REPORT OF THE PANEL OF EXPERTS

ON SPACE AND SECURITY

March 2005

Document Details

Client:	EC
Client Reference:	Space and security panel of experts
Project Number:	200446
Report Title:	
Report Reference:	
Issue Date:	March 1st 2005
Issue:	1.12
SPASEC Working Group leaders:	
Operational requirements:	Umberto Giovine
Capability gap:	Col. Yves Blin
Programme options:	Gerhard Brauer
Financial planning:	Willy Tack
EC Co-ordinator	Vincent Metten
Rapporteur:	Mike Dillon

Contents

Foreword

Improving the security of human beings is one of the most important contributions which space technologies and services can offer. Space, a strategic and multiple-use technology by nature, is a key instrument for a comprehensive approach to security.

An enlarged Europe takes an increasingly important role on the world stage. However, as a Union of 25 states with over 450 million people producing a quarter of the world's Gross Domestic Product (GDP), Europe must now accept a higher level of responsibility. These considerations, along with the clarification of EU competences in the areas of space and security in the Constitutional Treaty, demonstrate why the input of the Space and Security Pane of experts is valuable to the work of the Commission.

The magnitude 9 earthquake and subsequent tsunami disaster that ravaged Indonesia, Sri Lanka, India, Thailand, the Maldives, and as far west as Somalia has been recognised by the United Nations as "the worst natural disaster in recent history". Satellite technologies have played a key role in assessing tsunami damage as well as boosting relief and aid efforts. However, integrated monitoring and communications systems, combining satellite and terrestrial technologies on an operational basis, have the potential to reduce loss of life, assets, and natural resources arising from future such events. The European initiative Global Monitoring for Environment and Security (GMES) will make a major contribution to the establishment of such systems.

The General Affairs Council (7th January 2005) tasked the European Commission to evaluate the advantages of establishing a European voluntary humanitarian aid corps. I shall invite my colleagues to take this Report into account and to identify the role space based assets can play to support this potential force.

I would like sincerely to thank all the members of the Panel of Experts who participated in this exercise. The diversity of the experts gathered in this unique group allowed the identification of collective needs of different users in the fields of border monitoring, anti-fraud, transport, air control, civil protection, justice, defence.

The Panel, whose primary mission was to deliver a Report on Space and Security issues, has made a preliminary assessment of European security needs from space. Even though further work is necessary to detail the identified needs and to translate them into requirements, this Report is a significant step forward in planning for information independence and raising awareness regarding the current capability gap.

The Report formulates concrete recommendations which represent significant inputs for the elaboration of the future European Space Programme to be presented to the European Space Council.

It offers a meaningful basis for Europe to move forward into the new era of support for the enhanced security by effective usage of the space based capability developed over the last 30 years.

The Global Monitoring for Environment and Security (GMES) and GALILEO navigation satellite programmes are good examples of initiatives that will help Europe to build a coherent, efficient and strong space policy in support of many other EU policies and objectives, in particular the Common Foreign Security Policy (CFSP) and European Security Defence Policy (ESDP). Space technologies must play a key role in assisting the police, emergency response services, armed forces and agencies supporting humanitarian relief efforts to respond, for example, more effectively to natural disasters, especially those which occur rapidly, or terrorist attacks.

As Europe moves into a new era of responsibility concerning space activities, it is clear that security is a central issue for policy makers. This report reinforces the importance of space in achieving long-term European objectives in this critical area.

It is time for the European Union to play a much greater role in international security. Space is a unique tool to help achieve this strategic goal and this report points the way to ensure that it makes that contribution.

Günter Verheugen

1. The SPASEC Panel of Experts

In June 2004 the Space and Security Panel of Experts (SPASEC) was convened by the EC with participation from:

- EU member states
- European Commission Directorate General and Services (European Anti-Fraud Office, Energy and Transport, Enterprise, Environment, Information Society, Joint Research Centre, Justice, Freedom and Security, Research, Humanitarian Aid Office, External Relations)
- European Space Agency (ESA)
- National space agencies: Agenzia Spaziale Italiana (ASI), British National Space Centre (BNSC), Centro para el Desarrollo Tecnologico Industrial (CDTI), Centre National d'Etudes Spatiales (CNES), Deutsches Zentrum für Luft- und Raumfahrt (DLR).
- Eumetsat
- EU Satellite Centre
- Eurocontrol
- OCCAR (Organization for Joint Armament Co-operation)
- Global Monitoring for Environment and Security (GMES) advisory council
- European Capability Action Plan (ECAP) Space Assets Group
- Common European Priority Area (CEPA 9: Satellite Surveillance & Military Space Technology)
- Eurospace
- NAVOBS (network of SME's)
- European Satellite Operators Association (ESOA)
- Secretariat General of the Council (Observers))
- European Defence Agency (Obervers)

The primary mission of the Panel of Experts was to provide the Commission with a Report on the security issues raised in the White Paper on European Space Policy. This technical work would, in particular, appraise capabilities identified by operational groups and users, define synergies, and make proposals for inclusion in the European Space Programme. This report covers the preliminary assessment of those issues as a contribution to the future European space programme to be established early in 2005.

The panel considered issues relating to both civil and military security, response to terrorism, natural disasters, especially those which occur rapidly such as earthquakes and tsunamis, industrial accidents and shared threats to be within scope of its work. A number of user needs were identified together with a set of requirements to meet them. Existing systems were then considered to identify the gaps between perceived requirements and current capability. The identified needs and requirements form a comprehensive list of possible needs and requirements in this field. Ground based alternatives have not been systematically explored and no priorities have been determined or agreed among experts. Further discussion and decision-making among member states is needed to determine which actually qualify as agreed needs or requirements.

The terms of reference for the panel are included in appendix D.

2. The New Security Environment

The global security environment has undergone dramatic, fundamental and profound change in recent years. The threats of today have a completely different shape, direction and pace when compared to those of the cold war era. Europe, along with the rest of the world, faces threats with greater diversity, unseen command structures and business-like financing mechanisms.

The ready availability of technology to well financed groups who are willing to use unlimited violence to inflict massive casualties means that the technological edge that gave many developed countries a feeling of security has been significantly eroded. This means that Europe must re-evaluate how it protects its citizens with today's assets and also how it develops both the assets and operating procedures in order to keep pace with the ever changing threat. In this environment no single country is able to tackle such complex problems on its own.

Many member states are actively pursuing "Homeland Security" programmes but even these need to be considered in a collective way. Without multilateral co-operation, terrorists have the advantage in the battle for internal security of the Union. For scenarios which meet a common need, EU member States should plan collaborative efforts in order to share the costs of space-based assets. This can only be achieved if common needs and requirements are clearly identified.

It has long been the case security authorities of all types have acknowledged that information is key to defeating the enemy. The new environment has created not just a greater need for information but more importantly, a greater need to share that information with effective controls over access. This is the single biggest challenge facing the security authorities of Europe today.

Paradoxically, this means that control and reliability of information can only be achieved by collaborative operations across multiple agencies and boundaries which have previously acted like firewalls. These issues create a need to change the dynamic for policing and cross border control aspects of security. They are mirrored by the same need for radical rethink of information management for the joint and combined operations which are now the key characteristic of the expeditionary actions which European forces may undertake.

3. Sources of threat

The European Security Strategy[1] identifies the key sources of threat for us to consider. These are:

- **Terrorism:** groups are well resourced, network enabled and willing to use unlimited violence for maximum casualties. Europe is both target and base for such terrorists. Concerted European action is indispensable.

- **Proliferation of weapons of mass destruction:** potentially the greatest threat to our security. The spread of missile technology (with evidence of collaborative efforts across several states) adds a further element of instability and could pose increasing risk.

- **Regional conflicts:** can pose both direct and indirect threats to European interests and lead to extremism, terrorism and state failure. Tackling new threats is often achieved by dealing with older problems.

- **State failure:** bad governance and civil conflict corrode states from within. Collapse of states can be associated with obvious threats such as organised crime or terrorism which impacts both global governance and regional stability.

- **Organised crime:** Europe is a prime target for organised crime. This threat to internal security has important external dimensions with cross border trafficking in drugs, women, illegal immigrants and weapons.

Terrorism and organised crime are also identified in The Hague Programme[2] as important issues and an action plan will soon be finalised presenting concrete measures on how to achieve the goals of The Hague Programme.

In its wider definition, security refers to combating all threats that might affect our population, our institutions, our environment, our economic infrastructure and socio-economic interests. Many threats are man-made as listed above, but the impact of major natural catastrophes should not be underestimated. The terrible example of the Asian Tsunami of 26.12.2004 showed that it the developments of early warning and crisis management tools for natural disasters are also crucial.

At the heart of the European Security Strategy is the need to think globally and act locally. This philosophy is inherent in the three strategic objectives identified in the paper:

- **Addressing the objectives:** distant threats are as much a concern as those near at hand since the first line of defence will often be abroad. The new threats are dynamic which implies the need for readiness to act before a crisis occurs. Since none of these threats are purely military they cannot be handled by military means alone.

– [1] European Security Strategy, J. Solana, Dec. 2003, "A Secure Europe in a Better World".

– [2] The Hague Programme strengthening Freedom, Security and Justice in the European Union, Presidency conclusions of the European Council of 4/5 November 2004, 14292/1/04, REV 1 annex I.

- **Building security in our neighbourhood:** Our borders must be well governed. Europe should consolidate our achievements in the Balkans and promote a ring of democratic and stable countries to the East of the European Union and on the borders of the Mediterranean.

- **International order based on effective multilateralism:** security and prosperity depend upon an effective multilateralism. Strengthening the UN is a priority and the transatlantic relationship is one of the core elements of the international system with NATO as an important expression of this relationship.

The policy implications of this strategic thinking are that Europe needs to be:

More active in pursuing strategic objectives: this applies to the full spectrum of instruments for crisis management and conflict prevention. Active policies are needed to counter dynamic threats with the capability for preventative engagement to avoid serious incidents.

More capable: transformation of our militaries into more flexible, mobile forces focussed on the new threats with more effective use of resources. Systematic use of pooled and shared assets would avoid duplication and increase capabilities. Post crisis situations require greater capacity to bring civilian resources to bear. Common threat assessments are the best basis for common action.

More coherent: the major challenge is to bring greater coherence amongst our various instruments and capabilities including the external activities of member states. Problems are rarely solved on a single country basis.

Working with partners: the common threats that we now face are shared by all of our closest partners so international cooperation is a necessity. The European aim should be to establish an effective and balanced partnership with the USA and seek closer relations with Russia as well as strategic partnerships with those who share our goals and values.

4. Diverse communities, common objectives

The events of September 11th, 2001 and in Madrid on March 11th, 2004 highlighted the fact that the public is at risk in all areas of human activity. Protecting against the type of asymmetric threats which we all now face requires vigilance from an extremely diverse number of communities of interest each with their own particular priorities and objectives. The same groups who would threaten transport services can equally well turn their attention to core infrastructure, energy supplies or financial institutions.

With a common threat facing security agencies across such a wide range of communities of interest there is much to be gained by increased co-operation or collaborative action. However, collaborative action across multiple agencies each with their own operational procedures and processes is notoriously difficult even if it is of such vital importance in the current environment.

The organisations responsible for civil protection in Germany or France have a completely different structure from those in the Netherlands or Spain. Policing or information gathering organisations in larger member states will often have a completely different structure from those in the smaller member states. There is, therefore, a high degree of fragmentation across the large number of organisations and agencies that are responsible for our security across Europe.

More broadly, the global nature of this threat means that Europe must protect its interests both inside and outside our borders. In a recent study report[3] for DG Energy and Transport, the strategic importance to Europe of monitoring the security of our energy supply was highlighted together with the need for a dynamic external trade and foreign and security policy towards certain regions of the world.

With the current commitments to crisis management (Petersberg tasks) and the Headline Goal 2010[4], the overlap between both military and civil security operations becomes ever more important. The advance warning which enables action before a crisis occurs will often be triggered by indicators or information gathered from civil sources just as often as from military ones. Therefore, increased interaction between the activities of both civil and military agencies will be needed in the future. The final resolution for the 6th European Interparliamentary Space Conference underlined that: "…an integrated approach to the development of space applications that use multiple use technology and common (civil and security) standards, is the best guarantee for significant cost-effective collective achievements in the European Space field"[5].

This issue is further complicated by the diversity of structures and procedures amongst security organisations in the new member states. The process of practical integration will derive tremendous benefit from collective action amongst all 25 member states in areas where the satellite community can play an effective part.

Despite the current fragmentation and limited co-ordination between the various agencies responsible for European security they are each tackling the same basic requirements with the same common objectives. Pooling resources and sharing access to core support services which can be established at a pan European level will not only bring cost savings but also efficiency improvements. Targeting those "common" needs and requirements across Europe and providing mechanisms for collective action from the space community is the focus of the SPASEC panel of experts.

4.1 Civil and military interrelationship

Consider the story of change leading to revised balance of effort. The changing shape of the geopolitical landscape brings with it increasing threats from such new forces as international terrorism, organised crime, and the potential for regional conflicts in both civil and military spheres of interest. The protection of Europe's borders could easily become a single focus for our efforts in security. Europe must establish a new balance between the civil and military uses of space[6]. There is little point in concentrating on purely civil applications and ignoring the military requirements or vice versa. Striking this balance effectively will require continued effort as international events unfold.

– [3] Study on Energy Supply Security and Geopolitics Issued in January 2004 by the Clingendael International Energy Programme (CIEP), Institute for International Relations 'Clingendael', The Hague, The Neterlands.

– [4] The *Headline Goal 2010 provides a new framework for the conduct of European military operations and refers to "the development of an EU Space policy by 2006".*

– [5] Final resolution for the 6th European Interparliamentary Space Conference (EISC); Madrid, 10/11 November 2004.

– [6] The need to change the relationship of military-civil capabilities is underlined in the *Human Security Doctrine* presented to Solana the 15 September 2004.

The major space endeavours in Europe over the last thirty years have been primarily focussed on civil and commercial applications. Consequently, the space community does not have a long track record of engagement with the communities of interest serving the security sector (with the noticeable exception of several large Member States where industry has provided synergy between civil and military space activities).
Greater emphasis should therefore be placed on supporting the security authorities of the Union.

Thanks to the past investments of members states through ESA or through their national programmes in civil, military or multiple use systems, the European space industry has reached a significant level of excellence and knowledge which enables it to offer a complete range of capabilities, including a family of launchers, satellites and payloads for all kind of applications, end to end systems, space vehicles and manufacturing, testing and maintenance facilities. As a result, industrial capacity currently exists in European Member States to meet the perceived needs of the European Union for space systems for security missions. Furthermore, due to their inherent large-scale investment, and their common interest, security and defence programmes in particular represent a unique way to foster greater efficiencies at European level and a well developed programme for space and security can help achieve this goal.

4.2 Communities of interest

The communities of interest (COI) active in the security area considered by the panel that could benefit from a range of satellite services are shown in Table 1 below

COMMUNITIES OF INTEREST		MAJOR SECURITY ISSUES
COI1: Law enforcement services	• Customs • Policing • Justice	Cross border control and border surveillance Fight against illegal immigration, Fight against humans/drugs Trafficking Fight against organised crime and fraud Schengen Information System (SIS) Fight against illicit trafficking of small arms and light weapons and proliferation sensitive goods (e.g. WMD) Anti-terrorism, Surveillance of criminals on parole or probation.
COI2: Civil crisis management operators & search and rescue teams	• Medical services • Fire services • Humanitarian aid teams • Civil protection and other emergency teams	Management of natural, technological or epidemiological risks, in a predictive, preventive or response mode. Authorities exist at local/national/regional level and includes a growing community of decision makers at the European level. Examples of benefits to be brought by space capabilities : • Mapping with information on the disasters, health structures, access routes, travels plans; critical infra-structures, epidemiological mapping; tracking and tracing of refugees flows • Low cost and easily deployable telecommunication services for exchange and capitalisation of data • Navigation services for redefining geography of disaster struck areas • Telemedicine applications

COI3: Services operators	COI3A: Services operators already make extensive use of space capabilities: • Transport operators and associated agencies for traffic control (road, rail, aviation, maritime) • Telecommunications • Environmental information systems (environmental observatories; weather forecast; including space systems themselves) COI3B: Service operators with potential benefits from use of space based capabilities: • Energy production and distribution • Water supply • Food Safety • Health Agencies • Economic networks (Banks, Insurance)	The major issue is to ensure the security and availability of critical infrastructures and services, with the objective to make them less vulnerable and more efficient. This concerns all structures or organisations which are very critical to society life cohesion, including (but not only) those for which SPACE is already a core component of their process. A few examples of benefits to be brought by space capabilities • Ensuring the security of all modes of transport with security related specification for access to GNSS information • Undertaking a review of Pan European assets tracking for road, rail, air • Monitoring status of critical industrial infrastructures • Anticipating major meteorological events • Tracking and tracing of food safety • Use of observation space based systems to survey ground energy supply infrastructure • Providing with weather and sea state data for energy consumption and production prevision; • Using GNSS timing capabilities to implement a more reliable management of telecoms or power networks over continental areas. GALILEO will provide additional performance in this respect.
COI4: Political and Military users	• Decision making authorities (national and EU bodies) • Intelligence community • Headquarters (including civil and military planners) • Forces (including Rapid Reaction Battlegroups) • Other international organisations such as UN or NATO	Covering the overlap with military needs where the synergy between both civil and military activities may be provided. This includes crisis management teams

Table 1 Communities of Interest (COI)

4.3 New approaches, new partnerships

As an example of the new approaches and new partnerships which are evolving in response to the current shifts in threat, EUROCONTROL together with EU, the European Civil Aviation Conference (ECAC), EUROPOL, several national police and security authorities, national governments and NATO have been acting in concert to enhance the security of civil aviation and air traffic management (ATM) in Europe. In close co-ordination with NATO and the aviation industry, EUROCONTROL has developed four strategic security initiatives that concern:

- Sharing of civil and military ATM related information
- Creating a focal point for essential civil ATM information
- Improving communications with aircraft including the need for encrypted data
- Reviewing air traffic procedures and training concerning unlawful interference with aircraft

One of these initiatives has resulted in the development and concept validation of the European Regional Renegade Information Dissemination System (ERRIDS). This system is designed to distribute potentially confidential information via encrypted links to member states, the appropriate military community, airlines and other ATM and non ATM authorised users. It uses NATO accredited security communication ground components. A system wide

EUROCONTROL accreditation process may be introduced for implementation. A first live cross border pilot demonstration and evaluation is planned and it is expected to have between 40 and 50 terminals installed across Europe in support of the follow on concept validation.

One of the key issues to be recognised is that the major challenge for ERRIDS is not the technology but harmonisation of different international and national legislation, operating concepts and procedures. ERRIDS creates a "minimum common language" that brings together, in a safe and secure way, the different cultures of organisations and state-specific elements.

Aviation security is primarily a civil issue which needs inputs from all sources and sometimes requires responses from both civil and military communities. The priority is for appropriate means of access control to services with suitable interface standards. Some tasks lend themselves to civil leadership whilst others create the requirement for military leadership. This naturally creates the need for a pragmatic mix of services rather than a single network or set of facilities that are completely integrated at every level.

Satellite technology is being used in EUROCONTROL programmes where it is operationally and economically advantageous. Such programmes could become a useful model for future developments to support CFSP/ESDP initiatives.

Another recent initiative is the European Mobile Wideband Global Link System (MOWGLY) research and development project. The objective is to study the implementation of new appropriate standards for provision of broadband access to users on aircraft, trains and ships.

These initiatives illustrate what is possible given an appropriate degree of cooperation between interested parties in a particular area. Substantial work needs to be done in many other areas to reach the same level of insight.

5. Trends and tactics

In today's environment forces must be rapidly deployable and flexible enough to undertake peacekeeping, humanitarian or military missions with limited infrastructure or local support. Typically these missions will focus on joint and combined operations with multiple partners. In the same way that the military groups must evolve in both their thinking and their concepts of operation so too must the civil security communities.

5.1 The need for radical change

Experience from the Balkans showed that Europe needs to improve its overall capability if it is to meet its objectives for Common Foreign Security Policy (CFSP). Space has a unique role to play not only because of the ability to quickly install essential infrastructure but also because of the ability to configure common systems which protect the assets of partners. Many governments have recognised this and introduced "transformation" programmes to reshape the strategic approach taken all the way from procurement to prosecution of security operations. It is therefore a time for the broader space community to better understand the trends and tactics being employed by both the traditional agencies (and also the new emerging ones) in order to ensure that we make our best contribution to the next phase of development for security in Europe.

During this period of radical change it is the responsibility of the space community to engage with a sufficiently broad range of agencies in defining their new doctrines, operational requirements and programme plans if we wish to make the best of our potential contributions.

This includes the need for the EU to have assured access to reliable information and services, available to the authorities in all member states.

.

5.2 Security drivers

Issues which currently drive thinking in the security domain include:

Pace of change; The most vivid image of the new security environment must surely be the picture of the twin towers in New York. This image touched the world and has left its indelible mark on the start of the twenty first century. As a direct result, the level of common threat to the worldwide aviation community changed the style and spirit of cooperation and improved operational procedures for air travel overnight. Getting "inside the decision cycle" of the opposition is the critical issue for all military planners. This increase in pace creates a real need for focused efforts in shortening the time between gathering information and acting upon it. The fact that the opposition is grouped not by geography or nationality but by association of objective means we cannot organise security in "silos". The cross over between policing, intelligence, humanitarian aid, peacekeeping and military action is increasingly blurred. Managing our response to that characteristic lies at the heart of an effective response.

Need to share data; Such objectives will require major shifts of culture and operating procedures. Therefore the major challenge is how to marshal our resources in a way which enables secure handling of sensitive data across many agencies. This aspect of the new requirement is something which no single country has yet conquered. Regional police forces in many countries are trying to overcome such problems now as are the intelligence services.

Part of the challenge facing Europe today is the task of aggregation of demand for a diverse range of distinct user communities each of whom derives a benefit from the systems or procedures that the threat demands. If the groups active in the civil protection area are to benefit from information, services or investment available to the crisis management community then the European space community needs to establish a new management organisation in which public sector bodies can aggregate demand so that private sector bodies can aggregate supply. This requires a fresh approach to the co-ordination of requirements and capabilities in the space and security area. The recent tsunami disaster identified the urgent need for a management structure to coordinate demand for satellite imagery and the supply and distribution of derived products.

Precision; The importance of precision location has been highlighted in all recent operations. This is best ensured by making use of secure space positioning systems. Such systems are central to network enabled operations. In particular, continuous and precise knowledge of the position of our own personnel (blue force tracking) is essential, e.g. to ensure extraction of monitors in unsafe areas.

Mobility; The fact that areas of conflict are much less predictable means that we must now focus on mobile forces able to provide rapid response virtually anywhere in the world (including civil protection, fire brigade and humanitarian aid). This has changed the dynamic and increased the requirement for well managed and up-to-date geospatial data. Not only is it important to have improved access to the latest map and information but the fusion of data, including imagery, from a number of sources is also becoming a critical issue. Again, this was identified in the recent tsunami disaster, which showed that only the fusion of data from different sensors would allow a partial assessment of the extent and degree of the disaster, which would have been a boost to rescue and relief efforts.

Standards; This increased requirement for a diverse range of data needs a fresh approach to the tasks of acquisition, processing, storage and dissemination of such data. Unfortunately, since many of the relevant systems are based on programmes from individual member states, there is insufficient progress being made with regard to interoperability, standards, data formats. Harmonised standards and operating procedures are critical to cost effective ground segments.

Technology of opposition; The trend is not only for our own systems to become ever more performant but it is also for the ready availability of technology to our opposition. Consequently, the implementation of suitable controls over export and design information is essential.

Protection of critical infrastructure; One of the issues highlighted by the ability of hostile forces to understand and deploy space technology against our forces in recent conflicts is the fundamental need to protect our own space assets and services. This is a very broad ranging issue and includes the need for protection of our basic commercial satellite systems as well as those aimed specifically at the security and defence sector. For example, if the systems such as INMARSAT, EUTELSAT or GALILEO were hit by terrorists then not only would the defence related traffic have problems but there would be serious implications for our commercial and economic well being.

Europe therefore needs to consider the range of protection measures needed to ensure successful operation of both civil and military satellite systems (including defensive anti jam countermeasures). Part of the requirement for protection of assets includes the ability to monitor what is happening in space in order to ensure that we understand whence might originate sources of potential threat.

5.3 The importance of interoperability

In terms of military procurement strategies there is a very clear shift away from the procurement of large platforms towards network enabled capabilities. These are increasingly focussed on the needs of joint and combined forces in which interoperability lies at the heart of the requirement.

Such programmes are also moving away from systems aimed at support for a single service and more towards systems which cut across the traditional boundaries of an army, a navy and an air force. Even where operations are not necessarily "combined" they are increasingly "joint".

Many of these trends are mirrored in the civil protection, policing and fraud prevention communities. Historically, regional police forces operated with high degree of autonomy but increasingly the types of threats considered by the panel of experts has created a real need for police services to be better "joined up" than is traditionally the case (eg project Airwave[7] in UK provides full interconnectivity between all police forces with consideration being given to it's use by fire, ambulance and others).

The on-going INSPIRE (INfrastructure for SPatial InfoRmation in Europe) initiative aims at establishing interoperability between geographic datasets of EU Member States[8]. In several Member States, crisis centres are already connected to national geodata portals federated under INSPIRE for integrated data exchange. Another similar initiative – RESPOND - is an

– [7] Project Airwave is a TETRA based radio system used by Police Forces in UK.

- [8] Draft directive (COM[2004]516 final).presently under co-decision procedure.

alliance of European and International organisations working with the humanitarian community to improve access to maps, satellite imagery and geographic information.

Concepts of operation (Conops) and standard procedures paired with education and training exercises must be a basic foundation for achieving required capability. This of course brings us back to the most difficult questions of all. How do multiple agencies control and manage sensitive data sets across their respective interfaces. The ability to securely update and access data in different "Joint Situation Centres" is a particular challenge for the intelligence community for all types of data.

5.4 Concepts of Operation

The range of mission types of scenarios that must be undertaken by all types of security authorities has increased dramatically because of the diversity of location, opposition, source of threat and appropriate response. Therefore our security authorities need to be able to rapidly adapt their style of operation in both civil and military domains.

Traditionally, the defence community have made significant investments in facilities for war gaming where the chain of command can act out given scenarios to demonstrate operational effectiveness. This thinking evolved into more complex synthetic environments where the precision or levels of simulation facilities took advantage of the rapid evolution of processing capability. Increasingly, civil protection, policing and crisis management teams all need to evolve their concepts of operation to participate in the multi-agency environment of today's security environment.

The ability to use high speed links to connect remote environments offered another dimension to the ability to check through concepts of operation with a mix of service personnel at different sites or even countries. Such capability provides an excellent starting point for harmonising operations across Europe. For the enlargement agenda, there is real merit in using satellite services to provide underpinning infrastructure as part of a demonstration and training capability so that security authorities in both new and existing member states become more familiar with each others concepts of operation or training regimes. Over and above the wargaming, simulation or training considerations, it is important for the space community to understand and anticipate how the concepts of operation for all types of security missions will evolve.

The pace at which these concepts of operation will evolve for the Rapid Reaction Battlegroups will be different from that for cross border control, policing or tracking organised crime.

One of the direct consequences of the networked enabled approach to the "system of systems" thinking is that any asset whether it is a satellite, an unmanned airborne vehicle (UAV) or a more traditional platform are each part of an increasingly integrated system. Therefore, the concepts of operation for satellite based systems must be entirely complementary with those of other parts of the security and defence community.

6. User needs

The SPASEC panel of experts considered a large number of different types of organisations when evaluating their operational needs and requirements. The panel differentiated between the **"needs"** of user groups or communities of interest and the **"requirements"** for systems or services that would be necessary to fulfil those needs.

It is clear that some organisations have clearly defined interests and understand well what role satellite services can play in helping them to achieve their objectives. It is also clear that detailed operational assessments are needed for many of the user communities before operational needs and requirements can be precisely defined. However, this section identifies those needs or requirements which, in the opinion of some panel members, require action today. It was also acknowledged by the panel that the process of developing both needs and requirements is continuously ongoing. The conclusions of this report therefore need to be adapted as time goes by.

6.1 Sources of need

Operational needs and requirements for security authorities come from a wide range of organisations around Europe. Some of these organisations are engaged in **military activities** which are well understood and organised. There is a very clear dividing line between those activities which are undertaken by member states and those which are carried out at European level. The Headline Goal Task Force and the ECAP Project Groups have identified needs and requirements which are still evolving but nevertheless have focussed activities with a high degree of cohesion.

The operational needs and requirements involving the **civil aspects of security** come from a much wider range of organisations. There is a greater diversity and fragmentation in these communities with much less cohesion or cooperative programmes. Within the scope of the SPASEC panel of experts there is, therefore, a limit to how precise we can be about such needs and requirements.

However, the panel established an initial grouping as a working model which includes the following communities of activities:

- **Services:** this includes security aspects of Transport (road, rail, aviation, maritime, inland navigation) inter alia facilitating affordable real time communication on position information and securing the navigation and positioning systems themselves, Energy (surveillance of production and distribution of energy), Environment (including natural disasters and industrial accidents, terrorist attacks e.g. dirty bomb) and Telecommunications (all forms of critical infrastructure).

- **Civil protection and search and rescue operations:** including tasks within the borders or territorial waters of Europe for management of natural and technological risks and disasters.

- **Policing and intelligence:** the shifting pattern of co-operation between agencies both in internal and external related tasks creates new needs and requirements for which space services can provide added value, including early warning, situation awareness, and critical event monitoring.

- **Cross border control and border surveillance:** illegal immigration, organised crime, trafficking of humans/drugs , illicit trafficking of small arms and light weapons as well as goods of proliferation concern (e.g. WMD), and other things have created a real need for greater multi-agency cooperation and efficient use of technology to combat today's set of threats.

- **Crisis management teams:** civilian, military and mixed crisis management operations, both during the crisis prevention phase together with the planning

and conduct of crisis management phases, including early warning, preparedness, and response.

- **Humanitarian aid and international co-operation:** covering both civil and military involvement in specific operations.

6.2 Management of needs

One of the primary difficulties addressed by the panel was the difficulty of **aggregation of needs** for the diverse range of organisations covered by this diverse set of communities.

The communities of interest covered by the stakeholders for the SPASEC panel of experts have a tremendous range of different needs. No single agency spans the complete set of needs, situational awareness or competence. Therefore it is important to establish an effective mechanism for assessment of a multilevel approach to operational needs. This approach must extend to the management or support of implementation programmes which may be established under a common European project team, by multilateral action by groups of member states or alternatively by individual member states in areas where visible activity is made known. A good example of such an approach exists within the GMES programme which has produced much relevant work under the auspices of the GMES Working Group on Security.

The panel of experts discussed potential mechanisms by which a structured approach to this problem could be established. This approach centred on the definition of mission types that would highlight the needs of different groupings of user communities and that for each mission type there would be a number of scenarios each generating their own set of needs. Before such missions and scenarios can be constructed a series of operational effectiveness evaluations need to be carried out for each of the primary communities of interest.

6.3 Information gathering, processing and dissemination

Fundamental to all forms of security operation is the requirement for information gathering, processing and dissemination. In these tasks satellite services have a unique and indispensable role to play in support of each community of interest for situational awareness, support to decision making and undertaking direct operations. Much of this data is in the form of geospatial information as described in a user needs technical note from DG External Relations[9]. Satellite services that provide risk free access to information in denied or hostile areas are required for many phases of operation including:

- **before the occurrence of a crisis**, continuous information derived from different sources, notably from space assets, supports the situational assessment, conflict prevention and decision-making, helps authorities to prepare the adequate measures, it leads to the availability of documented information, ready for use during a possible intervention (police, anti-fraud, civil protection, military, and others)

- **during the crisis management phase**, information gathering from space in a timely manner is a highly valuable tool for:
    - the planning of Crisis Management Operations

[9] Geospatial Information Needs of DG RELEX, Michalis Ketselidis, March 2004.

- assessment of adverse activities within the Area of Responsibility (AOR), including rear zones and lines of communication
- the assessment and evolution of the extent and impact of natural disasters,
- preparation, deployment and conduct of own intervention resources
- humanitarian relief operations, search and rescue operations, including combat rescue
- damage assessment, and situational awareness/assessment
- dynamic evaluation of the success of the intervention
- tracking the movements and emplacements of refugees and vulnerable sectors of the population

- in the framework of **post-crisis operations**, information gathering allows the monitoring of:
  - the implementation and/or the respect of peace/cease-fire agreements,
  - demobilization and disarmament operations,
  - the monitoring of the resettlement of displaced populations
  - implementation of recovery and reconstruction operations

- satellite based information gathering is of great value ensuring **ongoing compliance** with international treaties (proliferation, disarmament)

Requirements for satellite based information gathering encompass different aspects such as:

- geographical environment including border surveillance, types of deployments, locations of and activities at sensitive infrastructures, possible support and/or constraints linked to the populations, local resources
- the capacities of hostile forces, including doctrine, combat structures, procedures and performance of their fighting assets
- the actual forces volumes, combat structures and capabilities including regular military forces, police forces, militia, terrorists, populations/refugees,
- the situation linked to humanitarian and rescue tasks,
- the overall or specific situation to support EU and Third Countries in combating terrorism
- Geographical data (mapping) on relevant theatres.

At the pre-operational and operational stages for Civil Protection, space-based early-warning systems are required for both natural and technological hazards such as volcanic, seismic, and tsunami events, pollutant activities and so on. The architecture of the data network is based on the idea of data sharing and exchange in real time among the hosts as well as the recovery and organisation of all the dataset available in order to support the decisions of the civil protection authorities.

Further, the improvement of technologies and infrastructures for communication and data exchange at different levels and detail should increase the capability of the early-warning system as well as the better integration of ground data and remote data. A relevant issue, involves the availability of the high-resolution satellite data in real-time of damaged areas, pre and post natural or technological event, as “quick” decision support in order to define intervention strategies and rescue resources allocation for civil protection activities. For the particular case of tsunamis, a disaster prevention system could be set up in the Euro-Mediterranean region.

6.4 Primary user needs in support of security policies

The primary user needs identified by the panel[10] in support of security policies are:

N1: **Improved performance** data acquisition with:

- world-wide coverage
- high image quality, including high to very high (one meter or better) spatial resolution electro-optical and radar imagery where appropriate
- all weather night and day observations
- adequate acquisition and frequent revisit times

N2: Improved collection of critical data:

- population (location of people, health statistics, poverty index)
- infrastructure (road, rail, hospitals)
- resources (oil, water, food)
- geography (maps)

N3: Improved production of information and response to user' needs:

- integration of data from different sources, images combined with GIS-generated background data
- rapid data interpretation and integration, as well as visualisation of the information
- off-the-shelf applications to meet users' priority needs
- further analysis of users' needs

N4: Improved access to critical data:

- better interface between users and data providers
- improved access to existing database

N5: Improved dissemination of critical and security information services to diverse user communities:

- Secure communications networks
- More data exchange programmes

N6: Improved interoperability of systems used by various organisations and rescue services in different countries and adequate communication tools.

6.5 Operational needs

The nature and scale of satellite investments frequently make it impossible for individual user groups to cover the full costs themselves. However, when a number of services are combined over a single system, it becomes clear that space can make a major contribution in achieving the effectiveness, efficiencies and synergies called for in the financial perspectives communication[11]. The panel considered the primary needs identified in section 6.4 and identified a set of system and services to satisfy those needs. These are mapped without any prioritisation in Table 2:

[10] Taking into account earlier work of the GMES working group on security.

[11] COM (2004) 487; Communication from the Commission to the Council and European Parliament, Final perspectives 2007-2013.

	N1	N2	N3	N4	N5	N6
S1Satellite communications services		x	x	x	x	X
S2Space based Earth observation services	x	x	x	x		x
S3Space based SIGNAL Intelligence		x	x	x		
S4Space based early warning systems		x			x	x
S5Space based Positioning, Navigation and Timing services		x	x		x	x
S6Space Surveillance systems				x	x	
S7 Harmonisation of operational standards and procedures	x	x	x	x	x	x

Table 2 Needs and servicesmapping

The following sections describe these services/systems and indicate some of the priority issues but further analysis and quantification will be required once a full appraisal of user needs has been conducted.

6.5.1 Satellite communications

Secure communications services are needed for a range of applications. These services are required to support the evolving "network enabled capability" that some member states are developing as well as the more general institutional communications networks required by the transport, policing and information gathering communities. In order to meet these requirements, these systems must ensure:

- a very high level of secure connectivity, an appropriate number of highly responsive and reconfigurable links, connecting headquarters (crisis management centres, police HQ, ISTAR & C2), sensors and the forces deployed in operational areas anywhere in the world (including maritime areas) and ad-hoc operations management centres in Europe

- interoperability with member states, user communities and defence NATO systems

- high data rate communications (bi-directional and multidirectional including videoconferencing) and datacast, between fixed users (decision and operations management centres, headquarters, harbours, airfields, information systems, logistics)

- high to very high data rate interconnections between space-based, aerial, maritime and terrestrial sensors, platforms and assets and monitoring "existing communication" networks and instrumentation, including information systems and early warning systems; apt and robust communications to relay information from early warning centre to population at risk is also critical

- low to medium data rate communications between mobile terminals (handheld, ground vehicle mounted, aerial platforms) and between mobile and fixed terminals

- Wide band air to ground communications for which it is clear that operational users need such services on a highly reliable basis but with real cost effective solutions that are affordable to a wide range of user categories. The user ground segment must ensure high reliability and availability with terrestrial telecommunication infrastructure.

6.5.2 Space-based Earth observation

Earth observation systems are needed to support geographic information for strategic applications. They must provide accurate weather and sea state data in particular in areas of interest. After image analysis either by interpreters or using automatic processes, space-based Earth observation systems must provide:

- detection and characterisation of any related civilian, industrial, natural or military activity

- analysis of the evolution of a crisis situation, specific environment or infrastructure

- a contribution to dossiers for analysis at political, strategic, operative or tactical levels in order to support the decision making process and any kind of related operations

- geospatial-products (topographic maps, digital elevation data)

- weather and sea state forecast (e.g. to be able to improve natural hazard forecasts).

The Earth observation space segment must:

- include the appropriate sensors

- provide worldwide coverage

- be as flexible and robust as possible in order to provide timely information on dedicated areas of interest

- be protected against jamming and deception actions

- ensure the availability, the security and the integrity of the imagery data

Taking into account that the effectiveness of Earth observation systems is strongly dependent on the architectural design, user ground segments must be designed to:

- maximise the information gathering capacity through the timely co-ordinated use of all existing types of sensors

- integrate any new space asset without excessive modification

- ensure the availability, the security and the integrity of the imagery data

In the absence of an agreed ESDP surveillance requirement, the SPASEC panel has not made a comprehensive review of the common European surveillance requirements although this

step is seen as a priority action. Work on these ESDP requirements is ongoing in the framework of the ECAP project group on space assets. However, much good work has already been done in the framework of the GMES and BOC initiatives identified in section 8.

6.5.3 Space-based signal intelligence

Some members of the panel felt that there is a need for an autonomous worldwide Signal Intelligence capability. Signal Intelligence systems make use of an adversary's electromagnetic broadcasts to obtain intelligence and are required to provide:

- the characterisation and the location of telecommunications and radar systems [12]
- access to the content of the communications to obtain information on documentation/content, situation and action[13]

As a key element for information gathering multiple space-based systems are required for:

- the monitoring of potentially hostile activities
- the detection and characterisation of related human activity
- the support of counter-terrorism operations
- the detection of emitters with a high degree of accuracy

6.5.4 Space-based early warning systems

Some members of the panel felt there is a need for an early warning space capability which would provide worldwide, timely detection of missile firings from assets placed in highly-elliptical or geostationary orbits. Early warning satellites are mainly used for the launch detection of ballistic strategic (intercontinental) and medium range missiles.

During crisis operations, space-based early warning systems are required to:

- alert the forces and national authorities of an incoming threat, providing impact prediction information (time and location) of the strike to enable passive defence and the use of protection measures
- cue counterforce actions against the incoming missiles and counterforce actions against hostile launch capabilities;
- locate the launch site with a sufficient precision to allow the identification of the aggressor and provide evidence to high level decision makers.

In a pre-crisis situation, these systems are required to:

– [12] more specific for military applications.

– [13] dual use nature, especially in law enforcement activities as fight against terrorism or organised crime (e.g. monitoring telephonic conversation)

- monitor the activities of potentially proliferating countries (missile development activities, frequency of test firings)
- measure the performance and characteristics of the missiles being tested
- determine the signature of these missiles
- monitor and detect hostile launches even when EU countries are not involved.

6.5.5 Space-based Positioning-Navigation-Timing

GALILEO is a civil navigation satellite programme under civil control, in comparison with other Global Navigation Satellite Systems (GNSS) which have been designed in the late sixties for military applications. It will provide positioning, navigation and timing signals on a global scale.

Out of its five different services, the GALILEO public regulated service (PRS), encrypted and resistant to jamming and interference, is reserved principally for the public authorities responsible for civil protection, national security and law enforcement which demand a high level of continuity. It enables secured applications to be developed in the European Union.

Security aspects of GALILEO will be managed by the European GNSS Supervisory Authority[14] on the establishment of structures for the management of the European satellite radio-navigation programmes.

A Council Joint Action has also been approved in July 2004 on aspects of the operation of the European satellite radio-navigation system affecting the security of the European Union[15] .

It is noted that the European Commission, with the help of the GALILEO Supervisory Authority, will propose to Council a policy of access to PRS in 2005. The financing of the deployment and commercial operating phase should include a financial contribution of the European Union for the period 2007 to 2013 to be defined in the context of the financial perspectives.

GPS system is the current base of development of European applications and services on the field of Navigation and Timing. However the availability of EGNOS[16], which increases the quality of GPS services fosters the development of new applications. EU has launched numerous pilot projects to emulate those new markets..

The location information, that GPS/EGNOS and GALILEO provide, needs to be completed. It is necessary to couple it with a data base (cartography, logistic, control and command, emergency). The combination of the most recent Information Communication Technologies (ICT) with the navigation satellites signals will be the key of the success of Security applications. Mastering the combination of ICT and SatNav is an asset for Europe.

– [14] as per COUNCIL REGULATION (EC) No 1321/2004 of 12 July 2004

– [15] Reference: 2004/552/CFSP, 12/07/2004

– [16] European Geostationary Navigation Overlay Service

6.5.6 Space surveillance system

The growing importance of space to every facet of life in Europe means that protection of our space asset is a fundamental need. Therefore, there is a need for a sufficiently independent European space surveillance system to:

- acquire and maintain a sufficient knowledge of the environment in space in order to safeguard the functional capabilities of any European satellite assets
- monitor European satellites in order to detect any damaging risk due to either aggression or collision with debris
- characterise any threat to these satellites
- observe and possibly forecast space weather[17] in order to protect own space-based assets
- verify the application of international treaties in outer space
- participate in the strategic evaluation of technological and operational capabilities of other countries/organisations;
- provide decision makers with pertinent information regarding the situation in space within the decision process or the planning/conducting of operations

The space surveillance system could provide information concerning:

- the main characteristics of satellites (e.g. orbital parameters, activity status)
- the main characteristics of potentially threatening debris (e.g. trajectory, physical parameters)
- pertinent information related to space weather and Near Earth Objects (NEO).

Quasi-real time responsiveness is required for all operations related to atmospheric re-entry of satellites or debris.

ESA is currently examining options for providing a space surveillance capability.

6.5.7 Harmonisation of standards and operating procedures

One of the overriding needs of the user communities is the easy integration of satellite services into their existing activities without the need to re-design interfaces for each proprietary system. Interoperability is critical for efficient systems for European security and defence applications.

The tradition of using systems developed under member states programmes as a contribution to pan-European efforts has created a number of interoperability issues in the past. Therefore, there is an urgent need to take stock of the security related projects which will be undertaken

[17] E.g. solar activities.

in the coming years and ensure that an appropriate set of standards, procedures and concepts of operation are built into the programme development stages at the outset.

This initiative will have a large impact on the development and operation of ground segments but will also impact space segment designs as well.

The interoperability or standardisation must be achieved at the level of ordering and product formatting for Earth observation data as well as at the level of information management (e.g. cross calibration between similar sensors and similar satellites to make data fusion possible). The highly successful CCSDS (Consultative Committee on Space Data Standards) initiative could be a suitable model for future efforts. The standards were based on civil developments but were later adapted for security applications.

A table “Space Systems Needs and Scenarios Matrix” is given in Appendix A.

7. Cross Cutting issues

There are several cross cutting issues which must be addressed if Europe is to make effective use of its capability in the security and defence field. There is a clear need both to establish new structures and also to better harmonise existing ones if we are to maximise our effectiveness. The following points cover some of the key issues considered by the SPASEC panel of experts.

Security and Defence Doctrine; the expected nature of engagement is based on collective action in some form of joint and coalition activities. This applies to operations at all levels of crisis management in both civil and military spheres. A recent study on European Defence by the European Institute for Security Studies spells out the need for a "doctrine centre" and for developing a real culture, to the point of suggesting the birth of a European Defence College.

Even if this is a long way off, then at least a body of practical knowledge and of accepted procedures should be established. The evolution of new and existing institutional structures will take time. However, the cornerstone of our thinking is that Europe should establish a clear security and defence doctrine based on the perceived needs of Europe.

Interoperability; this is not just a buzz word, it is the word. Interoperability between communities of interest within Europe is seen to be essential. This increasingly means interoperability of command structures as well as network protocols. Europe should evolve its own view of network enabled capability and ensure that researchers, development teams and the operational users are all clear about the vision that this embodies.

Standards; Europe has an outstanding track record of cooperation based upon common standards. The success of the GSM standard is the most outstanding demonstration of that. Many member states actively employ European standards such as CCSDS, DVB or NATO STANAGS which in themselves are evolving. Standards are the cornerstone upon which equipment manufacturers are able to provide cost effective solutions.

Operational Requirements Management; with such a diversity of user communities in an environment of continuous institutional change the task of identifying common operational needs and then managing the operational requirements to meet those needs is one of the most challenging aspects to the implementation of security policies (including CFSP/ESDP). However, the aggregation of demand by public sector agencies coupled with coordinated supply from the private sector is the essence of success in an environment with limited resource.

The range of mission types with the natural groupings of communities of interest mean that no single organisation is likely to tackle this in the coming decade. Therefore, a special action of cooperation in space between agencies that are credible for individual groupings of requirement should be at the heart of the management process.

Regulatory, Spectrum management and frequency coordination; the various forms of security service in Europe are equipped with an extremely wide range of assets that make use of the electromagnetic spectrum. Adequate access to the radio spectrum by these services is therefore key to fully exploiting operational capabilities. Radio communications systems, radar and weapons control devices, radio navigation aids and identification systems operate on land, at sea and in the air.

Many of these systems have conflicting requirements for the allocation of radio spectrum. Cooperation with activities such as NATO standardisation and coordination of common frequency allocations is essential to ensure interoperability among multinational forces in peacekeeping missions or humanitarian aid. International cooperation in this area is not a nicety it is an absolute necessity.

The Commission is seeking to support and to balance the radio spectrum requirements of all Community policies. Tackling the fragmentation of the radio spectrum in Europe improves the interoperability of all sectors using wireless equipment, including in the security domain. The legal basis for the harmonisation of frequencies in the European Union is the Radio Spectrum Decision, 676/2002/EC.

Legal issues; there are a large number of legal issues to be addressed in each of the areas of security operation. These range from the conditions for communications interception through to special investigative methods in administration or criminal investigations. These are areas with which the traditional space community has generally not had to concern itself. However, there is a real need for interaction between the space community and the public sector agencies responsible for management of the operational requirements and those charged with implementation of the resultant programmes.

Export controls/design control; the EU like USA belongs to the same export control regimes which define items for which export controls apply and has adopted binding regulation on export controls of dual use technologies. EU is very vigilant that export controls are efficient and proportionate.

Data policy issues; EO satellites will provide data with high spatial resolution to commercial markets, to the scientific community, and to users. Data distribution has to follow a reliable and transparent policy. The earth observation data policy will be applicable to all data providers exploiting advanced satellite remote sensing technologies with specific performance characteristics and consists of two major elements:

- an up-stream auditing/classification in which a governmental authority will determine in an individual assessment whether the satellite has the potential of generating data or data products with exceptionally high information content.

- in the case where a satellite is classified as being of specific "high-quality"(meaning that it could generate data products with a specifically high information content), individual transactions for application, transfer, distribution, sale or marketing always require predefined procedures to check the permissibility of individual transactions.

The "sensitivity" of an individual transaction will be defined by technical parameters of the specific data set at hand as well as by the target area, data take location, the distribution

chains, and the intended end user. In the above mentioned technical parameters, the spatial resolution of the data obviously is of major importance. However, there are also other parameters such as spectral resolution, spectral coverage, or number of spectral channels.

Access to space: Europe has repeatedly stated the need for a guaranteed and affordable access to space including – if appropriate – international cooperation[18]. The ability to launch satellites is beneficial to maintain a space-based capacity for security**.** This should include rapid capabilities, not only to ensure adequate coverage but also to ensure availability in orbit and/or recovery of specific tools in times of crisis. In the context of the White Paper, the need for an assured access to space is reflected in all considerations supporting the setting up of a European Space Programme.

Research for security: A key element for improving the European Union's ability to ensure a better security for its citizens is to develop a coherent security equipment policy at European level.

As a first step in addressing the need for Community action and preparing the basis for a fully-fledged "European Security Research Program" (ESRP) from 2007, the Commission has launched a 3-year long Preparatory Action[19] to support mission-oriented projects. It addresses 5 main areas: (i) improving situation awareness, (ii) optimising security and protection of networked systems, (iii) protecting against terrorism, (iv), enhancing crisis management, (v) and achieving interoperability and integrated systems for information and communication.

For the period to come, the main objectives for the Commission are to capitalize on the positive momentum it has created by consolidating its position with respect to other stakeholders and finalising the definition of the ESRP.

This full fledge programme will be propose in 2005, on the content, multi-annual financial plan and institutional framework as part of the next Framework Programme. Its aim will be to conduct multi-disciplinary mission oriented or capability-driven research for security applications and activities to support the coherent development of Community policies that contribute to protecting the EU citizen and strengthen the technological and industrial base of European industry.

8. Capabilities and capability gaps

Europe has both existing industrial capability and infrastructure for most types of satellite services. This capability is currently applied in a variety of ways. However, fragmentation of the various user groups and lack of coordinated requirements capture and procurement strategies have created varying degrees of effectiveness. The following sections identify some of those existing capabilities as a starting point for evaluating both the current and future gaps.

One of the systematic issues which occurs in all service areas is the lack of a concerted needs assessment mechanism for aggregation of needs and requirements across the multiple

– [18] EU Council Resolution on European Strategy for Space, 16 November 2000; ESA Council Resolution on European Strategy in the launcher sector ESA/C(2000)36; ESA Council Resolution on European Strategy for Space, 16 November 2000.

– [19] See COM (2004) 72, adopted on 3 February 2004 and Commission Decision 2004/213/EC published in OJ L67 from 5.3.2004. This preparatory action is carried out in cooperation between DG RTD and DG INFSO.

agencies active in the security communities of interest. A second systematic issue is the lack of interoperability which stems from different organisational structures and concepts of operation for the same service in each member state. Some panel members felt the solution to this problem was to establish a common agreed security architecture which would provide both civil and military communities of interest common interfaces and standards.

Space systems contribute significantly to quality of life and the European economy. So the continued security and protection of these systems becomes increasingly important (including the monitoring of space debris which could threaten space based assets). While Europe is able to detect and catalogue some space debris using facilities implemented by Member States, most of the data are still provided by the United States of America. The lack of a European Space Surveillance Capability is potentially a serious capability gap.

8.1 Satellite Communication Services

There is a range of both civil and military satcom services available for security applications. Table 3 provides an overview of the most well known ones.

Name	*Owner*	*Characteristics*	*Remarks*
SKYNET IV	UK,	5 Satellites, UHF SHF X-Band, Paradigm took over operations in 2004	Military/Operational
SKYNET V	Paradigm Secure Communication	2 Satellites, UHF, SHF X-Band, EHF	Military/Private Financed Initiative Launch 2006/2007
SICRAL	Italy	1 Satellite, S-Band, UHF, SHF X-Band, EHF	Military/Operational
SYRACUSE III	France	1 Satellite, SHF X-Band SHF, EHF	Military Launch 2005
SYRACUSE II	France	1 Satellite, SHF X-Band	Military/Operational
SPAINSAT	Spain	1Satellite SHF X-Band, Ka Band	Military Launch 2005/2006
XTAR-EUR	US/Spain	1 Satellite SHF X-Band	Military Launch 2005
SATCOMBw Stufe 2	Germany	2 Satellites, UHF, SHF X-Band, C-Band, Ku-or Ka-Band	Military Launch 2008
NATO IV	NATO	2 Satellites UHF, SHF X-Band	Military/Operational
NATO SATCOM Post 2000	NATO	UHF, SHF X-Band, EHF UHF, SHF X-Band Service Provider: FR, IT, UK EHF Service Provider: TBD	Military SHF X-Band, UHF Operational: 2005 EHF operational: 2008
HELLAS SAT	Greece	Ku-Band	Commercial/Operational
ARTEMIS	ESA	1 Satellite, S-and Ka-Band, optical data relay, navigation and L-Band mobile	Operational
SeSat	EUTELSAT	2 Satellites, Ku-Band	Commercial/Operational
e-bird	EUTELSAT	1 Satellite, Ku-Band	Commercial/Operational
W-Series	EUTELSAT	6 Satellites, Ku-Band	Commercial/Operational
HOTBIRD	EUTELSAT	6 Satellites, Ku- and some Ka-Band	Commercial/Operational
EUROBIRD	EUTELSAT	2 Satellites, Ku-Band	Commercial/Operational
ATLANTICBIRD	EUTELSAT	3 Satellites, Ku- and some C-Band	Commercial/Operational
ASTRA	SES GLOBAL	36 Satellites, mix of C-, Ku, and C/Ku-Band Satellites	Commercial/Operational
I-2, I-3, I-4	INMARSAT	10 Satellites, C- and L-Band	Commercial/Operational

Table 3 Milsatcom capability

Four European nations currently possess some form of military satellite communications (milsatcom): France, Italy, Spain and UK. This capability is used for normal military, antiterrorism and humanitarian relief operations involving defence and government personnel. In addition, Germany is planning the SATCOMBw Stufe 2 system for launch in 2008.

France: France joined the milsatcom community in 1984 when it launched its Telecom 1 satellites. These satellites were what are termed hybrid satellites where a military (SHF) payload (Syracuse 1) was added to an existing commercial communications satellite. This hybrid pattern was continued with the launch of the follow-on Telecom 2 satellites which carried a Syracuse 2 (also SHF) payload, in 1991. The Telecom 2 satellites are now nearing the end of their useful life.

The next generation of French milsatcom capability will be the first provided on dedicated military satellites, under the Syracuse 3 programme fully owned and operated by the French MOD. The first of the Syracuse 3 satellites is due for launch late in 2004. The Syracuse 3 satellites will be fully military hardened and have steerable spot beams and an anti-jamming capability as part of their SHF and EHF capability.

Germany: SATCOMBw Stufe 2 is a military satellite communication project by the German Armed Forces. It consists of a space segment of at least 2 satellites at 37 degree west and 63 degree east, 2 anchor stations and different types of user terminals for tactical and strategic communications and an improved control segment. is planned in 2005 with a duration of 10 years.

Italy: The most recent addition to the European milsatcom club is Italy, which joined in 2001 with the launch of SICRAL 1 in February of that year. SICRAL 1 is a dedicated military communications satellite which operates in the SHF, EHF and UHF bands. Italy plans to follow up on SICRAL 1 with the launch of SICRAL 1 bis scheduled for 2005/6, which will also have UHF, SHF and EHF and an even more capable SICRAL 2 satellite around 2009.

Spain: Spain joined the European milsatcom club in 1992 with the launch of HISPASAT 1A, which again, was a hybrid with a Military (SHF) payload on a Direct Broadcast TV satellite. Spain has contracted its next capability to HISDESAT which will operate the Spanish MOD capability from one of two satellites (SPAINSAT and XTAR/EUR) owned by HISDESAT. They will also offer SHF capability on these satellites to other customers on a commercial basis.

UK: The UK MOD first initiated a dedicated military communications satellite some 40 years ago. Skynets 1 & 2 operated at SHF only but the later Skynet 4 stage 1 and stage 2 systems use military SHF and UHF frequencies. These later satellites are also designed with full military hardening and anti-jamming capability.

Skynet 5, the next generation milsatcom capability for the UK MOD, will be provided under a service provision contract on a commercial basis using fully militarised satellites. Skynet 5 satellites and the associated ground system will be owned and operated by Paradigm, a UK commercial company, under a Private Finance Initiative. This will allow Paradigm to provide milsatcom services to other nations with the consent of the UK MOD. The first Skynet 5 satellite is due for launch late in 2006 and will have powerful and sophisticated SHF and UHF payloads with steerable spot beams and an ultramodern anti-jamming capability. This service provision, which will run for 15 years, has commenced with the contractor Paradigm Secure Communications taking over the Skynet 4 satellites.

NATO: NATO has also been a user of milsatcom since 1970 when it acquired its NATO I satellites. Its latest and most technologically advanced NATO IV satellites were provided by the UK in 1991 and are a version of the Skynet 4 stage 1 satellite produced specially for NATO. These satellites provide a SHF and UHF capability. NATO is looking to replace these satellites, which are now both well past their designed life, and has recently selected a European Service Provision capability from the MODs of UK, France and Italy, using the Skynet, Syracuse and SICRAL satellites, to meet its requirements.

8.2 Earth Observation services

The majority of Europe's Earth Observation services have been established in the civil sector. This trend is now shifting with several member states making progress with plans for both national and multilateral surveillance systems (including military systems).

The EU Satellite Centre operates in the military domain but uses predominately civil imagery. Table 4 provides an overview of the main services available today.

Name	*Owner*	*Characteristics*	*Remarks*
HELIOS I	France Italy Spain	2 optical satellites .	Next upgrade is Helios II
HELIOS II	France Belgium Spain	2 optical satellites and IR,	Operational 2005
PLEIADES	France	2 optical (res 70cm)	Operational after 2008
SAR LUPE	Germany	5 satellites SAR X-band, res.<1m	Operational after 2006
COSMO-SkyMed	Italy	4 sat. SAR X-band	Operational after 2006
ENVISAT	ESA	ASAR and MERIS	Operational
Topex-POSEIDON	France/US	Oceans monitoring	Operational
CRYOSAT	ESA	3 SAR Radar altimeter	Launch 2005
JASON 1	France/US	Oceans monitoring/Forecast	Operational
JASON 2	France/US	Oceans monitoring/Forecast	Launch 2008
ERS-2	ESA	SAR	Operational
SPAINISH EO System	Spain	optical/radar satellite	In definition
SPOT 5	France	Panchromatics/multispectral	EoL 2007
PROBA	ESA	High Resolution Imaging Spectrometer /Hyperspectral	Operational
MSG-1	EUMETSAT	Visible and Infrared/ Search and Rescue transponder	Operational
METOP	EUMETSAT	Advanced Very High Resolution Radiometer and Advanced Scatterometer	Launch 2005
TerraSAR-X	Germany	1 sat. SAR X-band, res. from 16 m to 1 m	Launch 2006 Public Private Partnership
Rapid Eye	Germany	5 optical satellites, res. 6,5 m	Launch 2007 Public Private Partnership
Disaster Monitoring Constellation (DMC)	Algeria, Nigeria, Turkey, Thailand, UK	optical satellites , 32m multispectral + 12m pan (Trukey)	Launched 2003/4
DMC Phase 2	China, Vietnam	satellites, 32m M/S, 4m pan	Launch 2005

Table 4 Earth observation capability

Europe has established an extremely strong capability in Earth observing systems over the last twenty years. With the Meteosat system, the MSG system and the Metop system, the role of Eumetsat in the international community is a real success story. With long track records of success in oceanography from ERS-1, ERS-2 and Envisat, combined with the well established skill base in processing Altimeter, SAR, ASAR and Meris data Europe can rightly be proud of its achievements to date. However, most of these activities have been centred in the civil domain. Apart from progress in one or two member states, and the successful EU Satellite Centre at Torrejon, there has been limited activity in the military domain.

Europe has yet to establish its own strategic surveillance system. There are two major on-going initiatives in this domain: GMES (Global Monitoring for Environment and Security) and the BOC (Besoins Opérationnels Communs).

GMES has already concretely contributed to aggregate areas of demand from a wide variety of user communities. This programme has a strong security element and will be able to offer several of the services identified under the operational needs and requirements section. GMES has been the primary focus for civil security activities in space to date. It covers a number of policy areas including Foreign and Security Policy (CFSP), European Security and Defence Policy (ESDP), policies related to the objectives of Justice, Freedom and Security and Cross Border Control. The GMES initiative has already acknowledged the added-value of aggregating needs and sharing infrastructure wherever possible.

Besoins Opérationnels Communs (BOC); Initiated outside the EU policy by a group of member States, the joint document on the "Common Operational Requirements for a European Global Earth Observation System by Satellites", commonly known by its French acronym BOC[20] was conceived as the first step towards an eventual autonomous European capacity in strategic imagery "aimed at supporting all the information requirements necessary to undertake the 'Petersberg Tasks'". The set of common operational requirements developed by the signatories of BOC is intended for a military satellite observation system. The BOC brings together contributions from a number of member states to form a collaborative programme that builds on the individual elements of SAR-Lupe, Cosmo-SkyMed, Pleiades/Helios.

Building on some of the ongoing initiatives such as the GMES activities for civil security, the work of the ECAP space assets working group and the BOC, there is an opportunity for Europe to enhance the contribution which earth observation programmes make to security policy. Several members of the panel acknowledged the potential for a more strategic approach to the surveillance area.

Earth observation systems currently in use or development have mostly been conceived as stand alone systems with specific user ground segments that are not interoperable. Customers who want to have access to the raw data and want to process these raw data must buy a dedicated user ground segment that is not interoperable with other existing ground segments. This situation creates significant additional costs and time consuming procedures that do not permit efficient operation.

Some current examples highlight this issue:

- The Italian Ministry of Defence will need to install different user ground segments for COSMO-SKYMED system and for the HELIOS II
- The German Ministry of Defence will need to install independent user ground segments for SAR Lupe and for HELIOS II
- The French Ministry of Defence will need to install different user ground segments for each of the HELIOS II, COSMO-SKYMED, SAR Lupe and the PLEIADES systems
- ESA has dedicated user ground segment for each systems (ERS, ENVISAT and others).

This situation is slowing the use of space based earth observation systems in many areas in which their capabilities would be particularly valuable. Tackling this fundamental issue by launching a concerted initiative in this field based on a common agreed architecture and set of interface standards is important. The availability of this standardised architecture will help to reduce duplication, lower the cost of the access to the EO satellite systems and improve responsiveness.

During the GMES Advisory Council of 8 December 2004, Member States operating or developing high resolution satellites asked the GMES Programme Office to address the issue of co-ordinating the various contributions of national missions in support of GMES. This could be done by implementing a suitable discussion forum involving the agencies in charge of the development and operation of these missions.

– [20] Besoins Opérationnels Communs

8.3 Position, Navigation and Timing Services by satellite

Most current applications of positioning, Navigation and Timing services in Europe are based on the existing GPS system. The ready availability of the EGNOS system for applications across the transport sector has prompted pilot projects in a range of areas.

Aiming to reach operational status after 2008, the GALILEO system is planned to offer positioning, navigation and timing (PNT) services worldwide. It will join the ranks of the current GPS and GLONASS systems allowing users to pinpoint their exact locations.

The GALILEO signals will meet security needs during natural disasters or crisis situations to manage actions under the responsibility of civil security and emergency services. It can also be used for a range of operations whose boundaries are often difficult to determine and for which satellite navigation system is a mission critical feature capable of significantly improving their efficiency, as well as their logistic support. GALILEO service may also be useful for redrawing maps in the aftermath of devasting natural disasters such as the recent Asian tsunami which drastically changes the geography of the affected areas.

With a growing number of users dependent on precise positioning services to carry out their daily functions, economic security would be adversely affected should there be an intentional or accidental service shutdown. Thus, besides protecting the system from unauthorised use, it will be important to safeguard the system to ensure signal continuity at all times.

All necessary actions and structures are already being implemented in order to address potential vulnerabilities of GNSS.

8.4 Non European Systems

In addition to its own current systems European organisations also have access to a wide range of other systems as shown in Table 5:

Name	*Owner*	*Mission*	*Characteristics*	*Remarks*
NAVSTAR GPS	USA	NAVIGATION	24 satellites (+3) Cep <10m	On-going upgrade
GLONASS	Russia	NAVIGATION	Foreseen 24, activ. 11 <60m	On-going refurbishment
QUICKBIRD	USA	OBSERVATION	Res : 0.6 m panchromatic	Commercial provider
IKONOS	USA	OBSERVATION	Res : 1m panchromatic	Commercial provider
Orbview	USA	OBSERVATION	Res : 1m panchromatic	Commercial provider
RADARSAT	Canada	OBSERVATION	Radar	Commercial provider
GLOBALSTAR	USA	COMMUNICATION	constellation	Commercial provider
IRIDIUM	USA	COMMUNICATION	constellation	Commercial provider
THURAYA	UAE	COMMUNICATION	Operational + 1 sat to be deployed	Commercial provider

Table 5 Non European systems

8.5 Capability Gaps

8.5.1 Transversal gaps

After a first glance at the needs and capabilities in Europe, the SPASEC panel of experts concluded that the gaps that exist today include the lack of:

G1: common operational effectiveness assessments or development of common multi-user needs and requirements to which space community may contribute

G2: **a mechanism to manage operational requirements** for space systems in the multi-user security sector

G3: common concepts of operation across multi-user groups in both civil and military security domains using satellite services

G4: sufficient interoperability of a wide range of both civil and military systems and between national assets

G5: common databases for current and planned IERs for a variety of systems

G6: testbeds or reference facilities to support the civil security communities

G7: focussed demonstration programmes to demonstrate potential of space to users

G8: simulation, planning & training facilities for multi-agency satellite programmes

G9: operational systems that would be of benefit to user communities of interest such as surveillance, satcom and application of location based services

8.5.2 Capabilities Gaps

The common understandings of the members of the SPASEC group permit to identify three capabilities gaps common to the non-security related communities and security/defence communities:

- lack of common agreed architecture and interfaces standards for the user ground segment of the Earth Observation Space based systems;

- lack of European space surveillance capabilities;

- lack of very high data / high data rate mobile telecommunications.

8.5.2.1 Earth Observation User Ground Segment

The earth observation systems, currently in use or development have been conceived as stand alone systems with specific not interoperable user ground segments. The customer who wants to have access to an earth observation space system to buy a dedicated user ground segment that is not interoperable with its existing user ground segments. This situation induced significant additional costs (more people necessary to make use of the ground segment, infrastructure, logistic, maintenance) and time consuming procedures that don't permit to fulfil the reactivity requirements.

This situation is slowing the use of space based earth observation systems in many areas in which their capabilities would be particularly valuable.

Tackling this issue is fundamental by launching an aggressive initiative in this field by a concerted elaboration of a common agreed architecture and interfaces standards for user ground segment. The availability of this standardised architecture will permit to eliminate duplication, to lower the cost of the access to the EO satellite systems and must contribute to more reactivity. By elaborating such standards, European Union must contribute to the birth of an international standard but also be a better position to impose its EO satellite systems.

8.5.2.2 Space surveillance capabilities

Space systems constitute items which contribute significantly to the life of European population but also became invaluable for many areas of the European economy. So the security of these systems become a true challenge taking into account the increasing security issue of the space debris proliferation.

While Europe is able to detect and catalogue some Space debris using European facilities implemented by some European Union Member States, most of the data are still provided for free by the United States of America. This situation could change in the near future and the data already provided are not exhaustive or not be made available at the needed time.

The lack of a European Space Surveillance Capability is identified as a serious capability gap that must be one of the priority of the future European Space Program. Beyond the security of the European space assets, this system must contribute to the control of the application of the International Space Treaties and to the evaluation of the activities of the space faring nations or organisations.

8.5.2.3 Very high data / high data rate mobile telecommunications

All the systems (ground-based, maritime, airborne, space based) contributing to the elaboration of the most comprehensive awareness situation for crisis management or disaster relief operations need to be programmed and to be able to transmit their data in the shortest time. Up to now, the efficiency of all these systems, in particular the current Earth Observation satellite systems, is limited by the lack of worldwide available very high data rate mobile communications systems. The satellites in geostationnary orbit or highly elliptical orbits with very high data rate telecommunications capabilities with geomobile (ground-based, maritime, airborne) and low earth orbit satellites must overcome this capability gap. These satellites, known as data relay satellite system, are needed but development and commissioning of such system is too costly to be borne by each single user. This is an enabling infrastructure capability to support security/defence related activities, in particular in the fields of transportation security, crisis management and disaster relief operations but also to ease the birth of new services (entertainment services aboard aircrafts ...).

9. Programme options

The scope of the programme possibilities that may be derived from the needs assessment or the identified capability gaps are wide ranging. They cover policy issues which run throughout the whole spectrum of current European affairs. Some of these policy issues require unanimous decisions whilst others may be carried forward by groups of member states acting together.

In several areas there is strong evidence of synergy between various communities of interest in the civil security sector even if the mechanisms for achieving those synergies are not foreseen. There is also very clear evidence of overlapping interest between the civil and military security domains even if this is not the case for all aspects of the work covered by the panel. There are three basic options for using space based assets to support our objectives in areas of freedom, security and justice:

- **Option 1:** Rely on non-European systems
- **Option 2:** Rely on assets of individual Member States
- **Option 3:** Augment declared national capabilities with additional operational systems needed to fill identified priority capability gaps

In the static environment of the Cold War, option 1 made the most sense as Europe largely relied on NATO for its collective security and had no foreseen need for an expeditionary capability. Today, the situation has changed and, with the collapse of the Soviet Empire, Europe no longer faces the same threats. However, few would argue that new dangers and challenges have filled the vacuum and European nations have to develop new doctrines and capabilities to face these new issues. Similarly, there is a growing awareness of the environmental threats to European security and the need for an independent monitoring and validation capability.

Europe and the member states are increasing their capabilities to operate outside our own borders in expeditionary forces, with multinational military, civil security and police formations. It is also increasingly working across its internal borders to counter fraud, organized crime and terrorism. However, Europe is still relying mainly on option 1 to support these activities, although there is increasing co-operation under option 2. This is entirely logical given the cost, complexity and high risk of developing Space-based capabilities. However, recent events suggest that this may not be enough. This was particularly obvious during the recent tsunami disaster in the Indian Ocean, whereby in-depth and useful damage assessments undertaken by European and international entities were based primarily on Ikonos and Quickbird; SPOTS 5 (2.5m PAN fused with MS) and other lower resolution systems were shown to lack the necessary spatial resolution for urban damage assessment and delineating the tsunami impact line. On the other hand, low resolution systems such as DMC are well able to provide regular, broad area, coverage for the purposes of monitoring disasters.

Europe can no longer assume a fortuitous coincidence of interest with the USA. Nor, unfortunately, can it guarantee unanimous agreement between the 25 Member States, and that is the weakness of option 2. Even though the risk may be small, Europe cannot guarantee access to Member State assets in support of possible or actual deployments of European multinational units or coalition forces under all circumstances. Europe possesses much expertise in space research and technology, but it is not harmonized. Instead, with the exception of ESA programmes, it is still largely national-based, and that limits its capabilities as economies of scale are not applied effectively.

The cost of doing nothing to redress this imbalance will be high. The importance of space based assets in all fields of security is increasing at a significant pace. If Europe does not capitalize on its investments in capability over the last thirty years, the cost to future generations of recreating that capability in times of crisis will be extremely high. Maximizing cost effective capability by co-operation, sharing and pooling of assets will go some way to minimizing the long term cost of security in Europe.

The utilization of space activities for supporting the CFSP and/or ESDP needs to be thoroughly discussed within the member states at EU level which may lead to new approaches for implementation in the medium and long term. Furthermore, arms control must be considered.

9.1 Mapping of needs, services/systems and gaps

Programme proposals for future satellite systems to support European space and security initiatives must take account of the need for effective links between member states and communities of interest. This is necessary to achieve the effectiveness, efficiency and synergy required to provide greater cohesion and value for money of investments across 25 member states.

Central to achieving this will be a clear mapping between user needs, system requirements and capability gaps.

A starting point for this is shown in table 6:

Needs	Services and systems	Gaps
N1: Improved performance of EO data acquisition	**S1:** Satellite communications services	**G1:** Common operational effectiveness assessments
N2: Improved collection of critical data	**S2:** Space based Earth observation services	**G2**: Mechanisms to manage operational requirements
N3: Improved production of information	**S3:** Space based Signal Intelligence	**G3:** Common concepts of operation

and response to user' needs		
N4: Improved access to critical data	**S4:** Space based early warning systems	**G4:** Sufficient interoperability
N5: Improved dissemination of critical information	**S5:** Space based Positioning, Navigation and Timing services	**G5:** Common databases
N6: Improved systems interoperability	**S6:** Space Surveillance systems	**G6:** Testbeds or reference facilities
	S7: Harmonisation of operational standards and procedures	**G7:** Focussed demonstration programmes
		G8: Simulation, planning & training

Table 6 Summary of needs, services/systems and gaps

There are four primary categories of tasks that must be undertaken if the current capability gaps are to be overcome. These are:

Operational analysis tasks: including the assessment of common operational effectiveness for space related security initiatives within any given community of interest; the development, management and maintenance of the information exchange requirements for specific operational activities; development of efficient concepts of operation for the overlapping activities in both civil and military areas; life cycle cost modelling and planning facilities for space related services.

Technology developments: including the development and maintenance of testbeds and reference facilities for the demonstration of security applications for space services; specific technological and research activities to ensure European capability in critical areas; effective use of synthetic environments for product proving exercises.

Pre-operational facilities: simulation, planning and exercise infrastructure to support rehearsal and training exercises for pre-operational trials of user equipment and services; interoperability trials and facilities for confirmation of the operational effectiveness of joint procedures or related equipment; facilities of developing and proving common operational procedures; programme tasks to cover Collaborative Coalition Interoperability Projects, (CCIPs).

Operational systems: facilities and programme activities for the development and roll out of operational systems together with key user groups and communities of interest [eg support to transport sector in the effective roll out of low cost operational satcom or asset tracking systems to support road/rail applications, support to the European Agency for the Management of Operational Cooperation at the External Borders of the Member States of the European Union for roll out of surveillance systems to overlap with UAV systems[21].

It will be essential to complete the Operational Analysis Tasks first so as to allow the more detailed technical tasks to be properly scoped and costed before embarking on them.

– [21] A Workshop held in Ljubljana the 18/20 October 2004 on "Research and Technological Challenges in the field of Border Control in the EU-25" stated that "all types of seal technologies are needed for tracking containers including electronic-seal technologies, sensors, and satellite tracking systems…".

9.2 Assessment related tasks

The scope of the proposed assessment related tasks is shown in table 7:

	Proposed tasks
WPOA1	Strategic reviews of each of the needs, requirements and gaps identified in table 5 (N1-N8, S1-S7, G1-G9)
WPOA2	Operational effectiveness assessments of satellite services for communities of interest in logical groupings (e.g. all transport together, Policing and information gathering grouped with cross border control, humanitarian aid and international cooperation grouped with crisis management teams, military taken separately for those items of overlap with the civil security sector)
WPOA3	Information exchange requirements evaluations for each user community of interest
WPOA4	Capability catalogue covering the civil security sector separate from the military sector
WPOA5	Reviews of evolving operational requirements and concepts of operation for each community of interest
WPOA6	Cost modeling and benefits assessments to evaluate those areas where satellite services offer increased value for money
WP0A7	Review of secure communications requirements
WP0A8	Review of common European surveillance requirements
WPOA9	Review of the case for pan European space based signal intelligence and early warning systems

Table 7 Assessment related tasks

Based on the inputs of the four Working Groups, the panel also produced a list of tasks in the technology, interoperability and operational systems areas. These detailed proposals were not sufficiently linked to needs and requirements for them to be agreed but, for illustrative purposes only, they have been enclosed in Appendix B.

10. Financial planning

Europe has been spending approx 950 M EUR per annum on related activities in the space and security area. The dramatic change in the security environment means that this level of expenditure is considered to be insufficient to meet the user needs or requirements for the future[22].

For the mid and long term, (post 2007) an attached chart (Appendix C) provided to the Panel by industry shows budgetary estimates for the cost of developing a contribution to support European security needs. There is a progression from a current budget of just under 1B€ in 2004 to around 2B€ from 2012 onwards[23].

– [22] Initial assessments of the leader of the Financial planning Working group have lead to the following annual estimations: generic ground segment (10-12 Mio €); interoperability and standards (40-50 Mio €); Earth observation (actual spending around 350 Mio € , it should reach a level of 600 Mio €); Satellite Communication (actual spending: 600 Mio €); Signal intelligence (200 Mio €); Early Warning (200 Mio €); Space Surveillance (100 Mio €); Technology research (250 Mio €); New applications (200 Mio €).

– [23] These figures will have to be confirmed by in-depth assessment of the capability gaps and the options for filling them

11. Conclusions and recommendations

The Members of the Panel:

acknowledged the valuable role that space assets play in the security domain for both the civil and military communities at local, national, regional and global levels.

underlined the fragmentation and lack of coherence across 25 Member States for space applications in support of security authorities. This hampers the sharing of information and effectiveness of operation when joint and combined activities are needed. One consequence of this is that there is no systematic process for aggregation of security needs at the European level. However, the Panel **confirmed** that space can play a valuable role in this respect since satellite services are intrinsically regional or global in nature.

discussed potential mechanisms by which a structured approach to achieving this could be established. This approach is centred on the definition of mission types that would highlight the needs of different groupings of user communities. For each mission type, there would be a number of scenarios generating their own set of requirements.

strongly recommended that the security applications of space should be given a high relevance in the forthcoming European Space Programme (ESP). This programme should be fully harmonised with other national and commercial programmes so as to obtain maximum synergy and affordability offering an enhanced capability for all aspects of security.

welcomed the document on European Space Policy "ESDP and Space", approved by the Council in November 2004. This document contains a comprehensive roadmap proposing in particular to provide to the Commission ESDP requirements to allow for identification of possible multiple-use capabilities inherent to civilian systems under development, and to establish, "in the context of the European Space Programme, a permanent inter-pillar dialogue (…) to ensure global coherence of all EU needs and requirements".

Made the following recommendations:

1. **The need to establish urgently in 2005 a platform or forum** for consolidating the security related user needs (short, long and medium term) for space in a structured way.

2. **The main tasks** of this platform/forum will consist of:

    a. **Establishing a network** between the users;
    b. **Giving the opportunity to users** to express their needs in a dedicated forum;
    c. **Determining how existing capabilities** could be considered in multiple-use systems to fulfil these needs;
    d. **Refining** of capability gaps
    e. **Translating** the user needs into requirements
    f. **Assessing** how space capabilities can match the requirements including definition of scenarios

g. **Examining** how optimum benefit could be gained by combining space based data with existing geospatial datasets[24]
h. **Defining** actor's roles and responsibilities including financial issues
i. **Proposing** inputs to the European Space Programme.

3. **A comprehensive study** of the costs of a contribution by the space sector to the EU security needs is required.

4. The Commission **should ensure** an effective and efficient liaison between the activities of the forum and the European Defense Agency in accordance with the activities of the 2005 EDA Work Programme as far as space is concerned.

5. Amongst the most important areas of convergence and overlapping between the operational needs of the different multiple-users communities existing in Europe, the Panel **identified the need for raise awareness on capabilities**.

   No single user community in Europe is sufficiently structured or ready to support autonomously large efforts to fulfill needs in this area in a cooperative way; space, in some cases, could offer an interesting solutions to many user groups.

6. The Panel of Experts also **concluded that it would be unrealistic** at this stage to propose a common approach to provide Europe with a complete system for global situation awareness and recognizes the continued importance of the national support for space activities. Nevertheless, the Panel **recommends setting up a coherent European framework initiative** aimed at contributing to the space elements of such a global situation awareness system. This framework shall be able to implement the above described process and to propose top-down dedicated projects complementing the national and intergovernmental actions and in support of Member States. Some projects need to be initiated immediately in order to be available for the next generation of space systems, for instance standardized architectures, common components to increase response time and cost effectiveness.

7. In order to support the exchange of information, the Commission **should support and develop** a process to ensure interoperability between current space systems in Europe in the fields of earth observation and communication. GMES could be seen as a first step along the road to achieving this. Work has to be coordinated with second pillar (EDA and concerned member states) in order to take in account confidentiality, security, adaptability and availability specific issues.

8. The EU and ESA have been aware for some time of the relevance of telecommunications for security and risk management, and some projects have been financed in order to establish better co-ordination among national initiatives in different emergencies.

   It seems therefore appropriate at this point that **a similar initiative should originate in the field of institutional and emergency telecommunications.** Co-ordination among national initiatives in this area appears urgent.

   Attention should be focused on:

[24] Taking into account harmonisation developments through the INSPIRE Directive

- Network and service interoperability
- End-to-end satellite telecommunications systems
- Convergence and integration of satellite telecommunications with other space applications domains.

9. Space services now play such a key role in the well-being of European society that **protection of critical infrastructure in the space sector is a priority**. This may need services and capabilities for surveillance of space based assets as well as protection for terrestrial infrastructure.

10. The Panel **confirmed the relevance** of using earth observation systems and data relay satellites in support of EU borders surveillance, in particular maritime borders, in order to fight against illegal activities (i.e. human trafficking, drug smuggling…) and to monitor transport activities in and around Europe.

11. A large number of members of the Panel **recommended implementing some focussed projects**, especially in terms of demonstrators as a first step, in order to maintain the level of European industry at a competitive state of the art. Short term needs should be covered with existing financial instruments[25], while long-term activities would benefit from Financial Perspectives instruments.

12. The Panel **confirmed the need** to guarantee affordable access to space, including – if appropriate – international cooperation. It is an essential infrastructure to support security policies and objectives.

13. Considering its transversal usefulness and its relevance to many security challenges, the Panel **considers that space applications are an integral part of security capabilities** in the frame of subsequent calls for the Preparatory Action for Security Research and in the future European Security Research Programme.

14. **Co-ordination of activities should be ensured** between the user organisations on one hand and between the procurement and programming organisations on the other hand (ESA, EDA, OCCAR …).

Action Plan:

Short term :

Launch actions (in an organisational and technical framework to be determined) in order to:

- **establish a user platform** or forum to:
  - consolidate common security needs;
  - fill horizontal gaps;
- **establish a financial working group** to
  - estimate and allocate costs;
  - take into account any additional specific MS requirements to be financed by concerned countries;

[25] Possible short term priorities could be: networking of monitoring capabilities, position reporting and space surveillance.

- **integrate** in the European Space Programme the necessary projects to fill the identified capability gaps (lack of common agreed architecture and interface standards for the user ground segment of Earth Observation Space based systems; lack of European space surveillance capabilities; lack of very high data / high data rate mobile telecommunications) .

For the medium/long terms :

Continue interpillar coordination processes such as the SPASEC in order to support the European Space Programme and launch appropriate programmes for long term operational adequate capabilities.

Acronyms

ASI:	Agenzia Spaziale Italiana
BOC:	Besoins Opérationnels Communs
BNSC:	British National Space Centre
CCIP:	Common collaborative interoperability projects
CDTI:	Centro para el Desarrollo Tecnologico Industrial
CEPA:	Common European Priority Area
CFSP:	Common Foreign Security Policy
CNES:	Centre National d'Etudes Spatiales
COI:	Community of Interest
CONOPS:	Concepts of operation
DLR:	Deutsches Zentrum für Luft- und Raumfahrt
EC:	European Commission
ECAC:	European Civil Aviation Conference
ECAP:	European Capability Action Plan
EDA:	European Defence Agency
EGNOS:	European Geostationary Navigation Overlay Service
EO:	Earth Observation
ERRIDS:	European Regional Renegade Information Dissemination System
ESA:	European Space Agency
ESDP:	European Security and Defence Policy
ESOA:	European Satellite Operators Association
EU:	European Union
GMES:	Global Monitoring for Environment and Security
GNSS:	Global Navigation Satellite Systems
HGTF:	Headline Goal Task Force
ICT:	Information Communication Technologies
INSPIRE:	INfrastructure for SPatial InfoRmation in Europe
MOWGLY	European Mobile Wideband Global Link System
NEO:	Near Earth Objects
OCCAR:	Organization for Joint Armament Co-operation
PASR:	Preparatory Action Plan for Security Research
PNT:	Positioning Navigation Timing
PRS:	Public Regulated ServicesSIS: Schengen Information System
SPASEC:	Panel of Experts on Space and Security
UAV:	Unmanned Airborne Vehicle

Appendix A: SPACE SYSTEM NEEDS AND SCENARIOS MATRIX

Area of operations	Missions	Applications	Organisation grouping concern	Space system needs						
				Telecom	**Observation (Imagery)**	**Signal related Information**	**PNT**	**Space surveillance**	**Early Warning[26]**	**Meteo**
External Security of EU	Crisis management operations to solve regional conflicts [27]	- Specific military issues	- Military	Worldwide cover Secure connectivity High rate data com. Interoperability Multimedia services Traditional services[28]	EHR[29] Geo-products Data base	ELINT[30] COMINT[31] E-M activity Data base	Worldwide cover Secure service[32] High precision High availability Integrity issues	Detection Identification Reconnaissance Characterisation	- Worldwide timely detection, location and impact prevision of missile[33] firings - Potentially proliferating countries monitoring - Characterisation of missiles under testing	Weather forecast Sea-state forecast Oceano altimetry
	Prevention of an attack involving WMD in the field of CRBN	- Ballistic Missile[34] launches detection and initial tracking - Impact area prevision - Alert diffusion - Intervention units facilities[35]	- Civil protection - Military	Worldwide cover Secure connectivity High rate data com. Interoperability Multimedia services Traditional services	EHR Geo-products Data base	ELINT COMINT E-M activity Data base			- Worldwide timely detection, location and impact prevision of missile[36] firings - Potentially proliferating countries monitoring - Characterisation of missiles under testing	Weather forecast Sea-state forecast
	Peace Support Operations abroad	- High data rate communication net quick deployment - Identification and surveillance of rogue human grouping - Intervention units facilities[10]	- Law enforcement - Military	Worldwide cover Secure connectivity High rate data com. Interoperability Multimedia services Traditional services	EHR Geo-products Data base	ELINT COMINT E-M activity Data base	Worldwide cover Secure service High precision High availability Integrity issues		- Worldwide timely detection, location and impact prevision of missile (8) firings - Potentially proliferating countries monitoring - Characterisation of missiles under testing	Weather forecast Sea-state forecast Oceano altimetry

– 26 Early warning : purely 2ond pillar capability ; mentioned here for information
– 27 Specific military needs are mentioned here for information because being taking in account with Council (military committee) issues
– 28 Telecom. Traditional services : fax, telephony, …
– 29 Extreme High Resolution => Identification, Reconnaissance, Characterisation
– 30 ELINT : Characterisation and location of radar systems
– 31 COMINT : Characterisation, location & access to content of communications
– 32 PNT secure service : ciphered & against jamming robust information ; guarantee of access
– 33 medium-range missiles
– 34 Ballistic Missile : including ICBM (Inter continental), IRBM (Intermediate Range), MRBM (Medium Range) and SRBM (Short Range)
– 35 Intervention units facilities : localisation (PNT) and status / Secured communications / MS interoperability
– 36 ballistic and medium-range missiles

	Anti-terrorism	- Moving and activity tracking of terrorist groups - Interception of terrorist communications - Intervention units facilities [10]	- Civil protection - Law enforcement - Military	Worldwide cover Secure connectivity High rate data com. Interoperability Multimedia services Traditional services	HR Geo-products Data base	COMINT E-M activity Data base	Worldwide cover Secure service High precision High availability Integrity issues		- Worldwide timely detection, location and impact prevision of missile(8) firings - Potentially proliferating countries monitoring - Characterisation of missiles under testing	Weather forecast Sea-state forecast
	Control of Mass destruction weapons proliferation	- Identification of WMD sites - Knowledge of WMD fabrication and testing sites activity - Localisation and tracking of sensitive equipment	- Law enforcement - Military	Worldwide cover Secure connectivity High rate data com. Interoperability Multimedia services Traditional services	EHR Geo-products Data base	ELINT COMINT E-M activity Data base			- Worldwide timely detection, location and impact prevision of missile(11) firings - Potentially proliferating countries monitoring - Characterisation of missiles under testing	
	Control of international treaty enforcement	- Detection, identification and tracking of military concentrations and flows - Border surveillance - Knowledge of weapons fabrication and testing sites activity - Detection and localisation of polluting emissions - Illegal fishing detection, identification and tracking - Production of juridical direct evidence supports	- Law enforcement - Military	Worldwide cover Secure connectivity High rate data com. Interoperability Multimedia services Traditional services	EHR Geo-products Data base	ELINT COMINT E-M activity Data base		Detection Identification Reconnaissance Characterisation	- Worldwide timely detection, location and impact prevision of missile(11) firings - Potentially proliferating countries monitoring - Characterisation of missiles under testing	
	EU citizens and interests protection in foreign countries	- Detection, localisation and record of alert messages from EU citizens in foreign countries - Surveillance of sensitive sites (industrial, strategic, … ones) - Prevision, detection, identification and tracking of refugee concentrations and flows - Cartography and knowledge of access conditions in order to prepare evacuation operations - Intervention units facilities [10]	- Law enforcement - Military	Worldwide cover Secure connectivity High rate data com. Interoperability Multimedia services Traditional services	EHR Geo-products Data base	ELINT COMINT E-M activity Data base	Worldwide cover Secure service High precision High availability Integrity issues			
	Control of borders and territorial waters	- Ship detection and identification in territorial waters - Detection and tracking of human concentrations in frontier vicinity - Hydrocarbon pollution origin detection and alert diffusion Intervention units facilities [10]	- Law enforcement - Military	Worldwide cover Secure connectivity High rate data com. Interoperability Multimedia services Traditional services	HR[37] Geo-products Data base	COMINT E-M activity Data base	Worldwide cover Secure service High precision High availability Integrity issues			Weather forecast Sea-state forecast

– 37 HR : High resolution : Detection (and reconnaissance, under conditions)

Internal Security of EU	Fight against organised crimes	- Moving and activity tracking of criminal groups, ships, vehicules - Interception of communications - Intervention units facilities [10]	- Law enforcement	High rate data com. Interoperability Multimedia services Traditional services	HR Geo-products Data base	COMINT E-M activity Data base	Worldwide cover High precision High availability Integrity issues			Weather forecast Sea-state forecast
	Surveillance of criminals on parole or probation	Permanent localisation of criminals on parole or probation	- Law enforcement			E-M activity	Worldwide cover High precision High availability			
	Ensuring Security of all modes of transport	- Strengthening mobile tracking in order to prevent collisions - Sea drifting dangerous objects localisation - Distress signal detection and localisation with information exchanges - Meteorology prevision, diffusion and alert - Dangerous cargo tracking - Intervention units facilities [10]	- Civil protection - Law enforcement - Operator services	Worldwide cover High rate data com. Multimedia services Traditional services	HR Geo-products Data base		Worldwide cover High precision High availability Integrity issues			Weather forecast Sea-state forecast
	Ensuring the security and availability of critical infrastructures and services	- Critical sites surveillance (detection and tracking of suspect movements or behaviours in vicinity) - Detection and identification of physical vulnerabilities - Meteorology prevision, diffusion and alert - Intervention units facilities [10]	- Civil protection - Law enforcement - Military - Operator services	Worldwide cover Secure connectivity High rate data com. Interoperability Multimedia services Traditional services	HR Geo-products Data base			Detection Identification	- Worldwide timely detection, location and impact prevision of missile(11) firings - Potentially proliferating countries monitoring - Characterisation of missiles under testing	Weather forecast Sea-state forecast
Crosscutting areas	Management of natural, technological or epidemiological crisis	- Detection, identification and moving prevision of radioactive / chemical pollution (clouds, slick), forest fire, flood, … - Identification of areas propitious to natural disasters (flooding, earthquake, fire, storms, …) - Cartography of natural disaster areas and damage assessment - Meteorology prevision, diffusion and alert - Intervention units facilities [10]	- Civil protection - Law enforcement - Military	Worldwide cover High rate data com. Interoperability Multimedia services Traditional services	HR Geo-products Data base		Worldwide cover High precision High availability Integrity issues			Weather forecast Sea-state forecast
	Stabilisation and reconstruction of third countries, sometimes in a non permissive environment	- Prevision, detection, identification and tracking of human concentrations and flows - Damage assessment - Energy, water and food resources status knowledge - Cartography and knowledge of access conditions - Intervention units facilities [10]	- Civil protection - Law enforcement - Military	Worldwide cover High rate data com. Interoperability Multimedia services Traditional services	HR Geo-products Data base		Worldwide cover High precision High availability Integrity issues			Weather forecast Sea-state forecast

	Humanitarian aid	- Prevision, detection, identification and tracking of refugee concentrations and flows - Water and food resources status knowledge in designed areas - Knowledge of access conditions to designed areas - Marking and tracking of package - Intervention units facilities [10]	- Civil protection - Law enforcement - Military	Worldwide cover Interoperability Multimedia services Traditional services	HR Geo-products Data base		Worldwide cover High precision High availability			Weather forecast Sea-state forecast

Appendix B: SCOPE OF TECHNOLOGY, INTEROPERABILITY AND OPERATIONAL SYSTEMS TASKS

The list of tasks below are included for illustrative purposes only.

Assessments related tasks

	Proposed tasks
WPOA1	Strategic reviews for needs, requirements, gaps
WPOA2	Operational effectiveness assessments
WPOA3	Information exchange requirements
WPOA4	Capability catalogue
WPOA5	Operational requirements and concepts of operation
WPOA6	Cost modelling and benefits assessments
WP0A7	Strategic review of secure communications
WP0A8	Strategic review of common European surveillance
WPOA9	Strategic review of case for space based signal intelligence and early warning systems

Technology related tasks

	Proposed tasks
WPOT1	Strategic review of the state of the art in satellite technology for the security domain
WPOT2	Technology development programmes which include: • observation from high orbits • enhanced components for on-board imagery chains • actuators and attitude control systems for better agility • multispectral and hyperspectral sensors and their linked • exploitation tools • radar interferometry capabilities • bi-static, space based radar techniques • advanced cryptographic devices for very high data rates • optical and radar image analysis tools and services • data fusion techniques • enhanced components in terms of sensitivity and accuracy • development of data mining and signal characterisation algorithms for on-board or ground signal processing • actuators for better agility • active antennae • large deployable antennae
WPOT3	Testbed and reference facilities which can be made available both to the user communities of interest and also to industry
WPOT4	Technology demonstrator programmes which target specific groupings of communities of interest

Interoperability related tasks

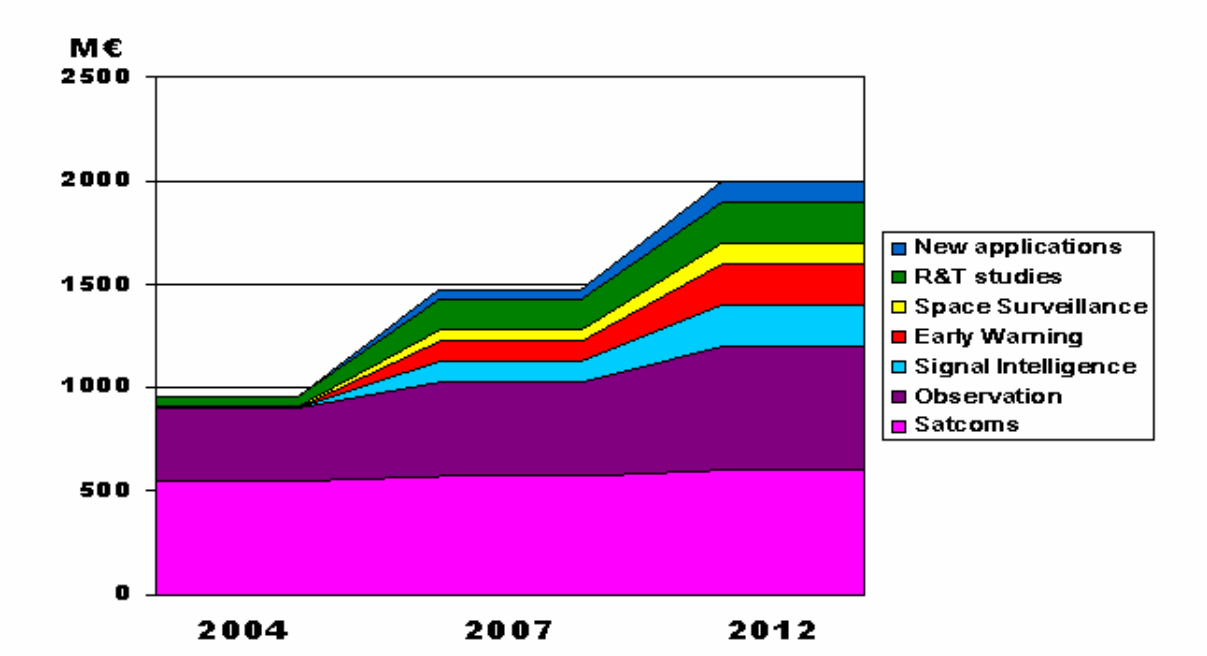
	Proposed tasks
WPOI1	Common collaborative interoperability projects (CCIPs) for specific communities of interest (eg Transport, policing, cross border control)
WPOI2	Cross community CCIPs which could group for example, civil protection, policing and intelligence, cross border control and transport together (using facilities or services developed for individual communities)
WPOI3	Simulation and training facilities and exercises organised with appropriate groupings of communities of interest (including new member states).

Operational system related tasks

	Proposed tasks
WPOO1	Short term capacity leasing programme to support replicated database systems for use with any community of interest (e.g. multicast network to update all airports in Europe with latest suspect information)
WPOO2	Programme definition tasks to establish specific initiatives for: • Secure communications programme • Common European surveillance system (of the Earth) • Space surveillance system (of space) • Harmonised ground segments, standards and procedures

Appendix C: COSTS ESTIMATES OF EUROPEAN SPACE SYSTEM FOR ESDP

The chart provided by EUROSPACE shows that a progression from a current budget of just under 1B€ in 2004 to around 2B€ which appears to be necessary from 2012 onwards.



The 2004 costs contain the programmes financed by the different national Ministries of Defence for governmental applications:

- Satcoms: Skynet, Syracuse, Sicral
- Observation : Helios, SAR Lupe, Cosmo-Skymed
- R&D Studies/Demonstrators ; EHF, Essaim (Comint), Spirale (Early warning), Lola (laser link), Grave (space surveillance).

The estimated 2012 costs are a projection to maintain and increase the actual capacities towards a coherent European space system for ESDP:

- Satcoms: secure systems/services including EHF and data relay capacity
- Observation: new generation of optical and radar observation systems including Extremely High Resolution (EHR), Very High Resolution/wide view, Infra-Red and hyperspectral capacity
- Signal Intelligence: European Sigint system including Elint and Comint)
- Early Warning: First step of a European system
- Space Surveillance: space component of a global system (radar and optical)
- R&D Studies: studies and technology R&D necessary for the above programmes together with new advanced applications studies Eg. Geostationary observation and sigint, high resolution micro-sats etc.
- New Applications: provision for new applications using existing technology Eg. Geo-mobile, mobile receiving stations, space MTI.

Remarks :

1. These estimates concern only the programmes mentioned above and include launch costs, ground segments and operations.
2. Europe has attained the technical capability to develop such programmes due to efforts at national or European level developing programmes such as SPOT, ERS, Artemis, Silex, Envisat, Jason and Launcher developments (Ariane, Véga). In the future, similar civil oriented efforts in terms of R&D and demonstration will be necessary to sustain the fundamental technical capability.
3. Other civil space applications that will be also used for security and defence (mulitple use) – such as GMES, meteorology or oceanography systems - shall still need to be financed through separate civil budgets that could be allocated at national or European level (not included in the above chart).
4. According to EUROSPACE, an independent access to space is essential for a European space system for ESDP and must continue to be maintained through ESA budgets.
5. Special attention should be paid to ground segments taking into account the necessary level of federation of sensors and fusion of data.
6. The approximate doubling of the budget on space systems for ESDP is consistent with other forecasts for a doubling of the overall space budget in the same timescale yet] will leave the expenditure in Europe on space systems for security and defence at one tenth of that in the US.

Appendix D: Panel of experts in the field of space and Security: Terms of Reference[38]

Context:

The consultation process for the Green paper[39], and the following White paper on European Space Policy[40], identified the strategic importance of space in implementing the Common Foreign and Security Policy (CFSP), including the European Security and Defence Policy (ESDP) and the policy in the area of freedom, security and justice (JHA).

The enlargement of the EU makes this ever more important since space services have a major part to play in enhancement of security of the citizen within Europe. This is largely due to opportunities for better enforcement of border control and surveillance (ie more effective controls on illegal immigration and smuggling), conflict prevention, identification of humanitarian crises at early stages, prevention of and fight against crime and criminal organisations throughout the Union.

Following on from the report by the Group of Personalities, the European Commission has now agreed to establish a Panel of Experts in the field of space and security to which these terms of reference apply.

1. The primary mission of the Panel of Experts is to provide the European Commission with a Report on the current EU needs for multiple-use capabilities needs in accordance with the White Paper on European Space Policy. This technical work would in particular appraise capabilities identified by operational groups and users (referred to in Annex A), define synergies and make proposals for inclusion in the European Space Programme.

2. The Panel of experts will also acknowledge the role of space and the available capabilities for both civil and military use with a focus on the synergies between them.

3. EU Member States have been invited to nominate experts to participate in the work of the panel. The panel will be composed of competent services from the European Commission, National Space Agencies, European Space Agency, relevant working groups, Industries (including SMEs) and other user organisations (see Annex A). Members of the General Secretariat of the Council of the EU will be invited to attend as observers.

   Exchange of classified information will be restricted to the appropriate subset of participants. Concerning EU classified information, the basic principles and minimum standards contained in the Commission Decision[41] will apply.

4. The Panel of experts will be supported by an appointed "Rapporteur", who will be in charge of drafting the report and ensuring support to the coordination with additional groups when required.

5. The activities of the Panel of Experts will :

– [38] Endorsed during the second Panel meeting (19 July)

– [39] COM 2003/17 final

– [40] COM 2003/673

– [41] Commission Decision 2001/844/EC, ECSC, Euratom of 29 November 2001

- Review the role of space in meeting the objectives of the CFSP/ESDP and of Justice and Home Affairs (civil protection, fight against terrorism, border monitoring…)

- Consider the management options for identifying, maintaining and updating the operational requirements for pan-European space and security capabilities

- Identify, take input from the main groups actively looking at operational requirements at the European level and provide feedback to the appropriate research programmes

- Assess the currently available information (from sources such as ECAP[42], and the Preparatory Action on Security Research) on the capability gap that exists in Europe today for space based security services

- Identify priority areas of interest and options for a preparatory action plan to bridge between current capabilities and future anticipated requirements

- Assess the potential funding scenarios necessary to ensure that the appropriate level of resource is available to deliver the primary programme options

6. The panel will call upon ad-hoc expertise as necessary, including expertise in:

   a. The content and capabilities of existing civilian space programmes,

   b. The process of translating operational requirements into technical requests.

   It is foreseen that the panel may benefit as well from the possible input of the EUMC[43] regarding an analysis on operational requirements for space assets, taking into account the paper on the Headline Goal 2010.

7. Groups will be created attending to the needs of the Panel of experts. The role of these groups will be to ensure the proper development of the recommendations elaborated by the Panel of experts, to whom they will report. Group leaders participate systematically to the Panel meetings to ensure an appropriate follow-up.

8. The Panel of Experts will meet at least four times and will report its conclusions before the end of 2004.

ANNEX : Composition of the Panel of experts

- Experts of the EU Member States
- European Commission Services
- European Space Agency (ESA)
- National Space Agencies (CNES, DLR, BNSC, ASI, CDTI)
- EUMETSAT
- EUROCONTROL
- OCCAR

– [42] European Capability Action Plan

– [43] European Union Military Committee

- Representatives from relevant existing working groups: European Capability Action Plan Space Group, GALILEO Security Board, GMES Advisory Council, Research Working Group, CEPA 9, External Borders Practitioners' Common Unit Composition and the related Centres (Land Border Centre, Air Border Centre, Western Sea Borders Centre, Eastern Sea Borders Centre, Risk Analysis Centre, Border Training Centre).
- Representatives from Industry

Members from the General Secretariat of the Council of the European Union will be invited as observers.

Appendix E: BACKGROUND DOCUMENTS

- European Commission, *Towards a European Space Policy*, Communication from the Commission to the Council and the European Parliament, Brussels, 7 December 2001
- *Star21*, Strategic Aerospace Research for the 21st Century, July 2002
- European Commission, *Green Paper: European Space Policy*, COM(2003) 17 final, 21 January 2003
- European Commission, White Paper, *Space: a new European frontier for an expanding Union An action plan for implementing the European Space policy*, COM(2003)673
- European Commission, *A Coherent Framework for Aerospace – a Response to the STAR 21 Report*, COM (2003) 600 final, 13/10/2003
- European Commission, *Research for a Secure Europe*, Report of the Group of Personalities in the field of Security Research, Group of Personalities Report, 15/03/2004
- European Commission, *Global Monitoring for Environment and Security (GMES): Establishing a GMES capacity by 2008- (Action Plan 2004-2008*), COM(2004) 65 final, 3/2/2004
- European Commission, "Space: a new European frontier for an expanding Union" November 2003.
- European Commission, Geospatial Information Needs of DG RELEX, Michalis Ketselidis, March 2004.
- European Commission, Communication from the Commission to the Council and European Parliament, Final perspectives 2007-2013, COM (2004) 487
- Assembly of the WEU, *Developing a European space observation capability to meet Europe's security requirements*, A/1789, 5 June 2002
- Assembly of the WEU, *A joint European space strategy: security and defence aspects*, A/1738, 20 June 2001
- Assembly of the WEU, La dimension spatiale de la PESD, Draft Report, 26 Octobre 2004
- European Commission Staff Working Paper *European Security Strategy, Fight against terrorism*, SEC(2004) 332, 19/3/2004
- *Common Operational Requirements for a Global Satellite Observation System for Security and Defence Purposes* (BOC), signed by six European Staff
- Council of the European Union, *Space Systems Needs for Military Operations*, 19 May 2003
- *Food for thought Paper, ESDP and Space*, Hellenic National Defence General Staff, Alexander Kolovos, March 2003
- Carl Bildt, Jean Peyrelevade and Lothar Spath, *Towards a Space Agency for the European Union*, Report for the Director General of the European Space Agency, November 2001.
- European Security Strategy, J. Solana, *A Secure Europe in a Better World*, December 2003
- Study on Energy Supply Security and Geopolitics, Clingendael International Energy Programme (CIEP), Institute for International Relations, January 2004, The Hague, The Netherlands.
- Council of the European Union, *Headline Goal 2010*, 6309/6/04
- Council of the European Union, *ESDP and Space*, 11616/3/04, 16 November 2004
- Council of the European Union, *Draft ESDP Presidency Report*, December 2004
- Institute for Security Studies, *Space and security policy in Europe*, Occasional Papers n°48, December 2003
- Institute for Security Studies, *The GALILEO satellite system and its security implications*, Occasional Papers n°44, April 2003
- Proceedings, Workshop on "Research and Technological Challenges in the field of Border Control in the EU-25", Ljubljana, 18/20 October 2004
- CNES, *NAUPLIOS, GALILEO Pilot Project*, Final Report, 20/07/04

- The George Washington University, *Bridging the Gap, European C4ISR Capabilities and Transatlantic Interoperability*, October 2004
- International Space University, *Civil, Commercial and Security Space: What will drive the next decade?*, 9th ISU Annual International Symposium, 30/11-3/12 2004, Strasbourg, France
- Final Resolution for the 6th European Interparliamentary Space Conference (EISC), November 10th and 11th 2004, Madrid
- *A Human Security Doctrine for Europe, The Barcelona Report of the Study Group on Europe's Security Capabilities*, Presented to the EU High Representative ofr CFSP Javier Solana, 15 September 2004
- The Hague Programme strengthening Freedom, Security and Justice in the European Union, Presidency conclusions of the European Council of 4/5 November 2004, 14292/1/04, REV 1 annex I.
- European Commission, *Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing an infrastructure for spatial information in the Community (INSPIRE)*, COM(2004) 516 final, 23.7.2004
- The Eisenhower Institute, Space Security 2003, 2004