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# Space integrated services to face new security and defence challenges

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## Abstract

In the context of ever-increasing globalization, security and defence strategies become inextricably linked. Global threats and new vulnerabilities up come. A boost in the number of crisis, crisis of different nature (natural disasters, technological accidents, complex man made crisis) that occur anywhere, emerging risks. The concept of threat is changing from a physical enemy to be fought by weapons, to an insecurity permanent feeling impacting the daily life of citizens. Defence becomes a part of a whole security strategy. This evolution entails an integrated approach involving different actors from military and civil contexts. Integration and interoperability are also concepts to be taken into account in the current context of financial crisis for the development of capabilities.

Space systems have been playing an essential role in the security and defence domain, at strategic, tactical and operational level. When different technologies are integrated, higher performance products and services are obtained and a wider spectrum of applications can be generated.

Integration can be performed at different level: while added value products can be obtained with the combination of data acquired by sources operating in different environments such as ground, sea, air and space, or by different space technologies (Earth Observation, Navigation), integrated services (or applications) are obtained by combining different systems .

Why is integration so important to face the new aspects of security? Within the core institutional use, integration brings more efficiency and provide services unobtainable otherwise (added value for more reliable information, surveillance of remote areas, crisis response). Within the emergent risks, integration provides “cost –effective” solutions to new users.

Far from being exhaustive, the article gives an overview of the different applications domains, the current developments and trends. Considerations apply to the European context as well as projects and programs given as examples.

## 1. The evolved concept of security

The flows of trade and investment, the development of technology and the spread of democracy have brought prosperity and freedom to many people, while others have perceived globalization as a cause of frustration and injustice. In much of the developing world, poverty and diseases rise up to security concerns, and in many cases economic failure is linked to political problems and violent conflict.

If on one hand the geographical European area is more stable than in the nineties, security threats raise from instable neighbors, transnational phenomena and from sectors with new aspects of security such as energy, cyberspace, water, piracy and natural disasters. Less conventional threats can arise from afar and can affect security at home. These dangers include attacks, terrorist strikes, drug trafficking, cyber assaults or the unlawful disruption of critical supply lines. The exploitation of the environment, of its natural resources and of the renewable energies also appears as new vulnerabilities both at single state and at worldwide level. Moreover the number of civil crisis (environmental natural disasters, technological accidents, and complex man made emergencies) is increasing.

The European and "occidental" security actors have today important challenges: the contribution to the international stability, including the management of its brutal degradation, the management of crisis occurring far from home, the protection of the citizens and critical infrastructures.

These challenges imply the involvement of a high diversity of actors. The situations are no more military "sensu stricto", they are multidimensional, more complex, unpredictable and with interlinked threats. Very often crisis occur in fragile States and Occidental countries intervene within a multinational framework that involves military and civil actors, International Organisations, Non Governmental Organisations (NGO) and private companies. The relationships between these actors are not yet organised nor formalised but a coherent and comprehensive approach has to be sought to integrate diplomacy, commercial, development and humanitarian actions together with police, justice and defence. At national level, governments are redefining their national and international security strategies and crisis and security units are created at interministerial level. The international implications of the phenomena go far beyond national borders, therefore bilateral, multilateral and regional patterns of cooperation have also been developed. This also occurs at European level. With the endorsement by the European Council in December 2003 of the European Security Strategy (ESS), European Union (EU) Member States committed to give the European Union the tools to contribute to its security and stability. The European Council, its General Secretariat and the European Defence Agency all play a significant role in the delivery of Europe's security policy, and the European Commission plays an equally important role through its various policies. EU processes have been rationalised to take into account the commonalities between civil and military capabilities and operations, reflecting the political will for a more integrated approach and for an increase of the European crisis response.

The development of adequate capabilities must take into account different elements, conditions and requirements:

- unpredictable crisis →  
the need to give priority to permanent surveillance, prevention and

anticipation the need for increasing responsiveness

- crisis occurring on a global scale →  
the need for remote wide areas mapping and operational support far from home
- the increasing integration of actors and budget constraints →  
the need of interoperability  
the need of sharing information among partners
- emerging risks →  
the need for cost effective innovative solutions applied to new domains such as energy, transportation, and generally to the security for the life and health of citizens and to of critical infrastructures

## **2. The benefits of space assets**

In all these areas space assets play a major role. Satellites do not perform tasks which cannot be performed otherwise. However they can achieve similar goals with different characteristics and by providing some unique benefits. They provide observation capacities which are non-intrusive, discrete, all weather; night and day, in stable conditions and in a legal context of any place of interest on the globe, with a regular updating (low orbit satellites) or a permanent monitoring (geostationary satellites). 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, population's flows/border migration, and damages, to the definition and targeting of military objectives during combat operations<sup>1</sup>. Space Telecommunications and telecasting complement and back up ground telecom infrastructures (fixed, mobile, diffusion, multimedia applications for telemedicine, remote assistance and remote consultation). They are essential because of their capacity to cover most of the world and to immediately replace services that are not available or destroyed (ground networks, mobile phones, etc.). In addition, they constitute the backbone of Command and Control functions, making them more efficient and secure through encryption. The Navigation, localisation and timing services support air, sea and ground transportation. They influence the tempo of the operations while integrated in the arm systems since their conception. Today, the United States Global Positioning System (GPS) signal is embedded into many aspects of European armed and security forces. The development of Galileo will enable European military and civilian users to rely on an independent capability. The most significant Galileo services for security and defence will be the Public Regulated Service (PRS) and

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<sup>1</sup> 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).

In a Common Security Defence Policy 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.

the Search and Rescue (SAR). 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, while SAR will also represent Europe's contribution to the international cooperative effort for humanitarian search and rescue activities worldwide. Electronic and signal intelligence (ELINT/SIGINT) allows acquiring and recording radio and radar transmissions. These capabilities can prove extremely useful in out-of-area operations. Connected to SIGINT and ELINT is early warning, a space-based capability allowing to detect and locate ballistic missile launches (intercontinental and medium range).

### **3. Integration for improved performances**

When different technologies are integrated, higher performances in products and services are obtained. The last decade has seen the development of increasingly diverse satellite applications, driven by ever more sophisticated user needs and by strong technological innovation across satellite, ground segments and terminals. One consequence has been a trend from the model of applications that were based on a single system operating in isolation towards customer requirements that can only be met by applications which work across two or more different types of satellite missions, and across different types of systems: space, aircraft, ground and sea. Some examples are given.

Integration of space and ground information data provides more reliable and fruitful information to evaluate and monitor sensitive situations and crisis.

Crisis occur on a global scale and integrated space capabilities are unavoidable when risks and interventions occur in remote and wide areas. The use of UAV remote piloted via satellite allow safer and less expensive missions for surveillance of dangerous areas. Surveillance of dangerous but also wide and remote areas such as deep sea can benefit from the use of integrated technologies. The MARISS project is an examples of space and non-space technologies integration applied to maritime surveillance and safety It is based on the integration of multiple space systems (SatCom, SatNav and EO), terrestrial assets (radar) and the Automatic Identification System (AIS) for the provision of services in the domain of maritime security. Sea is also an environment where most of all an integrated and shared surveillance is possible and has benefits for the actors involved. Sea is a “no rights “ environment, the sovereignty gives room to cooperation more easily than in other contexts. Different initiatives are carried out at European level for more efficient operations and reduced operating costs. The BluemassMed pilot project which focuses on the Mediterranean area, aims at providing a Common Information Sharing Environment to 37 public administrations out of six nations. Space capabilities, for their intrinsic technical characteristics (providing services overarching country borders and of dual use), are best suited to be exploited by various authorities, both within and across nations, supporting the integrated approach of the users. In the same line is the concept of “Network Enabled Capabilities” 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. In this respect, SATCOM constitute the necessary communications’ infrastructure for NEC capabilities at strategic level, and also play an important role at tactical level, speeding up the military decision making process, and make the Armed

Forces more efficient and effective in performing the whole spectrum of military operations. Another example of the effort to interoperate between partners is the MULTinational Space based Imaging System (MUSIS) which should replace the existing national Earth Observation systems in a common framework. The joint inter governmental effort for cooperation of France, Italy, Belgium, Germany, Greece , Spain, recently joined by Sweden and Poland, envisages the interoperability of all ground segments of the space missions involved involved for a straightforward mutual access to the assets, while the partners continue to develop their own space components on national basis (defence and dual use assets). Security also concerns daily life of the citizens and as well as critical infrastructures. Integration of Earth Observation, Telecommunication and Navigation technologies can provide innovative solutions for the management of complex energy grids, for the management of fleet, for the support of persons mobility with real-time and face-to-face communication all over the globe.

The examples above show that integration can be performed at different level but today the effort is still put “at posteriori”, on the ground segment, since each mission is conceived individually. The complexity of the nowadays crisis however calls for an increasing integration of the actors. Their operations could benefit in terms of efficiency from a more integrated approach occurring at an earliest stage, in the phase of the definition of the systems, taking into account the operational requirements of a wide variety of users, including interoperability between different space and non-space systems. This would increase system responsiveness and service provision efficiency which are needs that civil security and defence actors have expressed in various fora.

#### **4. Conclusions**

Space assets can play a fundamental role in security and defence applications. While individual space applications (Earth Observation, satellite navigation and satellite telecommunications), alone can play a major role, it is the combination of different space and non space technologies that bring unique benefits in terms of information content, surveillance autonomy, crisis responsiveness, information sharing and costs effective innovative solutions.

Being dual by its nature, space represents one of the capacities that are “mature” to be approached at European level in terms of Common Security and Defence Policy. A real integrated approach should result overall into a cost effective and more efficient development of services and infrastructures. But it is a long process which goes step by step and deeply depends on the concrete political will. Defence is still at the heart of national sovereignty however the cuts in public spending might make things move. It is envisageable a mixed system of systems where both national and common infrastructures interoperate, according to their respective rules. The process is on going as demonstrated by the recent Communication from the Commission to the European Parliament, The Council, The European economic and social committee and the Committee of the Regions “Towards a more competitive and efficient and security sector”.

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