an operational programme known as CERES (*Capacité de renseignement électromagnétique spatial*), which could eventually be brought within a European cooperative framework and become operational around 2016[46]. For the time being the cooperation has started with Sweden and Greece[47].

2.9.5 Early warning

As mentioned, in Europe only France is advancing in the development of an early warning system with its successful technological demonstrator SPIRALE, which gave the possibility to acquire and analyse infrared satellite data and images useful to identify the requirements for the successive programme. The positive experience concluded in early 2011 should lead to an initial operational capacity not earlier than 2020. The future system will be composed of one satellite, but remains open to a second to be developed in a cooperative framework with other European countries, possibly Italy and Germany48. With respect to other countries, France has come to acknowledge that missile defence in Europe does not raise direct interest, especially in time of financial crisis and budgetary austerity49. On the contrary, France attaches great importance to the missile warning space-based system as an element of its national defence and nuclear deterrence strategy as well as of its technological and industrial independence. In addition, such a system would provide a strong added value to the territorial NATO

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[44] *Ibid*

[45] Helios 2B, Press kit, Ministère de la Défense Français;
Military aspects of space: early warning and ELINT satellites – reply to the annual report of the Council, Assembly of Western European Union, 17 June 2010
http://www.assembly-weu.org/en/documents/sessions_ordinaires/rpt/2010/2071.php?PHPSESSID=f4dced2b91df166f3a973bbc25f527ff

[46] *Ibid*

[47] Helios 2B, Press kit, Ministère de la Défense Français

[48] Rapport d'information, *La défense antimissile balistique: bouclier militaire ou défi stratégique?*, Commission des affaires étrangères et de la défense, Sénat de la République Française, 6 July 2011,
http://www.senat.fr/rap/r10-733/r10-733_mono.html#toc311

[49] *Ibid*

missile defence programme, rather than just financing part of the latter under the industrial and technological leadership of the US[50].

2.9.6 Space Situational Awareness

To date, the US disposes of the most extended Space Surveillance Network in the world. Most of European space faring countries relies on such system for the protection of their own space assets.

Since so many activities and policies, in particular security and defence, both at the national and EU levels, are dependent on space, the need to secure such infrastructure is a priority. Indeed, SSA is gaining increasing attention in the framework of the European Space Policy, and the Seventh Space Council (November 2010) has invited EU institutions and MS to explore possibilities for SSA at the European level, exploiting existing and future civil and military assets to develop a system that is dual use[51]. In this sense, debate and work are already ongoing and have been intensified in the last months[52]. In particular, ESA is conducting a preparatory programme to define the systems' civil requirements to be aggregated by the EC and the EEAS, while EDA identifies military ones, so as to merge results and design a suitable system architecture. At the same time, EUSC is participating in a study funded by the EC on a governance framework and data policy for managing classified data in such a dual use system. At the national level, only France and Germany dispose of specific, though insufficient, systems, GRAVES (surveillance radar) and TIRA (tracking radar) respectively, which are already set into operational cooperation, also in connection with the US system[53].

As a result, if a European SSA programme is launched, the ensuing system could add on the US capability and contribute to the safety and security of space assets globally.

2.9.7 EDA/ESA/EC cooperation in space capabilities development

In recent years, especially since the launch of the European Space Policy (2007) and following the recommendations of the Fourth Space Council (2007), EDA, ESA and the EC have come to closely collaborate in order to foster synergies between the civil and military domains, while avoiding duplication of efforts. These forms of cooperation and coordination have also been sanctioned by the Lisbon Treaty, as recalled above (see section 1).

With such goal in mind, in first place, a "Structured Dialogue on Space and Security" was inaugurated gathering the EC, the EU Council, the EEAS, EDA, EUSC and ESA[54]. In second, EDA and ESA signed an

[50] *Ibid*

[51] Seventh Space Council's Resolution, Global challenges: taking full benefit of European space systems , points 22-24. Earlier, also the Fifth Space Council stressed the need for Europe to develop a system for the protection of space infrastructure. See *Ministers meet to take forward the European Space Policy (5th Space Council)*, official website of ESA, http://www.esa.int/esaMI/About_ESA/SEMW506EJLF_0.html

[52] For instance, in September the Polish EU Presidency organized a specific seminar on the subject, thereby gathering all the relevant European and US actors to discuss possible ways of cooperation between the EU and the US, civil and military requirements, governance and data policy issues, existing and future programmes. See Space Situational Awareness , Warsaw Seminar, 29 September 2011, http://www.ssawarsaw.pl/seminar.html

[53] See *US, French Defense leaders sign space agreement*, American Forces Press Service, 8 February 2011, http://www.defense.gov/news/newsarticle.aspx?id=62733

[54] *Space for Security forms an integral part of a comprehensive and coherent European Space Policy*, official website of the European Commission, http://ec.europa.eu/enterprise/policies/space/esp/security/index_en.htm

Administrative Arrangement in June 2011 with the scope of "providing a structured relationship and a mutually beneficial cooperation between ESA and EDA through the coordination of their respective activities"[55]. The cooperation will in particular aim at exploring the added value and contribution of space assets to the development of European capabilities in the area of crisis management and the Common Security and Defence Policy"[56]. As a matter of fact, such agreement only formalizes a cooperation that already existed in the field of space for security and defence. In fact, EDA and ESA engaged in collaboration for:

- Civil-military synergies in the field of EO,
- Intelligence, Surveillance , Reconnaissance (ISR),
- Satellite Services (C2) for UAS Missions,
- Tactical/mobile satellite communications,
- SSA[57].

The arrangement however contributes to the systematization of activities such as:

- identification of capability gaps that could be filled by space assets,
- sharing of capability requirements where appropriated and provision of mutual support accordingly,
- coordination of research, technology and demonstration activities,
- identification of synergies between ongoing EDA and ESA programmes and their future evolution,

exploration of synergies and coordinate activities in support of industrial competitiveness and European non-dependence issues58.

Similarly, the EC has set cooperation with both EDA and ESA through the "European Framework Cooperation for Security and Defence Research", and space clearly falls in the domain of such collaborative endeavour. This is also the framework within which a programme on Critical Space Technologies for European Non-dependence was set59. In fact, a strong space technological and industrial base is a requirement to maintain European strategic independence and a sustainable space infrastructure supporting CSDP. If Europe, for systems or sub-systems, relies on externally produced technologies and capabilities, there exist a risk of disruption of supply, due to both market and regulation reasons. For instance, the export control regime applied by the US, the International Traffic in

[55] *Signing of EDA-ESA Administrative Arrangement* http://www.eda.europa.eu/News/11-06-20/Signing_of_EDA_-_ESA_Administrative_Arrangement

[56] *Ibid*

[57] *Ibid*

[58] See *EDA & Space*, official website of EDA, http://www.eda.europa.eu/Libraries/Documents/factsheet_-Defence_space_final.sflb.ashx

[59] *European Framework Cooperation for Security and Defence Research*, EDA Factsheet http://www.europarl.europa.eu/meetdocs/2009_2014/documents/sede/dv/sede301109factsheetefcsecuritydefence_/sede301109factsheetefcsecuritydefence_en.pdf

Arms Regulations (ITAR), has often imposed on European military and commercial partners significant delays to obtain ITAR waivers60.

It should be recalled that the concept of autonomy of systems and technologies is one of the main reasons that led Europe to launch the Galileo programme for a GNSS. In fact, Europe feared that the US DoD, which controls the American GPS, could discretionally shut down and/or jam signals to the detriment of European safety and security. The same argument is valid for the development of the Ariane family of launchers.

[60] See David Berteau, Gregory Kiley, Guy Ben-Ari, Joshua T. Hartman, Gary Powell, Stephanie Sanok, Brian Green, *National Security and the Commercial Space Sector. An Analysis and Evaluation of Improving Commercial Access to Space*, CSIS, Washington DC, July 2010, http://csis.org/publication/national-security-and-commercial-space-sector

3. CONCLUSIONS AND RECOMMENDATIONS

As it emerged from the study, space and CSDP bear a political, strategic and technological dimension. In fact, political will is necessary to progress in both fields at the EU level; availability of space assets at the service of an effective CSDP can provide the EU with strategic advantages; technology is the core element of space assets for CSDP and for this reason requires significant investments and long-term planning. In a time of economic and financial crisis affecting the EU and its MS, duplications of capabilities are to be avoided and resources maximized based on a common approach and on the exploitation of all possible civil-military synergies at all levels. The EU flagships programmes are examples of the dual use nature of space technologies. Galileo and GMES are designed on a user-driven approach and on the continuity of service, while being under civilian control. As such they will provide services for a large community of civil and military users, thereby serving the needs of CSDP missions and of EU MS. Indeed, even if a CSDP mission was not launched for Libya, GMES services have been activated by some MS' MoD (for instance the Italian MoD). These dual use services provided on a continuity basis represent an effective way to enhance EU space capabilities as a whole, without suffering from eventual denial based on a case-by-case choice of intervening in military operations by single MS. In this sense, space services at the EU level provide a common capability open to any MS, differently to strictly national military platforms or systems on which each country remains sovereign, especially if there exist some kind of specialization in the required asset.

In Europe there exist today technologically advanced space capabilities and further are under development at the EU level, planned to be operational by 2014 (GMES and Galileo). In addition, ongoing cooperative efforts can contribute to the maximization of the utility and effectiveness of the assets available (Helios II/COSMO-SkyMed, Helios II/SAR Lupe, Athena-FIDUS, MUSIS, GRAVES-TIRA, etc.). As a result, national and EU assets potentially allow to meet increasingly complex CSDP needs in the field of EO, SATCOM and navigation and positioning. In this context the capability of autonomous access to space to allow the deployment of space systems must be maintained, along with technological non-dependence in critical technologies (for instance launchers themselves).

There remain however some capabilities gaps as it was showed by the Libyan experience. The operation was an example of high intensity intervention in which EU MS, even under the CSDP flag, can be involved. In Libya the coalition had a strategic advantage given by its technological superiority, which allowed to successfully conclude the operation. However, it clearly appeared that this type of operation could have not been managed by European forces alone. The Libyan case indicate some gaps in terms of Command, Control, Communication, Computers, Intelligence, Surveillance, Target Acquisition and Reconnaissance (C4ISTAR) which involves the collection, transmission and processing all information needed by military forces. These complex and integrated technological platforms heavily rely on space technologies among others. As a result, in order to obtain a certain degree of autonomy for CSDP, further investments in technology and R&D is needed, possibly in cooperative frameworks. For instance, future development and deployment of European fleets of UAS will require secure and redundant communication hardware and software. In fact, UAS rely on communications and satellite bandwidth both for control of the plane and for transmission of information to networked vehicles and systems as well as to facilities on the theatre. Solutions in this sense might also involve commercial procurement, but in general innovative and emerging technologies (i.e. data relay systems or space-based radar for moving objects detection) need to be supported by R&D budgets.

Even when considering lower intensity EU operations there persist some setbacks. The EUFOR Chad/RCA mission, conducted in close collaboration with, and handed over to the UN, was characterized by a number of weaknesses. In particular, it was reported the lack of high quality and

secure communications (for instance EU-UN command handover was managed through mobile phones), detailed local maps, and imagery and signal intelligence[61].

Space-based intelligence (SIGINT/ELINT) can be particularly valuable not only for Libya-like scenarios or the fight against terrorism, but even for lower intensity operations such as humanitarian assistance and protection of refugees camps (like in Chad). In this field concrete work has been carried out by France (CERISE, CLEMENTINE, ESSAIM, ELISA) and is now open to other countries for further evolution towards an operational system (CERES). To date, Greece and Sweden are involved in the in the design phase of this project.

The rationale for further investments in space assets for security and defence purposes rests on an effective and coherent CSDP as well as on clear requirements accordingly defined. CSDP appears today to be characterized by a strategic vision still in progress, by budgetary constraints imposed by the economic and financial crisis, and by the institutional adaptation derived by the entry into force of the Lisbon Treaty. In addition, provisions such as the permanent structured cooperation have not been taken into account to foster capabilities development and political consensus was not reached neither over a common EU position on Libya, nor over a military intervention in the country. On the contrary, it appears that bilateral agreements and coalitions of the willing were privileged. As a result, it is perceived that the influence of national interests on CFSP/CSDP is not yet overcome, thereby limiting EU concerted action. The definition of a foreign policy strategy and a White Paper for security and defence as proposed by the EP, beside providing clear orientations on both CFSP/CSDP, would surely also allow to maximize the utility of space assets in the context of CSDP and to address specific space capability gaps with adequate investments and development programmes.

As it emerged from the analysis space assets can support a wide range of complex needs arising from CSPD civilian and military missions. As a result, the EU should not miss the opportunity to maximize their use and develop the necessary additional technologies to fill the existing capability gaps. Based on its powers, the EP can contribute to this goal, therefore some recommendations are proposed.

Recommendation 1:

The EP's budgetary power will have a significant influence on the adoption of the MFF during the budget negotiations with the Council. The EP should therefore continue to support European space initiatives and investments, in particular those related to European security and defence. Such support allowed in 2008 to fund Galileo out of the EU budget, thereby assuring its continuation and avoiding to make previous investments fruitless. It is recommended to maintain a similar and firm position in order to provide the necessary funds for GMES, currently set out of the MFF, while also securing those proposed for Galileo by the EC. This EP's commitment could ensure the political and financial continuity necessary to a coherent European space policy in support of CSPD.

Recommendation 2:

In line with the views and concepts expressed in the EP's resolution on Space and Security (2008), the Subcommittee on Security and Defence could undertake an own initiative report to submit to the Parliament a motion for a resolution. The adoption of a new resolution would reinforce the case for the

[61] See D. Helly, *Lessons from EUFOR Tchad/RCA*, EUISS Seminar, 18 March 2010, http://www.iss.europa.eu/uploads/media/Lessons_from_EUFOR_Tchad_Report.pdf

use and development of space-based applications in the context of CSDP. In fact, in a time in which CSDP has lost momentum and EU funding for GMES is put at risk, it would be important to bring back space and CSDP high on the agenda. In addition, in the EP's regular reports on CSDP it could be considered, where appropriated, to include a specific paragraph on space and CSDP, highlighting progresses, addressing capabilities gaps, and promoting further cooperation among European space and security actors to invest in new technologies.

Recommendation 3:

It is recommended that the next EU's Speakers Conference makes all the efforts to establish a new interparliamentary conference. Beside increasing democratic legitimacy and accountability in CSDP, it would also contribute to the diffusion of awareness on the use of space in the context of CSDP. Before the dissolution of the European Security and Defence Assembly (ESDA)/ Assembly of WEU, space was the focus of its biannual Reports, even on the most specific and narrow aspects (i.e. ELINT, SSA, MUSIS, etc.). Space is pretty much an "unknown frontier" to many members of national parliaments and to the general public, thus the development and use of space-based applications for security and defence could be misunderstood or downplayed. The establishment of a new interparliamentary conference may, therefore, strengthen the information exchange essential for a better comprehension and knowledge of the use of space assets for CSDP.

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