SPACE AND SECURITY POLICY IN EUROPE

Istituto affari internazionali (IAI)
European Space Agency (ESA)
Presidenza italiana del Consiglio dell'Unione europea
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a. Programme
b. List of participants
c. Comunicato stampa
1. "Space and security policy in Europe : executive summary" (29 p.)
1/F. "L'espace et la politique de sécurité en Europe : synthese" (33 p.)
1/D. "Weltraum- und Sicherheitspolitik in Europa : Zusammenfassung" (37 p.)
2. "Space and security policy in Europe" (110 p.)
3. "Global monitoring for Environment and Security : GMES" / European Commission Joint Research Centre (46 p.)

(2)

Istituto Affari Internazionali

2003

Presidenza Italiana
del Consiglio dell'Unione Europea

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Presentation of an International Report on

SPACE AND SECURITY POLICY IN EUROPE

Tuesday, 2 December 2003
Center for High Defense Studies (CASD)
Piazza della Rovere, 83, Rome - ITALY

PROGRAMME

Chairman:
Luigi *Ramponi* — Chairman, Defense Committee, Italian Chamber of Deputies

15:00 **Welcome Address**
Ugo *De Carolis* — Chairman, Center for High Defense Studies (CASD)

15:10 **Presentation of the report**
Stefano *Silvestri* — President, Istituto Affari Internazionali (IAI)

15:25 **Intervention**
Jean Jacques *Dordain* — Director General, European Space Agency (ESA)

Comments
Ian *Abbott* — Assistant Chief of Staff Policy & Plans, EU Military Staff
Vincenzo *Camporini* — Deputy Chief, Italian Defense Staff
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Sarah *Mattocks* — EU Council Secretariat
Jean-Pol *Poncelet* — Director of Strategy and External Relations, (ESA)
Luc *Tytgat* — Head of the Space Policy Unit, European Commission

16:40 **Coffee-break**

16:55 **Round Table**

Bernard *Molard*	Chairman of the Security and Defense Group, Eurospace
Francesco *Olivieri*	Italian Representative, OSCE
Gunter *Stamerjohanns*	General Manager, Galileo Industries
Roberto *Testore*	Ceo and General Manager, Finmeccanica SpA
Marc *Vankeirsbilck*	Deputy Chief, Belgium Defense Staff
Sergio *Vetrella*	Chairman, Italian Space Agency (ASI)

18:25 **Conclusions**

Filippo *Berselli*	Undersecretary of State, Italian Ministry of Defense

Working language: English

SPACE AND SECURITY POLICY IN EUROPE

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OUTLOOK

The evolution of a European space policy is encouraged by the recent EU decision to develop the Galileo project. This decision confirms the willingness to pursue a policy in the space technologies that goes beyond the national level, even if national visions are still predominant. A new security concept is emerging. The evolution of the foreign, security and defense policy (CFSP, ESDP) and the protection of population requires a integrated approach.
Security needs are connected to the technological progress. Space assets must be used to protect populations, resources and territories, but also to maintain the integrity and the capabilities of the technological base. Space systems are a fundamental aspect of "technological security": they offer extremely versatile solutions in a global international dimension.
This research analyze how the different EU actors deal with these topics and how to promote a convergence towards a European Space Security Policy.

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Conferenza Internazionale di presentazione della ricerca "Spazio e Politica di Sicurezza in Europa"

In occasione della presentazione della ricerca sponsorizzata dall'Agenzia Spaziale Europea (ESA) su "Spazio e Politica di Sicurezza in Europa", l'Istituto Affari Internazionali (IAI) di Roma organizza una conferenza internazionale, continuazione ideale del cammino di approfondimento delle riflessioni già intraprese dalla Presidenza greca dell'Unione, nonché dalla Commissione Europea, attraverso il processo di consultazione legato alla redazione del libro verde e libro bianco sulla politica spaziale.

La politica spaziale europea si trova ad un bivio fra la necessità di mantenere la capacità tecnologica, lo sviluppo delle nuove applicazioni duali e il significativo bisogno di riorganizzare le istituzioni nazionali ed europee e di regolare i loro rapporti.
In questo quadro, l'elaborazione della strategia di sicurezza europea, un concetto legato agli obbiettivi politici dell'Unione, permette di ripensare le applicazioni spaziali e di inserirle in un ambito politico strutturato, meno frammentato e di ampio respiro strategico.

La conferenza si svolgerà sotto la Presidenza dell'Onorevole Luigi Ramponi, Presidente della Commissione Difesa della Camera dei Deputati; sono previsti interventi dei rappresentati ai massimi livelli delle differenti istituzioni europee interessate dai processi decisionali in campo spaziale e di sicurezza, quali l'Agenzia Spaziale Europea (ESA), la Commissione Europea, lo Staff Militare dell'UE, il Segretariato del Consiglio dell'UE e la Presidenza Italiana dell'Unione.
La conferenza permetterà di esplorare le strategie di convergenza fra i diversi attori istituzionali, anche tramite la partecipazione di altri attori europei del settore, quali la NATO, rappresentanti nazionali, agenzie e rappresentanti dell'industria.

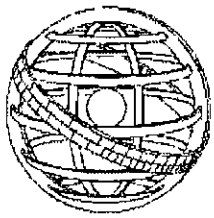
International Conference : presentation of the research « Space and Security Policy in Europe »

The Istituto Affari Internazionali (IAI) of Rome organizes an international conference to present a international study sponsored by the European Space Agency (ESA) on "Space and Security Policy in Europe" at the Center for High Defence Studies (CASD). This conference follows and deepens the initiative launched by the Greek Presidency of the Union and by the European Commission through the consultation process on the green and white papers on the European Space Policy.

The European space policy is at a crossroad and different needs are emerging: the preservation of the technological base, the development of dual-use applications, the reorganisation and regulation of national and European institutions.
The emergence of a European security concept, linked to the political goals of the Union, represents an opportunity to re-think space applications and to reinforce space policy, adopting a more unified, strategic approach.

Under the Presidency of Hon. Luigi Ramponi (Chairman of the Defense Committee, Italian Chamber of Deputies) the conference will gather high ranking representatives of the main European players in the field of space and security, such as the European Space Agency, the European Commission, the European Union Military Staff and the Secretariat of the Council of the European Union, the Italian Presidency of the Union.

The meeting will promote an open exchange between security and space European players, such as Nations, NATO, Agencies and industries and will explore strategies for a European convergence on a shared Space Policy.



Istituto Affari Internazionali

INTERNATIONAL REPORT ON

SPACE AND SECURITY POLICY IN EUROPE

EXECUTIVE SUMMARY

Rome, October 2003

1/E

SPACE AND SECURITY POLICY IN EUROPE

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OUTLOOK

The evolution of a European space policy is encouraged by the recent EU decision to develop the Galileo project. This decision confirms the willingness to pursue a policy in the space technologies that goes beyond the national level, even if national visions are still predominant. A new security concept is emerging. The evolution of the foreign, security and defense policy (CFSP, ESDP) and the protection of population requires integrated approach.
Security needs are connected to the technological progress. Space assets must be used to protect populations, resources and territories, but also to maintain the integrity and the capabilities of the technological base. Space systems are a fundamental aspect of "technological security": they offer extremely versatile solutions in a global, international dimension.
This research analyze how the different EU actors deal with these topics and how to promote convergence towards a European Space Security Policy.

1. Space is a strategic asset. Europe has always maintained an important presence in space. The development of dual-use technologies calls for a "European" approach to space security, linking the present national defence programs with mainly civilian European programs. The functions and means of security and defence uses of space overlap considerably. In fact, space operations can be seen as a continuum, including civilian and military functions as well as security and defence operations.

2. The emergence of the EU in European space policymaking has been characterised by an increasing interest in more "strategic" programs. Future European decisions and performance in the security and defence applications of space are likely to impact on the transatlantic relationship as well as help to define Europe's role in the world (and the future of Europe's defence-industrial base). Therefore, thinking in this area can no longer be kept on the margins of the European political process, but requires far-reaching political choices.

3. Space tools are necessary for our collective security, but there is no "European awareness" of the benefits of common space systems. A security and defence space user community still has to be created both among national defence establishments and at the level of the general European public.

4. The supply side is structurally inadequate. The globalisation of the market underlines the weakness of the European industrial base *vis-à-vis* American competitors. Further rationalisation is needed and will probably imply a growing level of industrial concentration. This process will have to be guided to avoid excessive distortion of the market. A principle informing this policy should be

continuity in techniques, industries and functions in space activities whether scientific, commercial security or defence.

5. Three functions are needed in any future, improved, space policy framework:
   a. targeted R&D for advanced space applications;
   b. increased involvement of those responsible for security and defence in space policy decision-making;
   c. increased institutionalised political visibility and effectiveness of security-related space activities.

6. There is no structure in place today in Europe that can cross-reference all space-related activities and provide an overarching approach for generating the needed assets and capabilities, also with recourse to commercial or public dual-use opportunities and public-private partnership solutions. Instead of continuing to rely on national approaches or possibly setting up a second European space agency for security and defence, there is the potentially attractive option of the European Space Agency (ESA) taking full advantage of the dual-use nature of space through a cooperative arrangement with the EU.

7. European governments and institutions should act to preserve some competition on the European market, at least in those sectors in which market dimensions and technological and industrial characteristics allow it, while opening up to concentration in other areas, such as launchers. The rise of a security and defence demand will have important positive effects on the competitiveness of the European market, making room for at least two different competitors in each sector.

8. It might be counterproductive to aim for the complete rationalisation and unification of European space policies in the short term as national governments logics and choices still are and will continue to be determinant. It is possible, however, to plan a European policy (under either a collective or an enhanced cooperation framework) that links all the European components and choices in space to some strategic primary objectives that could provide Europe with the knowledge and functions it still lacks today and make its presence in space more coherent and complete.

9. The European authorities should draw up some overarching industrial policy objectives to maintain full autonomy in basic space capabilities (in terms of satellites, launchers, ground segments, technologies and services) to guarantee access to and the optimal utilisation of space in accordance with a European policy. This does not exclude the possibility of agreements with other space powers nor does it call for parity with the US. It is merely a sufficient objective with minimal technological assets. In order to develop scientific and technological know-how, European authorities should also strive to maintain a lively, competitive and diversified European industrial and technological basis. This means guaranteeing a volume of production in the long run, and some public investment in science and technology that can have an anti-cyclical function with respect to commercial demand.

10. The most recent EU developments might play a positive role. The EU itself could be better placed to identify and articulate demand in terms of space assets, taking in the perceptions and choices of various European states (or more precisely a group of states, following an enhanced cooperation logic) and establishing criteria for the burden sharing and management of the systems.

11. In practical terms, "space security" committees can be set up in parallel in the ESA and the EU Council, in charge of thinking, programming, implementing and managing such a program, as well as providing an institutional link between the two institutions. To avoid creating too many institutional bodies, the composition of the committees could be the same.

12. One of the best ways to elevate Europe's space, security and defence capabilities-building efforts to a new level could be the launching, preferably by the European Union, of a European Security and Defence Advanced Projects Agency with a small, non-permanent staff and flexible, mission-based activity. Like DARPA in the US, this would provide a framework for pursuing a strategic approach to applied technologies of the future, combining a well-defined vision with highly responsive structures and methods.

13. These and other changes will not come easily. Thus the European Council will have to make a head start in this direction by establishing an independent space committee, composed of European experts and bringing together assessments from space industry, potential civilian and defence space users in the foreign, security and defence spheres. Such a committee should determine the optimal level for European ambitions in space with regards to demand and the evolution of needs. Apart from its function of advising the European Council, such a committee could do very important public work, contributing to the much needed identification and building of a European space constituency.

SUMMARY REPORT

1. Space, a decisive asset for European security policy

Space technology is linked to collective security, with the term "security" referring to the protection of European citizens from potential risks of both military and non-military origin. The European Commission Green Paper on "European Space Policy" included a statement on how security can be enhanced through space technologies. Space assets are fundamental for many common European endeavours, such as developing a "knowledge-based economy" or more integrated transport policies (single sky for example). At the same time, the development of a Common Foreign and Security Policy and a European Security and Defence Policy requires many new military capabilities. The increasing use of information technology is linked to these efforts to increase European capabilities, especially to meet data transmission and information requirements. The ECAP (European Capacities Action Plan) calls for concrete actions to increase asset availability.

The Thessalonica European Council launched the concept of an EU Security Strategy. This was an important step towards a better definition of the political basis of future space applications for security. Also, the decision to create an intergovernmental agency in the field of defence capacities development, research, acquisition and armament by 2004 represents a cornerstone for the development of security technologies, and thus for space activities, in the EU. In the United States, space technology is "military oriented" due to a military strategy increasingly based on the concept of "information dominance". European space technology is more "civilian oriented"; in fact, it is dual-use.
This duality has been established politically. The preamble of the ESA Convention defines its mission as one of "peaceful purposes". The development of European security policy, which deals with how to "help secure peace and defend stability", confirms the compatibility of this political orientation with the "non aggressive" use of technology.

The European space framework is exclusively civilian. Major defence/security programs have been developed on a national basis, and sometimes through bilateral or trilateral cooperation in data exchange. The development of dual-use programs calls for a "European" approach to space security, able to link national defence and European civilian approaches.

Civilian spin-offs of space-based technologies, backed by a strong "broad security policy" coming from EU authorities, establish some important points:

- The "security of citizens" is the basis of the growing use of space technologies. This security concept deals with both civil and military security.
- In some cases, applications for the security of citizens are only civilian, such as space-based crop monitoring or water management networks.
- In most cases, the space-based security applications provide sensitive information that have to be gathered and delivered by means of a clear procedure.

- There is the need for a strong political/juridical framework that can also facilitate the development of a defence, police and justice administration users community.
- The development of CFSP/ESDP calls for a number of space-based assets and applications to be matched by a significant operational capability.
- There is no link between intelligence users of space; better coordination of space at the European level could guarantee greater effectiveness.

The concept of "space security" involves different elements:

- The security applications provided by space technologies are a linchpin of European policy.
- The development of space is the concrete translation of a common democratic European political project. Space security applications are directly linked to the role of Europe in the world. The negotiations between the US and the EU on the Galileo system clearly confirm this.
- The space sector helps to define a "security concept" for Europe and a common strategic culture, not only where applications improve the security of the citizens, but also for the technological capacity in itself. End-user and industrial needs contribute to a comprehensive technological security.
- Space security includes defence and other security applications but is mainly civilian-driven, based on a very specific dual-use approach developed among multilateral and national European institutions.

Moreover, the European Convention on the Future of Europe included "European Space Policy" and a "European Space Program" in its draft Constitutional Treaty: a strong commitment shaping a high-tech sector and confirming its strategic importance. The draft Constitutional Treaty also calls for an important institutional and operational effort to foster such a security concept.

2 Aspects of intergovernmental cooperation in Europe

Space developments have been independent of the general process of European integration. In addition, different civilian and military bodies, either exclusively national or acting through various partnerships, have contributed to defining space policy and developing industrial activities. The European Space Agency has become the main authority in the European space industry. However, the growing role of the European Union, the development of military space activities, and changes in the industrial sector are new features that have to be taken into account along with the internal evolution of the national space sectors in individual European member countries.
Today, the main contributions to space in Europe are made by the European Space Agency, the European Union and intergovernmental programs.

European space programs as a whole are characterised by:

- a strong Research and Development orientation leading to experimental programs and acquisition of competence in high-tech domains;
- collective operational and strategic objectives;
- national goals.

For two of the major European space projects, Galileo and GMES, R&D aspects are managed by ESA while strategic issues are handled by the EU. In these cases, the involvement of national governments provides an additional layer of cooperation. The national authorities responsible for space matters can be either agencies devoted more or less exclusively to space, ministries (for example, research and technology, industry or foreign trade) or "inter-ministerial" entities. For the military space sector, defence ministries are responsible for those activities unrelated to civilian activities.

One of ESA's missions was to coordinate the European space programme and national programmes with a view to gradually "Europeanising" the latter. In practice, European space programmes have not supplanted purely national activities and both attitudes towards and the degree of involvement in them are far from uniform across Europe.
The tasks of the space agencies are now being reappraised in all countries. This reflects the gradually changing relations between the various protagonists and a certain maturity in the sector after more than thirty-five years of practice.

ESA has proven its ability both in managing major programmes and in carrying out original space science. However, new factors concerning the evolution of technology, changes in national space preferences and developments in the general framework of the European community all require a redefinition of objectives and ambitions for the future European space policy. In this context, ESA intends to enlarge its role to contribute to the implementation of European space policy as shown by the strategic work it has carried out with the EU (Green Paper exercise). While ESA remains the principle forum for any intergovernmental cooperation, with its own mechanisms for discussion and negotiation, current trends are towards a more visible role for the EU in intergovernmental relationships.

THE FIRST EU-ESA CO-MANAGEMENT PROGRAM: GALILEO

The Galileo program of satellite navigation and positioning can be considered the first "genuine" European Union-led space program.
The programme began at the European level, under a tripartite authority composed of the European Space Agency, the European Union, and the Eurocontrol organisation for the certification of air traffic. Largely supported by Brussels, the objective of establishing a completely independent European commercial system was initially embodied in a European directive, essentially civilian in character despite an obvious military dimension. One of the consequences of EU involvement in this initiative has been the creation of a new system of financing known as PPP (Public Private Partnership).
As shown by the Laeken "non decision" in 2001, some governments fear that developing the Galileo satellite capability could jeopardise national sovereignty in this field.
Aside from a strictly military analysis, Galileo's evolution has been plagued by some questioning about its relevance for national purposes and by government-to-government disputes about the political and industrial benefits (until recently involving Germany and Italy). It must be noted that the most recent intergovernmental discussions were settled without putting the principle of an EU-led Galileo program into question.

THE FIRST EUROPEAN "ENLARGED SECURITY" INITIATIVE: GMES

Originally strictly for monitoring the environment, the GMES has since been enlarged to the CFSP's security dimension with the notion of security incorporated into the title of the programme with the "S" of GMES. Apart from its commitments to programmes agreed upon in the civil domain by ESA, the European Commission favours an approach characterised by great caution in piloting a programme with acknowledged dual prospects, but which will be difficult to impose as an instrument of collective sovereignty, especially in the military field. It should, in theory, lead to the setting-up of an operational system for global monitoring of the environment by 2008.

MILITARY EXPERIENCE, THE WEU HERITAGE IN THE EU

In 1991, the Western European Union Satellite Centre for satellite data interpretation was set up in Torrejon, Spain, marking the conclusion of a long process of reflection. Five years later, the WEU's appraisal of activities at the Torrejon centre during its experimental stages showed that it had not yet achieved maximum efficiency. One of the main problems was genuine cooperation in sensitive areas like intelligence. More globally, the WEU had to deal with a basic lack of uniformity between member countries, in terms of financial resources as well as the political and strategic approach. However, the decision in May 1997 to support and strengthen activities at the Torrejon centre shows that the importance of space- assets is officially recognised, at least at the political level, even though most current programmes are still being developed in the context of direct bilateral or multilateral cooperation between the relevant countries.
In 2001, the Centre was designated a permanent Agency reporting to the EU Council, demonstrating that it plays a recognised role and that its missions are indeed considered a part of the development of the common European Security and Defence Policy (ESDP).

2.1 General position of the EU with respect to international cooperation in space

The emergence of the EU in European space policymaking has been characterised by an increasing interest in more "strategic" programs. This interest has changed the conditions of transatlantic cooperation in a rather radical manner: the EU decision to consider programs such as Galileo and GMES has stirred up a lot of scepticism in the US.
The EU has a relatively active policy in the field of space cooperation. It has established contacts with Russia and with China, mainly because of a potential cooperation on the Galileo program in accordance with the opened EU position to multilateral partners.
Today, one of the main issues in the building of a European military competence is the harmonization of national programs. Other European countries are studying the development of their own capabilities (German Sar Lupe, Italian Cosmo Skymed, French Pléiades) with agreements for exchange of information with other countries (Belgium, Sweden, Spain and Austria).

The possible development of a European security and defence presence in space requires careful consideration:

- It is taking place in a changing European political context since the affirmation of the "Headline Goals" aimed at establishing a European Rapid Reaction Force (ERRF).
- Space technologies, like information technology, are undergoing profound changes based on constant improvements in the cost/performance ratio of electronic components and, in a correlated way, on improvements in systems architecture making it possible to combine distinct systems. Such systems enrich the information

produced for all users, including the military. Moreover, given the flexibility of use which it permits, this technical opening up could respond, *a priori* and against all expectations, to the new security requirements that worry military headquarters today.

- For all military players, the harnessing and increased use of all kinds of information are necessary in all "modern" military operations. As seen by a professional army, the enemy is characterised by the lack of information possessed about him and the unpredictable actions which he might undertake. Military strategies therefore seek to compensate the lack of knowledge of the modern enemy by the reinforcement of their ability to see, to detect, to know.
- The convergence of these technical developments and new requirements appears to push to the fore the role of space as a primarily strategic defence tool.
- The European initiatives are obviously no exception. Yet, this is precisely where the problem lies. In effect, the magnitude of the consequences of the choices increases the difficulty in building a European military space presence. Thinking in this area can no longer be kept on the fringes of the European political process, but requires far-reaching political choices.

EUROPEAN MILITARY SPACE: THE CHANGING FRAME OF REFERENCE

A rough estimate extrapolated from existing systems costs (without the exploitation costs) gives an order of magnitude of the global investment that a European collective space defence system could require.

Table 1 - Costs of a potential European military space capability

Application	*Programme Cost (Millions €)*	*Programme Duration (years)*	*Annual Cost (Millions €)*
Telecom	*3,140*	*15*	*209*
Observation	*2,283*	*10*	*228*
Galileo	*150*	*8*	*19*
SIGINT	*875*	*10*	*87*
Warning	*555*	*10*	*55*
Surveillance	*251*	*10*	*25*
Total	*7,254*		*623*

Source: *European Global Space Metasystem for Security and Defence, presentation by Major General D. Gavoty in the Workshop on "Security and Defence Aspects of Space: The challenges for the EU, Contribution to the Green Paper Consultation Process" organised by the Greek Presidency of the EU, Athens, 8-9 May 2003,*
http://europa.eu.int/comm/space/futur/consultation5_en.html

2.2 Re-thinking political and military sovereignty

Setting up military space activity on a European scale raises questions of political and military sovereignty. Questions of sovereignty are currently treated in the context of conventional multinational relations, as with the "common operational requirements" of the Helios military observation programme. Establishing European programmes moves the problem to a completely different level, on the one hand because of the structural problems and hence the question of responsibilities posed by their development, on the other because of the political and strategic value that is attached to them.

Two key European programmes – civilian, but of a strongly dual nature – can be taken as evidence of this turning-point: Galileo and GMES. They reveal the scope but also the great sensitivity of the choices that EU member states must make. The latter are aware that the credibility of a European political and military whole depends on their involvement today. Yet, increasing examples of security-related, not to say military security-related applications of these programmes make it impossible for European states to restrict debates exclusively to economic, industrial or purely civil interests, and strengthen national reluctance to engage fully in their development.

2.3 Schemes for possible cooperation: multiplicity, complexity

The creation of a true European military space presence appears all the more delicate in that the way towards European integration is not unique, and multiple ways of cooperating are still open today. In this domain, cooperation has never gone beyond bilateral or multilateral relationships, with the exception of NATO Satcom assets. The latest arrangement, the Common Operational Requirement (COR) attempts to build on the cooperation inaugurated in the sensitive area of space intelligence gathering with the Helios-1A and Helios-1B satellites. The COR is a process of cooperation at the highest level, which may guarantee more permanent multilateral strategic agreements in future. The process involves finding simple funding agreements for a programme, but also defining operational objectives common to the different national systems, in the first instance those of Germany, Spain, France and Italy. This pooling of military requirements for optical, radar and infra-red observation could compensate for the temporary character of common programming ventures.
Efforts nevertheless have to be made to translate such a document into a European reality. What is, for the moment, only an initiative for some member states could become the embryo of a decision for action taken at the European level. In this sense, the COR could be a pertinent "bottom-up" type mechanism to advance European integration, even though this does not necessarily mean greater technical cooperation any more than it implies greater interoperability *a priori*.

3. European institutions and space policy for security and defence

In pooling Europe's resources for space activities, a separate integration track was created in the form of the European Space Agency.
While ESA stands outside the community approach, its statute qualifies it, like the EU, as more than simply an intergovernmental cooperation structure – it has an obligatory programme and its own common infrastructure.
Yet, the EU First Pillar, the European Community Treaty, still stipulates that the defence sector is largely outside the scope of the community authority and remains under the control of national governments. Policy areas where the European Commission is authorised to address security aspects openly and spend funds on them are still rare. It is clear at this time, though, that internal security as well as defence in the EU will remain intergovernmental for the foreseeable future, and any active role of the EU and the European Commission will be geared at facilitating member states' efforts.

Today, the European Commission sees its space role in conducting joint research and development, drafting regulatory conditions and gathering broad support for projects of Europe-wide interest such as Galileo. In the last decade, space activities have moved beyond their earlier focus on technology development and begun to deliver mature applications, in particular in communications and earth observation, including weather and climate change monitoring. Some of these applications have assumed important roles in various sectors of life and economic activity and are also relevant for security and defence.
The fragmentation of European space efforts – the split between civil and military activities and between national agencies and ESA, with the growing role of the EU – finally gave rise to calls for new institutional solutions.
In 2003, the Commission presented its Green Paper on European Space Policy, prepared in cooperation with ESA. It elaborates the fundamental notion that the benefits of space must be put more at the service of Europe and its citizens. Among the key areas where strong benefits could be expected are sustainable development, including global monitoring for stricter control of environmental regulations and capacities for managing environmental crises, as well as the security of citizens through CFSP and ESDP. The intensive public debate about the Green Paper that unfolded in the first half of 2003 provides a good basis for the White Paper.
As far as security is concerned, the Green Paper embraces the space aspects of the full spectrum of Petersberg tasks, both civil and military, that are covered by CFSP and ESDP. It rightly reflects the ECAP finding that "to a certain extent, the critical shortcomings of current crisis management are directly linked to a space technology capability".

Given the limited nature of EU defence integration, however, with the common defence remaining within the remit of member states, most of them coordinated by NATO, the Commission's Green Paper necessarily stops short of offering a truly integrated vision of a European space policy that includes strictly military and intelligence space capabilities. Therefore, the answer to the Commission's call for a more efficient and ambitious approach to space that binds efforts of the EU, ESA and member states together, will have to go beyond the Green Paper debate.

The first goal, as the Green Paper specifies, "is to ensure Member States discover added value" in a common, coherent EU space policy that also addresses security and defence. In practical terms, at least in the beginning, this challenge translates into the prospect of mobilising additional funds through European cooperation for security and defence-related space activities led by those members states that have active policies in this field.
This could be achieved in three ways:

- exploiting more effectively research and technology development funds for dual-use purposes on the national and European levels;
- increasing space funds for security applications;
- generating increased political support for additional appropriations to security-related space programmes by raising awareness and enabling accelerated success. The Commission estimates that total annual spending on space in the EU will have to be doubled to 12 billion euros to support the programmes seen as necessary components of a future coherent European space policy.

The functions needed in any future improved policy framework would thus be:

- targeted R&D for advanced space applications;
- increased involvement of those responsible for security and defence in space-policy decision-making;
- increased, institutionalised political visibility and effectiveness of security-related space activities.

These three points can serve as criteria for evaluating various possible future institutional approaches to space and security between EU, ESA, other related agencies and national institutions.

3.1 The EU as the Hub of European Security Policy

The political and military lessons of the Balkans wars of the 1990s led to the decision to equip the EU with a set of military and civilian police tools for crisis reaction, permitting the launch of the ESDP Headline Goal initiative in 1999. Interpretations of the "Petersberg tasks" on which this effort is based have been somewhat at variance in different member states from the beginning. There is increasing acceptance today that a broader spectrum of defence tasks, such as conflict prevention, joint disarmament operations, military advice and assistance, post-conflict stabilisation and combating terrorism (cf. Morillon Report to the European Parliament, March 2003), should be explicitly included. For planning purposes, it would be advisable to build on the most robust assumptions regarding the possible nature and scope of future EU operations. This applies even more in the strategic environment after 11 September 2001.

The draft strategy paper "A Secure Europe in a Better World" presented by Javier Solana in Thessalonica in June 2003 provides an overview of the challenges, including international terrorism, proliferation of Weapons of Mass Destruction (WMD) and the collapse of effective state institutions in many parts of the world, and makes the case for a "more

active, more coherent and more capable" European Union in response to these challenges, working with partners.
For the additional defence and intelligence capabilities required, space is going to be crucial as a field that offers cutting-edge technology advantages, covers the increasing global reach of European responsibilities and in effect favours the cost-effective use of scarce funds by providing force-multiplying components and capabilities. The same is true not only for the ESDP's Petersberg tasks but also for other shared European security tasks that do not normally fall under ESDP, such as border and coastal security.

Given the severe deficiencies in Europe, for both military and non-military missions, in certain key areas such as command and control of operations, global secure communications, strategic intelligence (monitoring, early warning, situation assessment), mapping, navigation and positioning, operational surveillance, tactical situation awareness, force protection and effective engagement capacity (all with a space dimension), the main focus of implementation efforts in ESDP has been the process of capability-building. European Capabilities Action Plan (ECAP), set up 19 working groups to examine the most significant shortcomings. None of them dealt specifically with space. However, a number of space-related capabilities have been included in the list of shortfalls, i.e. strategic satellite imagery, signal intelligence, early warning and support for UAVs.
There is today no structure in place in Europe that could cross-reference such space-related elements and provide an overarching approach for generating the required assets and capabilities, also with recourse to commercial or public dual-use opportunities and public-private partnership solutions. The overlapping of required space-related capabilities for defence purposes and for non-defence security purposes (such as border police, coast guard and emergency response) must be recognised and exploited on the national as well as European level.

A significant contribution could come from the creation of a European security and defence capabilities agency tasked not just with running procurement programmes, but also overseeing and targeting R&D, monitoring national efforts and assisting in the identification of requirements. Key member states of the EU are backing the creation of such an Agency, building on existing structures such as OCCAR, and the draft Constitution produced by the Convention calls for its establishment (cf. Burkard Schmitt, The European Union and Armaments, EU-ISS Chaillot Paper n. 63, Paris).
There is no guarantee, however, that such an agency would focus sufficiently on space. There may thus be the need to provide a separate framework and impetus on the European level specifically for the security and defence dimensions of space. One such proposal, even more narrowly designed for the military dimension, has been offered by the French General Gavoty in the form of an "Eumilsat" agency that would also be in charge of controlling the operational systems, including Galileo. What should be avoided is a further deepening of the existing civil/military divide because this would further undermine hopes for a more intelligent and effective use of limited resources.

To ensure that a European security and defence space agency would be able to draw on the technical expertise of ESA and its European network, a considerable degree of integration within ESA would probably be of advantage. Such an approach could also facilitate the

involvement of defence and security ministers from national governments in the political guidance of the agency; for the foreseeable future, defence ministers will continue to be able to meet only informally in the EU context, whereas the ESA Convention would provide the flexibility for member states to be represented not only by research ministries, especially under optional programmes (where the EU can also be a participant).
A security and defence authority created by member states within ESA, with EU participation, would also be a good place for developing and implementing European policies for security-relevant regulations on space, such as shutter control for imaging devices in times of crisis.
Given the fact that within Europe there is a strong asymmetry of military space efforts, with France spending more than twice as much as all others combined, the French experience and expectations are certainly going to be a major factor in the future institutional development. If others want to motivate France and other countries into less traditional approaches for their military space efforts, they will at least have to put attractive levels of additional funds on the table.

One complicating, but at the same time helpful element is the fact that the European capabilities-building efforts in ESDP are closely coordinated with NATO, since most members belong to both organisations and must make sure that their forces are geared to the requirements of both. This applies even more after the decision in NATO to establish an allied Response Force (NRF) and push for the adoption of network-centric, transformational approaches to defence among European allies.
Future European decisions and performance in security and defence applications of space are likely to impact not just on the quality of transatlantic consultation and cooperation in international security affairs but also on other aspects of strategic importance such as Europe's role in the world and the future of the European defence industrial base.
In space, the overwhelming US dominance is particularly striking since the vast majority of space expenditure and in particular of military space expenditure worldwide is in the US, leaving European firms at a severe disadvantage with respect to their US competitors in aerospace and defence.

The space sector is thus intricately linked to the question of defence market access and export control negotiations with the US and also to the themes recently addressed in the European Commission's communication "Towards an EU Defence Equipment Policy" (March 2003) with a view to creating a European defence equipment market.
In this context as well as in many other respects, the fact that space activities are relevant to a number of different directorates-general of the Commission needs to be taken into account when shaping a future organisational framework for a coherent EU space policy. A certain risk of rivalries, with adverse consequences, may arise between portfolios such as research, development, technology and innovation, enterprise, transport and trans-European networks, information society, environment and external relations in the pursuit of their respective tasks and policies.
The Commission, and the EU as a whole, are not yet sufficiently organised for an active, coherent space-policy role. This has also been visible in current space programmes with an EU role such as GMES and Galileo. It will be necessary in the future to find a suitable assignment of roles and lead responsibility within the EU.

3.2 ESA as a Dual-Use Space Agency

ESA can offer very attractive infrastructure for the whole range of space projects and has a successful track record. It has traditionally, though, been hindered from engaging in explicitly security-relevant activities by the reference to "exclusively peaceful purposes" in its statute.
Tacitly its achievements in providing autonomous access to space have of course also been motivated, as has been true for all other space powers, by the desire to gain access to the security and defence applications of space such as intelligence gathering from orbit.

The institutional separation of civil and military space activities was historically rooted (as with NASA and the US Department of Defence) and was originally based on valid political and legal considerations. However, it increasingly became outdated after the end of the Cold War. In 1993, ESA's International Relations Committee recommended an open mind towards a role in setting up a WEU satellite surveillance system. ESA has indeed shown flexibility. Not only were the Helios-1 satellites and several other military payloads launched with Ariane. Helios-1 was also tested at ESTEC (European Space Research and Technology Center, ESA Noordwijk, Netherlands).
ESA's successful demonstration of an optical communications link between ESA's Artemis and Envisat may lead to a similar link between Artemis and Helios-2.

Recently, ESA officially decided to re-evaluate the legal meaning of its statute, concluding that the Convention does not restrict ESA's capacity to launch and implement space programmes for defence and security purposes or dual purposes or for national or international public bodies in charge of security and defence. It also installed a security clearance system.
There is the potentially attractive option to take full advantage of the dual-use nature of space in ESA itself, based on a future cooperative arrangement with the EU. Any such opportunity to avoid intra-European duplication should be welcome as a cost-reducing factor.

On the other hand, one must realistically assume that defence space systems are likely to remain national assets for some years to come. Even in the longer term, there may always be some defence applications that are deemed so sensitive that they are either not available at all to European cooperation or need to be dealt with in special ways.
Given the infant nature of European military space, it is too early to judge to which extent this aspect is likely to undermine the vision of ESA as a single European space agency. In any case (as in the Helios programme) the facilities that ESA can draw on as a service provider – possibly augmented by a progressively consolidating network of currently national space facilities – should be available for specific tasks even in the context of such special programmes.

3.3 Other Aspects of Institutional Development

In order to both gain cutting-edge capabilities and help sustain a capable and viable industrial base in Europe, it is urgent that efforts be made to strengthen dual-use aware, mission-oriented research and technology development in the EU in support of other community policies and to jump-start advanced R&D investment in the defence-space sector. Only by fostering the early pooling of European efforts at the research and technology level can the present situation, in which systems remain national and are only made mutually accessible (imagers, transponders) as a minimal form of European cooperation, be changed.

At the moment, the Western European Armaments Group (WEAG) is the only place where this is attempted to some degree. Satellite surveillance technology has been one of the Common European Priority Areas (CEPA) in this organisation since 1990. In 2000, this was widened to include military space technology as a whole.
One of the best ways to put Europe's space, security and defence capabilities-building efforts on a new footing would be the launching, preferably by the European Commission, of a European Security and Defence Advanced Projects Agency with a small, non-permanent staff and flexible, mission-based activity. Like DARPA in the US, this would provide a framework for pursuing a strategic approach to applied technologies of the future, combining a well-defined vision with highly responsive structures and methods.

A more active security and defence space user community is needed to interact constructively in the development of concepts and requirements, the acquisition process and joint exploitation of space systems for security and defence purposes in Europe. It would also be of great help in professional interaction with US space experts and in perceiving developments in US military space policy with more accuracy and timeliness.
Furthermore, a whole range of new institutional and regulatory decisions will have to be taken to deal with new tasks in the field of security and defence applications of space. Galileo and its security implications (cf. G. Gasparini, G. Lindström, *The Galileo satellite system and its security implications,* EU-ISS Occasional Paper n. 44, Paris) have already provided a wake-up call. Among other things, security-aware policies will have to be established for access to signals and for their denial, as well as precautions for system protection.

Finally, once the operational systems are in place, European command structures in charge of space systems will have to be developed. They may have to satisfy full military requirements as well and the specific European desire to exploit the dual-use nature of many space systems for a broad range of security applications. In some cases, parallel user structures will be unavoidable because core security and defence tasks often require a different approach than would a wider notion of security, e.g. environmental monitoring.

4. Space and security in Europe: a crossroad between policy and industry

Development of the European Security and Defence Policy requires space assets. Therefore, Europe needs to maintain a technological and industrial base or it will lack the autonomy required for strategic decision. Specific policies must increase its efficiency and competitiveness, overcoming European imperfections on both the supply and the demand side of the space market.

The main problems in the area of space and security are:

- The lack of significant funds devoted to security and defence in Europe. This reality emerges dramatically from a simple comparison of European and American expenditures: the ratio is 1 to 2.6 in the commercial market; 1 to 3 in meteorology; 1 to 4 in civil institutional demand; 1 to 30 in the military area. This limited demand impacts negatively on the European industrial base in a number of ways.
- The overall production of European industry will remain lower than US production and this will have a negative impact on competitiveness since non recurrent and fixed costs, such as research and development, must be borne almost entirely by civil production. The dependence on the commercial market amplifies the effects of economic crisis, as recently occurred, since the military sector is not big enough to develop significant anti-cyclical demand.
- From the technological point of view, the dual nature of space requires full exploitation of all possible applications, civil and military.
- The lack of institutional demand for launch services implies that the European launcher, Arianespace, is less competitive.
- The commercial attractiveness of European products is limited to non-security sectors.

One problem is the absence of a common European strategy that guarantees the convergence of the present and future national, international and European efforts. It can only be solved by adopting a European space policy that includes both civil and military aspects. In the meantime, closer coordination between national and European dimensions, as well as between civil and military activities must be developed. This will avoid duplications and the dispersion of scarce resources and will gradually bring about the pooling of technological, industrial and operational capabilities.

The supply side is also structurally inadequate. The globalisation of the market underlines the weakness of the European industrial base *vis-à-vis* American competitors.
Further rationalisation is needed and will probably involve greater industrial concentration. This process must be guided to avoid excessive distortion of the market, of which some is almost inevitable. The European governments and institutions should act to preserve some competition on the European market, at least in those sectors in which the market dimensions and technological and industrial characteristics allow, while opening up to concentration in other areas, such as launchers.

The introduction of a security and defence demand will have important positive effects on the competitiveness of the European market, making room for at least two different competitors for each sector.

Some conclusions can be drawn from a comparison of US and European experiences:

- The experience of the American space sector underlines the anti-cyclical role of institutional spending (in particular from the Department of Defence).
- The institutional support of the R&D in this particular sector is critical for any success, given the high level of uncertainty and the long-term prospective of the investments.
- It is important to offer the supply side a common set of regulations and unified demand, providing a stable, predictable and rich counterpart.
- The presence of strong demand organised around a single actor is a key asset; the segmentation of demand into different agencies specialised by mission should be avoided.
- Strong political backing for the supply-side reform and concentration process should provide the necessary incentives to cut costs.

Table 2 Analysis by Mission

Missions	Assets	Industrial players	Main Institutional players	Security aspect	Problems	Policy
Access to space	Launchers. Shuttle (?) Human flight (?)	Missile producers, rocket engines, launch facilities	ESA, EU Commission	Relevant, dual	Costs, subsidy, low institutional demand	Maintain all-spectrum capability, develop new technology, savings
Communications	Satellites constellations (GEO, MEO, LEO, DRS)	Satellite producers, ground segment, transponders, receivers, services providers	ESA, Nations (F, G, I, S, UK), NATO	Relevant, dual	Lack of institutional demand, distortion of competition, security of data, lack of wideband capability	Coordinate national efforts and civil/mil assets, plan for integrated future expansion
Navigation	GNSS	Services providers, atomic clock producers, receivers	ESA, EU Commission, EU Council, NATO	Relevant, dual	Control over signal, integration with GPS and Glonass, improper use	Clarify chain of command, bilateral agreements with US and Russia
Meteorology	Observation satellites	Satellite producers, ground segment, services providers	Eumetsat, ESA	Relevant, dual	Protection of information	Strengthen existing institutional links
Monitoring	Radar, IR, optic constellations	Satellite producers, ground segment, sensors	ESA, EU Council, Torrejon, Nations (F, I, G, S)	Relevant, dual	Costs, lack of coordination, security of data, legal framework for exploitation	Coordinate national efforts and civil/mil assets, plan for integrated future expansion
Treaty enforcement	Observation satellites	Satellite producers, ground segment, services providers	EU Council, ESA (technology)	Military, preventive diplomacy	Costs, political mandate	Exploit monitoring assets better, provide dedicated ones
Targeting	Observation satellites, GNSS	Satellite producers, ground segment, transponders, receivers, services providers	EU Council, Torrejon, NATO, ESA (technology), Nations	Military only	Lack of interoperability, few dedicated assets, unclear political framework	Coordinate national assets, develop common constellations, procedures, enhance Torrejon
Intelligence (Elint, Comint)	Satellite constellations	Satellite producers, Crypto software, sensors	EU Council, NATO, Nations	Military mainly	Sovereignty issue, lack of coordination, no dedicated assets	Establish political and institutional framework, common assets, exchange information
Early Warning	Observation satellites	Satellite producers, sensors	EU Council, NATO, Nations (F, UK)	Military, preventive diplomacy	No assets available, costs, feasibility	Deploy EU system (additional payloads)
Attack hostile assets in space	ASAT, killer satellites	Rockets, missile, EKV, satellites	ESA (technology), NATO (?), Nations (?)	Military only	No assets available. Costs, feasibility, impact on stability	Study technology
Missile defense in space		Laser, EKV, satellites	ESA (technology), NATO (?), Nations (?)	Military only	No asset available, unreliable technology. Costs, feasibility, impact on stability	Study technology

(?) = Possible, foreseen
Nations in brackets as main players

Table 3 Main Players and Policies

Phase	Demand	Supply	Problems	Policy
Research	Nations, ESA, EU Commission, industry	ESA, Universities, Research centers, laboratories	Lack of public and private funds, no coordination	Develop common institutional framework, increase funding, exploit economy of scale
Technological development	Nations, ESA, EU Commission, industry, NATO, private sector	ESA, laboratories	Lack of public and private funds, no coordination	Develop common institutional framework, increase funding, exploit economy of scale
Requirements	Nations, ESA, ESDP institutions, NATO	ESA, industry	No common requirements, lack of interoperability	Establish common Agency, pool present capabilities, stimulate competition
Procurement, maintenance	Nations, ESA, ESDP institutions, NATO, private sector	Industry	Lack of institutional demand	Establish common Agency, pool present capabilities, increase funding
Services, applications	Nations, ESA, EU Council, EU Commission, NATO	Industry, service providers	Limited private and public demand	Stimulate private sector, unify or coordinate institutional demand
Legal framework	EU Council, EU Commission, Nations		Fragmentation	Establish a common set of rules
Political authority	EU Council, EU Commission, NATO, Nations		Fragmentation	Determine who is in charge of what, clarify links between institutions

CONCLUSIONS

The European Union (EU) cannot ignore space nor remain out of it. This is well understood by the member countries that have a significant space policy. The creation of the European Space Agency (ESA) and the importance of its activities in terms of science, technological and commercial programs illustrates this political concern. At the same time, more "space oriented" European countries have developed an autonomous space activity, with some defence and security space assets. Also the EU, through European Commission initiatives, has became a space policy maker, starting with transportation and environment monitoring fields: the Galileo and GMES programs, both developed by the European Union and ESA, clearly show this trend.

Meanwhile, the EU has further strengthened its attempt to define a Common European Foreign and Security Policy (CFSP) and a European Security and Defence Policy (ESDP) and has started acting as an international security player (in Bosnia Herzegovina, Kosovo, the FYROM and Congo).
The EU Intergovernmental Conference will evaluate a number of proposals made by the European Convention, including the strengthening of European solidarity in the security field (in particular against terrorism) and the modification of some procedures and institutions to improve the efficiency of the European foreign, security and defence policy.

Space, and the role of space in the future of Europe, has to be included in that framework. That could overcome one of the main constraints on efficiency in European space policy: the fragmentation of players and strategies. This is obvious today in the telecommunication field where Europe has produced three different military projects (Syracuse, Skynet and Sicral). In the defence field some cooperation programs involving small group of countries recall the extensions of national logic.
Europe is already a very significant space actor, both collectively and thanks to the national space policies of some of its member states. Today European space policy is led by different bodies, depending on the applications: national space authorities, national defence authorities, ESA and some EU Commission Directorates.

The current relationship with the US, the world's only space power, can also lead to fragmentation. Only important civilian scientific programs are multilaterally managed by ESA with a direct partnership link with NASA, but there is no parity between Europeans and Americans.
In the commercial field, and even more so in the defence field, there is no such multilateral framework and each country has a direct bilateral relation with the US, with the exception of some general agreements (service agreements) managed by NATO. It may not be easy to overcome those multiple factors of fragmentation. This has been the framework for operations for decades.

To break away from these strategies and unbalanced policies calls for a redefinition of strong strategic, institutional and organisational patterns.
For example, financing European space activities with a unified community budget could be counterproductive: today those activities (including ESA multilateral activities) are financed through individual national budgets based on the national demand, which can vary appreciably from one country to another. ESA responds to that demand with an adequate offer. The same logic is all the more necessary for defence budgets. Instead EU budget contributions follow an objective logic based on parameters (GNP and population): it is dubious that such "objective" criteria can increase the space budget.

Enhanced cooperation is a different case: if a group of countries decide to undertake a project in a certain sector with some key objectives, there is a clear interest on the part of the participating countries to finance the achievement of the project, even in a non-proportional way. In the end this means that it's not very likely (and might be dangerous too) to pursue a complete rationalisation and unification of European space policies in the short term, and that national government logic and choices are and will continue to be determinant.

This is also true for the space programs linked to security and defence policy. In the defence sector, space expenses are included in the very tight and shrinking framework of national defence budgets. National defence budgets define and maintain different priorities, and are not able to promote a competitive critical level of technological capacities. This makes it impossible for them to fully benefit from the enormous operational potential offered by space technologies. In other words, no individual European country can finance alone the space program needed to modernise its security forces.

Obviously this situation deepens the gap between Europe and the US in terms of space technologies. In fact, in that sector the expense ratio between the EU and the US is 1:2.6 in the commercial market, 1:3 in the meteorological sector, and 1:30 in the defence sector. This has a huge impact on European industry's competitiveness and technological capacity. Thus, three related problems have to be addressed in a European logic:

- the insufficient level of European space expenditure;
- the lack of convergence between different initiatives;
- the structure of supply (to maintain the competitive capacity).

On the political and strategic side, Europe requires space assets to achieve its objectives in security and defence policy but also to be able to maintain its role as a global space policy player.
One principle behind this policy must be continuity in techniques, industries and functions in space activities whether scientific, commercial security or defence. This would make it possible to work out a closely linked framework for budgeting, planning, implementation and management of programs.

The term security is comprehensive of both civilian and military activities. After the end of the Cold War and in the absence of a dominant military threat against the Western world, the perception of new threats, risks and vulnerabilities has gained importance.
Terrorism, organised crime, risks stemming from forced or illegal mass migrations, security of supplies and of main trade routes, availability of strategic resources, protection of the environment and the like, have become the main source of worry. Those new threats cannot be dealt with by military force only, but require a combination of different means, both civilian and military, better encompassed by the term security.

Moreover, while high-intensity, purely military confrontation is still possible, military operations and priorities are shifting away from what was traditionally defined as "defence policy" (defending borders, defending the nation against well identified and "symmetric" enemies, planning confrontation between easily identifiable armies, with a high level of legitimacy, etc.) towards crisis management intervention (of a dual – civilian and military – nature), preventive engagement, counter-proliferation and counter-terrorism, support of civilian security operations, peace- and state-building. These operations are a significant element of any comprehensive "security and defence policy".

There is considerable overlapping of functions and means between the security and defence uses of space. In fact, space operations can be seen as a continuum, including civilian and military functions as well as security and defence operations. Specific military requirements (such as continuous availability, greater reliability, interoperability, protection, miniaturisation, speed, redundancy, etc.) increase the performance of space systems and provide a positive push towards technological developments that can further increase their utility and competitiveness for civilian and security uses.

The general tendency seems to be going in the direction of an increasing internationalisation of security policies (in the EU and globally), which goes hand in hand with the globalisation of the economy and of all kind of services. The fight against international terrorism has accelerated this development, already present in crisis management and peace operations, arms control and disarmament policies, the fight against organised crime, etc. Yet these considerations contrast sharply with the present segmentation of European space policies into civilian and military activities, as well as among scientific research, economic and other activities, including security and defence, and between nations.

Transatlantic problems also increase the difficulty in identifying an overall, coherent European space policy. The scientific cooperation between ESA and NASA contrasts with Europe's military dependence on the United States; however, transatlantic differences emerge when Europe launches strategic programs such as Galileo; communication satellites are conceived with different technologies, creating problems of interoperability; and intelligence satellites become a bone of contention, as well as triggering the prospect of so-called "network-centric" warfare. There is the need to identify basic elements of a transatlantic cooperation policy coherent with the development of a European Security and

Defence Policy and with the various new requirements stemming from the operations in which European forces are involved.
In general, the major space projects have been decided by the major users, and the US is prominent among them. France, Britain, and now also the EU and ESA, are trying to foster space activities, but the US is, and will remain, the main space actor (and Europe's major partner) for many years to come. But Europeans have only been able to accept or refuse participation in US-defined and US-led projects, never the other way round. Even good European ideas have sometimes been implemented as US-led projects, with subsequent European participation.
Moreover, the strong US tendency to consider space as an essential element of US military dominance and to make military operations increasingly dependent on space assets and technologies diminishes the possibility that the United States will generously share these same assets and technologies with its allies, except on an *ad hoc* and limited basis and in exchange for full compliance with US political, economic strategic and operational priorities.

Finally, differences are emerging between the US and Europe on the best way to use space assets in operations. The American concept of network-centric warfare, based on the use of wideband communication of a large amount of data to the lowest possible level of fighting unit (ideally, the individual soldier) requires a delegation of authority and an independence in decision-making that is generally refused by European military planners, who prefer a more centralised distribution of selected information (on a "need to know" basis) following a hierarchical line.
Europeans doubt that a complete technological restructuring of their operational units and their hardware can be useful and suggest that a better compromise would be for their forces to be "network enabled" or at best "network based", but not fully "network centred".

This debate is also fuelled by the different strategic perspectives of the EU and the US. While the latter maintains a truly global strategic outlook, based on its ability to project overwhelming force worldwide, Europe has more limited ambitions and requirements, focussing on relatively proximate threats and on what is needed to perform the missions defined by the Petersberg tasks. Such a regional vision does not exclude the possibility of worldwide force commitments, which are not seen as isolate European operations, however, but in support and with the assistance of other allies, either local or, more likely, the Americans themselves.

Thus, while a high degree of interoperability is deemed essential to maintain the possibility of joint operations among allies, complete technological and operational identity is generally rejected. This may indeed reduce the possibility of conducting fully integrated, joint military operations and favour instead various forms of division of labour with a significant degree of separation, but it seems to be in line with the growing US tendency to downgrade the centrality of coalition warfare operations conducted by fully multinational headquarters. This increasing US independence underlines the importance of achieving greater European autonomy.

Considering the global spread of military and security crises and the degree of exploitation of existing space assets, the degree of redundancy that could be guaranteed by more and more effective European assets could increase the security of the network and perform a useful backup and decongestion function. The fact that US and EU security perceptions generally remain very similar, almost identical, favour this development.

Inter-agency problems complicate European decision-making on space. Respective functions and specialisations must be defined better to allow for more effective integration and policy coherence (and more efficient use of the limited resources available). While being the focus of European space policy, ESA cannot really "draw up" policies. It can only autonomously initiate the study or the proposal of new programmes, but still needs the approval of member states before it can implement or make budget allocations to them.
The European future in space has to be built on the existing reality. Present European space activities are generally carried out through various national agencies or ministries: national institutions are generally more capable than international ones at dribbling relevant budgetary decisions past institutional and political obstacles, lobbying for greater space budgets, gathering public support and identifying economic interests and technical capabilities.

The EU is a relatively new actor in space. It has the ability to initiate policies and fund them, but not to substitute all other actors. Its main asset is the possibility of combining overall security and industrial policies with space policy, thus allowing for more coherence and rationalisation. The first basic objective should be the stabilisation of the European presence in space in order to guarantee Europe's space capacity for the future, consistent with its political and economical weight and able to fulfil the needs of an articulated European security and defence policy.
This requires a number of minimum conditions:

- full autonomy in basic space capabilities (satellites, launchers, ground segments, technologies and services) in order to guarantee access to and the optimal utilisation of space in accordance to European policy. This does not exclude agreements with other space powers nor does it call for parity with the US; it is merely a sufficient objective with minimal technological assets.
- a lively, competitive and diversified European industrial and technological basis for the development of scientific and technological know-how. This means guaranteeing a volume of production in the long term, and some public investment programs in science and technology that can have an anti-cyclical function with respect to commercial demand.

It's important to identify what could be an essential and minimal European presence in space for security and defence purposes. Roughly, this would include a network of satellites to match requirements in terms of communication, observation, positioning, electronic intelligence and early warning: assets that go with adequate ground segments, and with space segment investment costs of around 8-9 billion euros over a period of 8 to 15 years, for a yearly investment below 800 million euros (with a part already allocated). These

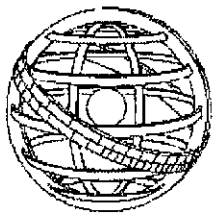
assets might not be affordable by a single European country but are highly compatible with a multilateral investment effort. Such a system would also provide CFSP, ESDP and the European rapid intervention forces with a higher degree of efficiency and autonomy. The details of such a space architecture are not new: they have long been known to European governments. The real problem is how to realise them.

The most recent EU developments could play a positive role. The EU may have to identify and articulate demand more precisely in terms of space assets, gathering the perceptions and choices from various European states (or more precisely a group of states, following an enhanced cooperation logic), and establish criteria for burden sharing and systems management. This would be the best way to guarantee equal fruition for users but also to establish the necessary link with the Atlantic Alliance and the US.
Within such a framework, ESA could act on the supply side, guaranteeing the necessary technical level and the system kick-off, linking up directly with the European industrial base and national authorities.

In practical terms, a "space security" committees can be set up in parallel in the ESA and in the EU Council ,in charge of designing, programming, implementing and managing programs, and providing an institutional link between the two institutions. Also, a European space security and defence sector could flank the future EU headquarters, but this need for a higher institutional profile for space security should not be limited to defence.
Again, European space is mainly civilian and a dual-use sector. This calls for a higher "dual-use space security" profile, which means that on the ESA side (ESA Council) European intergovernmental Councils would be specifically put in charge of space security, while on the EU side the European Council would give a precise mandate to develop coordination competence at the Coreper level, with a structure able to check and approve the security policy involvement of EU space projects.
In order to avoid too many institutional space security entities, such as one dedicated cooperation security council in ESA and another for space security in the EU Council, the composition of such a committee could be the same for both (space security being an "optional" program for some ESA countries and an "enhanced cooperation" for EU members), or the ESA and EU Councils could take a parallel decision to define a joint space security authority under the responsibility of the EU High Representative, with competence on the strategic and security aspects of space security.

As a starting point, the EU shall proceed for space in the same way that it progressively produced CFSP and ESDP: identification of objectives, problem analysis, solution hypotheses to be evaluated by European institutions and public opinion.
Such a task could be best done by a specialised Space Security Committee, composed of European experts bringing together assessments from space industry, potential civilian and defence space users in the foreign, security and defence spheres. Such a committee could help to determine the optimal level of European ambitions in space, with regards to both demand and the evolution of needs. This Space Security Committee would do a very important policy work, useful for identifying and building up a much needed European space constituency.

In the end, this Committee would present its conclusions to the European Council to start a formal decision-making process in the community framework and with the involvement of interested institutions.



Istituto Affari Internazionali

RAPPORT INTERNATIONAL

L'ESPACE ET LA POLITIQUE DE SECURITE EN EUROPE

SYNTHESE

Rome, Octobre 2003

1/F

L'Espace et la Politique de Sécurité en Europe

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INTRODUCTION

L'évolution de la politique spatiale européenne et la récente décision de l'UE de développer le projet Galileo montrent une approche positive. Cette décision confirme la volonté de poursuivre une politique de technologie spatiale qui dépasse l'échelon national, même si les visions nationales prédominent encore. Un nouveau concept de sécurité est en train d'émerger. Une approche intégrée est nécessaire pour satisfaire les évolutions des politiques étrangères, de sécurité et de défense (PESC, PESD) et les nécessités de protection des populations.

Les besoins de sécurité sont liés aux progrès technologiques. Les technologies spatiales doivent être utilisées pour protéger les populations, les ressources et les territoires mais aussi pour maintenir et renforcer l'intégrité et les compétences de la base technologique. Les systèmes spatiaux constituent un maillon fondamental de la « sécurité technologique » : ils offrent des solutions extrêmement souples et variées à l'échelle mondiale.
Ce travail analyse les positions des différents acteurs européens sur ces sujets dans la perspective d'une convergence vers une Politique de Sécurité Spatiale Européenne.

1. L'Espace est stratégique. L'Europe a toujours maintenu une présence importante dans l'Espace. Le développement des technologies duales est une opportunité pour favoriser une approche européenne de la sécurité spatiale, en coordonnant les actuels programmes nationaux de défense avec les programmes civils spatiaux européens. Dans le cas des technologies spatiales, les fonctions et les moyens sont assez similaires qu'il s'agisse de sécurité ou de défense. De ce fait, les opérations spatiales de sécurité doivent être conçues dans la continuité, incluant des fonctions civiles et militaires.

2. Le rôle émergent de l'UE dans la politique spatiale européenne a été caractérisé par un intérêt croissant pour des programmes stratégiques. Les décisions européennes à venir et les performances des systèmes spatiaux européens appliqués à la sécurité et à la défense auront un impact fort aussi bien sur les relations transatlantiques que sur la définition du rôle de l'Europe dans le monde (ainsi que sur le futur de la base technologique de l'industrie européenne de défense). En conséquence, la réflexion sur le secteur ne peut plus être reléguée en marge du processus de décision politique européen, mais impose des choix politiques forts sur le long terme.

3. Les technologies spatiales apparaissent comme nécessaires à notre sécurité collective mais nous constatons l'absence d'une conscience européenne des

bénéfices d'un système spatial commun. Un bassin d'utilisateurs de technologies spatiales de sécurité et de défense doit encore être créé aussi bien au niveau des institutions nationales de défense que parmi le grand public européen.

4. L'offre est structurellement inadéquate. La mondialisation des marches fait ressortir la faiblesse de la base industrielle européenne par rapport à la concurrence américaine. Des rationalisations ultérieures sont nécessaires et impliqueront probablement un niveau plus élevé de concentration industrielle. Ce processus devra être guidé de manière à éviter des distorsions excessives du marché. Les principes d'une telle politique devraient être la continuité des technologies, industries et fonctions des activités spatiales qu'elles soient scientifiques, commerciales, de sécurité ou de défense.

5. Une politique spatiale future requiert trois fonctions :
    a. Recherche et Développement pour applications spatiales avancées.
    b. Participation majeure des responsables Sécurité et Défense dans la prise de décision de la politique spatiale.
    c. Visibilité politique et institutionnelle majeure et processus opérationnel des activités spatiales de sécurité.

6. A ce jour en Europe aucune structure n'est capable de référencer l'ensemble des activités liées au spatial et d'avoir une approche globale en matière de production des systèmes et de capacité, en ayant aussi recours aux opportunités publiques et commerciales de type dual et en mettant en chantier des solutions de partenariats publics/privés. Au lieu de continuer à fonctionner sur des approches nationales ou de prévoir une seconde agence spatiale européenne pour la sécurité et la défense, l'option de renforcer le profil dual de l'Agence Spatiale Européenne (ESA) dans un cadre de coopération avec l'UE pourrait répondre aux problématiques soulevées.

7. Les gouvernements et institutions européennes devraient préserver la compétition dans le marché interne européen, au moins dans les secteurs où les dimensions des marchés et les caractéristiques techniques et industrielles le permettent. Dans les autres cas, comme le secteur des lanceurs, des concentrations doivent être envisagées. L'augmentation de la demande de Sécurité et de Défense produira un effet d'entraînement positif important sur la compétitivité du marché européen, créant la possibilité d'avoir au moins deux concurrents dans chaque secteur.

8. Une complète rationalisation et unification à court terme des politiques spatiales européennes serait contre-productive car les choix continuent à être opérés largement sur base nationale. Il est toutefois possible de programmer une politique européenne (dans un schéma collectif ou de coopération renforcée) qui regroupe toutes les composantes spatiales européennes pour réaliser des objectifs stratégiques primaires en vue d'apporter à l'Europe le savoir-faire et les fonctions aujourd'hui manquantes pour rendre sa présence dans l'espace plus cohérente et complète.

9. Les autorités européennes devraient déterminer une série d'objectifs de politique industrielle minimum pour maintenir une autonomie complète de capacité spatiale basique (satellites, lanceurs, segments au sol, technologies et services) de façon à garantir l'accès à l'espace et son utilisation optimale en accord avec une politique européenne. Ceci n'exclut en aucune manière la possibilité d'accords avec d'autres puissances spatiales, ni ne doit apparaître comme un appel à la parité avec les USA. Il s'agit d'un objectif suffisant avec un minimum de systèmes technologiques. De plus pour développer le savoir-faire scientifique et technologique, les autorités européennes devraient aussi être vigilantes et maintenir un tissu technologique et industriel compétitif et diversifié. Cela passe par la garantie d'un volume de production à long terme et par des investissements publics en science et technologie qui peuvent jouer une utile fonction anti-cyclique par rapport à la demande commerciale.

10. Les développements les plus récents de l'UE pourraient jouer un rôle positif. L'UE elle-même pourrait être bien placée pour identifier et planifier la demande en termes de systèmes spatiaux, en prenant en compte les perceptions et les choix des différents Etats membres (où plus précisément d'un groupe d'Etats qui suivrait une logique de coopération renforcée) et en établissant les critères de répartition des tâches et de gestion des systèmes.

11. Pratiquement, des commissions « sécurité et secteur spatial » peuvent être créées en parallèle au sein de l'ESA et du Conseil de l'UE, avec comme tâche de définir, programmer, mettre en œuvre et gérer un tel programme, ainsi que de devenir la charnière institutionnelle entre les deux institutions. Pour éviter la dispersion du fait de la création d'un trop grand nombre d'institutions, la composition de ces commissions pourrait être identique.

12. Une des meilleures solutions pour hausser le niveau des efforts spatiaux européens en matière de capacités de sécurité et de défense pourrait être le lancement, de préférence par l'Union Européenne, d'une Agence de Projets Avancés pour la Sécurité et Défense Européenne dotée d'un staff non-permanent et flexible, opérant sur la base de missions ponctuelles. De manière similaire à la DARPA américaine, cette agence fournirait un schéma d'approche stratégique pour les technologies appliquées futures, en combinant une vision définie avec des structures et des méthodes efficaces.

13. Ces changements souhaitables ne se produiront pas aisément. Aussi le Conseil Européen devra prendre l'initiative en établissant une commission spatiale indépendante, composée d'experts européens et qui pourra mettre en perspective les évaluations de l'industrie spatiale et celles des utilisateurs potentiels civils et militaires dans les sphères de la politique étrangère, de la sécurité et de la défense. Cette commission devrait déterminer le niveau optimal des ambitions spatiales européennes en prenant en compte la demande et l'évolution des besoins. Au-delà de la fonction de collaboration avec le Conseil Européen, une telle commission

pourrait effectuer un important travail de sensibilisation, en contribuant à un élément crucial, l'identification et la construction d'une « constitution européenne spatiale »

SYNTHESE DU RAPPORT

1. L'Espace, une dimension décisive pour la politique de sécurité européenne

La technologie spatiale est liée à la sécurité collective, le terme sécurité faisant référence à la protection des citoyens européens à l'égard des risques potentiels d'origine militaire et civile.
Le livre vert sur la « Politique Spatiale Européenne » de la Commission Européenne comprend un examen des technologies spatiales à des fins de sécurité. La dimension spatiale est fondamentale pour nombre d'actions européennes comme le développement d'une « économie basée sur le savoir » ou des politiques de transports intégrées (le « ciel unique » par exemple). Au même moment le développement d'une Politique Etrangère et de Sécurité Commune (PESC) et d'une Politique Européenne de Sécurité et de Défense (PESD) entraîne un besoin de capacités militaires nouvelles.
L'utilisation croissante des technologies de l'information est liée à ces efforts visant à faire croître les capacités européennes, en particulier pour faire face aux nécessités en matière de transmission de données et d'information.
L'ECAP (plan d'action pour les capacités européennes) requiert des actions concrètes pour augmenter la disponibilité des systèmes.
Le Conseil Européen de Thessalonique a lancé le concept d'une Stratégie de Sécurité pour l'UE. C'est un pas important vers la définition plus précise des fondements politiques des applications spatiales futures en matière de sécurité. De plus, la décision de créer d'ici 2004 une agence inter-gouvernementale pour le développement des capacités de défense, la recherche, les acquisitions et les armements représente une avancée fondamentale pour le développement des technologies de sécurité dans l'UE, et donc pour les activités spatiales.

Aux Etats-Unis, les technologies spatiales bénéficient d'un effet d'entraînement par le secteur militaire, la stratégie militaire étant basée de manière croissante sur le concept de « maîtrise de l'information ». Les technologies spatiales européennes sont elles essentiellement civiles ; même s'il s'agit de technologies duales.

Ce caractère dual a été politiquement réaffirmé. Le préambule de la Convention de l'ESA définit une mission « dans un but pacifique ». Le développement d'une politique européenne qui prévoit dans ses objectifs « d'aider au maintien de la paix et à la défense de la stabilité » confirme la compatibilité de cette orientation politique avec une utilisation « non agressive » de la technologie.

Le système spatial européen est exclusivement civil. Les principaux programmes de défense et de sécurité ont été développés sur une base nationale, et parfois au travers d'accords de coopération bi ou trilatéraux pour l'échange de données.
Le développement de programmes à double usage requiert une approche européenne envers les activités de sécurité spatiale qui soit capable de créer un lien entre les politiques de défense nationale et l'espace européen civil.

Les opportunités de retombées technologiques basées sur le spatial, renforcées par une « politique de sécurité élargie » en provenance des autorités de l'UE, impliquent des évolutions importantes :

- La "sécurité des citoyens" constitue l'élément fondateur pour une utilisation croissante des technologies spatiales. Ce concept de sécurité est à la fois civil et militaire.
- Dans certains cas, les applications destinées à la sécurité des citoyens sont essentiellement civiles comme, par exemple, le contrôle des cultures par l'imagerie satellite ou la gestion de ressources en eau.
- Dans la plupart des cas, les applications de sécurité dérivées de technologies spatiales fournissent des informations sensibles qui doivent être collectées et communiquées en suivant une procédure précise.
- Un encadrement politique et juridique renforcé est nécessaire pour traiter ces informations, ce qui pourrait aussi faciliter l'élargissement du nombre des utilisateurs des technologies spatiales au sein des administrations de défense, police et justice.
- Le développement de la PESC/PESD requiert des applications et systèmes spatiaux qui correspondent à une capacité opérationnelle significative.
- Aucun lien n'existe entre les différents services de renseignements comme utilisateurs communs de ressources spatiales si bien qu'une meilleure coordination du secteur spatial au niveau européen pourrait garantir une meilleure efficacité.

Le concept de « sécurité spatiale » met en jeu différents éléments :

- Les applications de sécurité dérivées des technologies spatiales constituent un élément clef de la politique européenne.
- Le développement du spatial s'inscrit dans la mise en œuvre concrète d'un projet politique démocratique européen commun. Les applications spatiales de sécurité sont directement liées au rôle de l'Europe dans le monde. Les négociations entre les Etats-Unis et l'UE à propos du système Galileo en démontrent l'importance.
- Le secteur spatial contribue à la définition d'un concept de sécurité pour l'Europe et à une culture stratégique commune, non seulement pour les applications qui améliorent la sécurité des citoyens mais aussi pour la capacité technologique en elle-même. Les besoins exprimés par les utilisateurs et par les industriels font partie d'une vision de sécurité technologique globale.
- La sécurité spatiale inclut le secteur de la défense et des applications de sécurité, mais est pour l'essentiel entraînée par le secteur civil, se basant sur une approche duale spécifique développée par les institutions européennes multilatérales et nationales.

De plus, la Convention Européenne sur le Futur de l'Europe inclut la "politique spatiale européenne" et un « programme spatial européen » dans son projet de Traité Constitutionnel : il s'agit d'une affirmation politique forte qui encadre un secteur de haute technologie et confirme son importance stratégique. Egalement, ce projet de Traité Constitutionnel rappelle la nécessité d'un important effort institutionnel et opérationnel pour développer un concept européen de sécurité.

2 Aspects de la coopération intergouvernementale et Europe

Le développement du spatial en Europe s'est opéré séparément du processus général d'intégration européenne. De plus, différentes institutions civiles et militaires, travaillant sur base nationale ou par le biais de partenariats divers, ont contribué à définir les politiques spatiales et à développer l'activité industrielle. L'Agence Spatiale Européenne est devenue l'autorité principale pour l'industrie spatiale européenne. Néanmoins, le rôle croissant de l'Union Européenne, le développement des activités spatiales militaires ainsi que les changements dans le secteur industriel constituent des facteurs émergents qui doivent être pris en compte et intégrés dans l'évolution interne des systèmes spatiaux nationaux des Etats-membres.

Aujourd'hui les contributions principales à l'activité spatiale en Europe sont le fait de l'Agence Spatiale Européenne, l'Union Européenne et des programmes inter-gouvernementaux.

Les programmes spatiaux européens sont caractérisés dans leur ensemble par :

- Un accent fort mis sur la recherche et le développement produisant des programmes expérimentaux et l'acquisition de compétences dans les secteurs de haute technologie.
- Le caractère opérationnel collectif et des objectifs stratégiques.
- Les objectifs nationaux.

En ce qui concerne deux des principaux projets européens spatiaux, Galileo et GMES, les aspects de recherche et développement sont gérés par l'ESA alors que la stratégie est pilotée par l'UE. Dans ces cas, la participation des gouvernements nationaux constitue une phase ultérieure de coopération. Les autorités nationales en matière spatiale peuvent être des agences à compétence spatiale plus ou moins exclusive, des ministères (par exemple recherche et technologie, industrie ou commerce extérieur) voire des entités inter-ministérielles. Pour le secteur spatial militaire, les ministères de la Défense sont responsables de la part d'activités non liées au civil.

Une des missions de l'ESA consistait à coordonner le programme spatial européen et les programmes nationaux avec comme objectif d'européaniser graduellement ces derniers. En pratique, les programmes spatiaux européens n'ont pas supplanté les activités purement nationales et l'attitude à l'égard des programmes européens aussi bien que le degré de participation varient d'un membre à l'autre.
Les taches des agences spatiales sont aujourd'hui remises en question dans l'ensemble des Etats. Ceci reflète les évolutions progressives des relations entre les différents protagonistes et aussi une certaine maturité du secteur après plus de 35 ans d'activités.

L'ESA a démontré ses capacités pour la gestion de grands programmes et de recherches scientifiques spatiales originales. Toutefois de nouveaux facteurs concernant l'évolution des technologies, des changements dans les priorités spatiales nationales et les développements de l'organisation générale de l'Union Européenne poussent à une

redéfinition des objectifs et des ambitions de la future Agence Spatiale Européenne. Dans ce contexte l'ESA entend élargir son rôle pour contribuer au développement d'une politique spatiale européenne comme le montre l'effort stratégique conjoint avec l'Union Européenne (Livre vert). Alors que l'ESA reste le principal forum pour toute forme de coopération intergouvernementale, avec ses propres mécanismes de discussion et de négociation, l'UE est un acteur en croissance dans le cadre intergouvernemental.

LE PREMIER PROGRAMME CO-GERE PAR EU-ESA: GALILEO

Le programme Galileo de satellites de navigation et de positionnement est le premier programme spatial véritablement piloté par l'Union Européenne.
Le programme a commencé au niveau européen dans le cadre d'une autorité tri-partite composée par l'ESA, l'UE et par Eurocontrol, l'organisation de certification du trafic aérien. Pouvant compter sur un large soutien au sein de la Commission, l'objectif de créer un système commercial européen indépendant conçu comme civil malgré une évidente dimension militaire a été initialement défini par une directive européenne. Une des conséquences de la participation de l'UE a cette initiative a été la création d'un nouveau système de financement dénommé PPP (Partenariat Public Privé).
L'impasse décisionnelle du conseil de Laeken en 2001 a montré comment certains gouvernements craignent que le développement du système spatial Galileo puisse remettre en cause la souveraineté nationale dans ce secteur.
Au-delà d'une analyse strictement militaire, l'évolution de Galileo a été caractérisée par des questionnements sur sa validité pour des objectifs nationaux et par des disputes entre gouvernements sur les bénéfices politiques et industriels (encore récemment l'Italie et l'Allemagne). Il convient de souligner que les plus récentes discussions inter-gouvernementales se sont déroulées sans remettre en cause le principe d'un programme Galileo avec le leadership UE.

LA PREMIERE INITIATIVE EUROPEENNE DE SECURITE ELARGIE : GMES

Conçu à l'origine pour l'observation de l'environnement, le programme GMES a depuis été élargi à la dimension de sécurité PESC, la notion de sécurité étant incorporée dans le titre du programme par le biais du "S" de GMES. A la différence des programmes civils coordonnés par l'ESA, la Commission Européenne privilégie une approche d'extrême prudence en pilotant un programme qui comporte de clairs aspects duaux, mais dont on entrevoit la difficulté à l'imposer comme un instrument de souveraineté collective, en particulier dans le domaine militaire. Ce programme devrait théoriquement conduire à la mise en place d'un système opérationnel pour l'observation globale de l'environnement

d'ici 2008.

L'EXPERIENCE MILITAIRE : L'HERITAGE DE L'UEO DANS L'UE

En 1991 le centre satellitaire de l'UEO pour l'interprétation des données satellites fut crée à Torrejon en Espagne après la conclusion d'un long processus de réflexion. Cinq années plus tard, un examen par l'UEO des activités du centre de Torrejon durant sa phase expérimentale a montré qu'il n'avait pas encore atteint son efficacité maximale. Un des problèmes principaux concerne la coopération dans des domaines sensibles comme le renseignement. De façon plus générale, l'UEO devait faire face à un manque d'uniformité entre les pays membres, et ce en termes de ressources financières mais aussi d'approches politiques et stratégiques. Cependant la décision prise en mai 1997 de soutenir et renforcer les activités du centre de Torrejon démontre que l'importance des systèmes spatiaux est officiellement reconnue, au moins au niveau politique, même si la plupart des programmes actuels sont développés dans le contexte de coopérations strictement bilatérales ou multilatérales entre les Etats à fort secteur spatial. En 2001 le Centre a été institué comme Agence permanente rattachée au Conseil de l'UE, démontrant un rôle reconnu et soulignant le fait que ses missions soient véritablement considérées comme faisant partie du développement de la Politique Européenne de Sécurité et de Défense (ESDP)

2.1 La position générale de l'UE par rapport à la coopération spatiale internationale.

L'émergence de l'UE dans la politique spatiale européenne a été caractérisée par un intérêt croissant envers les programmes stratégiques. Cet intérêt a fait profondément évoluer les conditions de coopération transatlantique : la décision de l'UE de mettre en chantier des programmes comme Galileo ou GMES a suscité une vague de scepticisme aux Etats-Unis.
L'UE a une politique plutôt active dans le secteur de la coopération spatiale. L'UE a établi des contacts avec la Russie et avec la Chine, principalement dans le cadre potentiel de coopération du programme Galileo en accord avec la position d'ouverture de l'UE envers des partenaires multilatéraux.
Aujourd'hui, l'harmonisation des programmes nationaux est l'un des problèmes majeurs de la construction d'une compétence militaire européenne. Certains pays européens ont programmé le développement de leurs propres capacités (Sar Lupe allemand, Cosmo

Skymed italien, Pléiades français) et des accords d'échange d'information avec d'autres pays (Belgique, Suède, Espagne et Autriche).

La possibilité d'un développement d'une présence européenne spatiale en matière de sécurité et de défense demande une réflexion rigoureuse :

- Le contexte de la politique européenne est en forte évolution depuis l'affirmation des « headline Goals » qui visaient à établir une Force de Réaction Rapide Européenne (FRRE).
- Les technologies spatiales, comme les technologies de l'Information, connaissent des changements importants liés aux améliorations constantes du rapport coût/performance des composants électroniques et, de façon corrélée, aux améliorations des architectures de systèmes qui rendent possible la combinaison de systèmes distincts. De tels systèmes ont la capacité d'enrichir l'information produite pour tout type d'utilisateurs, militaires inclus. De plus étant donné la flexibilité d'utilisation potentielle, cette ouverture technologique pourrait répondre, a priori et contre toute attente, aux nouveaux besoins en matière de sécurité qui préoccupent les militaires aujourd'hui.
- Pour l'ensemble des militaires, la disponibilité et l'utilisation croissante de tout type d'informations sont nécessaires pour la conduite des opérations militaires modernes. Du point de vue d'une armée professionnelle, l'ennemi est caractérisé par le manque d'informations possédées à son sujet et par les actions imprévisibles qu'il peut conduire. Les stratégies militaires cherchent cependant à compenser le manque de connaissance de l'ennemi moderne par le renforcement de leur capacité d'observer, de détecter et de savoir.
- Ces développements techniques et les nouveaux besoins convergent pour donner au développement du secteur spatial une dimension stratégique de premier plan.
- Les initiatives européennes ne font pas exception à cette logique. Le problème est là aussi considérable : l'importance des conséquences d'un tel choix augmente les difficultés de construction d'une présence spatiale européenne. La réflexion dans ce domaine ne peut plus se contenter d'évoquer les applications militaires en marge d'autres programmes et requiert l'expression de choix politiques à long-terme.

L'ESPACE MILITAIRE EUROPEEN : EVOLUTION DES SCENARIOS DE REFERENCE

Une estimation des coûts extrapolée des systèmes existants (hors coûts d'exploitation) donne un ordre de grandeur de l'investissement nécessaire pour un éventuel système collectif européen de défense spatial.

Table 1 – Coûts d'un potentiel système de défense spatial européen

Application	*Coûts de Programme (Millions €)*	*Durée de Programme (années)*	*Coût annuel (Millions €)*
Télécommunications	*3,140*	*15*	*209*
Observation	*2,283*	*10*	*228*
Galileo	*150*	*8*	*19*
Recueil du Signal	*875*	*10*	*87*
Alerte précoce	*555*	*10*	*55*
Surveillance	*251*	*10*	*25*
Total	*7,254*		*623*

Source: *European Global Space Metasystem for Security and Defence, presentation by Major General D. Gavoty in the Workshop on "Security and Defence Aspects of Space: The challenges for the EU, Contribution to the Green Paper Consultation Process" organised by the Greek Presidency of the EU, Athens, 8-9 May 2003,* http://europa.eu.int/comm/space/futur/consultation5_en.html

2.2 Re-penser la souveraineté politique et militaire

La mise en place d'activités spatiales militaires à l'échelon européen soulève des questions de souveraineté politique et militaire. Les questions de souveraineté sont actuellement traitées dans le cadre des accords multilatéraux, comme les « besoins opérationnels communs » du programme militaire d'observation Hélios. Créer des programmes européens déplacerait la problématique à un niveau totalement différent non seulement par les problèmes structuraux et la question de responsabilités posées par leur développement mais aussi de par l'importance politique et stratégique de tels programmes.
Deux programmes européens majeurs – civils mais avec une forte nature duale - synthétisent ce véritable tournant : Galileo et GMES. Ils révèlent l'objectif mais aussi le caractère sensible des choix que doivent opérer les Etats-membres de l'UE. Ces derniers ont conscience que la crédibilité de l'ensemble de l'Europe politique et militaire dépend de leur engagement aujourd'hui. Déjà des exemples de plus en plus nombreux d'applications de sécurité, pour ne pas dire de sécurité militaire, de ces programmes font qu'il devient impossible pour les Etats européens de restreindre ces débats exclusivement aux intérêts économiques, industriels ou purement civils, ce qui renforce les résistances nationales pour s'engager complètement dans leur développement.

2.3 Schémas de coopération possible : complexité et multiplicité

La création d'une véritable présence militaire spatiale européenne apparaît d'autant plus délicate que l'intégration européenne n'est pas uniforme, et que de nombreux systèmes de coopération co-existent. Dans ce domaine précis, la coopération n'a jamais dépassé un cadre bi ou tri-latéral, à l'exception des systèmes OTAN Satcom. L'accord le plus récent

sur le Besoin Opérationnel Commun (BOC) vise à faire progresser les accords de coopérations initiés dans le domaine sensible du renseignement spatial par les systèmes satellitaires Hélios-1A et Hélios-1B. Le BOC est un processus de coopération au plus haut niveau, qui pourrait garantir des accords multilatéraux stratégiques plus durables et continus dans le futur. Ce processus recherche tout d'abord un accord de co-financement pour un programme et définit ensuite des objectifs opérationnels communs pour les différents systèmes nationaux, soit dans ce cas ceux de l'Allemagne, l'Espagne, la France et l'Italie. La mise en commun des besoins militaires dans les domaines de l'observation optique, radar et infra-rouge pourrait ensuite compenser le caractère temporaire des financements communs de programmes. Des efforts ultérieurs sont cependant nécessaires pour traduire ce document dans la réalité européenne.

Cette initiative reste cantonnée à certains Etats-membres : elle pourrait devenir l'embryon d'une décision d'action prise au niveau européen. En suivant cette logique, le BOC pourrait constituer un mécanisme progressif pertinent pour avancer dans l'intégration européenne, même si cela ne signifie ni une coopération technique plus importante, ni n'implique un caractère inter opérationnel majeur a priori.

3. Les institutions européennes et la politique spatiale de sécurité

L'Agence Spatiale Européenne, créée pour regrouper les ressources européennes en matière de compétence spatiale, constitue un processus d'intégration autonome.
Alors que l'ESA reste en dehors de l'approche communautaire, son statut (comme celui de l'UE) dépasse le cadre d'une structure intergouvernementale de coopération : il comporte un programme obligatoire et une infrastructure commune propre.

De plus, le premier pilier de l'UE stipule que le secteur de la défense est hors du cadre d'action des autorités communautaires et reste sous le contrôle des gouvernements nationaux. La Commission Européenne n'est autorisée à intervenir de façon ouverte et à dépenser des budgets pour les politiques de Sécurité que dans de rares cas. Il est clair que les politiques de sécurité interne et de défense dans l'UE resteront inter-gouvernementales dans le futur prévisible, et que l'UE et la Commission Européenne auront un rôle visant à faciliter les efforts des Etats-membres.

Aujourd'hui la Commission Européenne conçoit son rôle dans la politique spatiale par la conduite d'activités conjointes de recherche et de développement, la mise en place des instruments de régulations et la recherche de soutien pour les projets d'intérêts européens comme Galileo. Au cours de la dernière décennie, les activités spatiales ont évolué : une fois dépassé l'objectif initial de développement technique, elles se sont concrétisées par des applications avancées, notamment dans les secteurs des communications et de l'observation de la terre, incluant l'observation météo et le suivi des changements climatiques. Certaines de ces applications prennent une importance croissance dans différents secteurs civils et économiques ; elles sont aussi importantes pour les activités de sécurité et de défense.

La fragmentation des efforts spatiaux européens –la division entre activités civiles et militaires, entre agences nationales et ESA, le rôle croissant de l'UE – rend nécessaire de nouvelles solutions institutionnelles.
En 2003 la Commission a présenté son livre vert sur la politique spatiale européenne, préparé en coopération avec l'ESA. Le message fort de ce document est que les bénéfices de l'espace doivent être mis au service de l'Europe et de ses citoyens. Les secteurs les plus à même de profiter de ces bénéfices sont le développement durable, avec le contrôle des réglementations et les capacités de gestion des crises environnementales, ainsi que la sécurité des citoyens par le biais de la PESC/PESD.
Le débat public autour du livre vert qui s'est déroulé tout au long du premier semestre 2003 a fourni la base du Livre Blanc.
Dans le domaine de la Sécurité, le livre vert insiste sur les aspects spatiaux de l'ensemble des « missions de Petersberg », aussi bien civils que militaires, couvertes par la PESC et la PESD. Ceci reflète la formulation du Plan Européen d'Action sur les Capacités (ECAP) selon laquelle « dans une certaine mesure, les besoins critiques en terme de gestion des crises sont directement liés à une capacité technologique spatiale ».
Etant donnée la nature limitée de l'intégration de défense dans l'UE, la défense commune restant l'apanage d'Etats-membres la plupart coordonnés par l'OTAN, le Livre Vert de la Commission ne peut évidemment pas offrir une vision véritablement intégrée d'une

politique spatiale européenne incluant des capacités spatiales strictement militaires et d'intelligence.
Toutefois l'appel de la Commission pour une approche plus efficace et ambitieuse envers la politique spatiale en vue de réunir les efforts de l'EU, de l'ESA et des Etats-membres est un message fort qui doit aller au-delà du débat sur le Livre Blanc.
Le premier objectif, tel que spécifié dans le Livre Vert, est « d'assurer aux Etats-membres une valeur-ajoutée » dans le cadre d'une politique spatiale de l'Ue cohérente et commune qui traite également la sécurité et la défense. De façon pratique, au moins au début, cet objectif doit ouvrir la possibilité de mobiliser de nouvelles ressources financières par le biais d'une coopération européenne pour les activités spatiales liées à la sécurité et à la défense, sous l'impulsion des Etats-membres déjà actifs dans ce secteur.

Cet objectif pourrait être atteint en suivant trois logiques :

- exploiter de façon plus efficace les fonds de recherche et développement pour les activités duales au niveau national et européen.
- augmenter les budgets spatiaux pour les activités de sécurité.
- accroître le soutien politique envers de nouvelles attributions budgétaires pour les programmes spatiaux de sécurité par un travail de sensibilisation ciblé et rapide. La Commission estime que le budget annuel spatial de l'EU devrait être doublé et porté à 12 Milliards d'Euros pour réaliser les programmes nécessaires pour une future politique spatiale européenne cohérente.

Les fonctions requises dans un cadre politique futur et amélioré sont :

- activités de R&D ciblées pour des applications spatiales avancées.
- participation majeure des responsables de sécurité et défense dans la prise de décision de la politique spatiale.
- augmentation du niveau de visibilité politique et institutionnelle des activités spatiales de sécurité.

Ces trois points nous fournissent un critère utile pour évaluer les différentes approches futures en termes d'évolution des rapports institutionnels entre EU, ESA, les agences du secteur et les institutions nationales.

3.1 Le rôle de l'UE dans la politique de Sécurité Européenne

Les évolutions politiques et militaires basées sur les conflits balkaniques des années 1990 sont à la base des décisions visant à doter l'UE d'une série d'outils militaires et civils destinés à la gestion des crises, ce qui a permis le lancement de l'initiative PESD « Headline Goal » en 1999. Toutefois les interprétations des « missions de Petersberg » sur lesquelles se base cet effort connaissent des différences d'un Etat-membre à l'autre. Aujourd'hui une définition élargie de ces missions semble acceptée par la majorité, incluant la prévention des conflits, les opérations de désarmement, l'assistance et le conseil militaire, la stabilisation post-conflit et la lutte contre le terrorisme (cf Rapport Morillon au Parlement Européen, Mars 2003). Les impératifs de la planification rendent nécessaire de prévoir un scénario maximal concernant la nature et les objectifs des futures opérations de

l'UE. Cette nécessité est rendue plus forte par l'évolution des stratégies après le 11 septembre 2001.
Le projet de stratégie pour l'UE « A Secure Europe in a Better World » présenté par Javier Solana à Thessalonique en juin 2003 présente une vision générale des problématiques, en incluant le terrorisme international, la prolifération des armes de destruction de masse et la désagrégation des structures institutionnelles étatiques dans de nombreuses zones de la planète : ce projet enjoint à l'Union Européenne d'être « plus active, plus cohérente et plus capable » pour répondre à ces défis en coopération avec ses partenaires.
En ce qui concerne les capacités additionnelles en matière de défense et de renseignement, le secteur spatial a un rôle crucial à jouer en se basant sur des facteurs à forte valeur ajoutée : applications de technologies avancées, couverture des objectifs toujours plus globaux de l'Union, fourniture de composants et de capacités multiplicateurs de force d'excellent rapport coût/performance. Cette logique s'applique non seulement aux missions de Petersberg définies par la PESD mais aussi pour d'autres missions de sécurité européenne hors de ce cadre comme la sécurité des frontières et des côtes.

L'Europe connaît un déficit de systèmes important pour les missions à la fois militaires et non militaires dans des secteurs clefs qui comportent tous une dimension spatiale : opérations de commandement et de contrôle, communications globales sécurisées, renseignement stratégiques (surveillance, alerte précoce, évaluation des situations), cartographie, positionnement et navigation, surveillance opérationnelle, gestion tactique, protection des forces et capacité d'engagement. L'action principale de la PESD a été celle du processus de construction des capacités. Le Plan Européen d'Action pour les Capacités (ECAP) prévoit 19 groupes de travail pour examiner les aspects les plus importants. Aucun de ces groupes n'est spécifiquement dédié au spatial. Néanmoins des capacités basées sur les systèmes spatiaux ont été inclues dans la liste des besoins urgents comme l'imagerie satellitaire stratégique, le recueil du signal, l'alerte précoce et les systèmes de support de drônes.
Aucune structure aujourd'hui en Europe n'a la capacité de prendre en compte ces demandes en matière de système spatiaux et de planifier une approche globale pour produire les systèmes et capacités nécessaires, en faisant aussi appel aux possibilités des technologies commerciales et à double usage et en prévoyant des solutions de partenariat public-privé.
Les doublons qui existent entre les capacités spatiales dédiées aux besoins de défense et celles dédiés à la sécurité au sens large (comme la police des frontières, les gardes côtiers et la gestion des crises civiles) constituent des opportunités qui doivent être exploitées aussi bien au niveau national qu'européen.
La création d'une agence européenne des capacités de sécurité et de défense constituerait un pas en avant. Une telle institution devrait avoir les objectifs suivants : gestion des programmes de fourniture, planification de la R&D, contrôle des efforts nationaux et assistance pour l'identification des besoins. La création d'une telle agence peut compter sur un soutien fort parmi les Etats membres, en se basant sur des structures existantes comme l'OCCAR. De plus sa création a été insérée dans le projet de Constitution de la Convention (cf. Burkard Schmitt, The European Union and Armaments, EU-ISS Chaillot Paper n. 63, Paris).
L'espace court cependant le risque de ne pas être inséré d'une manière suffisamment forte parmi les priorités d'une telle structure.

Une organisation de sécurité et défense spatiale européenne pourrait s'avérer nécessaire. Le Général français Gavoty a lancé ce débat, en proposant une agence essentiellement militaire (« Eumilsat ») qui aurait également la charge de contrôler les systèmes opérationnels, Galileo inclus. Il convient cependant d'éviter de séparer encore plus les activités spatiales civiles et militaires car cela pourrait remettre en cause une politique censée rationaliser des ressources limitées.
Une agence spatiale européenne pour la sécurité et la défense devrait pouvoir s'appuyer sur l'expertise technique et le réseau européen de l'ESA et un fort degré d'intégration avec l'ESA serait donc un avantage. Une telle approche aurait aussi l'intérêt de faciliter la participation des ministres nationaux chargés de la Défense et de la Sécurité à la prise de décision ; selon les scénarios prévus, les ministres de la Défense pourront seulement se réunir de façon informelle dans le cadre de l'UE, alors que la convention de l'ESA pourrait fournir la flexibilité nécessaire pour les Etats-membres qui seraient représentés par d'autres ministres que ceux de la recherche, en particulier dans le cadre des programmes optionnels (auxquels l'UE peut aussi participer).
Une autorité de sécurité et de défense créée par les Etats membres au sein de l'ESA, avec une participation de l'EU, constituerait aussi un bon endroit pour développer et mettre en œuvre des politiques de réglementation de sécurité des activités spatiales, comme le contrôle de l'accès aux images satellitaires en cas de crise.
La France dépense plus du double de l'ensemble des autres Etats européens dans les programmes spatiaux de défense. L'expérience et la volonté française jouent donc un rôle central pour le développement des institutions futures. Si l'on veut faire évoluer la France ou d'autres pays vers des approches moins traditionnelles envers la politique spatiale militaire, il faudra que des Etats contribuent avec des ressources supplémentaires significatives.
La coordination des efforts avec l'OTAN en termes de capacités complique le scénario mais le renforce également. Les efforts européens de capacités dans le cadre de la PESD sont coordonnés de façon étroite avec l'OTAN, l'appartenance commune de la plupart des membres dictant une approche compatible. La décision de l'OTAN d'établir une Force de Réaction Rapide (Nato Response Force) et de favoriser l'adoption d'une approche évolutive et *network centric* de la défense au sein des alliés européens pousse à l'évolution.
Les décisions européennes futures et les performances des applications spatiales dans le domaine de la sécurité et de la défense auront un impact non seulement sur la nature de la communication et la coopération transatlantique pour la politique internationale de sécurité, mais aussi sur d'autres aspects d'importance stratégique comme le rôle de l'Europe dans le monde et le futur de l'industrie européenne de la défense.
En ce qui concerne le secteur spatial, la domination des Etats-Unis est massive : les Etats - Unis couvrent l'essentiel des dépenses spatiales mondiales, et en particulier des dépenses militaires. Les industries européennes souffrent d'un handicap important par rapport à leurs concurrents américains du secteur aérospatial.
L'évolution du secteur spatial est donc liée de façon intrinsèque à la question de l'accès au marché de la défense et au contrôle des exportations vers les Etats-Unis, et est concernée par les thèmes récemment évoqués dans la communication de la Commission Européenne "Towards an EU Defence Equipment Policy" (Mars 2003) visant à créer un marché européen des équipements de défense.

Dans ce contexte précis ainsi que dans beaucoup d'autres, il convient de prendre en compte le fait que les activités spatiales se situent à la croisée des compétences de différents directorats généraux de la Commission. C'est un facteur qui doit être pris en compte pour définir une organisation institutionnelle cohérente pour la politique spatiale de l'EU. Il existe un risque de rivalités et d'absence de concertation entre différents portefeuilles comme ceux de la recherche, développement, technologie et innovation, entreprise, transport et réseaux trans-européens, société de l'information, environnement et relations extérieures.
La Commission, et l'UE dans son ensemble, souffrent d'un manque d'organisation pour conduire une politique spatiale active et cohérente. Les programmes spatiaux actuels dans lesquels intervient l'UE comme GMES et Galileo révèlent ces problèmes. Pour le futur, il est nécessaire de définir de façon précise les rôles et les responsabilités de direction de la politique spatiale au sein de l'UE.

3.2 L'ESA, une agence spatiale duale ?

L'ESA offre une infrastructure très intéressante pour l'ensemble des projets spatiaux et peut capitaliser les succès passés. La référence aux « missions pacifiques » de son statut lui a fait éviter de s'engager dans des activités de sécurité. De façon tacite, sa mission d'accès autonome à l'Espace a été aussi motivée, comme pour toutes les puissances spatiales, par le désir de pouvoir accéder aux applications de sécurité et de défense tels les satellites de renseignement,.

La séparation institutionnelle entre spatial civil et militaire a des racines historiques comme aux Etats-Unis pour la NASA et le « Department of Defense » et était à l'origine basée sur des considérations politiques et légales valables. Cependant ce scénario a été complètement dépassé depuis la fin de la guerre froide. En 1993, le Comité pour les Relations Internationales de l'ESA a recommandé une attitude ouverte envers la mise en place d'un système de surveillance satellitaire pour l'UEO. L'ESA a démontré cette flexibilité, non seulement à l'occasion du lancement par Ariane des satellites Hélios-1 ainsi que d'autres systèmes militaires, mais aussi lors des test d'Hélios-1 à l'ESTEC (European Space Research and Technology Center, ESA Noordwijk, Netherlands).
Le test réussi de communication optique réussi entre les satellites ESA Artemis et Envisat pourrait conduire à un lien similaire entre Artemis et Hélios-2.

Récemment, l'ESA a officiellement décidé de ré-examiner les implications légales de son statut juridique, concluant que la Convention ne restreint pas les capacités de l'ESA pour lancer des systèmes et développer des programmes pour des missions de sécurité et de défense ou pour des missions duales, pour des organismes publics de sécurité nationaux ou internationaux. L'ESA s'est de plus dotée d'un système interne de sécurité.

L'option qui consisterait à profiter pleinement de la nature duale des activités spatiales au sein de l'ESA dans le cadre d'un accord futur de coopération avec l'UE apparaît comme très séduisante. Ce serait aussi une opportunité pour éviter toute duplication au sein de l'Europe, ce qui serait un important facteur de réduction des coûts.

Il faut cependant garder à l'esprit que les systèmes spatiaux de défense resteront probablement sous contrôle strictement national dans un futur proche. Même à long terme, certaines applications spatiales de défense sont tellement sensibles qu'elles pourraient ne pas être disponibles pour la coopération ou auraient besoin de programmes spéciaux.
Etant donné le caractère immature des activités spatiales militaires européennes, il est trop tôt pour juger jusqu'à quel point cet aspect peut s'écarter de la vision de l'ESA d'une agence spatiale européenne unique. Dans toutes les hypothèses, les structures de l'ESA et sa capacité à fournir des services, qui devraient monter en puissance par l'intégration progressive du réseau de structures nationales spatiales, seraient disponibles pour des tâches spécifiques même dans le cadre de programmes spéciaux, comme cela a été le cas pour Hélios.

3.3 Autres aspects de développements institutionnels

Il apparaît aujourd'hui urgent de programmer des efforts pour renforcer les logiques duales et le développement de recherches et de technologies orientées pour fournir un support à d'autres politiques communautaires et impulser des investissements dans le secteur espace et défense. Une telle politique doit produire des capacités de haute technologie au meilleur niveau mais aussi jouer un rôle d'entraînement et de soutien pour le secteur industriel européen.
La situation actuelle de coopération minimale entre systèmes nationaux ne peut être modifiée que par l'organisation et la mise en commun des efforts européens en matière de recherche et de technologie
Le Groupe Armement de l'Europe Occidentale (GAEO) est aujourd'hui l'unique institution chargée de cette mission. Les technologies de surveillance satellitaires ont constitué l'un des domaines communs européens de priorité (CEPA) au sein de cette organisation depuis 1990. En 2000, ce domaine a été élargi à l'ensemble des technologies militaires spatiales.

Une des manières les plus efficaces pour faire prendre un nouveau départ aux efforts de construction de capacités européennes spatiales de sécurité et de défense serait que la Commission Européenne puisse lancer une agence européenne pour la recherche avancée dans la sécurité et défense, avec une équipe réduite et non permanente, travaillant de façon flexible en fonction des missions. Comme la DARPA aux USA, une agence de ce type pourrait fournir un schéma d'approche stratégique pour l'application des technologies futures, en combinant une vision définie avec des structures et méthodes extrêmement réactives.

L'évolution des utilisateurs du secteur de la sécurité et de la défense (forces armées, police, organismes publics de sécurité) est aussi à prendre en compte : une communauté d'utilisateurs plus active est nécessaire pour pouvoir interagir sur le développement des concepts et des besoins, les processus d'acquisition et l'exploitation conjointe des systèmes spatiaux pour des objectifs de sécurité et de défense en Europe. Cette montée en puissance est également souhaitable pour améliorer l'interaction avec les experts spatiaux américains et pour comprendre les développements de la politique spatiale américaine avec plus de précision et de rapidité.

Egalement, un ensemble de décisions institutionnelles et réglementaires devra être pris pour réguler les applications spatiales dans le secteur de la sécurité et de la défense. Le système Galileo et ses conséquences en matière de sécurité ont déjà attiré l'attention sur ce point (cf. G. Gasparini, G. Lindström, *The Galileo satellite system and its security implications,* EU-ISS Occasional Paper n. 44, Paris). Par exemple, des procédures de sécurités devront être établies pour l'accès au signal et pour son interdiction, ainsi que des précautions en matière de protection des systèmes.

Enfin, une fois les systèmes opérationnels en place, des structures de commandement européennes pour les systèmes spatiaux doivent être organisées. Leur tâche pourrait être de nature duale, devant satisfaire aussi bien des besoins militaires stricts que des applications de sécurité au sens large, en phase avec l'évolution spécifiquement européenne de la sécurité.
Dans certains cas, des structures parallèles seront inévitables car les tâches de sécurité et de défense au sens strict requièrent une approche différente de celle de sécurité élargie comme la surveillance de l'environnement.

4. L'Espace et la sécurité en Europe : à la croisée des chemins entre évolution politique et industrielle

Le développement de la Politique Européenne de Sécurité et de Défense a besoin de systèmes spatiaux. De plus, l'Europe doit maintenir une base industrielle et technologique ; sinon elle perdrait sa capacité de décision stratégique. Des politiques ciblées doivent permettre d'améliorer l'efficacité et la compétitivité, en corrigeant une série d'imperfections typiquement européennes concernant l'offre et la demande dans le marché spatial.

Les principaux problèmes du secteur espace et sécurité sont :

- La faiblesse des budgets européens en matière de sécurité et de défense.
  Une simple comparaison entre les dépenses européennes et américaines dans le secteur spatial offre un panorama cruel : le rapport est de 1 à 2,6 pour le marché commercial ; 1 à 3 pour la météorologie ; 1 à 4 pour la demande institutionnelle civile ; 1 à 30 pour le secteur militaire. Le caractère étriqué de cette demande entraîne un impact négatif sur la base industrielle européenne.
- La production globale de l'industrie européenne restera plus faible que la production américaine, ce qui aura un impact sur la compétitivité car des coûts fixes non récurrents comme la recherche et le développement, grèvent exclusivement la production civile. La dépendance à l'égard du marché commercial amplifie les effets des cycles de crises (cf. période récente) car le secteur militaire n'a pas un volume suffisant pour développer une demande anti-cyclique significative.
- D'un point de vue technologique, la nature duale des systèmes spatiaux requiert une exploitation de l'ensemble des applications, qu'elles soient civiles ou militaires.
- L'absence de demande institutionnelle pour les services de lancement implique que le lanceur européen, Arianespace, est moins compétitif.
- Commercialement, le caractère attractif des produits européens reste cantonné aux secteurs hors sécurité.

Un des principaux problèmes est celui de l'absence de stratégie commune européenne qui puisse garantir les convergences entre les efforts présents et futurs à un niveau national et international. Ceci ne peut être résolu que par l'adoption d'une politique spatiale européenne qui englobe aussi bien les aspects civils que militaires. En attendant, la coopération entre les dimensions nationales et européennes, ainsi qu'entre activités civiles et militaires doit être développée. Cela permettra d'éviter les doublons et la dispersion de faibles ressources et permettra de faire progresser la mise en commun de capacités techniques, industrielles et opérationnelles.

La structure de l'offre doit être également revue. La mondialisation des marchés souligne la faiblesse de la base industrielle européenne face à la concurrence américaine.

Une nécessaire rationalisation ultérieure comportera probablement un degré majeur de concentration industrielle. Ce processus doit être piloté de façon à éviter des distorsions excessives du marché, même si elles sont inéluctables dans une certaine mesure. Les gouvernements européens et les institutions doivent agir pour préserver un certain degré de concurrence dans le marché européen, au moins pour les secteurs dont les dimensions du marché et les caractéristiques industrielles et techniques le permettent, mais doivent aussi favoriser les concentrations dans d'autres secteurs comme celui des lanceurs.

L'introduction de la demande de sécurité et de défense aura un impact positif considérable sur la compétitivité du marché européen, permettant le maintien d'aux moins deux concurrents pour chaque secteur.

Certaines conclusions utiles peuvent être tirées d'une comparaison entre les expériences américaines et européennes:

- L'expérience du secteur spatial américain souligne la fonction anti-cyclique des dépenses institutionnelles (en particulier en provenance du Department of Defense).
- Le soutien institutionnel à la R&D dans ce secteur est un facteur essentiel de succès, étant donné le haut degré d'incertitude et la perspective à long terme des investissements.
- Il apparaît comme important de fournir au secteur de l'offre un ensemble de règles communes et une demande unifiée qui puissent constituer une contre-partie stable, prédictible et dotée de budgets solides.
- La présence d'une demande forte organisée autour d'un seul acteur institutionnel est fondamentale; la segmentation de la demande entre différentes agences spécialisées suivant les missions devrait être évitée.
- Un soutien politique fort pour une réforme du secteur de l'offre et un processus de concentration devrait être accompagné par les incitations nécessaires pour réduire les coûts.

Table 2 Analyses par Missions

Missions	Systèmes	Industriels	Institutions	Aspect de sécurité	Problèmes	Politique
Accès à l'Espace	Lanceurs Navette (?) Vol Humain (?)	Producteur de missiles, moteurs de fusées, base de lancement	ESA, UE Commission	Important, dual	Coûts, subventions, faiblesse de la demande institutionnelle	Maintenir un spectre complet de capacités, développer de nouvelles technologies, politique d'économie
Communications	Constellations de Satellites (GEO, MEO, LEO, DRS)	Production de satellites, segment au sol, transpondeurs, récepteurs, producteurs de services	ESA, Nations (F, G, I, S, UK), OTAN	Important, dual	Faiblesse de la demande institutionnelle, distorsion de concurrence, sécurité des données, manque de capacités de bande large	Coordination des efforts nationaux civils et militaires, planification pour un développement futur intégré
Navigation	GNSS	Producteurs de services, horlogerie nucléaire, récepteurs	ESA, UE Commission, UE Conseil, OTAN	Important, dual	Contrôle du signal, intégration avec GPS et GLONASS, utilisation impropre	Clarification des responsabilités de décision, accords bilatéraux avec USA et Russie
Météorologie	Satellites d'observation	Producteurs de satellites, stations au sol, producteurs de services	Eumetsat, ESA	Important, dual	Protection de l'information	Renforcement des liens institutionnels existants
Surveillance	Constellations Radar, IR, optique	Producteurs de satellites, stations au sol, senseurs	ESA, UE Conseil, Torrejon, Nations (F, I, G, S)	Important, dual	Coûts, manque de coordination, sécurité des données, schéma légal d'utilisation	Coordination des efforts nationaux civils et militaires, planification pour un développement futur intégré
Respect des Traités	Satellites d'observation	Producteurs de satellites, stations au sol, producteurs de services	UE Conseil, ESA (technologie)	Militaire, Diplomatie préventive	Coûts, mandat politique	Amélioration de l'exploitation des systèmes de surveillance, création de systèmes dédiés
Ciblage	Satellites d'observation, GNSS	Producteurs de satellites, stations au sol, transpondeurs, récepteurs, producteurs de services	UE Conseil, Torrejon, OTAN, ESA (technologie), Nations	Militaire exclusivement	Inter-opérationnalité, peu de systèmes dédiés, schéma d'autorité politique peu clair,	Coordination des systèmes nationaux, développement de constellations communes, procédures, mettre à niveau Torrejon
Ecoute (Ecoute électronique, Ecoute des signaux)	Constellations de satellites	Producteurs de satellites, programmes de cryptage, senseurs	UE Conseil, OTAN, Nations	Militaire principalement	Souveraineté des informations, manque de coordination, pas de systèmes dédiés	Etablir un schéma politique et institutionnel, systèmes communs, échanges d'information
Alerte Précoce	Satellites d'observation	Producteurs de satellites, senseurs	UE Conseil, OTAN, Nations (F, UK)	Militaire Diplomatie préventive	Pas de systèmes disponibles, coûts, réalisme du projet	Déploiement d'un système UE (charges additionnelles)
Attaque d'objectifs hostiles dans l'espace	ASAT, satellites tueurs	Fusées, missiles, EKV, satellites	ESA (technologie), OTAN (?), Nations (?)	Militaire exclusivement	Pas de systèmes disponibles, coûts, réalisme di projet,	Etude de la technologie

					impact sur la stabilité	
Interception spatiale de missiles		Laser, EKV, satellites	ESA (technologie), OTAN (?), Nations (?)	Militaire exclusivement	Pas de systèmes disponibles, Technologie pas fiable, coûts, réalisme du projet, impact sur la stabilité	Etude de la technologie

(?) = Possible, prévisible

Table 3 Les principales institutions et les politiques sectorielles

Phase	Demande	Offre	Problèmes	Politiques
Recherche	Nations, ESA, UE Commission, industries	ESA, Universités, Centres de recherche, laboratoires	Manque de fonds publics et privés, absence de coordination	Développer un schéma institutionnel commun, augmentation des budgets, économies d'échelles
Développement technologique	Nations, ESA, UE Commission, industries, OTAN, secteur privé	ESA, laboratoires	Manque de fonds publics et privés, absence de coordination	Développer un schéma institutionnel commun, augmentation des budgets, économies d'échelles
Spécifications	Nations, ESA, institutions PESD, OTAN	ESA, industries	Pas de besoins communs, manqué d'inter-opérationnalité	Créer une agence commune, mettre en commun les capacités actuelles, stimuler la concurrence
Equipement, maintenance	Nations, ESA, institutions PESD, OTAN, secteur privé	Industries	Demande institutionnelle faible	Créer une agence commune, mettre en commun les capacités actuelles, augmenter les budgets
Services, applications	Nations, ESA, UE Conseil, UE Commission, OTAN	Industries, secteur services	Demande publique et privée limitée	Stimuler le secteur privé, unifier ou coordonner la demande institutionnelle
Schéma légal	UE Conseil, UE Commission, Nations		Fragmentation	Etablir un schéma réglementaire commun
Autorité politique	EU Conseil, UE Commission, OTAN, Nations		Fragmentation	Déterminer qui décide, clarifier les liens entre les institutions

CONCLUSIONS

L'Union Européenne ne doit ni ignorer l'Espace ni le laisser de côté. Les Etats membres traditionnellement forts dans ce secteur l'ont compris depuis longtemps. La création de l'Agence Spatiale Européenne (ESA) et l'importance de ses activités scientifiques, technologiques et commerciales illustrent cette priorité. De plus, certains Etats membres plus velléitaires ont développé des activités spatiales autonomes avec des systèmes de sécurité et de défense. Enfin l'UE, par le biais d'initiatives de la Commission Européenne, a lancé une politique spatiale en commençant par des applications de transport et de surveillance de l'environnement. Ce sont les programmes Galileo et GMES, développés conjointement par l'UE et l'ESA.

D'autre part, l'UE a progressé dans sa définition d'une Politique Etrangère et de Sécurité Commune (PESC) et d'une Politique Européenne de Sécurité et de Défense (PESD). L'UE a commencé à mettre en œuvre des opérations de sécurité internationale (Bosnie, Kosovo, Macédoine et Congo).
La conférence intergouvernementale de l'UE doit évaluer les propositions faites par la Convention Européenne, incluant le renforcement de la solidarité européenne dans le secteur de la sécurité (en particulier contre le terrorisme) et la modification de certaines procédures et institutions pour améliorer l'efficacité de la politique étrangère, de sécurité et de défense de l'Union Européenne.

L'Espace, et le rôle de l'Espace dans le futur de l'Europe, doit être inclus dans ce schéma.
Ceci est essentiel pour pallier à l'un des problèmes majeurs de la politique spatiale européenne : la fragmentation des institutions et des stratégies. Il s'agit d'une évidence dans le secteur des télécommunications où l'Europe a produit trois programmes militaires différents (Syracuse, Skynet et Sicral). Dans le secteur de la défense, les programmes de coopération qui concernent des groupes réduits d'Etats font figure d'extension des logiques nationales.

L'Europe est déjà un acteur spatial important, aussi bien de façon collective que par le biais des institutions spatiales de certains Etats membres. Aujourd'hui la politique spatiale européenne est gouvernée par différentes institutions qui varient suivant les applications : autorités spatiales nationales, autorités nationales de défense, ESA et certaines directions de la Commission Européenne.

La relation actuelle avec les Etats-Unis, unique puissance spatiale mondiale globale, peut aussi constituer un facteur de fragmentation. Fait remarquable mais isolé, d'importants programmes scientifiques civils sont gérés par des accords multilatéraux de l'ESA en partenariat direct avec la NASA, sans toutefois rejoindre la parité entre Européens et Américains.

Dans le secteur commercial et, a fortiori, dans le secteur de la défense, on ne trouve pas de tels schémas multilatéraux et chaque pays entretien une relation bilatérale directe avec les USA, à l'exception de certains accords généraux (accords de services) gérés par l'OTAN.
Faire évoluer ces multiples facteurs de fragmentation pourrait s'avérer difficile car ce schéma fonctionne depuis des dizaines d'années.

Un changement de ces stratégies et politiques déséquilibrées demande une redéfinition forte des schémas stratégiques, institutionnels et organisationnels en Europe.
Par exemple, il pourrait être contre-productif de financer les activités spatiales européennes par le biais d'un budget communautaire unifié : aujourd'hui ces activités (qui incluent les activités multilatérales de l'ESA) sont financées par des budgets nationaux basées sur la demande nationale, qui varient de façon considérable de pays à pays. L'ESA répond à cette demande par une offre adéquate. Une logique similaire est souhaitable pour les budgets de la défense. Au contraire, les contributions au budget UE suivent une logique objective basée sur des paramètres (PIB et population) : il est douteux que de tels critères « objectifs » permettent d'augmenter le budget spatial.

La coopération renforcée est différente : si un groupe de pays décide de lancer un projet dans un secteur visant des objectifs-clefs, alors il y a un intérêt clair de la part des pays participants à financer la réalisation du projet, en faisant même fi des logiques proportionnelles. Il n'est donc pas finalement très souhaitable (et il pourrait même s'avérer dangereux) de rechercher une complète rationalisation et unification des politiques spatiales européennes à court terme, car les logiques et les choix des gouvernements nationaux sont fondamentaux, et continueront à l'être.

C'est vrai aussi en ce qui concerne les programmes spatiaux liés à la politique de sécurité et de défense. Dans le secteur de la défense, les dépenses spatiales sont insérées dans le contexte extrêmement étriqué des budgets nationaux de la défense. Les budgets de défense définissent et maintiennent des priorités différentes, et ne sont pas capable de programmer et de promouvoir un niveau critique compétitif de capacité technologique. Ce mécanisme empêche de pleinement bénéficier d'un potentiel opérationnel énorme offert par les technologies spatiales. En d'autres termes, aucun pays européen n'a la capacité de financer seul les programmes spatiaux nécessaires à la modernisation de ses forces de sécurité.

Evidemment cette situation contribue à creuser le fossé entre Europe et USA pour les technologies spatiales. Dans ce secteur, le rapport de dépense entre l'UE et les USA est de 1/2.6 pour le marché commercial, 1/3 pour le secteur météorologique et de 1/30 pour le secteur de la défense. Ceci a un impact énorme sur la compétitivité de l'industrie européenne et ses capacités technologiques.
En conséquence, l'Europe doit prendre en considérations trois problèmes :

- Le niveau insuffisant de la dépense de l'Europe dans le spatial;
- Le manque de convergence entre les différentes initiatives;
- La structure de l'offre (pour maintenir la compétitivité).

Politiquement et stratégiquement parlant, l'Europe a besoin de systèmes spatiaux pour atteindre ses objectifs en matière de politique de sécurité et de défense mais aussi pour maintenir sa capacité spatiale globale.
Une telle politique doit avoir comme principe la continuité technologique, industrielle et fonctionnelle des activités spatiales qu'elles soient scientifiques, commerciales ou de défense. Ceci, afin de rendre possible un schéma cohérent et coordonné pour le financement, la planification, la réalisation et la gestion des programmes.

Le terme sécurité comprend des activités civiles et militaires. Après la fin de la Guerre Froide et en l'absence d'un danger militaire majeur contre le monde occidental, la perception de nouvelles menaces et risques a pris de l'importance.
Le terrorisme, le crime organisé, les risques liés aux migrations illégales, la sécurité des approvisionnements et des routes commerciales, la disponibilité des ressources stratégiques et la protection de l'environnement sont devenus les principales sources d'inquiétude.
Ces nouvelles menaces ne peuvent pas être traitées dans une dimension purement militaire mais elles nécessitent une combinaison de moyens différents, civils et militaires, mieux décrits par le terme sécurité.
En outre, alors qu'une confrontation militaire est toujours possible, les opérations et les priorités militaires évoluent depuis la traditionnelle « politique de défense » (défense des frontières, défense « symétrique » de la nation contre des ennemis identifiés, confrontation planifiée entre armées avec un degré fort de légitimité politique...) vers l'intervention de gestion de crises (de nature duale, civile et militaire), l'engagement préventif, la contre-prolifération et le contre-terrorisme, le support pour les opérations de sécurité civile, le maintien de la paix et la reconstruction étatique. Ces opérations occupent une part majeure de toute « politique de défense et de sécurité ».

Les utilisations de sécurité et de défense du spatial comportent de nombreuses fonctions et moyens parallèles. Les opérations spatiales doivent être conçues comme un continuum qui inclut des fonctions militaires et civiles dans des cadres opérationnels de sécurité et de défense. Les besoins spécifiques militaires (comme la disponibilité immédiate et continue, une fiabilité améliorée, le caractère interopérationnel, la protection, la miniaturisation, la vitesse, la redondance...) améliorent les performances des systèmes spatiaux et poussent vers des développements technologiques à leur tour utiles à la compétitivité des applications civiles et de sécurité.

La tendance générale est celle d'une internationalisation croissante des politiques de sécurité (au sein de l'UE et globalement), en parallèle avec la mondialisation de l'économie et des services. La lutte contre le terrorisme international a accéléré ce développement, déjà en cours pour la gestion des crises et des opérations de paix, le contrôle des armements et des politiques de désarmements, la lutte contre la criminalité organisée. Ces exigences de sécurité offrent un contraste fort avec la fragmentation actuelle des politiques spatiales européennes entre activités civiles et militaires mais aussi avec les segmentations de la recherche scientifique, les difficultés d'intégration de l'économie et de l'ensemble des activités européennes comme la sécurité et la défense, et, enfin, les divisions entre les nations.

Les problématiques transatlantiques accroissent aussi la difficulté à identifier une politique spatiale européenne globale et cohérente. La coopération scientifique entre la NASA et l'ESA offre un contraste par rapport à la dépendance militaire de l'Europe à l'égard des USA ; mais des divergences transatlantiques apparaissent lorsque l'Europe entreprend des programmes stratégiques comme Galileo ; les satellites de communication sont conçus avec des technologies différentes ce qui crée des problèmes d'interopérabilité ; les satellites de surveillance deviennent sujets de contentieux et annoncent aussi l'avènement de la *network centric warfare*. Il est urgent d'identifier les éléments de base d'une politique de coopération transatlantique cohérente avec le développement d'une Politique Européenne de Sécurité et de Défense et avec les nouveaux besoins découlant des opérations auxquels participent les forces européennes.
D'une manière générale, les principaux projets spatiaux ont été mis en chantier par les utilisateurs principaux, et les USA sont les premiers d'entre eux. La France, le Royaume-Uni et maintenant l'Union Européenne et l'ESA essaient de développer leurs activités spatiales mais les Etats-Unis sont et resteront l'acteur spatial principal (et le principal partenaire européen) pour de nombreuses années à venir. Mais les Européens jusqu'ici ont juste eu la possibilité d'accepter ou de refuser la participation dans des projets définis et gérés par les USA, et jamais le contraire. Dans certains cas, de bonnes idées européennes ont été concrétisées dans des projets américains, avec une participation européenne ultérieure.
Les Etats-Unis ont une forte tendance à considérer l'Espace comme un élément essentiel de la domination militaire. Les changements dans les opérations militaires qui deviennent de plus en plus dépendantes des systèmes et technologies spatiales diminuent la possibilité que les USA puissent généreusement partager ces systèmes et technologies, à l'exception de coopérations limitées et ad hoc qui se basent sur une acceptation complète des priorités politiques, économiques, stratégiques et opérationnelles américaines.

Enfin des différences apparaissent entre Europe et Etats-Unis sur la façon optimale d'utiliser les systèmes spatiaux dans un cadre opérationnel. Le concept américain de *network centric warfare* basé sur une utilisation de communications à bande large et la disponibilité maximale de données pour les unités de combat au niveau le plus bas (le soldat) requiert une délégation d'autorité et une indépendance dans la prise de décision généralement refusée par les planificateurs militaires européens, qui préfèrent une distribution plus centralisée d'informations sélectionnées (« l'information nécessaire ») en suivant la ligne hiérarchique.

Les Européens doutent de l'utilité d'une restructuration technologique complète de leurs unités opérationnelles et de leur matériel et suggèrent de rendre leurs forces *network enabled* voire *network based* et non complètement *network centric*.
Ce débat est également alimenté par les perspectives stratégiques différentes de la part de l'UE et des USA. Alors que ces derniers maintiennent une véritable vision stratégique globale, basée sur la capacité de projection de force massive dans l'ensemble de la planète, l'Europe a des ambitions et des besoins plus limités, se concentrant sur les menaces de proximités et sur les missions de Petersberg. Cette vision régionale n'exclut pas la

possibilité d'emplois de force dans le monde entier, emplois conçus non pas comme des opérations Européennes isolées mais en support et avec l'assistance d'autres alliés, qu'ils soient locaux ou, de façon plus probable, que ce soient les USA eux-mêmes.
Même dans ce cas, alors qu'un haut degré de capacité inter opérationnelle est perçu comme essentiel pour maintenir la possibilité d'opérations conjointes entre alliés, une assimilation technologique et opérationnelle totale est généralement rejetée. Ceci pourrait réduire la possibilité de conduire des opérations jointes totalement intégrées et favoriser plutôt différentes formes de division des taches avec un degré de séparation important, mais cela semble aussi correspondre à la tendance américaine à ne plus privilégier les opérations militaires en coalition conduites par des quartiers généraux complètement multinationaux. Ce regain d'indépendance américaine souligne l'importance d'atteindre un degré majeur d'autonomie européenne.
En prenant en considération la prolifération des crises militaires et de sécurité et le degré d'utilisation des systèmes spatiaux existants, les redondances qui pourraient être garanties par des systèmes européens de plus en plus consistants pourraient améliorer la sécurité du réseau et assurer un utile capacité de sauvegarde et de décongestion. Le fait que les perceptions de sécurité américaine et européennes restent généralement très semblables, pour ne pas dire quasi-identiques, favorise ce développement.

Les problématiques entre les différentes agences européennes compliquent la prise de décision dans le secteur spatial. Une meilleure définition des fonctions respectives et des spécialités doit permettre une intégration et une cohérence politique majeure (ainsi qu'une utilisation meilleure de ressources limitées). L'ESA est l'objet de la politique spatiale européenne : il lui est difficile de véritablement définir cette politique. Elle peut de façon autonome commencer l'étude ou la proposition de nouveaux programmes, mais elle a toujours besoin de l'approbation des Etats membres avant de les entamer ou de leur attribuer un budget. Le futur européen de l'Espace doit être construit en se basant sur les réalités existantes. Les activités spatiales européennes sont aujourd'hui exécutées par différentes agences nationales ou ministères : les institutions nationales sont souvent plus capables que celles internationales lorsqu'il s'agit de contourner des obstacles institutionnels et politiques pour l'attribution des budgets, et de faire pression pour augmenter les budgets spatiaux, en réunissant des soutiens publics et en identifiant à la fois les intérêts économiques et les capacités technologiques.

L'UE est un acteur relativement jeune dans le spatial. Elle a la possibilité de lancer des politiques et de les financer, mais pas de se substituer aux autres acteurs. Son atout principal consiste dans la possibilité de combiner la sécurité élargie et les politiques industrielles avec la politique spatiale, en développant la cohérence et la rationalisation.

L'objectif primaire doit être celui de stabiliser la présence européenne dans l'Espace de façon à garantir les capacités spatiales de l'Europe du futur, cohérentes avec son poids politique et économique, et capables de remplir les besoins d'une politique Européenne de Sécurité et de Défense complète.
Ceci requiert certaines conditions minimales :

- Une autonomie complète pour les capacités spatiales basiques (satellites, lanceurs, segments au sol, technologies et services) de façon à garantir l'accès et l'utilisation optimale de l'Espace en accord avec la politique européenne. Ceci n'exclut pas les accords avec d'autres puissances spatiales et ne constitue pas un appel à la parité avec les USA ; il s'agit d'un objectif raisonnablement suffisant avec un minimum de systèmes technologiques.
- Une industrie européenne dynamique, diversifiée et compétitive et une base technologique pour le développement du savoir-faire scientifique et technologique. Ceci signifie garantir un volume de production à long terme, et des programmes d'investissements publics en science et technologie capables de jouer une fonction anti-cyclique par rapport à la demande commerciale.

Il apparaît comme important d'identifier ce qui pourrait être une présence européenne essentielle et minimale dans l'Espace pour les objectifs de sécurité et de défense. Globalement, il s'agirait d'un réseau de satellites capables de répondre aux besoins en termes de communication, observation, positionnement, écoute électronique et alerte précoce : des systèmes accompagnés de segments au sol dédiés, pour un investissement sur le segment spatial d'environ 8-9 milliards d'Euros sur une période de 8 à 15 ans, correspondant à un investissement annuel de moins de 800 millions d'Euros (comprenant une partie déjà allouée). Ces systèmes ne seraient peut-être pas à la portée d'un seul pays mais sont vraiment compatibles avec un effort multilatéral d'investissement. Un tel système pourrait aussi fournir à la PESC, PESD et à la Force d'Intervention Rapide Européenne un degré majeur d'autonomie et d'efficacité. Les détails d'une telle architecture spatiale ne constituent pas une nouveauté ; ils sont connus depuis longtemps par les gouvernements européens. Le véritable problème consiste dans sa réalisation.

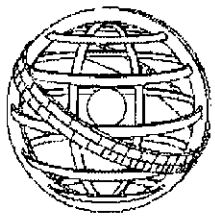
Les développements les plus récents de l'UE pourraient jouer un rôle positif. L'UE pourrait avoir à identifier et exprimer de façon plus précise la demande en termes de systèmes spatiaux, en regroupant les perceptions et les choix de différents Etats membres (ou plus précisément d'un groupe d'Etats en suivant une logique de coopération renforcée), et d'établir les critères de division des taches de gestion des systèmes. Cela serait la meilleure des solutions pour garantir un usufruit égal pour les utilisateurs mais aussi pour établir le lien nécessaire avec l'Alliance Atlantique et les Etats-Unis. Dans ce cadre, l'ESA pourrait agir sur l'offre, en garantissant le niveau technique nécessaire et la mise en route du système, en liaison directe avec les industriels européens et les autorités nationales.

Comme solution pratique, un comité de « sécurité spatiale » pourrait être constitué en parallèle au sein de l'ESA et du Conseil de l'EU, avec la tache de déterminer, programmer, mettre en oeuvre et gérer les programmes en assurant aussi un lien institutionnel entre les deux institutions. De plus, un secteur spatial de sécurité et défense européenne pourrait être mis en œuvre au sein du futur quartier général de l'UE, mais le besoin d'un profil institutionnel majeur pour la sécurité spatiale ne doit pas être limité aux activités de défense.

Comme cela a déjà été souligné, le spatial européen est essentiellement civil et dual. Cela nécessite un profil de « sécurité spatiale duale » plus élevé. En ce qui concerne l'ESA (le Conseil de l'ESA), un conseil intergouvernemental européen serait chargé de façon spécifique de la sécurité spatiale, alors que dans le cadre de l'Union Européenne le Conseil Européen donnerait un mandat précis pour développer une compétence de coordination avec le Coreper, définissant ainsi une structure capable de vérifier et d'approuver les aspects de sécurité politique des projets spatiaux de l'EU.
Pour éviter de multiplier les institutions de sécurité spatiale, telles qu'un conseil de coopération dédié au sein de l'ESA et une autre pour la sécurité au sein du conseil de l'EU, la composition de ce comité devrait être la même pour les deux institutions (la sécurité spatiale devenant un « programme optionnel » pour certains membres de l'ESA et une « coopération renforcée » pour certains membres de l'UE) ou bien les conseils de l'ESA et de l'UE pourraient prendre une décision parallèle pour définir une autorité de sécurité spatiale jointe sous la responsabilité du Haut Représentant de l'UE, compétente sur les aspects de sécurité et stratégie de la politique spatiale.

Pour commencer, l'UE devrait mettre en œuvre pour le spatial un processus similaire à celui qui a progressivement amené la PESC et la PESD : identification des objectifs, analyse des problèmes, hypothèses de solutions à évaluer par les institutions européennes et l'opinion publique.
Cette tâche pourrait être remplie au mieux par une Commission de Sécurité Spatiale spécialisée, composée d'experts européens chargés de présenter les estimations de l'industrie spatiale et d'utilisateurs militaires et civils dans les sphères des affaires étrangères, de la sécurité et de la défense. Cette Commission pourrait proposer une évaluation du niveau optimum pour les ambitions européennes dans l'Espace, en prenant en compte à la fois la demande et l'évolution des besoins. En outre elle effectuerait un travail de prospection politique important, extrêmement utile pour identifier et construire une nécessaire constitution spatiale européenne.

Cette Commission présenterait ses conclusions au Conseil Européen pour commencer un processus formel de prise de décision dans le cadre communautaire et avec la participation des institutions intéressées.



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INTERNATIONALER BERICHT ÜBER

WELTRAUM - UND SICHERHEITSPOLITIK IN EUROPA

ZUSAMMENFASSUNG

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Weltraum- und Sicherheitspolitik in Europa

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ÜBERBLICK

Die Fortschreibung einer europäischen Weltraumpolitik wird durch die vor kurzem getroffene Entscheidung der EU bestärkt, das Projekt Galileo durchzuführen. Diese Entscheidung bestätigt die Bereitschaft, im Bereich der Weltraumtechnologien eine Politik zu verfolgen, die über die nationale Ebene hinausgeht, auch wenn nationale Erwägungen immer noch überwiegen. Ein neues Sicherheitskonzept zeichnet sich ab. Die Entwicklung der Außen-, Sicherheits- und Verteidigungspolitik (GASP, ESVP) und des Zivilschutzes macht integrative Ansätze notwendig.
Anforderungen der Sicherheit sind verbunden mit dem technologischen Fortschritt. Weltraumkapazitäten müssen für den Schutz der Völker, Ressourcen und Territorien genutzt werden, aber ebenso für den Fortbestand von Integrität und Kapazität der technologischen Basis. Weltraumsysteme sind ein grundlegender Aspekt „technologischer Sicherheit": Sie bieten äußerst vielseitige Lösungen in globalem, internationalem Ausmaß.
Diese Studie analysiert, wie die unterschiedlichen Akteure der EU diesen Themenkomplex behandeln und wie eine Zusammenführung mit Ziel einer Europäischen Weltraum- und Sicherheitspolitik gefördert werden kann.

1. Der Weltraum ist ein strategischer Posten. Europa hat stets eine bedeutende Präsenz im Weltraum gewahrt. Die Entwicklung von Dual-Use Technologien fordert eine europäische Annäherung an Weltraumsicherheit, welche die gegenwärtigen nationalen Verteidigungsprogramme mit den vornehmlich zivilen europäischen Programmen verbindet. Die Zwecke und Bedeutungen der Weltraumnutzung für Sicherheit und Verteidigung überschneiden sich beträchtlich. In der Tat können Weltraumoperationen als ein Kontinuum betrachtet werden, das zivile und militärische Zwecke ebenso umfasst wie Operationen in den Bereichen der Sicherheit und Verteidigung.

2. Das Hervortreten der EU bei der Entwicklung europäischer Weltraumpolitik ist charakterisiert durch ein wachsendes Interesse an mehr „strategischen" Programmen. Künftige europäische Entscheidungen und Durchführungen von Anwendungsprogrammen im Bereich der Sicherheit und Verteidigung werden sich voraussichtlich sowohl auf die transatlantischen Beziehungen auswirken als auch Europas Rolle in der Welt definieren helfen (und die Zukunft der europäischen Verteidigungsindustrie). Daher können Überlegungen in diesem Bereich nicht länger am Rand des europäischen politischen Prozesses gehalten werden, sie bedürfen vielmehr weitreichender politischer Entscheidungen.

3. Weltraumapplikationen sind notwendig für unsere kollektive Sicherheit, doch es gibt kein „Europäisches Bewusstsein" bezüglich der Vorteile gemeinsamer Weltraumsysteme. Eine Anwendergemeinschaft für Weltraumapplikationen im Bereich der Sicherheit und Verteidigung muss noch immer sowohl aus den

nationalen Verteidigungseinrichtungen als auch aus der allgemeinen europäischen Öffentlichkeit herausgebildet werden.

4. Die Zulieferseite ist strukturell unzulänglich. Die Globalisierung des Marktes unterstreicht die Schwächen des europäischen Industriestandortes gegenüber amerikanischen Wettbewerben. Weitere Rationalisierung tut Not, und sie wird wahrscheinlich zu einem wachsenden Grad industrieller Konzentration führen. Dieser Prozess muss geführt vonstatten gehen, um übermäßige Marktverzerrungen zu vermeiden. Die Politik muss hierbei von dem Grundsatz der Kontinuität in den Bereichen Technologie, Industrie und Raumfahrt, gleich ob wissenschaftlicher, kommerzieller oder verteidigungsrelevanter, geleitet werden.

5. Drei Ziele werden in jedem künftigen, fortentwickelten Netzwerk für Weltraumpolitik verfolgt werden müssen:
   a. planmäßige F&E (Forschung und Entwicklung) für fortschrittliche Raumfahrtanwendungen;
   b. erweiterte Einbeziehung der für Sicherheit und Verteidigung Verantwortlichen in den Beschlussprozess für Weltraumpolitik;
   c. vermehrte institutionalisierte politische Übersicht und Effektivität der sicherheitsbezogenen Weltraumaktivitäten.

6. Es gibt derzeit in Europa keine Struktur, in der alle weltraumbezogenen Aktivitäten querverwiesen und ein übergreifender Ansatz zur Generierung des benötigten Kapitals und Wissens, auch mit Rückgriff auf kommerzielle oder öffentliche Dual-Use-Möglichkeiten und Public-Private-Partnership Lösungen, bereitgestellt werden könnte. Anstelle weiterhin auf nationale Ansätze oder möglicherweise die Schaffung einer zweiten europäischen Weltraumagentur für Sicherheit und Verteidigung zu bauen, ergibt sich die potentiell attraktive Möglichkeit, dass die Europäische Weltraumagentur (ESA) den Dual-Use Charakter des Weltraums durch eine kooperative Vereinbarung mit der EU vollständig ausschöpft.

7. Die europäischen Regierungen und Institutionen sollten einen gewissen Grad des Wettbewerbs auf dem europäischen Markt erhalten, zumindest in den Sektoren, in welchen Marktgröße sowie technologische und industrielle Eigenschaften dies erlauben, während in anderen Bereichen, etwa den Trägern, Konzentrationen ermöglicht werden sollten. Das Entstehen eines Bedarfs nach Sicherheit und Verteidigung wird wichtige positive Effekte auf die Wettbewerbsfähigkeit des europäischen Marktes mit sich führen, wodurch Platz für zumindest zwei unterschiedliche Wettbewerber in beiden Sektoren geschaffen werden wird.

8. Es mag kontraproduktiv sein, kurzfristig die vollständige Rationalisierung und Vereinigung der europäischen Weltraumpolitik anzustreben, da Überlegungen und Entscheidungen nationaler Regierungen nach wie vor ausschlaggebend sind und auch künftig sein werden. Dennoch ist es möglich, eine europäische Politik (in einem entweder kollektiven oder erweitert kooperativen Netzwerk) zu planen, die

alle europäischen weltraumrelevanten Komponenten und Entscheidungen zu strategischen Primärzielen verbindet, wodurch Europa noch fehlendes Wissen und bislang nicht beschrittene Tätigkeitsfelder erschlossen werden könnten, sowie die europäische Präsenz im All kohärenter und umfassender gestaltet werden dürfte.

9. Die europäischen Autoritäten sollten übergreifende industriepolitische Ziele entwickeln, um die volle Autonomie bei grundlegendem weltraumspezifischen Kapazitäten zu wahren (hinsichtlich Satelliten, Trägerraketen, Bodeneinrichtungen, Technologien und Dienstleistungen), damit der Zugang zum Weltraum und seine optimale Nutzung in Übereinstimmung mit der europäischen Politik sichergestellt werden kann. Dies schließt die Möglichkeit von Vereinbarungen mit anderen Weltraummächten weder aus noch ist es ein Ruf zur Parität mit den USA. Es ist nur ein hinlängliches Ziel mit minimalen technologischen Vorteilen. Um wissenschaftliches und technologisches Know-how zu entwickeln, sollten sich die europäischen Autoritäten zudem bemühen, eine starke, wettbewerbsfähige und diversifizierte industrielle und technologische Grundlage zu erhalten. Dies bedeutet, dass langfristig ein bestimmtes Produktionsvolumen sichergestellt wird und öffentliche Investitionen für Wissenschaft und Technologie getätigt werden, welche unter Beachtung kommerzieller Bedürfnisse eine antizyklische Funktion ausüben können.

10. Die aktuellen Entwicklungen innerhalb der EU mögen hierbei eine positive Rolle spielen. Die EU selbst könnte besser positioniert werden, um weltraumspezifische Bedürfnisse zu identifizieren und artikulieren, indem sie Erkenntnisse und Entscheidungen verschiedener europäischer Staaten (oder präziser: einer Gruppe von Staaten, die einer erweiterten Kooperationslogik folgen) übernehmen und Kriterien für die Lastenteilung und das Management für Weltraumsysteme erstellen würde.

11. In der Umsetzung könnten Arbeitsgruppen zur „Weltraum-Sicherheit" parallel in der ESA und dem EU Rat eingerichtet werden, welche die Ausarbeitung, Implementierung und Durchführung eines solchen Programms vornehmen würden. Ebenso würden sie eine Verbindung zwischen beiden Institutionen herstellen. Um die Errichtung zu vieler institutioneller Körper zu vermeiden, könnte die Zusammensetzung dieser Arbeitsgruppen identisch sein.

12. Einer der besten Wege, um Europas Bemühungen im Ausbau der Weltraum-, Sicherheits- und Verteidigungskapazitäten auf eine neue Ebene zu heben, könnte die, vorzugsweise im Rahmen der EU vorgenommene, Einführung einer Europäischen Sicherheits- und Verteidigungsagentur für Leitprojekte mit einem kleinen, nicht permanenten Stab und flexiblen, missionsspezifischen Aktivitäten sein. Ähnlich DARPA in den USA würde dies ein Netzwerk für die Verfolgung eines strategischen Vorstoßes hin zu angewandten Zukunftstechnologien zur Verfügung stellen, welches präzise definierte Visionen mit im höchsten Grade flexiblen Strukturen und Methoden verbinden könnte.

13. Diese und andere Änderungen werden nicht einfach sein. Folglich muss der Europäische Rat durch die Einsetzung eines unabhängigen Weltraum-Ausschusses einen Vorstoß in diese Richtung unternehmen. Dieser Ausschuss sollte sich aus europäischen Experten zusammensetzen und den Sachverstand der Raumfahrtindustrie sowie potentieller ziviler und militärischer Weltraumnutzer für die Bereiche Äußeres, Sicherheit und Verteidigung zusammenführen. Unter Berücksichtigung der Bedürfnisse und der Entwicklung von Nachfragen sollte er zudem den optimalen Level europäischer Ambitionen im Weltraum bestimmen. Jenseits seiner Funktion als Ratgeber des Europäischen Rates könnte solch ein Ausschuss äußerst wichtige Öffentlichkeitsarbeit leisten, indem er zu Identifizierung und Ausbau eines europäischen Kundenkreises für Weltraumanwendungen beiträgt.

ZUSAMMENFASSUNG DER STUDIE

1. Der Weltraum, ein maßgeblicher Zugewinn für europäische Sicherheitspolitik

Weltraumtechnologie ist verbunden mit kollektiver Sicherheit, wobei der Begriff "Sicherheit" auf den Schutz der europäischen Bevölkerung vor potentiellen Risiken sowohl militärischer als auch nicht militärischer Natur verweist. Das Grünbuch der Europäischen Kommission „Europäische Weltraumpolitik" beinhaltete eine Aussage, wie Sicherheit durch Raumfahrttechnologie vergrößert werden könnte. Weltraumkapazitäten sind grundlegend für viele gemeinsame europäische Bemühungen, wie etwa die Entwicklung einer „wissensbasierten Wirtschaft" oder stärker integrierter Verkehrsregelungen (beispielsweise ein einheitlicher Luftraum). Gleichzeitig erfordert die Entwicklung der Gemeinsamen Außen- und Sicherheitspolitik sowie der Europäischen Sicherheits- und Verteidigungspolitik zahlreiche neue militärische Kapazitäten. Die sich ausweitende Nutzung von Informationstechnologien ist verbunden mit den Anstrengungen, die europäischen Kapazitäten, insbesondere im Bereich der Datenübertragung und der Informationsbeschaffung, zu verbessern. Der ECAP (European Capacities Action Plan) ruft zu konkreten Maßnahmen für eine steigende Wertschöpfung auf.

Der Europäische Rat initiierte in Thessaloniki das Konzept einer EU Sicherheitsstrategie. Dies war ein wichtiger Schritt in Richtung einer besseren Definition der politischen Grundlagen für künftige sicherheitsspezifische Weltraumapplikationen. Weiterhin war die Entscheidung, bis 2004 eine zwischenstaatliche Agentur für verteidigungsspezifische Kapazitätsentwicklung, Forschung, Beschaffung und Bewaffnung aufzubauen, ein Eckpunkt für die Entwicklung von Sicherheitstechnologien, und daher für Weltraumaktivitäten, innerhalb der EU. In den USA ist Weltraumtechnologie „militärisch orientiert" – dies aufgrund einer militärischen Strategie, die immer mehr auf dem Konzept der „Informations-Dominanz" basiert. Europäische Weltraumtechnologie ist stärker „zivil orientiert"; tatsächlich besitzt sie Dual-Use Charakter.
Diese Dualität ist politisch etabliert worden. Die Präambel der ESA Konvention definiert die Bestimmung der Organisation zu „friedlichen Zwecken". Die Entwicklung der europäischen Sicherheitspolitik, welche darauf ausgerichtet ist, wie „Friede gesichert und Stabilität verteidigt" werden kann, bestätigt die Vereinbarkeit dieser politischen Orientierung mit der „nicht aggressiven" Nutzung von Technologie.

Das europäische Weltraum-Netzwerk ist ausschließlich zivil. Bedeutende Verteidigungs- und Sicherheitsprogramme sind auf nationaler Basis entwickelt worden, durch Datenaustausch manchmal auch in bilateraler oder trilateraler Kooperation. Die Entwicklung von Dual-Use Programmen bedingt einen „europäischen" Vorstoß zu Weltraum-Sicherheit, welcher nationale Verteidigung und europäische zivile Anstrengungen verknüpft.

Zivile Spin-offs von Weltraumtechnologien, mit einer „erweiterten Sicherheitspolitik" der EU im Rücken, führen zu einigen wichtigen Punkten:

- Die „Sicherheit der Bevölkerung" ist die Grundlage für die wachsende Nutzung von Weltraumtechnologien. Dieses Sicherheitskonzept umfasst sowohl zivile als auch militärische Sicherheit.
- Anwendungen für den Bevölkerungsschutz sind in einigen Fällen rein zivil ausgerichtet, etwa bei weltraumgestützter Überwachung des Getreideanbaus oder Netzwerken zur besseren Wasserversorgung.
- In den meisten Fällen liefern weltraumgestützte Anwendungen sensible Informationen, die nach einem eindeutigen Verfahren zusammengeführt und verteilt werden müssen.
- Es besteht der Bedarf nach einem starken politischen und juristischen Netzwerk, das ebenso die Entwicklung einer administrativen Nutzergemeinschaft in den Bereichen Verteidigung, Polizei und Justiz erleichtern kann.
- Die Entwicklung von GASP und ESVP verlangt nach einem erweiterten Maß an weltraumgestützter Infrastruktur, der mit bedeutender operationeller Fähigkeit begegnet werden muss.
- Es gibt keine Verknüpfung der nachrichtendienstlichen Weltraumnutzung; bessere Koordination der Weltraumnutzung auf europäischer Ebene könnte hier größere Effektivität sicherstellen.

Das Konzept der "Weltraumsicherheit" umfasst verschiedene Elemente:

- Die Sicherheitsanwendungen, die durch Weltraumtechnologien erschlossen werden, sind ein Kernstück der europäischen Politik.
- Die Entwicklung der Weltraumnutzung ist die konkrete Umsetzung eines gemeinschaftlichen, demokratischen, europäischen Politikprojektes. Anwendungen der Weltraumsicherheit sind unmittelbar mit der Rolle Europas in der Welt verknüpft. Die Verhandlungen zwischen den USA und der EU über Galileo bestätigen dies nachhaltig.
- Der Weltraumsektor hilft, ein umfassendes „Sicherheitskonzept" für Europa und eine gemeinschaftliche Strategiekultur zu definieren, nicht nur für die Bereiche, in denen Anwendungen die Sicherheit der Bevölkerung direkt verbessern, sondern auch in bezug auf die technologischen Fähigkeiten selbst. Die Bedürfnisse von Endnutzern und Industrie tragen zu einer umfassenden technologischen Sicherheit bei.
- Weltraumsicherheit umschließt Anwendungen für die Verteidigung und andere Sicherheitsbereiche, ist aber hauptsächlich zivil ausgerichtet. Sie ist gestützt auf einen sehr spezifischen Dual-Use Ansatz, der zwischen multilateralen und nationalen europäischen Institutionen entwickelt wurde.

Darüber hinaus beinhaltete die Europäische Konvention über die Zukunft Europas eine „Europäische Weltraumpolitik" und ein „Europäisches Weltraumprogramm" in ihrem Entwurf eines Verfassungsvertrags: eine starke Verpflichtung zur Prägung eines Hochtechnologiesektors und eine Bestätigung seiner strategischen Bedeutung. Der Entwurf

des Verfassungsvertrags fordert zudem eine bedeutende institutionelle und operationelle Anstrengung, um solch ein Sicherheitskonzept zu fördern.

2. Aspekte zwischenstaatlicher Kooperation in Europa

Die Entwicklung der Weltraumzusammenarbeit vollzog sich unabhängig vom Prozess der generellen europäischen Integration. Zudem haben unterschiedliche zivile und militärische Institutionen, entweder rein national oder in unterschiedlichen Partnerschaften, zur Bestimmung der Weltraumpolitik und der Entwicklung industrieller Aktivitäten beigetragen. Die Europäische Weltraumorganisation (ESA) ist die ausschlaggebende Autorität im Bereich der europäischen Raumfahrtindustrie geworden. Gleichwohl sind die wachsende Rolle der Europäischen Union, die Entwicklung militärischer Weltraumaktivitäten und Änderungen im Industriesektor Merkmale, die zusammen mit der Fortentwicklung der nationalen Weltraumsektoren der europäischen Mitgliedstaaten in Betracht gezogen werden müssen.
Heute wird das europäische Weltraumengagement maßgeblich von der ESA, der EU und zwischenstaatlichen Programmen getragen.

Europäische Weltraumprogramme sind generell charakterisiert durch:

- eine starke Orientierung auf Forschung und Entwicklung, welche zu experimentellen Programmen und Kompetenzzugewinnen in Hochtechnologiebereichen führt;
- kollektive operationelle und strategische Ziele;
- nationale Ziele.

Bei zwei der wichtigsten europäischen Weltraumprojekte, Galileo und GMES, werden die Aspekte der F&E von der ESA geleitet, während strategische Fragen von der EU behandelt werden. In diesen Fällen sorgt die Einbeziehung nationaler Regierungen für zusätzliche Kooperationsebenen. Die mit Weltraumbelangen beauftragten nationalen Autoritäten sind entweder mehr oder weniger ausschließlich auf Weltraumfragen spezialisierte Agenturen, Ministerien (z.B. Forschung und Technologie, Industrie oder Außenhandel) oder interministerielle Körperschaften. Für den militärischen Weltraumsektor sind die Verteidigungsministerien für diejenigen Vorhaben verantwortlich, die nicht in Zusammenhang zu auch zivilen Aktivitäten stehen.

Eine von ESAs Bestimmungen war die Koordination des europäischen Weltraumprogramms mit den nationalen Programmen unter der Zielsetzung, letztere nach und nach zu „europäisieren". In der Praxis konnten europäische Weltraumprogramme rein nationale Aktivitäten jedoch nicht verdrängen, und sowohl die Einstellung bezüglich einer europäischen Einbindung als auch ihr Grad sind europaweit alles andere als einheitlich.
Die Aufgaben der Weltraumagenturen werden gegenwärtig in allen Ländern neu bewertet. Dies spiegelt den allmählichen Wandel der Beziehungen zwischen den einzelnen Protagonisten sowie eine gewisse Reife des Sektors nach mehr als 35 Jahren Praxis wider.

Sowohl beim Management wichtiger Programme als auch bei der Durchführung originärer Weltraumforschung hat die ESA ihre Fähigkeiten unter Beweis gestellt. Neue Faktoren die Technologieentwicklung betreffend, Änderungen bei den Schwerpunkten nationaler Weltrauminteressen und Entwicklungen im allgemeinen Netzwerk der europäischen

Gemeinschaft machen dennoch eine Neudefinition von Zielen und Ambitionen für die künftige europäische Weltraumpolitik erforderlich. In diesem Zusammenhang beabsichtigt die ESA ihre Rolle zu vergrößern, um zur Einführung einer europäischen Weltraumpolitik beizutragen, wie sie es bei der strategischen Arbeit mit der EU gezeigt hat (Ausarbeitung des Grünbuchs). Während die ESA das zentrale Forum für jede zwischenstaatliche Zusammenarbeit mit ihren eigenen Mechanismen für Diskussion und Beratung bleibt, weisen aktuelle Trends in Richtung einer stärker erkennbaren Rolle für die EU im Bereich der zwischenstaatlichen Beziehungen.

Das erste EU-ESA Gemeinschaftsprogramm: Galileo

Das Galileo Programm zur Satellitennavigation und -ortung kann als erstes „genuin" von der Europäischen Union geführte Weltraumprogramm betrachtet werden.
Das Programm begann auf europäischer Ebene unter der trilateralen Führung von ESA, EU und Eurocontrol, der Organisation zur Zertifizierung des Luftverkehrs. Brüssel unterstützte maßgeblich, dass die Errichtung eines vollständig unabhängigen europäischen, kommerziellen Systems von Beginn an im Rahmen einer europäischen Direktive erfolgte, die mit der Ausnahme einer offensichtlich auch militärisch relevanten Dimension von grundsätzlich zivilem Charakter war. Eine der Konsequenzen der EU-Einbindung in diese Initiative ist die Entwicklung eines neuen Finanzierungssystems gewesen, das als PPP (Public-Private-Partnership) bekannt ist.
Wie die „Nicht-Entscheidung" von Laeken im Jahr 2001 zeigte, fürchten einige Regierungen, dass die Entwicklung der Galileo Satellitenkapazität nationale Souveränität in diesem Bereich gefährden könnte.
Jenseits einer rein militärischen Analyse hat Galileos Entwicklung an der Infragestellung seiner Relevanz für nationale Zwecke ebenso gelitten wie an Auseinandersetzungen zwischen den Regierungen über die politischen und industriellen Nutzen des Systems (bis vor kurzem unter Beteiligung Deutschlands und Italiens). Es muss hervorgehoben werden, dass die letzten zwischenstaatlichen Diskussionen das Prinzip der EU-Führung des Galileo-Programms nicht mehr in Frage stellten.

DIE ERSTE EUROPÄISCHE INITIATIVE ZUR „ERWEITERTEN SICHERHEIT": GMES

Ursprünglich nur für die Umweltbeobachtung gedacht, ist GMES unter Einbeziehung der Sicherheitsdimension von GASP erweitert worden, wodurch der im Titel des Programms von GMES durch das „S" eingebundene Begriff der Sicherheit Beachtung fand. Jenseits ihrer Verpflichtungen bezüglich der zivilen ESA-Programme tritt die Europäische Kommission für eine weitere behutsame Annäherung bei einem Pilotprogramm mit ausgewiesener dualer Ausrichtung ein. Dieses aber als ein Instrument kollektiver Souveränität zu schaffen, wird kompliziert werden, vor allem im militärischen Bereich. Es soll, in der Theorie, bis 2008 zu der Errichtung eines operationellen Systems für globales Umwelt-Monitoring führen.

MILITÄRISCHE ERFAHRUNGEN, DAS WEU-ERBE IN DER EU

1991 wurde das Zentrum für die Interpretation von Satellitendaten der WEU in Torrejon, Spanien, errichtet, wodurch ein langer Meinungsbildungsprozess zum Abschluss gebracht wurde. Fünf Jahre später erwies die WEU-Aktivitätenbeurteilung am Zentrum in Torrejon während ihrer Erprobungsphase, dass es noch nicht seine maximale Effektivität erreicht hatte. Eines der Hauptprobleme war eine ernsthafte Zusammenarbeit in sensiblen Gebieten wie der Nachrichtendienste. Allgemeiner gesprochen hatte die EU sowohl bezüglich der finanziellen Ressourcen als auch bei den politischen und strategischen Annäherungen mit einem generellen Mangel an Übereinstimmung der Mitgliedstaaten zu kämpfen. Jedoch erwies die Entscheidung vom Mai 1997, die Aktivitäten am Zentrum in Torrejon zu unterstützen und zu stärken, dass der Wert der Weltraumaufklärung offiziell wahrgenommen worden war, zumindest auf politischer Ebene, auch wenn viele laufende Programme noch immer in bilateraler oder multilateraler Kooperation zwischen entsprechenden Mitgliedstaaten entwickelt werden. 2001 wurde das Zentrum zu einer permanenten, dem EU Rat berichtenden Agentur ernannt. Dies stellte sowohl seine anerkannte Rolle unter Beweis als auch die Tatsache, dass seine Aufgaben als Teil der Entwicklung einer gemeinsamen Europäischen Sicherheits- und Verteidigungspolitik (ESVP) erwogen wird.

2.1 Allgemeine Stellung der EU im Hinblick auf internationale Weltraumkooperation

Das Eintreten der EU in den Ausgestaltungsprozess europäischer Weltraumpolitik ist geprägt von einem wachsenden Interesse an „strategischen" Programmen. Dieses Interesse hat die Bedingungen der transatlantischen Kooperation auf beinahe drastische Weise gewandelt: Die Entscheidung der EU, Programme wie Galileo und GMES zu erwägen, hat eine Menge Skepsis in den USA erweckt.

Die EU verfolgt eine relativ aktive Politik im Bereich der Weltraumkooperation. Hauptsächlich wegen einer möglichen Zusammenarbeit beim Galileo Programm hat sie in Übereinstimmung mit der EU-Position gegenüber multilateralen Partnern Kontakte zu Russland und China etabliert.
Eines der Hauptthemen bei der Herstellung einer europäischen Militärkompetenz ist heute die Harmonisierung nationaler Programme. Verschiedene europäische Länder untersuchen die Fortentwicklung ihrer eigenen Kapazitäten (Deutschland: Sar Lupe; Italien: Cosmo Skymed; Frankreich: Pléiades) mit Vereinbarungen zum Informationsaustausch mit anderen Staaten (Belgien, Schweden, Spanien, Österreich).

Eine mögliche Entwicklung europäischer Sicherheits- und Verteidigungspräsenz im All bedarf sorgfältiger Erwägungen:

- Seit der Bestätigung der „Headline Goals", welche auf die Errichtung einer Europäischen Schnellen Eingreiftruppe (ERRF) abzielt, findet sie in einem gewandelten europäischen politischen Kontext statt.
- Ähnlich der Informationstechnologien unterliegen Weltraumtechnologien tiefgreifenden Änderungen, die sowohl in der ständigen Verbesserung des Kosten/Nutzen-Verhältnisses elektronischer Komponenten begründet liegt als auch, in Korrelation hierzu, in Verbesserungen der Systemarchitektur, welche die Verbindung verschiedener Systeme ermöglichen. Solche Systeme bereichern die für alle Nutzer, auch das Militär, gewonnenen Informationen. Mit der gegebenen Flexibilität der Nutzung könnte diese technische Erschließung, *a priori* und entgegen aller Erwartungen, auf die neuen Sicherheitsbedürfnisse, welche alle militärischen Hauptquartiere heute sorgen, antworten.
- Für alle militärischen Akteure ist die gesteigerte Nutzung aller möglichen Arten von Informationen für „moderne" Militäroperationen unabdingbar. Von Seiten einer professionellen Armee betrachtet ist der Gegner durch den Mangel an Information über ihn und die unvorhersehbaren Aktionen, welche er unternehmen könnte, gekennzeichnet. Militärstrategien versuchen daher, diesen Informationsrückstand über den modernen Gegner durch die Verstärkung ihrer Fähigkeiten des Sehens, Aufspürens und des Wissens zu kompensieren.
- Die Konvergenz dieser technischen Entwicklung und neuer Anforderungen scheint die Rolle des Weltraums als primär strategischen Verteidigungsfaktor in den Vordergrund zu rücken.
- Die europäischen Initiativen sind offensichtlich keine Ausnahmen. Doch dies ist genau, wo das Problem liegt. Die Größe der Konsequenzen der Entscheidungen lässt die Schwierigkeit anwachsen, eine europäische Militärpräsenz im Weltraum aufzubauen. Überlegungen in diesem Bereich dürfen nicht länger am Rande des europäischen politischen Prozesses gehalten werden, sondern bedürfen weitreichender politischer Entscheidungen.

Eine grobe Abschätzung, extrapoliert aus bestehenden Systemkosten (ohne die Auswertungskosten), gibt eine Größenordnung der gesamten Investitionen, die ein kollektives europäisches System der Weltraumsicherheit benötigen würde.

Tabelle 1: Kosten einer möglichen europäischen militärischen Weltraumkapazität

	Kosten Anwendungsprogramme (Millionen €)	*Laufzeit der Programme (Jahre)*	*jährliche Kosten (Millionen €)*
Telekommunikation	*3,140*	*15*	*209*
Beobachtung	*2,283*	*10*	*228*
Galileo	*150*	*8*	*19*
SIGINT	*875*	*10*	*87*

Frühwarnung		
		555
	10	
		55
Überwachung		
		251
	10	
		25
Total		
		7,254
		623

Quelle: *European Global Space Metasystem for Security and Defence, Präsentation von Major General D. Gavoty im Arbeitskreis "Security and Defence Aspects of Space: The challenges for the EU, Contribution to the Green Paper Consultation Process" organisiert von der griechischen EU-Präsidentschaft, Athen, 8.-9. Mai 2003, http://europa.eu.int/comm/space/futur/consultation5_en.html*

2.2 Überdenkung politischer und militärischer Souveränität

Die Einführung militärischer Weltraumaktivitäten auf europäischer Ebene wirft Fragen der politischen und militärischen Souveränität auf. Gegenwärtig werden Souveränitätsfragen im Kontext mit den üblichen multinationalen Beziehungen behandelt, so bei den „gemeinsamen operationellen Anforderungen" des militärischen Beobachtungsprogramms Helios. Die Einführung europäischer Programme hebt dieses Problem auf eine vollständig andere Ebene, einerseits wegen der strukturellen Probleme und daher der von ihrer Entwicklung aufgeworfenen Frage nach Verantwortlichkeiten, andererseits aufgrund des politischen und strategischen Wertes, der mit ihnen einhergeht.

Zwei europäische Schlüsselprogramme – zivil, doch mit einem starken dualen Charakter – können als Beweis für diesen Wendepunkt herangezogen werden: Galileo und GMES. Sie offenbaren das Ausmaß, aber ebenso die große Sensibilität der Entscheidungen, welche die EU-Mitgliedstaaten treffen müssen. Letztere sind sich bewusst, dass die Glaubwürdigkeit eines europäischen politischen und militärischen Ganzen von ihrem heutigen Engagement abhängt. Dennoch: Vermehrte Beispiele von sicherheitsrelevanten, um nicht zu sagen militärisch-sicherheitsrelevanten Anwendungen dieser Programme machen es für europäische Staaten unmöglich, die Debatten ausschließlich auf ökonomische, industrielle oder rein zivile Interessen zu begrenzen und stärken daher gegenwärtig noch nationale Widerstände, sich voll für ihre Entwicklung zu engagieren.

2.3 Schemata für mögliche Kooperationen: Vielfalt und Komplexität

Die Schaffung einer wahren europäischen militärischen Weltraumpräsenz erscheint um so schwieriger zu sein, als dass der Weg zur europäischen Integration keineswegs ohne Alternative wäre, und tatsächlich werden heute noch vielfältige Wege der Kooperation beschritten. Mit Ausnahme von NATO Satcom ging die Zusammenarbeit auf diesem Gebiet nie über bilaterale oder multilaterale Beziehungen hinaus. Das letzte Übereinkommen, der Gemeinsame Operationelle Bedarf (Common Operational Requirement; COR), versucht auf der für den sensiblen Bereich der Weltraumaufklärung im Rahmen von Helios-1A und Helios-1B errichtete Zusammenarbeit aufzubauen. COR ist ein Kooperationsprozess auf höchster Ebene, der in Zukunft verstärkt dauerhafte multilaterale strategische Abkommen ermöglichen könnte. Dieser Prozess umfasst sowohl die Erarbeitung schlichter Finanzierungsübereinkommen für ein Programm, doch ebenso die Definition gemeinsamer operationeller Ziele für unterschiedliche nationale Systeme, vornehmlich derjenigen von Deutschland, Spanien, Frankreich und Italien. Diese Zusammenführung von militärischen Bedürfnissen für Satellitenaufklärung im optischen, Radar- und Infrarotspektrum könnte den temporären Charakter gemeinschaftlicher Programme kompensieren.
Dennoch müssen Anstrengungen unternommen werden, um ein solches Dokument in die europäische Realität zu überführen. Was momentan nur eine Initiative einiger Mitgliedstaaten ist, könnte der Keim einer Entscheidung zum Handeln auf europäischer Ebene sein. In diesem Sinne könnte COR ein angemessener „bottom-up"-Mechanismus zur Vertiefung der europäischen Integration sein, auch wenn dies nicht notwendigerweise stärkere technische Zusammenarbeit bedeutet, sondern auf erweiterte Interoperationalität *a priori* hinausläuft.

3. Europäische Institutionen und Weltraumpolitik für Sicherheit und Verteidigung

Mit der Zusammenführung der europäischen Kapazitäten für Weltraumaktivitäten wurde ein separater Pfad in Form der Europäischen Weltraumagentur geschaffen.
Wenn die ESA auch außerhalb des Gemeinschaftsprozesses steht, so qualifizieren sie doch ihre Statuten, ähnlich der EU, zu mehr denn nur einer schlichten zwischenstaatlichen Kooperationsstruktur – sie hat ein Pflichtprogramm und eine eigenständige gemeinsame Infrastruktur.
Doch noch schreibt die erste Säule der EU, der Europäische Gemeinschaftsvertrag, vor, dass der Verteidigungssektor weitestgehend außerhalb der Reichweite gemeinschaftlicher Autorität liegt und unter Kontrolle der nationalen Regierungen verbleibt. Politikfelder, auf denen die Europäische Kommission autorisiert ist, Sicherheitsaspekte offen vorzutragen und Finanzmittel einzusetzen, sind nach wie vor rar. Es ist aus heutiger Sicht auch offensichtlich, dass innere Sicherheit ebenso wie Verteidigung in der EU für die vorhersehbare Zukunft zwischenstaatlich bleibt und dass jegliche aktive Rolle der EU und der Europäischen Kommission mit den dies unterstützenden Mitgliedstaaten abgestimmt werden wird.

Heute sieht die Europäische Kommission ihre weltraumspezifischen Aufgaben in der Leitung gemeinsamer Forschung und Entwicklung, im Entwurf von Regulationen und dem Requirieren weiterer Unterstützung für Projekte von europaweitem Interesse, so wie Galileo. Im letzten Jahrzehnt haben sich die Weltraumaktivitäten über ihren ursprünglichen Schwerpunkt der Technologieentwicklung hinfortbewegt und ausgereifte Anwendungen hervorgebracht. Dies trifft vor allem in den Bereichen der Kommunikation und Erdbeobachtung, respektive des Monitoring von Wetter und Klimaveränderungen, zu. Einige dieser Anwendungen haben bedeutende Aufgaben für verschiedene Bereiche des Lebens und der Wirtschaft übernommen und sind auch für Sicherheit und Verteidigung von Relevanz.
Die Fragmentierung der europäischen Weltraumanstrengungen – die Teilung zwischen zivilen und militärischen Aktivitäten sowie zwischen nationalen Agenturen und der ESA, mit einer wachsenden Rolle der EU – führte schließlich zu Überlegungen nach neuen institutionellen Lösungen.
2003 stellte die Kommission ihr Grünbuch zur Europäischen Weltraumpolitik vor, welches in Zusammenarbeit mit der ESA entwickelt wurde. Es arbeitet sorgfältig den grundlegenden Gedanken heraus, dass die Vorteile der Weltraumnutzung mehr zum Nutzen Europas und seiner Bevölkerung herangezogen werden müssen. Unter den Kernbereichen, in denen maßgebliche Vorteile erwartet werden dürfen, ist nachhaltige Entwicklung, welche globales Monitoring für eine striktere Kontrolle von Umweltregulationen und Kapazitäten für das Management von Umweltkrisen umfasst, ebenso die Sicherheit der Bevölkerung durch GASP und ESVP. Die intensive öffentliche Diskussion über das Grünbuch, die in der ersten Hälfte des Jahres 2003 geführt wurde, bietet eine gute Grundlage für das Weißbuch.
Soweit die Sicherheit berührt wird, umfasst das Grünbuch die Weltraumaktivitäten im vollen Spektrum der Petersberg Tasks, sowohl zivil als auch militärisch, die in der GASP und ESVP enthalten sind. Dies spiegelt die ECAP richtig wider, welche befindet, „dass zu

einem gewissen Grad die kritischen Unzulänglichkeiten des gegenwärtigen Krisenmanagements nach einer Kapazität an Weltraumtechnologien verlangt."

Aufgrund der begrenzten Integration der Verteidigung in der EU und dem Verbleib der gemeinsamen Verteidigung in der Verantwortung der Mitgliedstaaten, zumeist koordiniert durch die NATO, hält sich das Grünbuch der Kommission notgedrungen bedeckt bezüglich einer wirklichen Vision einer europäischen Weltraumpolitik, die deutlich auch militärische und nachrichtendienstliche Weltraumkapazitäten beinhaltet. Daher muss die Antwort auf die Herausforderung der Kommission, einen effizienteren und ambitionierteren Vorstoß in den Weltraum zu unternehmen, der die Anstrengungen der EU, ESA und Mitgliedstaaten verknüpft, über die Debatte des Grünbuches hinausgehen.
Das erste Ziel, wie es im Grünbuch spezifiziert wird, ist sicherzustellen, dass die Mitgliedstaaten den Wert einer gemeinschaftlichen, kohärenten EU-Weltraumpolitik entdecken, die auch auf die Sicherheit und Verteidigung ausgerichtet ist. Umgesetzt zielt diese Herausforderung zumindest anfänglich auf die Akquirierung weiterer Finanzmittel im Rahmen der europäische Kooperation für sicherheits- und verteidigungsspezifische Weltraumaktivitäten ab, welche von denjenigen Staaten geleitet werden, die bereits eine aktive Politik in diesem Bereich verfolgen.
Das kann auf drei Wegen erreicht werden:

- effektivere Ausnutzung der Finanzmittel für Forschung und Technologieentwicklung zu Zwecken des Dual-Use auf nationaler wie europäischer Ebene;
- Erhöhung der Weltraummittel für Sicherheitsapplikationen;
- Schaffung einer wachsenden politischen Unterstützung für zusätzliche Mittelbewilligungen für sicherheitsrelevante Programme durch spezifische Bewusstseinsschärfung und die Ermöglichung rascherer Erfolge. Die Kommission schätzt, dass die jährlichen Weltraumausgaben der EU auf 12 Mrd. Euro verdoppelt werden müssen, um die Programme, die als notwendige Bestandteile einer künftigen, kohärenten europäischen Weltraumpolitik betrachtet werden, zu unterstützen.

Die Zwecke, die in einem künftigen Politiknetzwerk erfüllt werden müssen, wären demnach:

- gezielte F&E für fortschrittliche Weltraumapplikationen;
- verstärkte Einbindung der Verantwortlichen für Sicherheit und Verteidigung in den Entscheidungsprozess zur Weltraumpolitik;
- verstärkte, institutionalisierte politische Klarheit und Effektivität sicherheitsbezogener Weltraumaktivitäten.

Diese drei Punkte können als Kriterien für die Beurteilung möglicher künftiger internationaler Vorstöße bezüglich Weltraum und Sicherheit zwischen EU, ESA, anderen involvierten Agenturen und nationalen Institutionen dienen.

3.1 Die EU als Angelpunkt europäischer Sicherheitspolitik

Die politischen und militärischen Lehren der Balkankriege in den 1990er Jahren führten zu der Entscheidung, die EU mit einer Reihe militärischer und ziviler Ordnungsinstrumente für die Krisenreaktion zu versehen, welche 1999 die Initiative des ESVP „Headline Goal" erlaubte. Die „Petersberg Tasks", auf welche dieser Ansatz zurückgeht, wurden in den unterschiedlichen Mitgliedstaaten von Beginn an verschiedentlich interpretiert. Es gibt heute aber eine wachsende Akzeptanz, dass ein weiterer Rahmen von Verteidigungsaufgaben wie die Konfliktvorbeugung, gemeinsame Entwaffnungsoperationen, die militärische Beratung und Hilfeleistung, die Stabilisierung nach einem Konflikt und die Bekämpfung des Terrorismus (vgl. Morillon Report to the European Parliament, März 2003) ausdrücklich einbezogen werden sollte. Zu Planungszwecken wäre es ratsam, sich auf die sichersten Annahmen bezüglich des möglichen Charakters und Rahmens künftiger Operationen der EU zu stützen. Dies gilt umso mehr im strategischen Umfeld nach dem 11. September 2001.

Der Entwurf des Strategiepapiers "Ein sicheres Europa in einer besseren Welt", der von Javier Solana im Juni 2003 in Thessaloniki vorgestellt wurde, bietet einen Überblick der Herausforderungen. Sie umfassen den internationalen Terrorismus, die Verbreitung von Massenvernichtungswaffen und den Zusammenbruch effektiver staatlicher Institutionen in vielen Teilen der Welt. Solana setzte sich daher für eine „aktivere, kohärentere und tatkräftigere" Europäische Union in Zusammenarbeit mit Partnern ein.
Für die zusätzlich erforderlichen Kapazitäten bei Verteidigung und Nachrichtendienst wird die Weltraumnutzung ein entscheidendes Feld sein, denn sie bietet die Vorteile von Spitzentechnologien, deckt die wachsende globale Ausdehnung europäischer Verantwortung ab und begünstigt die kosteneffektive Nutzung begrenzter Mittel durch die Bereitstellung von kräftebündelnden Komponenten und Fähigkeiten. Das gleiche gilt nicht nur für die Petersberg Tasks im Rahmen der ESVP, sondern ebenso für andere gemeinsam wahrgenommene Sicherheitsaufgaben, die normalerweise nicht unter die ESVP fallen, wie die Grenz- oder Küstensicherung.

Aufgrund der schwerwiegenden Mängel in Europa, sowohl bei militärischen also auch nicht militärischen Missionen, hat sich in gewissen Schlüsselbereichen der Schwerpunkt der ESVP-Umsetzung auf die Errichtung von gemeinsamen Fähigkeiten gerichtet. Solche Schwerpunkte sind beispielsweise Kommando und Kontrolle von Operationen, weltweite abhörsichere Kommunikation, strategischer Nachrichtendienst (Monitoring, Frühwarnung, Situationseinschätzung), Kartierung, Navigation und Ortung, operationelle Überwachung, taktische Situationserkennung, Truppenschutz und effektive Gefechtskapazitäten – allesamt mit einer weltraumgebundenen Dimension. Im Rahmen des European Capabilities Action Plan (ECAP) sind 19 Arbeitsgruppen einberufen worden, um die schwerwiegendsten Mängel zu untersuchen. Keine hiervon war schwerpunktmäßig mit dem Weltraum befasst. Dennoch wurden einige weltraumspezifische Fähigkeiten auf die Liste der Mängel aufgenommen, beispielsweise strategische Satellitenaufnahmen, nachrichtendienstlicher Datenverkehr, Frühwarnung sowie die Unterstützung der UAV.

Es gibt derzeit in Europa keine Struktur, in der alle weltraumbezogenen Aktivitäten querverwiesen und ein übergreifender Ansatz zur Generierung des benötigten Kapitals und Wissens, auch mit Rückgriff auf kommerzielle oder öffentliche Dual-Use Möglichkeiten und Public-Private-Partnership Lösungen, bereitgestellt werden könnte. Der sich überlagernde Bedarf an Weltraumkapazitäten für Verteidigungszwecke und nicht verteidigungsspezifischer Sicherheitsbedürfnisse (etwa Grenzschutz, Küstenwacht und Notfallreaktion) muss wahrgenommen und sowohl auf der nationalen als auch der europäischen Ebene ausgewertet werden.

Ein bedeutender Beitrag könnte von der Gründung einer europäischen Agentur für Sicherheit und Verteidigung kommen, die nicht nur auf laufende Beschaffungsprogramme ausgerichtet wäre, sondern ebenso die F&E überschauen und ausrichten, nationale Bemühungen verfolgen und bei der Identifizierung von Bedürfnissen mithelfen würde. Bedeutende Mitgliedstaaten der EU unterstützen die Gründung einer solchen Agentur, die auf existierenden Strukturen wie beispielsweise OCCAR aufbauen würde, und der Verfassungsentwurf der Versammlung fordert ihre Einrichtung (vgl. Burkard Schmitt, The European Union and Armaments, EU-ISS Chaillot Paper No. 63, Paris).
Es gibt jedoch keine Garantie, dass sich solch eine Agentur maßgeblich auf den Weltraum konzentrieren würde. Daher mag es notwendig sein, auf europäischer Ebene einen separaten Anstoß speziell für die sicherheits- und verteidigungsrelevante Dimension der Weltraumnutzung zu geben. Einen solchen Vorschlag, sogar noch enger für die militärische Dimension gefasst, ist vom französischen General Gavoty eingebracht worden. Er sieht eine „Eumilsat"-Agentur vor, die auch für die Kontrolle der operationalen Systeme wie Galileo verantwortlich wäre. Was vermieden werden sollte ist eine weitere Vertiefung der bestehenden zivilen und militärischen Trennung, denn dies würde Hoffnungen auf eine intelligentere und effektivere Nutzung der limitierten Ressourcen weiter unterminieren.

Um sicherzustellen, dass eine europäische Agentur für weltraumbezogene Sicherheit und Verteidigung auf dem technologischen Sachverstand der ESA sowie ihr europäisches Netzwerk zurückgreifen kann, wäre eine weitreichende Integration in die ESA wahrscheinlich von Vorteil. Solch ein Ansatz könnte zudem die Einbeziehung der Verteidigungs- und Sicherheitsminister der nationalen Regierungen in die politische Führung der Agentur erleichtern; in der absehbaren Zukunft werden sich die Verteidigungsminister nach wie vor nur informell im Rahmen der EU treffen können, wohingegen die ESA-Konvention die Flexibilität für Mitgliedstaaten bieten würde, vor allem bei optionalen Programmen (an denen die EU ebenso teilnehmen kann) nicht nur durch die Forschungsministerien vertreten zu sein.
Eine von den Mitgliedstaaten innerhalb der ESA – und unter Teilnahme der EU – aufgebaute Sicherheits- und Verteidigungsautorität wäre ebenso ein gutes Mittel, um europäische Richtlinien für sicherheitsrelevante Regulierungen im Weltraum zu entwickeln und umzusetzen, so beispielsweise eine Kontrolle für Beobachtungskapazitäten während Krisenzeiten.

Aufgrund der Tatsache, dass es innerhalb von Europa eine deutliche Asymmetrie bei der militärischen Nutzung des Weltraums gibt, wobei Frankreich mehr als doppelt so viel investiert als alle anderen Mitgliedstaaten zusammen, werden die französischen

Erfahrungen und Erwartungen sicherlich eine bedeutende Rolle bei der künftigen institutionellen Entwicklung spielen. Sollten andere Staaten Frankreich oder weitere Länder zu einem weniger traditionellen Ansatz für ihre militärische Weltraumnutzung gewinnen wollen, so werden sie zumindest attraktive zusätzliche Finanzmittel anbieten müssen.

Ein komplizierter, aber zugleich hilfreicher Aspekt ist die Tatsache, dass die europäischen Anstrengungen zur Entwicklung von spezifischen Fähigkeiten im Rahmen der ESVP eng mit der NATO koordiniert werden, da die meisten Mitgliedstaaten beiden Organisationen angehören und sicherstellen müssen, dass ihre Streitkräfte den Anforderungen beider gerecht werden. Dies trifft erst recht nach der Entscheidung der NATO zu, eine alliierte Reaktionstruppe (NRF) aufzustellen und unter europäischen Alliierten die Anpassung von netzwerkzentrierten, veränderlichen Annäherungen an eine Verteidigung anzustreben.
Künftige europäische Entscheidungen und Umsetzungen von sicherheits- und verteidigungsspezifischen Anwendungen des Weltraums werden sehr wahrscheinlich nicht nur einen Einfluss auf die Qualität der transatlantischen Konsultationen und Kooperationen bei internationalen Sicherheitsfragen mit sich bringen, sondern auch andere Aspekte von strategischer Bedeutung wie Europas Rolle in der Welt und den künftigen europäischen Standort für Verteidigungsindustrie berücksichtigen. Die überwältigende Weltraumdominanz der USA ist besonders ausschlaggebend, da die große Mehrheit der globalen Weltraumausgaben und im Besonderen der militärischen Weltraumausgaben in den USA liegt. Dies birgt für europäische Firmen im Vergleich zu ihren amerikanischen Wettbewerbern in den Bereichen Aerospace und Verteidigung einen nennenswerten Nachteil.

Der Weltraumsektor ist aus diesen Gründen kompliziert mit dem Problem des Zugangs zum Verteidigungs- und Ausrüstungsmarkt verbunden sowie den Gesprächen zur Exportkontrolle mit den USA. Ebenso spielen die kürzlich in der Mitteilung der Europäischen Kommission „In Richtung einer EU-Politik zur Verteidigungsausrüstung" (März 2003) aufgeführten Themen eine Rolle, bei denen auch eine Anregung zur Schaffung eines europäischen Verteidigungs- und Ausrüstungsmarktes gegeben wurde.
Wie in vielen anderen Zusammenhängen so muss auch in diesem Kontext die Tatsache, dass Weltraumaktivitäten für eine Anzahl unterschiedlicher Generaldirektorate der Kommission von Bedeutung sind, berücksichtigt werden, wenn das künftige organisatorische Netzwerk für eine kohärente EU-Weltraumpolitik strukturiert wird. Ein gewisses Risiko zur Rivalität mit kontraproduktiven Konsequenzen könnte in der Verfolgung ihrer jeweiligen Aufgaben und politischen Ziele zwischen folgenden Bereichen entstehen: Forschung, Entwicklung, Technologie und Innovation, Unternehmen, Transport und transeuropäische Netze, Informationsgesellschaft, Umwelt und äußere Beziehungen.
Die Kommission, und die EU als ganzes, sind noch nicht ausreichend für eine aktive, kohärente Rolle in der Weltraumpolitik organisiert. Dies ist auch bei den gegenwärtigen Weltraumprogrammen mit EU-Beteiligung, wie GMES und Galileo, deutlich geworden. Es wird künftig notwendig sein, eine geeignete Verteilung von Zuständigkeiten und Führungver-antwortung innerhalb der EU zu finden.

3.2 Die ESA als eine Dual-Use Weltraumagentur

Die ESA bietet eine äußerst attraktive Infrastruktur für die gesamte Spannweite von Weltraumprojekten und hat eine Erfolgsgeschichte vorzuweisen. Traditionell jedoch wurde sie an einem Engagement für ausdrücklich sicherheitsrelevante Aktivitäten mit Verweis auf die „ausschließlich friedliche Nutzung" in ihren Statuten gehindert.
Stillschweigend aber war die Schaffung eines autonomen Zugangs zum All natürlich wie bei allen anderen Weltraummächten ebenso von dem Streben nach der Nutzung von sicherheits- und verteidigungsrelevanten Applikationen des Alls (wie etwa der Weltraumaufklärung) motiviert.

Die institutionelle Trennung von zivilen und militärischen Weltraumaktivitäten ist historisch verwurzelt (so mit der NASA und dem US Department of Defence) und war ursprünglich auf stichhaltigen politischen und rechtlichen Überlegungen gegründet. Mit dem Ende des Kalten Krieges veralterte diese jedoch rasch. 1993 empfahl der Ausschuss für internationale Beziehungen der ESA Aufgeschlossenheit gegenüber einer Rolle bei der Errichtung eines Satellitenüberwachungssystems der WEU. Die ESA zeigte sich in der Tat flexibel. Nicht nur wurden die Helios-1 Satelliten und einige andere militärische Nutzlasten mit der Ariane gestartet. Helios-1 wurde zudem im ESTEC (European Space Research and Technology Center, ESA Noordwijk, Niederlande) getestet. Die erfolgreiche Demonstration einer optischen Kommunikationsverbindung zwischen den ESA-Satelliten Artemis und Envisat durch die ESA könnte zu einer ähnlichen Verbindung zwischen Artemis und Helios-2 führen.

Erst kürzlich hat die ESA offiziell entschieden, die rechtliche Bedeutung ihrer Statuten neu zu bewerten. Dies beinhaltet, dass die Konvention keineswegs den Kapazitäten der ESA verbietet, Weltraumprogramme für Verteidigung oder Sicherheit, für duale Zwecke oder für mit Sicherheits- und Verteidigungsbelangen betraute nationale oder internationale öffentliche Körperschaften zu starten und durchzuführen. Sie führte zudem ein Sicherheitsabfertigungsverfahren ein.
Die potentiell attraktive Option, den vollen Nutzen aus dem Dual-Use Charakter des Weltraums innerhalb der ESA selbst zu schöpfen, liegt auf der Hand. Dies würde durch ein weiteres Kooperationsabkommen mit der EU begründet werden können, und jede Möglichkeit, innereuropäische Verdopplungen zu vermeiden, sollte als ein kostenreduzierender Faktor begrüßt werden.

Auf der anderen Hand muss realistischerweise angenommen werden, dass Verteidigungssysteme im All wahrscheinlich noch einige Jahre lang unter nationaler Verantwortung bleiben werden. Selbst längerfristig mag es immer Verteidigungssysteme geben, die als derart kritisch eingeschätzt werden, dass sie entweder überhaupt nicht in die europäische Kooperation eingebracht werden oder im Rahmen besonderer Regelungen behandelt werden müssen.
Da die europäische militärische Weltraumnutzung erst in den Anfängen steckt, ist es zu früh zu urteilen, inwieweit dieser Aspekt die Vision der ESA als eine einzige europäische Weltraumagentur untergraben könnte. Auf jeden Fall (so wie beim Helios-Programm) sollten die Einrichtungen, die ESA als Dienstleister einbringen kann, für spezifische Aufgaben auch im Zusammenhang mit derart speziellen Programmen nutzbar sein. Dieser

Aspekt könnte durch ein progressiv konsolidiertes Netz der momentan nationalen Weltraumeinrichtungen verstärkt werden.

3.3 Weitere Aspekte institutioneller Entwicklung

Um sowohl Know-how bei Spitzentechnologien zu entwickeln als auch einen tatkräftigen und lebensfähigen europäischen Industriestandort zu erhalten, sind Anstrengungen zur Stärkung des Dual-Use Bewusstseins ebenso dringlich wie missionsorientierte Forschung und Technologieentwicklung innerhalb der EU, auch zur Unterstützung anderer politischer Gemeinschaftsziele, und fortschrittliche F&E-Investitionen im Bereich der Weltraumverteidigung zu veranlassen. Nur durch die Unterstützung einer frühzeitlichen Zusammenlegung der europäischen Bemühungen auf der Ebene von Forschung und Technologie kann die gegenwärtige Situation geändert werden, in der Systeme national verbleiben und nur wechselseitig als minimale Form europäischer Kooperation zugänglich gemacht werden (Beobachtungssysteme, Transponder).

Momentan ist die Western European Armaments Group (WEAG) die einzige Stelle, wo derartiges bis zu einem gewissen Grad versucht wird. Seit 1990 sind Technologien zur Satellitenüberwachung eines der Gemeinsamen Europäischen Prioritätsgebiete (Common European Priority Areas; CEPA) dieser Organisation. 2000 wurde dies auf die gesamte militärische Weltraumtechnologie ausgeweitet.
Einer der besten Wege, um Europas Bemühungen im Ausbau der Weltraum-, Sicherheits- und Verteidigungskapazitäten auf eine neue Ebene zu heben, könnte die, vorzugsweise im Rahmen der EU vorgenommene, Einführung einer Europäischen Sicherheits- und Verteidigungsagentur für Leitprojekte mit einem kleinen, nicht permanenten Stab und flexiblen, missionsspezifischen Aktivitäten sein. Ähnlich DARPA in den USA würde dies ein Netzwerk für die Verfolgung eines strategischen Vorstoßes hin zu angewandten Zukunftstechnologien zur Verfügung stellen, welches präzise definierte Visionen mit im höchsten Grade flexiblen Strukturen und Methoden verbinden könnte.

Es bedarf eines aktiveren Nutzerkreises für sicherheits- und verteidigungsspezifische Weltraumanwendungen zur konstruktiven Interaktion bei der Erarbeitung von Konzepten und der Feststellung von Bedürfnissen, dem Beschaffungswesen sowie der gemeinsamen Ausnutzung von Weltraumsystemen für Sicherheit- und Verteidigungszwecke in Europa. Dies wäre zudem von großer Hilfe bei der Kooperation mit amerikanischen Weltraumexperten und bei der detaillierteren und zeitlich präziseren Abschätzung von Entwicklungen in der amerikanischen militärischen Weltraumpolitik.
Zudem wird man sich mit einer ganzen Reihe neuer institutioneller und regulatorischer Entscheidungen treffen müssen, um sich mit den neuen Aufgaben im Bereich der sicherheits- und verteidigungsspezifischen Weltraumapplikationen auseinandersetzen zu können. Galileo war mit seinen Sicherheitsimplikationen (vgl. G. Gasparini, G. Lindström, *The Galileo satellite system and its security implications,* EU-ISS Occasional Paper No. 44, Paris) diesbezüglich bereits ein Alarmsignal. Unter anderem müssen sicherheitsbewusste

Strategien eingeführt werden, um einen Zugang zu Informationen und ihrer Falsifizierung zu erhalten, ebenso wie zu Vorkehrungen für den Systemschutz.

Wenn einmal die operationellen Systeme im Einsatz sind, werden schließlich europäische Kommandostrukturen für die Verantwortung über die Weltraumsysteme entwickelt werden müssen. Sie werden möglicherweise den vollen militärischen Ansprüchen ebenso genügen müssen wie auch dem spezifischen europäischen Streben, den Dual-Use Charakter vieler Weltraumsysteme für eine große Bandbreite an Sicherheitsapplikationen auszuschöpfen. In manchen Fällen wird die Einrichtung von parallelen Nutzerstrukturen unvermeidlich sein, denn die zentralen Sicherheits- und Verteidigungsaufgaben bedürfen eines anderen Ansatzes als das weitergefasste Sicherheitsverständnis, zu dem beispielsweise das Umwelt-Monitoring zählt.

4. Weltraum und Sicherheit in Europa: Ein Schnittpunkt von Politik und Industrie

Die Entwicklung der Europäischen Sicherheits- und Verteidigungspolitik bedarf Weltraumkapazitäten. Deshalb muss Europa eine eigene technologische und industrielle Basis erhalten, oder es wird die für strategische Entscheidungen unabdingbare Autonomie nicht erlangen. Spezifische politische Ziele müssen ihre Effizienz und Wettbewerbsfähigkeit verbessern und dabei europäische Unzulänglichkeiten sowohl auf der Angebot- als auch der Nachfrageseite des Weltraummarktes hinter sich lassen.

Die Hauptprobleme im Bereich von Weltraum und Sicherheit sind:

- Der Mangel an signifikanten Finanzmitteln für Sicherheit und Verteidigung in Europa. Diese Tatsache wird bei einer einfachen Gegenüberstellung der europäischen und der amerikanischen Ausgaben auf dramatische Weise deutlich: Das Verhältnis auf dem kommerziellen Markt beträgt 1 zu 2,6; 1 zu 3 in der Meteorologie; 1 zu 4 beim Bedarf für zivile Institutionen; 1 zu 30 im militärischen Bereich. Diese begrenzte Nachfrage wirkt sich in unterschiedlicher Weise negativ auf den europäischen Industriestandort aus.
- Die Gesamtproduktion der europäischen Industrie wird niedriger als die der USA bleiben, was einen negativen Einfluss auf die Wettbewerbsfähigkeit haben wird, denn nicht zurückfließende und fixe Kosten, etwa bei der Forschung und Entwicklung, müssen fast vollständig von der zivilen Produktion getragen werden. Die Abhängigkeit vom kommerziellen Markt vergrößert die Effekte von ökonomischen Krisen, wie sie sich kürzlich ereignete, denn der militärische Sektor ist nicht groß genug, um nennenswerten antizyklischen Bedarf zu entwickeln.
- Vom technologischen Standpunkt gesehen erfordert der duale Charakter der Weltraumnutzung die vollständige Ausnutzung aller möglichen Applikationen, zivil oder militärisch.
- Aus dem Mangel an institutionellem Bedarf an Startleistungen ergibt sich, dass das europäische Trägerkonsortium Arianespace weniger wettbewerbsstark ist.
- Die kommerzielle Attraktivität europäischer Produkte ist auf die nicht sicherheitsrelevanten Sektoren begrenzt.

Ein Problem ist zudem der Mangel einer gemeinschaftlichen europäischen Strategie, welche die Konvergenz der gegenwärtigen und künftigen nationalen, internationalen und europäischen Anstrengungen sicherstellen würde. Dieses kann lediglich durch die Annahme einer europäischen Weltraumpolitik gelöst werden, die sowohl zivile als auch militärische Aspekte umfasst. In der Zwischenzeit muss eine engere Koordination zwischen den nationalen und europäischen Ebenen sowie zwischen zivilen und militärischen Aspekten erreicht werden. Dies wird eine Verdopplung der Aktivitäten und die Verschwendung von knappen Ressourcen verhindern und allmählich zu einer Zusammenführung der technologischen, industriellen und operationellen Fähigkeiten führen.

Auch die Zulieferseite ist strukturell unzulänglich. Die Globalisierung des Marktes unterstreicht die Schwäche der europäischen Industrie gegenüber amerikanischen Wettbewerbern.
Weitere Rationalisierung ist notwendig und wird vielleicht eine größere industrielle Konzentration umfassen müssen. Dieser Prozess verlangt nach einer politischen Führung, um eine übermäßige Verzerrung des Marktes zu vermeiden, wovon manche fast unvermeidlich ist. Die europäischen Regierungen und Institutionen sollten einen gewissen Grad an Wettbewerb auf dem europäischen Markt sicherstellen, zumindest in solchen Sektoren, in denen Marktgröße sowie technologische und industrielle Charakteristika dies erlauben, während sie in anderen Bereichen auf Konzentration hinlenken, etwa bei den Startdienstleistungen.
Die Einbringung der sicherheits- und verteidigungsspezifischen Bedürfnisse wird bedeutende positive Effekte auf die Wettbewerbsfähigkeit des europäischen Marktes haben und Platz für zumindest zwei verschiedene Wettbewerber in beiden Bereichen schaffen.

Einige Schlüsse können aus dem Vergleich der amerikanischen mit den europäischen Erfahrungen gezogen werden:

- Die Praxis des amerikanischen Weltraumsektors unterstreicht die antizyklische Funktion staatlicher Ausgaben (insbesondere des Department of Defence).
- Die staatliche Unterstützung von F&E ist in diesem speziellen Sektor ausschlaggebend für jeglichen Erfolg, da hier ein hoher Grad an Unsicherheiten für Investitionen und eine langfristige Kapitalbindung besteht.
- Es ist wichtig, der Anbieterseite gemeinschaftliche Regularien und einen gemeinsamen Bedarf in Aussicht zu stellen, um ein stabiles, abschätzbares und ertragreiches Gegenüber sicherzustellen.
- Eine starke Nachfrage um einen einzigen Akteur herum ist ein zentraler Faktor; die Verteilung der Nachfrage auf verschiedene Agenturen je nach Mission sollte vermieden werden.
- Starker politischer Rückhalt für die Reform der Anbieterseite und des Konzentrationsprozesses sollte die notwendigen Anreize zur Kostensenkung geben.

Tabelle 2: Missionenanalyse

Missionen	Zwecke	Industrielle Teilnehmer	Institutionelle Hauptverantwortliche	Sicherheitsaspekte	Probleme	Politische Ziele
Weltraumzugang	Launcher, Shuttle (?) bemannte Raumfahrt (?)	Raketenhersteller, Raketenmotoren, Starteinrichtungen	ESA, EU Kommission	relevant, dual	Kosten, Subventionen, geringer institutioneller Bedarf	Vorhaltung des gesamten Spektrums an Weltraum Know-how, Entwicklung neuer Technologien, Kosteneinsparung
Kommunikation	Satellitenkonstellationen (GEO, MEO, LEO, DRS)	Satellitenhersteller, Bodeneinrichtungen, Transponder, Empfangsgeräte, Dienstleister	ESA, Staaten (F, D, I, S, UK), NATO	relevant, dual	geringer institutioneller Bedarf, Wettbewerbsverzerrung, Datensicherheit, Mangel an Breitbandkapazitäten	Koordination von nationalen Bemühungen und zivilen/militärischen Anwendungen, Planung der integrierten künftigen Erweiterung
Navigation	GNSS	Dienstleister, Hersteller von Atomuhren, Empfangsgeräte	ESA, EU Kommission, EU Rat, NATO	relevant, dual	Signalkontrolle, Integration mit GPS und Glonass, missbräuchliche Nutzung	Klare Kommandokette, bilaterale Abkommen mit den USA und Russland
Meteorologie	Beobachtungssatelliten	Satellitenhersteller, Bodeneinrichtungen, Dienstleister	Eumetsat, ESA	relevant, dual	Informationsschutz	Verstärkung der bestehenden internationalen Verbindungen
Monitoring	Radar-, Infrarot-, optische Konstellationen	Satellitenhersteller, Bodeneinrichtungen, Sensoren	ESA, EU Rat, Torrejon, Staaten (F, D, I, S)	relevant, dual	Kosten, mangelnde Koordination, Datensicherheit, rechtlicher Rahmen der Datenauswertung	Koordination von nationalen Bemühungen und zivilen/militärischen Anwendungen, Planung der integrierten künftigen Erweiterung
Vertragsvollzug	Beobachtungssatelliten	Satellitenhersteller, Bodeneinrichtungen, Dienstleister	EU Rat, ESA (Technologie)	militärisch, präventive Diplomatie	Kosten, politisches Mandat	bessere Auswertung von Monitoring-Daten
Zielerfassung	Beobachtungssatelliten, GNSS	Satellitenhersteller, Bodeneinrichtungen, Transponder, Empfangsgeräte, Dienstleister	EU Rat, Torrejon, NATO, ESA (Technologie), Staaten	rein militärisch	Mangel an Interoperationalität, wenige spezifische Einrichtungen, undeutlicher politischer Rahmen	Koordination von nationalen Einrichtungen, Entwicklung gemeinschaftlicher Konstellationen, Verfahrensentwicklung, Erweiterung von Torrejon
Nachrichtendienst (Elint, Comint)	Satellitenkonstellationen	Satellitenhersteller, cryptographische Software, Sensoren	EU Rat, NATO, Staaten	hauptsächlich militärisch	Souveränitätsaspekte, mangelnde Koordination, keine spezifischen Einrichtungen	Errichtung eines politischen und institutionellen Rahmens, gemeinsame Einrichtungen, Informationsaustausch
Frühwarnung	Beobachtungssatelliten	Satellitenhersteller, Sensoren	EU Rat, NATO, Staaten (F, UK)	militärisch, präventive Diplomatie	keine verfügbaren spezifischen Einrichtungen, Kosten, Durchführbarkeit	Einführung eines EU-Systems (zusätzliche Nutzlast)
Angriff feindlicher Einrichtung im All	ASAT, Killersatelliten	Trägerraketen, Kampfraketen, EKV, Satelliten	ESA (Technologie), NATO (?), Staaten (?)	rein militärisch	Keine verfügbaren Einrichtungen, Kosten, Durchführbarkeit, Einfluss auf die politisch-strategische Stabilität	Technologieerforschung

weltraumgebundene Raketenabwehr		Laser, EKV, Satelliten	ESA (Technologie), NATO (?), Staaten (?)	rein militärisch	Keine verfügbaren Einrichtungen, nicht verfügbare Technologien, Kosten, Durchführbarkeit, Einfluss auf die politisch-strategische Stabilität	Technologieerforschung

(?) = möglich, vorgesehen
Staaten in Klammern als Hauptakteure

Tabelle 3: Hauptakteure und politische Ziele

Bereich	Bedarf	Anbieter	Probleme	Politische Ziele
Forschung	Staaten, ESA, EU Kommission, Industrie	ESA, Universitäten, Forschungszentren, Labore	mangelnde öffentliche und private Finanzierung, keine Koordination	Entwicklung eines gemeinschaftlichen institutionellen Rahmens, Anhebung der Finanzierung, Ausschöpfung von Skalenerträgen
Technologieentwicklung	Staaten, ESA, EU Kommission, Industrie, NATO, privater Sektor	ESA, Labore	mangelnde öffentliche und private Finanzierung, keine Koordination	Entwicklung eines gemeinschaftlichen institutionellen Rahmens, Anhebung der Finanzierung, Ausschöpfung von Skalenerträgen
Bedürfnisse	Staaten, ESA, ESVP Institutionen, NATO	ESA, Industrie	keine gemeinschaftlichen Bedürfnisse, mangelnde Interoperationalität	Gründung einer gemeinschaftlichen Agentur, Zusammenlegung bestehender Kompetenzen, Anregung des Wettbewerbs
Beschaffungswesen, Wartung	Staaten, ESA, ESVP Institutionen, NATO, privater Sektor	Industrie	mangelnder institutioneller Bedarf	Gründung einer gemeinschaftlichen Agentur, Zusammenlegung bestehender Kompetenzen, Anhebung der Finanzierung
Dienstleistungen, Anwendungen	Staaten, ESA, EU Rat, EU Kommission, NATO	Industrie, Dienstleister	Beschränkter privater und öffentlicher Bedarf	Anregung des privaten Sektors, Vereinheitlichung oder Koordination des institutionellen Bedarfs
rechtlicher Rahmen	EU Rat, EU Kommission, Staaten		Fragmentation	Einführung von gemeinschaftlichen Regelungen
politische Autorität	EU Rat, EU Kommission, NATO, Staaten		Fragmentation	Kompetenzfestlegung, Klarstellung der institutionellen Beziehungen

SCHLUSSBETRACHTUNG

Die Europäische Union (EU) kann den Weltraum weder ignorieren noch ihm fernbleiben. Das ist von den Mitgliedstaaten mit signifikanter eigener Weltraumpolitik verstanden. Die Schaffung der Europäischen Weltraumorganisation (ESA) und die Bedeutung ihrer Aktivitäten in der Wissenschaft sowie bei technologischen und kommerziellen Programmen verdeutlicht diese politische Sachlage. Gleichzeitig haben mehrere „Weltraum-orientierte" europäische Staaten autonome Weltraumaktivitäten, teilweise mit verteidigungs- und sicherheitsrelevanter Bedeutung, entwickelt. Auch die EU ist durch die Initiativen der Europäischen Kommission zu einem Akteur der Weltraumpolitik geworden. Ihre Aktivitäten gehen von den Bereichen Verkehrs- und Umwelt-Monitoring aus: Die Programme Galileo und GMES, beide entwickelt von Europäischer Union und ESA, zeigen deutlich diesen Trend.

In der Zwischenzeit hat die EU ihre Bemühungen, eine Gemeinsame Europäische Außen- und Sicherheitspolitik (GASP) und eine Europäische Sicherheits- und Verteidigungspolitik (ESVP) zu definieren, weiter verstärkt und begonnen, als ein Akteur der internationalen Sicherheit zu handeln (in Bosnien-Herzegowina, Kosovo, der Ehemaligen Jugoslawischen Republik Makedonien und im Kongo).
Die zwischenstaatliche Regierungskonferenz der EU wird eine Reihe von Vorschlägen der Europäischen Versammlung untersuchen. Diese umfassen auch die Stärkung der europäischen Solidarität im Bereich der Sicherheit (im Speziellen gegen den Terrorismus) und die Modifikation einiger Verfahren und Institutionen, um die Effektivität der europäischen Außen-, Sicherheits- und Verteidigungspolitik zu verbessern.

Der Weltraum, und die Bedeutung des Weltraums für die Zukunft Europas, muss in diesen Rahmen eingebunden werden. Hierdurch könnte eines der Hauptprobleme für die Effizienz der europäischen Weltraumpolitik ausgeräumt werden: Die Fragmentation der Akteure und ihrer Strategien. Dies ist heute offensichtlich im Bereich der Telekommunikation der Fall, wo Europa drei verschiedene militärische Projekte hervorgebracht hat (Syracuse, Skynet und Sicral). Auf dem Gebiet der Verteidigung nehmen einige Kooperationsprogramme von kleineren Staatengruppen den Umfang nationalen Denkens zurück.
Europa ist bereits ein sehr bedeutender Weltraum-Akteur, sowohl kollektiv als auch dank der Weltraumpolitik einiger Mitgliedstaaten. Heute wird die europäische Weltraumpolitik, je nach Anwendungen, von verschiedenen Institutionen geführt: nationalen Weltraum-Autoritäten, nationalen Verteidigungs-Autoritäten, ESA und einigen Direktoraten der EU Kommission.

Die gegenwärtige Beziehung zu den USA, der global einzigen Weltraummacht, kann ebenso zu Fragmentation führen. Nur bedeutende zivile wissenschaftliche Programme werden multilateral von der ESA, mit einer unmittelbaren partnerschaftlichen Verbindung zur
NASA, geleitet, doch es herrscht keine Parität zwischen Europäern und Amerikanern.

Im kommerziellen Bereich, und erst recht im Verteidigungsbereich, gibt es solch einen multinationalen Rahmen nicht, und jedes Land hat eine unmittelbar bilaterale Beziehung zu den USA, mit Ausnahme einiger allgemeiner Abkommen (Dienstleistungsvereinbarungen), die von der NATO geleitet werden. Es mag nicht einfach werden, diese vielschichtigen Faktoren der Fragmentation hinter sich zu lassen, denn dies war Jahrzehnte lang der operationelle Rahmen.

Um einen Schlussstrich unter diese Strategien und unausgeglichenen politische Ziele zu ziehen, muss eine Neudefinition starker strategischer, institutioneller und organisatorischer Modelle vorgenommen werden.
Beispielsweise könnte die Finanzierung europäischer Weltraumaktivitäten mit einem vereinheitlichten Gemeinschaftsbudget kontraproduktiv sein: Heutzutage werden solche Aktivitäten (inklusive der multilateralen ESA-Vorhaben) durch individuelle nationale Haushalte gemäß dem nationalen Bedarf finanziert, der von Land zu Land merklich verschieden sein kann. Die ESA beantwortet diese Bedürfnisse mit einem entsprechenden Angebot. Derselbe Ansatz ist umso notwendiger für Verteidigungsbudgets. Hingegen erfolgen EU-Budgetbeiträge gemäß objektiver Überlegungen, die auf bestimmten Parametern basieren (Bruttosozialprodukt und Bevölkerung): Es ist zweifelhaft, ob derartige „objektive" Kriterien das Weltraumbudget vergrößern können.

Die erweiterte Kooperation ist ein anderer Fall: Wenn sich eine Gruppe von Staaten entscheidet, in einem bestimmten Bereich ein Projekt mit gewissen Kernelementen durchzuführen, so besteht ein klares Interesse der teilnehmenden Staaten, die Durchführung des Projektes zu finanzieren, selbst auf nicht proportionale Weise. Im Endeffekt bedeutet dies, dass es nicht besonders wahrscheinlich ist (und zudem gefährlich sein könnte), dass kurzfristig eine vollständige Rationalisierung und Vereinheitlichung der europäischen Weltraumpolitiken verfolgt wird und dass die Überlegungen und Entscheidungen nationaler Regierungen nach wie vor und künftig entscheidend sind und sein werden.

Dies trifft auch auf die mit Sicherheits- und Verteidigungspolitik verbundenen Weltraumprogramme zu. Im Verteidigungssektor sind Weltraumausgaben im äußerst begrenzten und abnehmenden Rahmen nationaler Verteidigungsbudgets eingebunden. Die nationalen Verteidigungshaushalte verfolgen unterschiedliche Prioritäten und sind nicht in der Lage, ein wettbewerbsfähiges, kritisches Niveau an technologischen Kapazitäten zu fördern. Dies macht es für sie unmöglich, Nutzen aus dem großen operationellen Potential der Weltraumtechnologien zu ziehen. Mit anderen Worten: Kein einzelner europäischer Staat kann selbstständig das Weltraumprogramm finanzieren, das zur Modernisierung seiner Sicherheitskräfte notwendig ist.

Es ist offensichtlich, dass diese Situation die technologische Lücke im Weltraumbereich zwischen Europa und den USA vergrößert. Tatsächlich liegt das Verhältnis bei den weltraumspezifischen Ausgaben zwischen der EU und den USA bei 1:2,6 im kommerziellen, bei 1:3 im meteorologischen und bei 1:30 im Verteidigungssektor. Dies hat einen mächtigen Einfluss auf die Wettbewerbsfähigkeit der europäischen Industrie und das technologische Know-how.

Daher müssen im europäischen Kontext drei miteinander verbundene Probleme hervorgehoben werden:

- der unzulängliche Grad der europäischen Weltraumausgaben;
- der Mangel an Konvergenz zwischen verschiedenen Initiativen;
- die Struktur der Angebotsseite (zur Aufrechterhaltung des wettbewerbsfähigen Know-hows).

Im politischen und strategischen Bereich bedarf Europa Weltraumkapazitäten, nicht nur um seine Ziele in der Sicherheits- und Verteidigungspolitik zu erreichen, sondern auch um seine Rolle als Akteur der globalen Weltraumpolitik aufrechtzuerhalten.
Ein Prinzip hinter dieser Politik muss Kontinuität bei Technologie, Industrie und Weltraumanwendungen sein, gleich ob im Bereich der Wissenschaft, der kommerziellen Sicherheit oder der Verteidigung. Dies würde es ermöglichen, einen engen Rahmen für die Budgetierung, Planung, Umsetzung und Leitung von Programmen zu erarbeiten.

Der Begriff der Sicherheit umschließt sowohl zivile als auch militärische Aktivitäten. Nach dem Ende des Kalten Krieges und durch die Abwesenheit einer dominierenden militärischen Gefahr für die westliche Welt hat die Wahrnehmung neuer Bedrohungen, Risiken und Verletzbarkeiten an Bedeutung gewonnen.
Terrorismus, organisiertes Verbrechen, Risiken durch erzwungene oder illegale Massenmigration, Sicherheit des Güterstroms und der wichtigen Handelsrouten, Verfügbarkeit von strategischen Ressourcen, Umweltschutz und ähnliches sind die bedeutendsten Ursprünge für Sorgen geworden. Diesen neuen Bedrohungen kann man nicht mit rein militärischer Gewalt begegnen. Sie bedingen eine Kombination verschiedener Ansätze, sowohl zivile als auch militärische, was besser mit dem Begriff der Sicherheit umschrieben wird.

Wenn auch äußerst intensive, rein militärische Konfrontationen nach wie vor möglich sind, so bewegen sich militärische Operationen und Prioritäten doch weg von dem, was traditionell als "Verteidigungspolitik" bezeichnet wurde (Grenzverteidigung, Landesverteidigung gegen eindeutig identifizierte und „einheitliche" Feinde, Konfrontationsplanung hinsichtlich eindeutig identifizierbarer Armeen, mit einem hohen Grad an Legitimation, etc.) hin zu Krisenmanagement-Interventionen (mit dualem – zivilem und militärischem – Charakter), präventiven Maßnahmen, Eingrenzung der Proliferation und des Terrorismus, Unterstützung von Zivilschutzmaßnahmen, Friedens- und Staatsbildung. Diese Operationen sind ein signifikantes Element einer jeden umfassenden „Sicherheits- und Verteidigungspolitik".

Es gibt beträchtliche Überschneidungen von Zwecken und Bedeutungen der Weltraumnutzung für Sicherheit und Verteidigung. Tatsächlich können Weltraumoperationen als ein Kontinuum verstanden werden, das zivile und militärische Aufgaben genauso umfasst wie sicherheits- und verteidigungsspezifische Operationen. Spezifische militärische Bedürfnisse (sowie kontinuierliche Verfügbarkeit, größere Zuverlässigkeit, Interoperationalität, Schutz, Miniaturisierung, Geschwindigkeit,

Redundanz, etc.) erweitern die Zweckerfüllung von Weltraumsystemen und sorgen für einen positiven Schub an technologischen Entwicklungen, welcher die Nützlichkeit und Wettbewerbsfähigkeit von Weltraumapplikationen für zivile und sicherheitsspezifische Zwecke weiter vergrößern kann.

Der generelle Trend scheint in Richtung einer erweiterten Internationalisierung der Sicherheitspolitik (innerhalb der EU und global) zu gehen, was einhergeht mit der Globalisierung der Wirtschaft und aller Arten von Dienstleistungen. Der Kampf gegen den internationalen Terrorismus hat diese Entwicklung beschleunigt, was sich bereits beim Krisenmanagement und bei Friedensoperationen, Rüstungskontrolle und Entwaffnungspolitik, dem Kampf gegen das organisierte Verbrechen, etc. zeigt. Noch stehen diese Überlegungen im scharfen Kontrast zu der gegenwärtigen Zersplitterung der europäischen weltraumpolitischen Ziele in zivile und militärische Aktivitäten, bei der wissenschaftlichen Forschung, bei kommerziellen und sonstigen Aktivitäten, sicherheits- und verteidigungsrelevante eingeschlossen, sowie zwischen den Staaten.

Transatlantische Probleme erweitern ebenso das Problem, eine ganzheitliche, kohärente europäische Weltraumpolitik zu identifizieren. Die wissenschaftliche Kooperation zwischen ESA und NASA steht im Gegensatz zur europäischen militärischen Abhängigkeit von den Vereinigten Staaten; trotzdem tauchen transatlantische Schwierigkeiten auf, wenn Europa ein strategisches Programm wie Galileo initiiert; Signale von Kommunikationssatelliten werden mit unterschiedlichen Technologien empfangen, was Probleme der Interoperationalität mit sich bringt; und Satelliten für nachrichtendienstliche Zwecke entwickeln sich zum Anstoß für Streitigkeiten, zudem wird die Aussicht auf die sogenannte „network-centric" Kriegsführung eröffnet. Es besteht der Bedarf zur Herausarbeitung grundlegender Elemente einer transatlantischen Kooperationspolitik, die kohärent sein muss sowohl mit der Entwicklung der Europäischen Sicherheits- und Verteidigungspolitik als auch mit den unterschiedlichen Erfordernissen aufgrund der Operationen, in die europäische Truppen eingebunden sind.
Generell wurden die maßgeblichen Weltraumprojekte von den maßgeblichen Weltraumnutzern beschlossen, und die USA sind dabei führend. Frankreich, Großbritannien und nun auch die EU und ESA versuchen, Weltraumaktivitäten zu fördern, aber die USA sind und bleiben auf absehbare Zeit der ausschlaggebende Weltraumakteur (und Europas bedeutendster Partner). Doch die Europäer hatten nur die Möglichkeit, eine Partnerschaft bei amerikanisch definierten und geführten Projekten zu akzeptieren oder abzulehnen, niemals war es umgekehrt. Selbst gute europäische Ideen wurden manchmal als amerikanisch geführte Projekte, und bei untergeordneter europäischer Teilhabe, umgesetzt.
Zudem verringert die stark ausgeprägte amerikanische Tendenz, den Weltraum als essenzielles Element der US-Militärdominanz zu betrachten und militärische Operationen immer mehr von Weltraumkapazitäten abhängig zu machen, die Wahrscheinlichkeit, dass die USA genau diese Kapazitäten großzügig auch ihren Alliierten zur Verfügung stellen werden. Dies geschieht höchstens zu einem beschränkten Grad und nur *ad hoc* sowie bei der vollständigen Erfüllung amerikanischer politischer, wirtschaftsstrategischer und operationeller Prioritäten.

Schließlich erwachsen Schwierigkeiten zwischen den USA und Europa bei der Übertragung von Weltraumanwendungen für operationelle Zwecke. Das amerikanische Konzept der „network-centric" Kriegsführung, das auf der Nutzung von Breitbandkommunikation einer großen Menge von Daten hin zu der kleinstmöglichen Kampfeinheit (idealerweise dem einzelnen Soldaten) basiert, erfordert die Delegation von Autorität und Unabhängigkeit bei der Beschlussfindung, was von europäischen Militärstrategen allgemein abgelehnt wird. Sie bevorzugen eine stärker zentralisierte Verteilung ausgewählter Informationen (auf einer „need to know" Basis), wobei sie sich an einer hierarchischen Struktur orientieren.
Die Europäer bezweifeln, dass eine vollständige technologische Neukonstruktion ihrer operationellen Einheiten und ihrer Hardware sinnvoll wäre, und sie schlagen vor, dass der bessere Kompromiss für ihre Truppen wäre, „network enabled" zu sein oder bestenfalls „network based", aber nicht vollständig „network centred".

Diese Debatte wird auch aufgrund der unterschiedlichen strategischen Perspektiven der EU und der USA geführt. Während letztere aufgrund der Fähigkeit zum weltweit überzeugenden militärischen Einsatz eine wirklich globale Ausrichtung behält, hat Europa stärker begrenzte Ambitionen und Bedürfnisse, die auf relativ naheliegende Bedrohungen und die Durchführung von Missionen auf Grundlage der Petersberg Tasks beruhen. Eine derartige regionale Vision schließt keinesfalls weltweite militärische Verpflichtungen aus, die nicht als isolierte europäische Operationen betrachtet werden, sondern mit der Unterstützung und mit Hilfe von Alliierten, entweder lokalen oder, was wahrscheinlicher ist, amerikanischen durchgeführt werden.

Während also ein hoher Grad an Interoperationalität als essentiell für die Gewährleistung möglicher gemeinsamer Operationen zwischen Alliierten erachtet wird, lehnt man eine vollständige technologische und operationelle Vereinheitlichung allgemein ab. Dies mag in der Tat die Möglichkeiten vollständig integrierter, gemeinsamer militärischer Operationen einschränken und stattdessen verschiedene Formen der Arbeitsteilung mit einem deutlichen Grad der Trennung bevorzugen. Doch dies scheint der wachsenden amerikanischen Tendenz zu folgen, die Bedeutung der Zentralisierung alliierter Kriegsoperationen, die von vollständig multinationalen Hauptquartieren geleitet werden, herabzustufen. Diese wachsende amerikanische Unabhängigkeit unterstreicht die Relevanz, eine stärkere europäische Autonomie zu entwickeln.
In Erwägung der globalen Ausweitung von militärischen und Sicherheitskrisen und dem Ausnutzungsgrad existierender Weltraumkapazitäten, könnten die Redundanzen, die durch effizientere europäische Kapazitäten garantiert werden könnten, die Sicherheit des Netzwerks erweitern und als ein sinnvolles Backup sowie zur seiner Entlastung dienen. Die Tatsache, dass die Sicherheitswahrnehmungen der USA und EU generell ähnlich, beinahe identisch, bleiben, begünstigt diese Entwicklung.

Probleme zwischen den Agenturen erschweren den europäischen weltraumspezifischen Entscheidungsfindungsprozess. Die jeweiligen Funktionen und Spezialisierungen müssen besser definiert werden, um eine effektivere Integration und kohärente Politik zu erlauben (und eine effizientere Nutzung der begrenzten zur Verfügung stehenden Ressourcen). Wenn auch die ESA im Zentrum der europäischen Weltraumpolitik steht, kann sie nicht

wirklich politische Ziele definieren. Sie kann lediglich Studien oder Vorschläge für neue Programme autonom initiieren, aber benötigt immer noch die Zustimmung der Mitgliedstaaten, bevor sie mit der Umsetzung oder Budgetierung beginnen kann.
Die europäische Zukunft im Weltraum muss sich aus dem Bestehenden herausentwickeln. Gegenwärtige europäische Weltraumaktivitäten werden allgemein von verschiedenen nationalen Agenturen oder Ministerien ausgeführt: Nationale Institutionen sind im Allgemeinen besser in der Lage relevante Budgetentscheidungen an institutionellen und politischen Hindernissen vorbeizumanövrieren als internationale. Ebenso gilt dies für die Lobbyarbeit für größere Weltraumbudgets, die Gewinnung öffentlicher Unterstützung und Identifizierung ökonomischer Interessen und technischer Fähigkeiten.

Die EU ist ein relativ neuer Akteur bei der Weltraumnutzung. Sie hat die Befugnis zur Formulierung und Finanzierung politischer Ziele, doch kann sie die anderen Akteure nicht ersetzen. Ihr Hauptvorzug ist die Verbindung übergeordneter sicherheits- und industrierelevanter politischer Ziele mit der Weltraumpolitik, wodurch ein größeres Maß an Kohärenz und Rationalisierung zu erreichen ist. Das vordringlichste Ziel sollte die Wahrung der europäischen Weltraumpräsenz sein, um Europas Weltraumkapazität für die Zukunft zu sichern. Dies muss im Einklang des politischen und ökonomischen Gewichts Europas erfolgen sowie zu einer dezidierten europäischen Sicherheits- und Verteidigungspolitik führen.
Dies erfordert einige Minimalanforderungen:

- vollständige Autonomie bei grundlegendem weltraumspezifischen Know-how (Satelliten, Träger, Bodeneinrichtungen, Technologien und Dienstleistungen), um Zugang zum und optimale Nutzung des Weltraums im Einklang mit der europäischen Politik zu ermöglichen. Dies schließt keinesfalls Vereinbarungen mit anderen Weltraummächten aus, noch fordert es eine Parität mit den USA; es ist lediglich ein hinlängliches Ziel mit minimalem technologischem Vorteil.
- eine lebens- und wettbewerbsfähige europäische industrielle und technologische Grundlage für die Entwicklung von wissenschaftlichem und technologischem Know-how. Dies bedeutet langfristig die Garantie eines gewissen Produktionsvolumens sowie öffentliche Investitionsprogramme für Wissenschaft und Technologie, die eine antizyklische Funktion im Hinblick auf die wirtschaftliche Nachfrage haben können.

Es ist bedeutsam festzustellen, wie eine essentielle und minimale europäische Präsenz im All für Belange der Sicherheit und Verteidigung aussehen könnte. Grob sollte dies ein Netzwerk von Satelliten umfassen, das die Bedürfnisse bezüglich Kommunikation, Beobachtung, Positionierung, elektronischem Nachrichtendienst und Frühwarnung erfüllt: Diese Kapazitäten erfordern adäquate Bodeneinrichtungen und für die Weltraumsegmente Investitionskosten von etwa 8-9 Milliarden Euro über eine Periode von 8 bis 15 Jahren, was eine jährliche Investition von unter 800 Millionen Euro bedeutet (wobei ein Teil bereits zugeteilt ist). Diese Kosten mögen nicht von einem einzelnen europäischen Staat erbracht werden können, doch sind sie im Rahmen einer multilateralen Finanzierung möglich. Ein derartiges System würde GASP, ESVP und die europäische Schnelle Eingreiftruppe mit

einem höheren Grad an Effizienz und Autonomie ausstatten. Die Details einer solchen Weltraumarchitektur sind nicht neu: sie sind den europäischen Regierungen seit langem bekannt. Das wirkliche Problem besteht in ihrer Realisierung.

Die gegenwärtigen Entwicklungen innerhalb der EU könnten eine positive Rolle spielen. Die EU muss ihre weltraumspezifischen Bedürfnisse präziser identifizieren und formulieren, die Standpunkte und Entscheidungen verschiedener europäischer Staaten (genauer gesagt einer Gruppe von Staaten, die einer erweiterten Kooperationslogik folgen) zusammenführen und Kriterien für die Lastenverteilung und das Systemmanagement etablieren. Dies wäre der beste Weg, gleichwertigen Nutzen für die Anwender zu garantieren, als auch die notwendige Verbindung zur NATO und zu den USA herzustellen.
In solch einem Rahmen könnte die ESA auf der Anbieterseite agieren, indem sie das notwendige technische Niveau und die Systeminitialisierung sicherstellt, wobei sie mit der europäischen Industrie und den nationalen Autoritäten in unmittelbarer Verbindung steht.

In der Umsetzung könnte ein Ausschuss zur Weltraumsicherheit parallel in der ESA und EU eingesetzt werden, das verantwortlich wäre für das Design, die Programmgestaltung, Einführung und Leitung der Vorhaben, und das eine institutionelle Verbindung zwischen ESA und EU darstellen würde.
Erneut soll festgehalten werden, dass sich das europäische Weltraumengagement hauptsächlich auf den zivilen und Dual-Use-Sektor konzentriert. Dies erfordert ein stärkeres duales Weltraumsicherheits-Profil. Dies bedeutet, dass auf Seiten der ESA (ESA Rat) die europäischen zwischenstaatlichen Versammlungen für die Weltraumsicherheit verantwortlich wären, während auf Seiten der EU der Europäische Rat einen präzisen Auftrag für die Herausarbeitung von Koordinations-Kompetenzen auf der Coreper Ebene erhalten würde, verbunden mit einer Struktur, die im Stande wäre, die sicherheitspolitische Einbindung der EU in Weltraumprojekte zu überprüfen und zu genehmigen.
Um zu viele institutionelle Einheiten der Weltraumsicherheit zu vermeiden, so wie ein spezifischer Kooperationssicherheitsrat innerhalb der ESA und ein weiterer für Weltraumsicherheit innerhalb des EU Rates, könnte die Zusammensetzung eines solchen Ausschusses für beide Seiten gleich sein. Hierbei wäre Weltraumsicherheit ein „optionales" Programm für einige ESA Mitgliedstaaten und eine „erweiterte Kooperation" für EU Mitglieder. Eine andere Möglichkeit wäre, dass die ESA und der EU Rat eine gemeinsame Entscheidung treffen könnten, um eine gemeinsame Autorität für Weltraumsicherheit unter der Verantwortung des Hohen Vertreters für die Gemeinsame Außen- und Sicherheitspolitik der EU zu schaffen.

Als Ausgangspunkt sollte die EU für die Weltraumpolitik auf die gleiche Weise verfahren, wie sie es bei der kontinuierlichen Errichtung von GASP und ESVP tat: Zielformulierung, Problemanalyse, Lösungsansätze, die von europäischen Institutionen und der öffentlichen Meinung evaluiert werden sollten.
Diese Aufgabe könnten am besten von einem spezialisierten Ausschuss für Weltraumsicherheit bewältigt werden, der mit europäischen Experten besetzt ist, die Einschätzungen aus der Weltraumindustrie sowie von potentiellen zivilen und militärischen Weltraumnutzern aus den Bereichen der Außen-, Sicherheits- und Verteidigungspolitik

zusammenbringen. Ein solcher Ausschuss könnte dabei helfen, den optimalen Grad europäischer Weltraumambitionen zu bestimmen, sowohl was die gegenwärtige Nachfrage als auch ihre Entwicklung betrifft. Dieser Ausschuss zur Weltraumsicherheit würde einen wichtigen Beitrag zur politischen Arbeit leisten, bedeutsam auch für die Identifizierung und den Aufbau einer dringend benötigten europäischen Weltraum-Interessengemeinschaft.
Schließlich würde dieser Ausschuss seine Erkenntnisse dem Europäischen Rat vorlegen, um im europäischen Rahmen einen formellen Entscheidungsfindungsprozess unter Einbeziehung der interessierten Institutionen zu beginnen.

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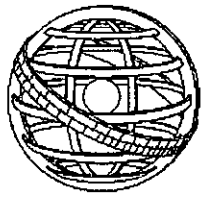

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INTRODUCTION

The evolution of a European space policy is encouraged by the recent EU decision to develop the Galileo project. This decision confirms the willingness to pursue a policy in the space technologies that goes beyond the national level, even if national visions are still predominant. A new security concept is emerging. The evolution of the foreign, security and defense policy (CFSP, ESDP) and the protection of population requires integrated approach.
Security needs are connected to the technological progress. Space assets must be used to protect populations, resources and territories, but also to maintain the integrity and the capabilities of the technological base. Space systems are a fundamental aspect of "technological security": they offer extremely versatile solutions in a global, international dimension.
This research analyze how the different EU actors deal with these topics and how to promote convergence towards a European Space Security Policy.

1. Space is a strategic asset. Europe has always maintained an important presence in space. The development of dual-use technologies calls for a "European" approach to space security, linking the present national defence programs with mainly civilian European programs. The functions and means of security and defence uses of space overlap considerably. In fact, space operations can be seen as a continuum, including civilian and military functions as well as security and defence operations.

2. The emergence of the EU in European space policymaking has been characterised by an increasing interest in more "strategic" programs. Future European decisions and performance in the security and defence applications of space are likely to impact on the transatlantic relationship as well as help to define Europe's role in the world (and the future of Europe's defence-industrial base). Therefore, thinking in this area can no longer be kept on the margins of the European political process, but requires far-reaching political choices.

3. Space tools are necessary for our collective security, but there is no "European awareness" of the benefits of common space systems. A security and defence space user community still has to be created both among national defence establishments and at the level of the general European public.

4. The supply side is structurally inadequate. The globalisation of the market underlines the weakness of the European industrial base *vis-à-vis* American competitors. Further rationalisation is needed and will probably imply a growing level of industrial concentration. This process will have to be guided to avoid excessive distortion of the market. A principle informing this policy should be continuity in techniques, industries and functions in space activities whether scientific, commercial security or defence.

5. Three functions are needed in any future, improved, space policy framework:
   a. targeted R&D for advanced space applications;
   b. increased involvement of those responsible for security and defence in space policy decision-making;
   c. increased institutionalised political visibility and effectiveness of security-related space activities.

6. There is no structure in place today in Europe that can cross-reference all space-related activities and provide an overarching approach for generating the needed assets and capabilities, also with recourse to commercial or public dual-use opportunities and public-private partnership solutions. Instead of continuing to rely on national approaches or possibly setting up a second European space agency for security and defence, there is the potentially attractive option of the European Space Agency (ESA) taking full advantage of the dual-use nature of space through a cooperative arrangement with the EU.

7. European governments and institutions should act to preserve some competition on the European market, at least in those sectors in which market dimensions and technological and industrial characteristics allow it, while opening up to concentration in other areas, such as launchers. The rise of a security and defence demand will have important positive effects on the competitiveness of the European market, making room for at least two different competitors in each sector.

8. It might be counterproductive to aim for the complete rationalisation and unification of European space policies in the short term as national governments logics and choices still are and will continue to be determinant. It is possible, however, to plan a European policy (under either a collective or an enhanced cooperation framework) that links all the European components and choices in space to some strategic primary objectives that could provide Europe with the knowledge and functions it still lacks today and make its presence in space more coherent and complete.

9. The European authorities should draw up some overarching industrial policy objectives to maintain full autonomy in basic space capabilities (in terms of satellites, launchers, ground segments, technologies and services) to guarantee access to and the optimal utilisation of space in accordance with a European policy. This does not exclude the possibility of agreements with other space powers nor does it call for parity with the US. It is merely a sufficient objective with minimal technological assets. In order to develop scientific and technological know-how, European authorities should also strive to maintain a lively, competitive and diversified European industrial and technological basis. This means guaranteeing a volume of production in the long run, and some public investment in science and technology that can have an anti-cyclical function with respect to commercial demand.

10. The most recent EU developments might play a positive role. The EU itself could be better placed to identify and articulate demand in terms of space assets, taking in the perceptions and choices of various European states (or more precisely a group of states, following an enhanced cooperation logic) and establishing criteria for the burden sharing and management of the systems.

11. In practical terms, "space security" committees can be set up in parallel in the ESA and the EU Council, in charge of thinking, programming, implementing and managing such a program, as well as providing an institutional link between the two institutions. To avoid creating too many institutional bodies, the composition of the committees could be the same.

12. One of the best ways to elevate Europe's space, security and defence capabilities-building efforts to a new level could be the launching, preferably by the European

Union, of a European Security and Defence Advanced Projects Agency with a small, non-permanent staff and flexible, mission-based activity. Like DARPA in the US, this would provide a framework for pursuing a strategic approach to applied technologies of the future, combining a well-defined vision with highly responsive structures and methods.

These and other changes will not come easily. Thus the European Council will have to make a head start in this direction by establishing an independent space committee, composed of European experts and bringing together assessments from space industry, potential civilian and defence space users in the foreign, security and defence spheres. Such a committee should determine the optimal level for European ambitions in space with regards to demand and the evolution of needs. Apart from its function of advising the European Council, such a committee could do very important public work, contributing to the much needed identification and building of a European space constituency.

1. FOR A NEW CONCEPT OF SPACE SECURITY IN EUROPE

1.1 Space, a decisive asset for European security policy?

Space technology is linked to collective security. In our view the term "security" refers to the protection of European citizens from potential risks of both military and non-military origin. However, the EU is still working on a coherent approach to both space technology and collective security. The European Commission Green Paper on "European Space Policy" [1] included a definition of how security can be enhanced through space technologies. For example, the primary idea behind EU programs like GMES or Galileo is to improve security for European citizens. But there is still a lack of awareness and effort on the part of member-state governments.
Space assets are fundamental for many common European endeavours, such as developing a "knowledge-based economy" (European Council of Feira[2]) as well as more integrated transport policies (single sky for example).
More specifically, the development of a Common Foreign and Security Policy and a European Security and Defence Policy requires many new military capabilities.
The increasing use of information technology is linked to these efforts to increase European capabilities, especially for meeting data transmission and information requirements.[3] The ECAP (European Capacities Action Plan) calls for concrete actions to increase assets availability.

The Thessalonica European Council has launched the concept of a EU security strategy[4]. It's an important step to better define the political basis of future space applications for security. Also, the decision to create by 2004 an intergovernmental agency in the field of defence capacities development, research, acquisition and armament represents a cornerstone for the development of security technologies in the EU, and thus for space activities[5]. The push for increased capabilities in the field of crisis management, strengthening the industrial and technological base of European defence as well as promoting research aimed at leadership in strategic technologies for future defence and security capabilities directly involves the space sector. The creation of this agency gives a higher political profile to the development of security technologies. In the space sector, the European space agency can take advantage of such a coordinating body : the ESA, a unique European architecture in terms of technological know-how and procedures, can develop a renewed dual-use security approach, under the strong political and programmatic coherency of the intergovernmental agency.

In the United States, space technology is more "military oriented", due to a military strategy increasingly based on the concept of "Information Dominance".[6] This thinking is also linked to the so-called "Revolution in Military Affairs".[7] At the heart of the "network-centric warfare"[8] doctrine, control of information technologies is fundamental.

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[1] http://europa.eu.int/comm/space/futur/greenpaper_en.html
[2] http://ue.eu.int/Newsroom/LoadDoc.asp?BID=76&DID=62050&from=&LANG=1
[3] cf Michele Nones, Jean Pierre Darnis, Giovanni Gasparini, Stefano Silvestri , *The Space Dimension of European Security and Defence Policy* , IAI Papers, 2002
[4] http://www.eu2003.gr/en/articles/2003/6/20/3121/
[5] cf Burkard Schmitt, "The European Union and armament", Chaillot Paper, Paris, August 2003, 69p.
[6] http://www-tradoc.army.mil/dcscd/spaceweb/informat.htm
[7] cf Paul Van Ryper and F.G. Hoffman, "Pursuing the real revolution in military affairs : exploiting knowledge-based warfare", http://www.georgetown.edu/sfs/programs/nssp/nssq/Hoffman.pdf
[8] cf Arthur K. Cebrowski, and John J. Garstka "Network-Centric Warfare: Its Origin and Future", in Proceedings, 1998, http://www.usni.org/Proceedings/Articles98/PROcebrowski.htm

That is not the European vision. Lower defence and IT budgets, and a different political orientation, means that Europe is more "civilian oriented". In fact, space assets should be considered as dual-use technology ; civilian technologies can help security in the broad sense, and can be adapted to military uses.

The preamble of the ESA convention defines the mission of "peacefull purposes"[9]. The evolution of the European Security policy, which deals with how to "help secure peace and defend stability"[10], confirms the compatibility of this political orientation with a "non aggressive" use of technology. This is the basis for a deeper integration of the ESA inside the framework of EU security policy.

A dual approach : National defence space assets, European civilian space policy

Space policy trends in Europe have followed a double track.

- On the one hand, space policy in general has always been a "national policy". Defence space policy has been even more nationalistic, and some European defence space systems exist through national or strictly inter-governmental efforts.

- On the other hand, civil space technologies have been developed through a common European approach. The European Space Agency has managed most of the programs, from production to coordination of research efforts.

The European-level space framework is exclusively civilian. Major defence/security programs have been developed on a national basis, and sometimes through bi-lateral or tri-lateral cooperation in data exchange. The development of dual-use programs calls for a "European" approach to space security, able to link national defence and European civilian approaches.

1.2 A broader concept of space security. Internal and external security

The concept of security is widely used in space policy documents like the Green Paper for Space Policy . Space should "improve the security of citizens".[11] Following the Commission, Space technologies shall be applied to "crisis management" in its civilian and military dimensions.

This policy follows a technological logic: many space systems are dual-use and have both commercial and security applications. For example modern remote-sensing applications, like the GMES programs[12], can offer precise dual-use environment and territorial monitoring. A fishery sea monitoring service, based on tides, salinity and temperature of water could be useful for submarine navigation. Cargo tracking is requested both from civilian and defense administrations. Remote sensing technologies used to monitor illegal construction are the same as those used to monitor strategic installations and their evolution. Moreover, the integration of modern Earth Observation applications can offer very efficient tools of control and command for all kinds of crisis management, from civil protection administrations to a military unit in a battlefield.

[9] http://www.esa.int/convention/
[10] cf Thessaloniki summit conclusions http://www.eu2003.gr/en/articles/2003/6/20/3121/
[11] http://europa.eu.int/comm/space/futur/greenpaper_en.html
[12] http://earth.esa.int/gmes/

A good example of this integrated technological approach is the Brazilian SIVAM program. It offers a full range of monitoring capacities applied to the Amazonian area, with a mix of technologies involving radar, EO images and communication satellites. This system defines an area's security and provides information to all public authorities.

A civilian GMES (EU and ESA program), could easily be applied for security and defense purposes. There is still a lack of sensitivity from the defense administrations who tend to consider only the technology that they own, such as dedicated satellites. But the development of efficient territorial monitoring applications that integrate satellite images and data, for example combining GIS base satellite images, positioning data (GPS and next Galileo) and information from a cartographic database (often produced through satellite imagery), provides tremendous efficiency and simplifies active monitoring and the decision-making process.

Another important civilian asset, the Galileo positioning network (GNSS 2), calls for new procedures. The delivery of a secure position signal based on the PRS, Public Related Signal (precise and coded security users) calls for a precise "chain of command" and the creation of an authority, with European political legitimacy, in order to manage such a system.

This civilian spin-off of space-based technologies, backed by a strong "broad security policy" coming from EU authorities, raises some important questions :

- The "Security of citizens" is the basis of a growing use of space technologies. This security concept deals both with civil and military security.
- In some cases, some applications for the security of citizens are only civilian, such as space-based crop monitoring or water management networks.
- Most of the time, the space-based security applications provide sensitive information that have to be gathered and delivered through a clear procedure.

For example, space EO construction monitoring information has to be delivered to the competent legal/administrative authority.
Other applications like oil-spilling monitoring or forest fire monitoring require the precise, legally defined control of information, which has to be included in a military-like chain of command.

- Space based security-oriented monitoring is used in most cases by security bodies or administrations, such as "civil protection", coast guards, navies, financial authorities, justice authorities, police...It involves a rigorous control of data proceedings to define the legality of operations, and the delivery procedures, which that has to be done under precise security controls, to avoid leaks and the misuse of information.
- The development of space-based security applications also concerns defense users. Military bodies might use a territorial monitoring service developed on a civilian basis.
- "Broad security" space applications are always to be managed through extremely well-defined security procedures. A wide number of administrative bodies, including all sorts of police and military bodies, might use these applications. Yet, there is a need for a strong political / juridical framework, that could also facilitate the development of a defense, police and justice administrations users community.
- The development of CFSP/ESDP requires that a number of space-based assets and applications attain a significant operational capability.

ESDP and space, some decisive steps?

European governments need many new military capabilities to meet their ESDP goals, and a cost/benefits analysis shows that space technology has much to offer this particular European

policy. In addition to the Helsinki Headlines Goals and the ECAP process, from the Green Paper of the European Commission to the "STAR 21" strategic aerospace review[13], the ESDP approach to capabilities calls for an increased development and use of space technologies.

National military information systems cannot even meet the requirements agreed by member-states at the Helsinki summit of 1999, so as to be able to conduct the "Petersberg tasks" – the military mission list for ESDP. National systems are even more limited when compared to American military equipment. Space technology provides a whole range of essential solutions for the modernization of the information systems supporting security and defense. First of all, they are a fundamental technological link for all levels of data management, from the single individual to decision-making committees. Furthermore, apart from specific technological requirements and capabilities, they can offer a new possibility of international co-operation, exploiting the synergy that exists with civilian equipment (so-called dual-use).
The European initiatives – whether national or inter-governmental, civilian or military – seem very low-key compared to the apparent need for increasing information flow within the decision-making process.
Insofar as space technology is concerned, there seems to be a double-track approach: on one side, ESDP development is based on specific needs at a European level, such as the C4ISR systems; on the other, these requirements are not today necessarily associated with solutions based on space technology.. The first mention of a military space policy within the CESDP was made during the Franco-German Defence and Security Council in Paris, on 30th November 1999. At the meeting in Porto in May 2000, the WEU Council of Ministries officially recognizes the need for satellite imaging resources. In June 2000, in Mayence, France and Germany reassert their intentions insofar as spatial policy is concerned, declaring to build an independent European observation satellite system. In a report submitted at the Nice European Council on 8th December 2000, Javier Solana underlined the need to pool together the capacities for capturing and managing information on any conflict. [14]
Despite some important political statements this "declatory policy" has produced very few results. The Iraqi crisis might have changed this trend and the EU Thessalonica council, introducing a EU "security" concept and a defense and security research agency, seems to draw a new prospective.

But space still remains a prolegomena of common defense and security policy.

Existing space security applications already perform important tasks, such as information gathering and data processing. On the national level, intelligence services are the main space technology users. These services are traditionally the most secret and nationally oriented bodies since so much of their work is covert.
Moreover, space technology is useful not only for information gathering, but also for communications as stated in the ECAP goals, and other areas such as early-warning, electronic intelligence (elint) and possibly missile defence.

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[13] http://europa.eu.int/comm/enterprise/aerospace/report_star21_screen.pdf

[14] "...since we are specifically referring to intelligence capacity, a central part of the EU potential of autonomous assessment, we are determined to confederate all existing and future means, including the spatial sector, in order to set up joint European capacities...". Cf. Franco-German Council, Final declaration, Paris, 30th November 1999.
Cf. Final Declaration, WEU Council of Ministries, Porto, 15th and 16th May 2000
Cf. Final Declaration, Franco-German Defence and Security Council, Mayence, 9th June 2000.
Cf. Javier Solana, *Rapport présenté au Conseil Européen de Nice par le Secrétaire Général/Haut représentant et la commission*, Nice, 8 décembre 2000.

At present, there is no link between intelligence users of space; a better coordination of space at the European level could guarantee major effectiveness.
Space tools are useful for our collective security, but there is no "European consciousness" of the benefits of common space systems.

However, Europe needs a coherent space security policy. A strong political commitment, at the highest level, can generate such a space security policy. Such a commitment should define a program for European space capabilities, either a common system or an architecture of systems, and should not neglect the structural changes in national security administration needed to create a users' community by defining common procedures and forums.
As mentioned in this chapter, the fostering of a EU security strategy and the creation of a European agency in the field of defense capabilities represent two decisive steps.

The strategic value of European space security

Europe has successfully developed some important strategic assets, such as access to space (launch capabilities), the transmission of data and images and positioning services. Space technologies are fundamental in today's IT dependent society. The concept of "space security" involves different elements.

- Space policy is essential to Europe. Like the civilian aeronautic sector, the development of space goes far beyond the industry and technology in themselves. It is the concrete translation of a common European political project.
- The strategic value of space technology in itself : technological and financial capacities in the space sector are fundamental to maintain and develop know-how and technological assets, as a guarantee of political independence.
- The space sector helps to define a "security concept" for Europe and a common strategic culture, not only where applications improve the security of the citizens, but also for the technological capacity in itself. End-user and industrial needs contribute to a comprehensive technological security. The development of high-tech and space-based control technologies is also a guarantee for a European democratic project.
- Space defense applications remain largely in national hands. Defense applications can also be developed from civilian programs (dual-use). Defense applications should not be a taboo. Theses purposes are shared by a growing community of users for space and confirm the need for a high political and institutional profile for space security activities.

Space security applications are directly linked with the role of Europe in the world.
The example of the negotiations between the US and EU about the Galileo system, and particularly about the control of the PRS signal, shows how space technological assets represent a new step in a political process. It increases technological capacities and, even more, it foster a political project.
Space technologies are to be considered a decisive political asset on the international scene, where investment in technologies means independent capability of decision and control.
The European Convention puts the "European Space Policy" and a "European Space Program" inside its Treaty project : a strong commitment that shapes a high-tech sector as part of a Constitution.

European Space Security might appear to be an ambitious concept. It is rooted in the political project of Europe, a knowledge-based democratic society, and represent a comprehensive

vision of the development and use of technology to improve the lives of citizens. It includes defense and "straight security" applications but is mainly civilian-driven, based on a very specific dual-use approach developed among multilateral and national European institutions. Security applications provided by space technologies are a linchpin of European policy. But Space security goes far beyond this utilization logic : Space technologies directly contribute to the building of an EU political project.

2. Aspects of inter-governmental cooperation in Europe

The very notion of a European space capability is in itself rather complex because of the different kinds of cooperative patterns between the European countries.
First of all, it has to be reminded that space developments have been carried out independently of the general process of European construction. In addition, different civilian and military bodies, either exclusively national or acting through various kinds of partnership, have contributed to defining space policy and developing industrial activities. The European Space Agency has become the main authority in the European space industry. However, the growing role of the European Union, the development of military space activities, and internal changes in the industrial sector are new features that should be taken into account along with the internal evolution of the national space sectors in individual European member countries.

2.1 General approach

Today, considering the co-existence of these two institutional actors in addition to the conjectural governments-to-governments agreements, the main contributions made to space by Europe are three-folded: European Space Agency, European Union, Government-to-Government.

When considered as a whole, the European existing programs appear to be very different according to their philosophy and purposes, to their management and considering the side aspects (political, economic, and military) attached to them.

The European space programs as a whole can be characterized:
by a strong Research and Development orientation leading to experimental programs and acquisition of competence in High-Tech domains,
by collective operational and strategic objectives,
by national purposes.

Obviously, this typology reflects the diversity of the institutional status of the actors in charge of these programs. More over, some of these programs can be jointly managed by several actors at the same time as they can deal with different aspects entrusted in each institution. This is the current situation for two of the main European collective space projects, Galileo and GMES, for which the R&D aspects are managed at the ESA level while the strategic issues are taken care of by the EU. In these particular cases, the involvement of the national governments is an additional layer of cooperation.

The table below intends to give a synthesised view of the main trends of the European space activities today, in terms of sort of actors, programs and characteristics:

ACTORS	PROGRAMS	CHARACTERISTICS
European Space Agency	Science, Application : telecom.(Artemis), weather (Metop), navigation (Galileo), environment (GMES) and security), Manned space flight, launchers	Long-term R&D, "experimental-to-operational" process, Dual-Use, externalisation in dedicated structures (Arianespace, Eumetsat, Eutelsat,...)
European Union	Operational application products (*Vegetation* sensor, Galileo), Global strategic projects (Galileo, GMES)	Mid-term, promotion of commercial aspects, Political aspects embedded, Security issues involved (ex. Torrejon Satellite Center)
National Governments level	Civilian and Military Application programs for national purposes (SPOT, Hélios, Pléiades-Cosmo project, ...)	Short-mid term, very few, mainly French, global political perspectives, Military or Dual-use issues associated

2.2 Existing institutions for European space cooperation

European Space Agency (ESA), a federative body in builiding European space capability

Traditionally, the European Space Agency has been the main framework for developing European space activities besides the national space programs. ESA has been put in place 30 years ago by the European Governments with the stated goal to develop a European space capability and promote a European presence in space.

The ESA would have as a central task to promote and organize a genuine European scientific cooperation in space and that would be given the technical (launchers, telecommunications), the financial and the industrial resources to fulfil this goal. Obviously in this context, the ESA was excluded *de facto* from any military activity.

This explains why the ESA can be viewed as a particular institution in respect to the kind of programs it is in charge of, i.e. high-tech, scientific and non-controversial long-term programs. It must be reminded that the ESA was built after the model of the *Centre for European Nuclear Research* (CERN) as an "excellence centre" in a highly strategic field. The main differences with the CERN were 1) the choice to put the Governments in control of the decision-making process and 2) to promote the "*Just return*" principle in order to develop a European industrial basis. The ESA can manage "à la carte" and optional programs which allows a great deal of flexibility regarding the programs.

In order to be widely accepted, this idea of a European autonomy had to be translated in a manner that would fit the different national political constituencies, especially at a time when the European political construction process was still at a nascent stage. It must be noted that from the start the ESA has accepted member states that would not necessarily be the same belonging to the European Union. For instance Norway and Switzerland belong to the ESA and not to the European Union. In the same time, the Agency has proved to be an efficient

integrative mechanism per se by gathering its own membership. Since 1997, Austria, Norway, Finland and Portugal have entered the ESA.

The ESA must articulate a European space program that reflects the different national points of view. These can be very different, first because of the political orientations of the respective countries. The national Governments have devoted very different level of resources to space activities and they have had very distinct priorities for implementing their own programs. Also the differences at the ESA level express the diverse nature of actors in charge of the space activities in these different countries. Space can be represented for example by several national administrations, ranging from the Post and telecommunication, to the Science, Research and Education ministries or to the Industry ministry.

The national authorities responsible for space matters vary widely[15]. A first category is composed of countries with their own agencies devoted more or less exclusively to space. In a second category, space questions are directly handled by a ministry. In yet other cases, a simple "inter-ministerial" entity may deal with these matters. Civilian ministries, with varying degrees of authority, can be divided into two main categories revealing quite different approaches. Depending on the country, space may be classed with research and technology, or it may be associated with industry and foreign trade. As far as the military space sector is concerned, defence ministries are responsible for activities specific to them, and relations with civilian activities are generally rather restricted. Inter-ministerial coordination is a useful way of taking occasional users into account, such as those dealing with the environment.

In fact, the way space activities are organised does not necessarily reveal the importance they have for a given country. Hence, the existence of a national space agency does not necessarily prove that space plays a key role for that country. Apart from France, where the CNES does in fact play a central role, other agencies exist in Austria, Italy, the United Kingdom, Sweden and Spain. These agencies have different purposes. Some are mainly responsible for civilian activities, like the British National Space Centre (BNSC) in the United Kingdom, whilst military activities exist in parallel even if they are limited to telecommunications and observation from space. In Holland the agency responsible for space activities also deals with aeronautic affairs and in Ireland, space matters are dealt with by the science and technology agency. In Germany, the space agency has been integrated into a larger ensemble.

One of the ESA's missions (Article II of the Convention) was to coordinate the European space programme and national programmes with a view to gradually europeanising the latter. In practice, European space programmes have not supplanted purely national activities. This is sometimes because a consensus has not been reached and sometimes because the national

[15] Depending on the case, the ministries supervising space matters are, under various appellations, those responsible for science, research, technology and education (Austria, Denmark, Italy), trade and industry (Finland, Ireland, Norway, United Kingdom, Sweden), or the economy (Holland). In one case, space even depends directly on the prime minister (Belgium). In France, the space agency CNES came under the supervision of three ministries, industry, research and defense, from 1993 to 1997. In June 1997 it was transferred to the authority of just two ministries, the Ministry of Education and Research and the Ministry of Defense. In Germany in 1997, the *Deutsche Agentur für Raumfahrtangelegenheiten* (DARA) was integrated into the *Deutsche Forschungsanstalt für Luft- und Raumfahrt* (DLR), whose responsibilities and name were slightly modified (DLR becoming *Deutsches Zentrum für Luft- und Raumfahrt*). The result is that the Ministry of Research and the Ministry of Defense have an overseeing role related to their budgetary contribution. In other cases, space may depend on interministerial bodies, as in Switzerland. This generally corresponds to a rather low level of activity. However, the interministerial approach, whether institutionalised or not, is adopted in the majority of countries.

programmes embody military concerns. In fact, national organisation of space activities and the weight of national budgets, which differ from country to country, show that both attitude and degree of involvement are far from uniform across Europe.

The complexity of the space question is clearly shown by the internal deliberations that take place at national level concerning the best ways to organise space-related structures, and also the switching of ministerial supervision when new governments are installed. In Germany, the merging of the DARA with a technical organisation, to the benefit of the latter, no doubt represents an attempt to streamline, but it spells the end of a purely spatial speciality. The main trend today favours synergism. The idea of partnership with manufacturers described in the plan of action which the CNES set out in 1997 to present the main lines of its future activities also features amongst ideas discussed at the ESA. The tasks of the space agencies are up for reappraisal in every country. This reflects the gradually changing relations between the various protagonists and a certain maturity in the sector after more than thirty-five years of practice. Such redefinitions must take into account the way the various European space authorities are to fit together as well as their specific relationship with the ESA.

The agency was originally conceived as a research and development organisation, deprived of commercial capabilities and denied any military leanings. Its aim was to rationalise space activities in the different European countries and thereby create the world's third great space organisation. In practice, the basic working principles of the ESA, that is, one country one vote and an ever stricter application of the principle of fair industrial returns, have led to a drift away from initial objectives. Agency policy has more and more often been reduced to a quest for compromise between member countries with differing national strategies. Besides obligatory scientific programmes, the flexibility of the system allows the development of optional activities. This has meant that the main stakeholders have specialised in areas of activity where the size of their contribution guarantees them a dominant role.

In accordance with choices made on a national level, France has thus placed itself in the lead for launch programmes and manned flights, symbols of European independence. Germany, the second main contributor and one traditionally more favourable towards cooperation with the United States, has built up acknowledged skills in the field of manned flight with the objective to become a European lead in that field. Italy is in an unusual situation since manufacturers have introduced a wide range of contributions to ESA programmes, despite national budgetary difficulties and limited industrial returns. In contrast, the United Kingdom, with very modest ambitions lying mainly in the area of Earth observation, has clearly benefited from the ESA's principle of fair returns.

The ESA has proven its ability both in managing major programmes (see annexe on ESA satellites programs) and in carrying out original space science. However, the existence of new features, whether they concern the evolution of technology, changes in national space preferences or developments in the general framework of the European community, all require a redefinition of objectives and ambitions for the future European space policy.

In this context, ESA intends to enlarge its role to contribute to the European space policy implementation as shown by the strategic work it has conducted with the EU (Green and White paper exercices). Moreover, ESA has the experience of a large multilateral interagency cooperation.

European Union, new actor in building a European space policy

While the ESA remains the principle forum for any inter-governmental cooperation, with its proper mechanisms for discussions and negotiations, the current trend show a more visible role of the EU in the inter-governmental relationships.

The first example of a EU-ESA co-management program: Galileo

Officially started in 1999, Galileo can be considered as the first space "genuine" European Union-led program. The Galileo program of navigation and positioning by satellite was very quickly confirmed as a strategic programme for Europe in the context of domination by the American GPS.

The programme had its beginnings at a European level, under a tripartite authority composed of the European Space Agency, the European Union, and the Eurocontrol organisation for the certification of air traffic, initially taking the form of projects of systems augmentation and of monitoring the integrity of GPS data (under the GNSS-1 programme). Largely supported by Brussels, the objective of eventually (2008) establishing a completely independent European commercial system was initially embodied in a European directive, essentially civilian in character, despite an obvious military dimension. Whereas, by construction, the ESA was safe from any discussion about these issues as reminded earlier, the civilian-military ambiguity about the future uses of Galileo may explain very largely the difficulties which the programme has encountered for some time, notably in the matter of its financing.

One of the consequences of the EU involvement in this initiative has been the creation of a new system of financing known as PPP (*Public Private Partnership*). It was conceived by the ESA-EU-Eurocontrol tripartite structure led to the successive involvement of public and private finance with, consequently, authorisation given to commercial exploitation by industry. After several transformations, especially elimination of restrictions on the level of financing by industry, the system seems now to have settled down. In this context, since the beginning of the programme the ministries of defence have shown a certain reluctance to intervene to support Galileo directly, considering it as a programme with essentially civilian origins and goals. The inclusion by the Commission of the budget for Galileo in the "aerospace" budgetary line of the 6th RDP (Research and Development Programme) has reinforced this civilian identity, with the consequence of further diluting the strategic character of the programme facing, under the heading of aerospace expenditure as a whole, competition from the efforts made in other programmes concerning various forms of transport.

From the point of view of the member states, it can be noted that the particular attention devoted by the European level was not without consequences on the national positions of the various countries, since it placed in jeopardy the link established between the development of a satellite capability in this field and very notion of sovereignty. This rupture became evident with the European dithering at Laeken, in December 2001, when the European transport ministers were not able to agree on the public financing of a system which had been approved one month before at the European Space Agency summit in Edinburgh. Beyond the reluctance of ministers not keen to see this programme of more than 3 billion euros impinging on their budgets, this "non decision" showed in a sense the weakness of political support on the part of member states for space programmes. Carl Bildt, the former Swedish president, blamed "the inability of the Belgian and Swedish presidencies of the European Union to find solutions to

problems posed by the Galileo satellite programme", adding that this inability, like the urgent need to begin dialogue with the United States "has shown up the lack of European political coherence and of an effective decision-making structure[16]". Echoing this, Loyola de Palacio, European Commissioner for Transport and Energy, added "what was lacking was a decision by the government of the European Union. It is not a problem of cost but of policy[17]".

This need of political endorsement of the importance of the programme for Europe has been to some extent confirmed even by the countries most in favour of Galileo, such as France. In addition to a strictly military analysis which habitually underlines the operational character of GPS and the civilian inspiration of the programme, the evolution of Galileo has been plagued by some questioning about its relevance for national purposes or by Government to Government dispute about the political and industrial benefits (involving noticeably Germany and Italy until recently).

But this equation which associates sovereignty with the concept of the nation-state is today called into question by programmes of the Galileo type, a project which demands a great effort of political conversion, alongside efforts to make civil technologies and military use converge. At least, it must be noted that the most recent government-to-government discussion have been settled without putting the principle of an EU –led Galileo program into question.

The first European "enlarged security" initiative: GMES

If some ESA programs can be dual-use (e.g. ERS), the increasing reference to new security needs (including military aspects) is directly linked to the emergence of a new institutional actor. It could *a priori* help to bring to mind the reality of common European objectives, including in the military domain. The first stirrings have been visible in the thinking underlying the announcement of the GMES project, born in 1998 from the avowed need for environmental surveillance[18].

Originally strictly associated with monitoring of the environment, the notion of security incorporated in the title of the programme, the "S" of GMES, was enlarged in the first place to the security "*of individuals and nations*" and later concern, according to the Space Advisory Group (SAG), "*environmental problems[...] [which] could lead to international conflict*[19]". This first initiative thus led to a clearer definition of the "S" of GMES, the latter becoming a project related to "environment and security", replacing the concept of "environmental security". In 2001, the joint work of the European Space Agency and the Commission confirmed even more clearly the possible connections between the programme and the military dimension in requiring the studies to take into account the "Petersberg Tasks". Among the Joint Task Force recommendations, the requirement must be noted for investigation "into the security dimensions and dual uses by the Commission, the European Secretariat for the common security and defence policy, the ESA and the competent authorities within the member states[20]"

[16] *Satellite News*, 21 January 2002.
[17] *Ibid.*
[18] *Global Monitoring for Environmental Security: A Manifest for a European Initiative*, ASI, BNSC, CNES, DLR, EARSC, ESA, Eumetsat, European Commission, 1998.
[19] *Global Monitoring for Environment and Security*, SAG/99/3, European Commission, 12 July 1999.
[20] *Joint Task Force Report*, September 2001. Incidentally, the JTF requested that the role of the ESA in these matters - non-existant at the moment due to the founding principles of the Agency itself - should be reviewed.

Taking account of the political sensitivity of the subject, this partial identification of the programme with a European military destiny still in discussion has not contributed to the clarification of its future. For the moment, its gestation is largely left in the hands of Brussels. It is emerging from the way the programme is developing that the strategic character of the GMES is still struggling to manifest itself politically, in spite of the initial efforts of the Commission to bring out the importance to Europe of having a follow-up instrument in the areas of the protection of the environment and security. In fact, this initial association seems to be relegated to the background today, taking into account also the difficulty in reaching a European consensus in the matter. Besides the commitments to programmes agreed in the civil domain by the Space Agency, the European Commission is favouring an approach characterised by great prudence in piloting a programme whose dual prospects it admits, but in which it also sees the difficulties in imposing it as an instrument of collective sovereignty, especially in the military field.

For the time being, the GMES (Global Monitoring for Environmental Security) program is officially the subject of a European Union action plan composed of an "initial period" which began in 2001 and extends to 2003, the date from which the period termed "Capacity Build-Up" begins. This should, in theory, give rise to the setting-up of an operational system for global monitoring of the environment in 2008. In its essentials, this action plan is now the object of collegiate management in which the member states will play a relatively minor role. On 19 March 2002, a joint decision of the European Commissioner for Research, Philippe Busquin, and the Director of the European Space Agency, Antonio Rodota, announced the creation of a Steering Committee composed of a representative of each member state to which experts were attached, with the task of choosing from the responses to the first request for bids launched by Brussels. These very preliminary responses, directed towards research programmes, are co-ordinated at the level of each member state, which confine themselves to the role of administrative co-ordinators without real powers of initiation. From this viewpoint, the Space Agency still appears at the moment as the actor most directly involved in the project. The very preliminary action decided at the ESA's Council of Edinburgh must also be mentioned. ESA is to establish "service elements" in its centres with 83 million euros granted to the programme on that occasion, in order to provide the data preparation service of GMES. The results of this process, which remains very largely confined within the ESA's services, should theoretically support the final phase of the Capacity Build-Up period.

Military experience, the WEU heritage in the EU

One of the most dramatic evolution deals with the European military space sector first came into existence within the framework of the Western European Union (WEU), which has the vocation of defining conditions for European security, including related technological and industrial problems. To begin with, the WEU initiated several reports and colloquia on space. These approached the subject through a variety of themes, concerned first with the scope of European space activities and then more precisely, the management of a European space system designed to improve security. They then tackled the question of observation satellites as a European instrument for checking the application of arms control treaties, particularly the Conventional Forces in Europe (CFE) Treaty. In 1991, the Western European Union Satellite Centre for satellite data interpretation was set up in Torrejon, Spain, marking the conclusion of a long process of reflection. Five years later, the appraisal carried out by the WEU of activities at the Torrejon centre during its experimental stages showed that maximal efficiency had not yet been achieved. One of the main problems was to implement genuine cooperation

in sensitive areas like intelligence. More globally, the WEU had to face the basic dissimilarity between member countries, in terms of financial resources as well as political and strategic approach. However, the decision in May 1997 to support and strengthen activities at the Torrejon centre shows that, at least on a political level, the importance of space methods is officially recognised, even though most current programmes are still being developed in the context of direct bilateral or multilateral cooperation between the relevant countries.
In 2001, following the integration of the WEU in the European Union, the centre was designated a permanent military organisation reporting to the Council of the European Union, demonstrating that it plays a recognised role and that its missions do indeed belong to the development of the Common European Security and Defense Policy (CESDP).

General position of the EU respective to international cooperation in space

As noted earlier, the emergence of the EU in the European space policy making has been characterized by an increasing interest for more "strategic" programs. This interest has changed the conditions of the transatlantic cooperation in a rather radical manner. As the EU has decided to consider programs such as Galileo and GMES, it has stirred up a lot of scepticism, even reluctance, from the US part. This was in no respect a "premiere" and it must be reminded that the US have always been very reluctant to see ESA and the European states involved in very sensitive or strategic programs (e.g. shuttle type of cooperation in the 70's). Traditionally, the cooperation with the US has especially focused on scientific programs or on selected manned space flight issues. Thus, historically, this cooperation has been undertaken between the ESA and the NASA, mainly under the form of technical relationships in the context of a general alliance between Europe and the United States. These cooperative programs have been able to develop given their relatively low political and strategic profile, allowing them to be taken in charge at the agency-to-agency level.

The EU is having a relatively active policy in the field of space cooperation. The fact must be noted that whereas the European Union has established contacts with Russia and with China, mainly because of a potential cooperation on the Galileo program in accordance with the opened EU position to multilateral partners.

Government-to-government cooperation

From the establishment of the European Space Agency (ESA) in 1975, France has had an active, leading role developing Europe's presence in space and relationships with other space faring countries.

Since ESA was in charge of scientific and experimental programs, the French team focused on satellite applications, such as telecommunications and remote sensing, which evolved into, respectively, the Symphonie and SPOT satellite programs.

Earth Observation

- First civilian cooperative programs developed on national basis

In December 1976, France officially proposed carrying out a remote sensing satellite project under European auspices to the ESA Council. CNES made several presentations on the SPOT project in different European capitals. However, most of the member states were not interested in the project, with the notable exception of Belgium and Sweden. At the time, the

ESA budget was almost entirely devoted to Spacelab and Ariane projects. Further, interest in optical remote sensing systems was weak in countries with often-cloudy skies. Opposition was particularly strong in Germany, which was more interested in radar techniques.

Given these circumstances, CNES decided to study the feasibility of pursuing the project on a national basis, with the participation of other interested states. The SPOT project was submitted to the French government, which formally approved it in September 1977. In this regard, Belgium and Sweden's willingness to participate in the program (at an original level of 4 percent each) eased the political decisionmaking process. Sweden had expressed interest as early 1977 and formalized an agreement in November 1978, and Belgium signed an agreement in June 1979.

The operational character of SPOT programs due to its commercialisation policy and the launching of different satellites reflect the efficiency of such a pragmatic approach even if limited. The same way to proceed has also been used for military cooperation.

- The reconnaissance program, an example of limited cooperation

The Hélios programme is the result of an old French initiative freely opened to co-operation. Germany appears *a priori* to be the natural partner. However, Germany's different perception of space as a tool of sovereignty, and the investment already made by France in civilian observation programmes with the SPOT satellites, make this an unequal partnership. Another route has therefore been preferred, that of co-operation with the Mediterranean countries of Europe. The launch of the tripartite satellite Hélios-1A (79% French, 14% Italian, and 7% Spanish) marks the appearance of an independent European source of information. In spite of its limitations, linked to the constraints of its sensors, which work in the optical spectrum and are thus blind in cloudy conditions, the system proved its usefulness in crisis management in offering Europeans a source of information independent of their allies. The launch of a second Hélios-IB satellite in 1999, while Hélios-IA was still operational, provided an improvement in coverage and in the delays in image acquisition, a given site now capable of being photographed every day under good meteorological conditions.

The Hélios programme was expected to reach a new phase with the joint development of Hélios-II by France and Horus by Germany. The complementary aspect of their capabilities, Hélios in the optical field and Horus in that of radar, would have helped in the reinforcement of the Franco-German partnership and its role in the Europe of defence. It was also planned to give the responsibility for the programme to OCCAR as with other co-operative armaments projects. Although it was officially launched in 1998[21] political and budgetary difficulties in Germany have prevented this project from going ahead, and it has rather given way to national programmes, though an effort is being made to study possible complementarities.

France consequently decided to pursue the Hélios-II programme alone. The first satellite will be launched in 2004 and the second the following year. The expected performance will allow an infrared capability for observation by night and clear weather, the detection of activity indicators, an improvement in resolution to less than one metre, and a capability for very high-resolution photographs, as well as a 50% reduction in acquisition time and in the availability of information, while the number of photographs will be multiplied by three[22].

[21] A joint declaration by President Chirac and Chancellor Kohl was made at the Franco-Germam summit in Cologne.

[22] According to the report on the Finance Bill for 2001: Nuclear, Space and Common Services (www.senat.fr).

Since 2001, Belgium and Spain have been participating at the level of 2.5% and 3% each, but according to different rules, since it will no longer be a matter *a priori* of sharing resources for the programming of observations but the direct provision of available imagery.

- Current cooperations

Today, one of the main issue in the building of a European military competence is the harmonization of national programs. Other European countries are studying the development of their own capabilities. Germany, with its SAR Lupe, envisages a constellation of five small radar satellites of 700 kilogrammes each orbiting at 500 kilometres altitude, the first of which should be launched in 2004, the complete configuration being planned for 2006. Italy, with COSMO Skymed (Constellation of Small satellites for Mediterranean basin Observation) is developing four dual-purpose radar satellites which will function in synergy with the optical satellites of the French Pléiades programme, intended to replace the Spot-5 and Hélios-2 system. This Franco-Italian accord of January 2001, which includes defence requirements, is also intended to widen, and discussions are taking place with Belgium, Sweden, Spain and Austria. In this context, co-operation proceeds effectively by the exchange of data, each country preserving its autonomy in programming, ensuring cost-effectiveness without the constraint of rigid programming, as in true co-operation.

Future fields of military cooperation: Telecom, Early Warning

- Telecommunications

The scope of the telecommunication programme for the replacement and modernisation of the current structure of space-based military telecommunications is also very considerable for future European capabilities. The NATO Satcom Post-2000 programme defines the conditions of interoperability of allied information systems at the same time as it decides on the level of technological competence of the different countries involved in the architecture of the whole, as a function of the technologies used. The choice of the ranges of frequencies is therefore at the heart of the discussions, with strong pressure from the United States to get the Alliance to adopt the EHF (Extremely High Frequency) standard already in the process of being introduced across the Atlantic. For the United States, in addition to the real operational advantages which the use of such frequency ranges would bring (secrecy, portability, resistance to jamming, bandwidth), an almost unique mastery of these highly sophisticated techniques would confer on it a dominant position in equipping NATO as well as in the organisation of the flow of the Alliance's telecommunications traffic.

This last point, in particular, poses questions to the extent that, from the military point of view alone, the choice of telecommunications architecture of fundamentally American origin implies the eventual adoption of doctrines and methods of operating by allied forces which are adapted to these new means. The choice of depending on the transfer of large volumes of information (digitisation of the battlefield) or the adoption of a posture of the "sensor to shooter" type which, according to military specialists signifies a move towards a "flattening" of the chain of command, all possibilities which EHF architecture offers, gives rise to a certain prudence, even a relative mistrust on the part of European armies. Impregnated with a form of scepticism in respect of the invasion of military affairs by high technologies, following the example of the famous "Revolution in Military Affairs" (RMA) developed over the Atlantic, European armies, with the French Army in the first rank, prefer to hold on to the

idea of having access to "the necessary information in good time", as distinct from real time as extolled by the American authorities.

Discussions are therefore taking place now with a view to developing a *Satcom* platform common to the Americans and Europeans, the latter having the aim of avoiding being overwhelmed by large volumes of information which then become unusable. This has happened on occasions, in Kosovo for example. In addition, it is a question of not linking the destiny of Europe too closely with American positions at the strategic, operational and tactical levels, while of course favouring co-operation. On this matter the insertion of Syracuse-III in the NATO architecture under discussion takes on its full meaning, the Alliance remaining the only forum for discussion on these questions at the European level.

- Early Warning

At last, programmes are currently in gestation at national level, notably in France, which will probably be converted to European ones in a second phase. This is particularly the case for space projects for early warning of missile launches.

Financial Aspects

A rough estimate extrapolated form existing systems costs (without the exploitation costs) give an order of magnitude of the global investment that a collective space defense system may require in the case of Europe.

Table 1 - Costs Of A European Military Space Capability To Be Developed

Application	Cost of Programme	Duration of Programme (years)	Annual Cost
Telecom	3 140 M€	15	209M€
Observation	2 283 M€	10	228M€
Galileo	150 M€	8	19M€
SIGINT	875 M€	10	87M€
Warning	555 M€	10	55M€
Surveillance	251 M€	10	25M€
Total	7254 M€		623M€

Data from: European Global Space Metasystem for Security and Defense, presentation by Major general D. Gavoty in Workshop on "Security and Defence Aspects of Space: The challenges for the EU, Contribution to the Green Paper Consultation Process" organised by the Greek Presidency of the EU, Athens 8-9 May 2003, http://europa.eu.int/comm/space/futur/consultation5_en.html

2.3 European military space: changing framework of reference

Overview

Thinking on the constitution of a European military presence in space cannot be treated today in the same way as before. First of all, it takes place in a greatly altered political context since the affirmation of the "Headline Goals", aiming at the establishment of a rapid reaction force in 2003. It constitutes a kind of reference (for want of being an objective) on which any European military space project can now support itself, at least in theory.

In addition, the distinction between civilian and military technology is increasingly tending to disappear. Space techniques, like those of information technology, are undergoing profound changes based at the same time on the constant improvement in the cost/performance ratio of electronic components and, in a correlated way, on improvements in systems architecture which can now combine distinct systems. No-one today disputes that the addition of such systems enriches the information produced for all users, including the military. Better still, by the flexibility of use which it permits, this technical opening up could even *a priori* respond, against all expectations, to the new security requirements which preoccupy military headquarters today.

For all military participants in fact, the harnessing and growing use of all kinds of information are necessary in all "modern" military operations, that is, no longer in the context of the Cold War, where the enemy was well-known and identified, indeed codified. Military operations today have, on the contrary, demonstrated all the uncertainty and the difficulties caused by the unusual character of contemporary methods of combat, whether they be employed by a very mobile army or by a guerrilla. As seen by a professional army, the enemy is characterised by the lack of information possessed on him and the unpredictable actions which he might undertake. Military strategies therefore seek to compensate the lack of knowledge of the modern enemy by the reinforcement of their ability to see, to detect, to know....

The convergence of these technical developments and these new requirements appear to push the role of space as primarily a military tool to the fore. The global nature of space applications, their proximity to the needs of the moment, but even more, the increasingly widespread use of generic components, and indeed equipment, for civil use as well as military, and finally, the progress achieved in information processing; all comes together to give any space initiative a strongly strategic content which goes beyond the purely military dimension. The European initiatives are obviously no exception to this. And yet it is precisely there that the problem lies today. In effect, it can be maintained that the scale of the consequences of the choices increases the difficulty in building a European military space presence. Thinking in this area can no longer be kept on the fringes of the European construct in that they necessitate far-reaching political choices.

Re-thinking political and military sovereignty

Current ideas on setting up military space activity on a European scale lead first of all to the question of the political and military sovereignty of Europe. In this respect, the establishment of authentically European programmes poses new problems compared with the present situation, where national programmes co-exist whose control is obviously provided by the states themselves. Questions of sovereignty are thus treated in the setting of conventional multinational relations along the lines of the relations described above for the Hélios military

observation programme, under the heading of "common operational requirements" for example. The establishment of European programmes situates the problem at a completely different level, on the one hand because of the structural problems which the very development of these programmes poses and hence the question of responsibilities, and on the other the dimension in terms of strategy which is attached to them.

As always in Europe, two key civilian programmes, but of a strongly dual nature, will be quoted as evidence of this turning-point: Galileo, the satellite navigation programme, and GMES (Global Monitoring for Environment and Security) intended to furnish Europe and the international community the means of monitoring the impact of human activities on the environment. By themselves, they symbolise the scope but also the great sensitivity of the choices which the member states of the European Union must make. They are aware that today their degree of involvement will either give credibility or not to the constitution of a European political and military whole. And yet the growing example of the use of these programmes for applications related to security, not to say military security, highlights the impossibility of the European states keeping to debates centred exclusively on their economic, industrial or purely ecological interests, and strengthens national reluctance to engage fully in their development.

Schemes for possible co-operation: multiplicity, complexity

The creation of a true European military space presence appears all the more delicate in that the way towards European integration is not unique, and multiple ways of co-operating can still be chosen today. Although the habits of the past provide a reference, relatively fundamental for European military space initiatives owing to the small number of programmes concerned, it must be admitted that European integration does not provide much of a model. In this domain, co-operation has never gone beyond bilateral or multilateral relationships. The latest arrangement, the Common Operational Requirement (COR) attempts to build on the co-operation inaugurated in the sensitive area of space intelligence gathering with the Hélios-1A and Hélios-1B satellites. In the absence of a European will to participate in the development of Hélios II, the COR can be seen as the manifestation of a process of co-operation at the highest level, which could guarantee a greater permanence of multilateral strategic agreements in future. It concerns not just finding simple funding agreements for the achievement of a programme, but defining operational objectives common to the different national systems, in the first instance those of Germany, Spain, France and Italy. This pooling of military requirements for visible, radar and infra-red observation is therefore a first which could compensate for the temporary character of common programming ventures. Efforts have nevertheless to be made to translate such a document into a European reality. What is, for the moment, only an initiative for some member states could become the embryo of a decision for action taken at a European level. In this sense, the COR can appear as a pertinent mechanism of the "bottom-up" type to advance purely European integration, even though this type of integration does not definitely signify greater technical co-operation, any more than it implies *a priori* greater interoperability.

Annexe

ESA operational or due or launch before the end of 2004 satellites programs
(Ariane not included)

science/exploration	meteorology	Earth observation	telecommunic	navigation	ISS contribution
Hubble Space Telescope *Ulysses* *SOHO* Huygens XMM-Newton *Cluster* Integral SMART-1 Rosetta Mars Express CryoSat	MSG-1 (Meteosat Second Generation) METOP-1	ERS-2 Envisat	Artemis	EGNOS Galileo	ATV (Automated Transfer Vehicle) European Robotic Arm Columbus

Source: ESA.
Legend: programs in italic are developed in cooperation with NASA, program in bold is developed with Japan.

3. European Institutions and Space Policy for Security and Defence

In the context of the European integration process of the last half century, both the space aspect and the security and defence aspect represent special cases that for the longest time developed outside the mainstream of integration, i.e. the EU. In pooling Europe's resources for space activities, first of all for the French-led effort to provide Europe with an autonomous launch capacity (the Ariane), a separate integration track was created in the form of the European Space Agency (ESA). While it stands outside the community approach, its statute qualifies ESA, like the EU, as more than simply an intergovernmental cooperation structure, at least as far as its obligatory programme and own common infrastructure is concerned.

After the earlier failure of the European Defence Community, defence remained completely excluded from the EC/EU's activities until the 1990s. The same was true for most other aspects of security, although – in what is now the EU's Third Pillar (Justice and Home Affairs) -- institutionalised anti-terrorism cooperation among member states began in the 1970s and – in what is now the Second Pillar (CSFP) -- economic aspects of security were first admitted as a legitimate field of interest into the Community's foreign-policy cooperation in the mid-1980s.

For the "First Pillar", the European Community Treaty still stipulates that the defence sector is exempt from community authority and remains in national control (Art. 296). Policy areas where the Commission is authorised to openly address security aspects and expend funds on them are still rare – one item on the agenda of the upcoming intergovernmental conference for possible change, based on the abolition of the pillar structure in the draft constitution. It is clear at this time, though, that in the EU internal security as well as defence will remain intergovernmental for the foreseeable future, and any active role of the EU and the Commission will be geared at facilitating member states' efforts.

The European Commission first showed interest in space as a user of Landsat imagery for implementing its common agricultural policy. Since 1988, it has increasingly claimed a role in the formulation of space policy, based on the high importance of space technology for critical markets such as telecommunications, and making use of its competencies for certain sectoral policies that also have a space dimension (such as research, transportation, telecommunication and information), as well as its responsibility for regulating the internal market and for external trade negotiations. In the future, due to this effect the Commission's role in space is bound to further increase

Today, the European Commission sees its space role in joint research and development, regulatory conditions and assembling broad support for projects of Europe-wide interest such as Galileo. In the current 6th Framework Programme, research funds of more than 1000 million euros are allocated to aeronautics and space over five years.

In the last decade, space activities have moved beyond their earlier focus on technology development and began to deliver mature applications, in particular in communications and earth observation, including weather and climate change monitoring. Some of these applications have quickly assumed important roles in various sectors of life and economic activity and are also relevant for security and defence.

The fragmentation of European space efforts -- split between civil and military activities and between national agencies and ESA, and with a growing role of the EU – finally gave rise to calls for new institutional solutions. In December 1999, the member states mandated the Commission and ESA to work together and develop a coherent European strategy for space.

The first resulting joint document, "Europe and Space: Turning to a New Chapter" (September 2000), also referred to the benefits of space for Europe's common security and defence policy (ESDP), through means of intelligence gathering and crisis management, building on GMES and the satellite centre transferred from WEU to the EU, and aiming at a European consolidation of national plans.

An ESA report written by Carl Bildt, Jean Peyrelevade and Lothar Späth, "Towards a Space Agency for the European Union" (November 2000), presented the proposal that ESA, on the basis of the EU's enhanced cooperation rules, should develop into an encompassing space agency for Europe as an element of the EU's institutional architecture, extending its fields of action also to defence requirements.

The Commission and ESA established a Joint Task Force (JTF) to explore scenarios for their future relationship on the spectrum from cooperation to integration with a view to the conclusion of a framework agreement. In its first report, "Towards a European Space Policy" (December 2001), this body recommended that the European Community should contribute funds to ESA programmes where appropriate, ESA should become the implementing agency of EU space programmes and ESA's activities should be extended to programmes related to CFSP and ESDP, considering the dual aspects of technology, systems and industry.

The significant differences between ESA's geographical industrial return policy and the EU's competition and enterprise policies, based on the requirement of fair tendering, were flagged as one issue that needed to be understood better and eventually harmonised.

In July 2002, the "Strategic Aerospace Review for the 21st Century" (STAR21), an advisory high-level expert report to the Commission, pointed to the detrimental mismatch between the increasingly ambitious goals and requirements Europe was pursuing, especially in security and defence, and the policy framework within which the aerospace industry was expected to contribute the necessary capabilities. The report noted the absence of any structure on the European or multilateral level to address security and defence space technology needs, and it welcomed moves to develop a consolidated European space policy.

In 2003, the Commission presented its Green Paper on European Space Policy, prepared in cooperation with ESA. It elaborates the fundamental notion that the benefits of space must be put more at the service of Europe and its citizens, exploiting the multiple use options and opportunities for value-added services that space-related assets often purvey. Among the key areas where strong benefits could be expected are sustainable development, including global monitoring for stricter control of environmental regulations and capacities for managing environmental crises, as well as the security of citizens through CFSP and ESDP. The intensive public debate about the Green Paper that unfolded in the first half of 2003 provides a good basis for the production of a White Paper on the same issue to be presented in autumn.

As far as security is concerned, the Green Paper embraces the space aspects of the full spectrum of Petersberg tasks, both civil and military, that are covered by CFSP and ESDP.

It rightly reflects the ECAP finding that "to a certain extent, the critical shortcomings of current crisis management are directly linked to a space technology capability".
Given the limited nature of EU defence integration -- with the common defence remaining within the remit of member states, coordinated by most of them in NATO --, however, the Commission's Green Paper necessarily stops short of offering a truly integrated vision of a European space policy that would also include strictly military and intelligence space capabilities. Therefore in military space the answer to the Commission's call for a more efficient and ambitious approach to space that binds efforts of the EU, ESA and member states together, will need to reach beyond the Green Paper debate.
The first goal, as the Green Paper specifies, "is to ensure Member States discover added value" in a common, coherent EU space policy that also addresses security and defence. In practical terms, at least in the beginning, this challenge translates into the prospect of mobilising additional funds through European cooperation for security and defence-related space activities led by those members states that have active policies in this field.
This effect could be achieved in three ways: by better exploiting research and technology development funds for dual-use purposes on the national and European levels; by dedicating a larger share of existing space funds to security applications; and by generating increased political support for additional appropriations to security-related space programmes through raising awareness and enabling accelerated success. on this last point, the Commission estimates that total annual spending on space in the EU will have to be doubled to 12 billion euros to support the programmes seen as necessary components of a future coherent European space policy. The functions needed in any future improved policy framework would thus be threefold: (1) targeted R & D for advanced space applications; (2) increased involvement of those responsible for security and defence in space-policy decision-making; (3) increased, institutionalised political visibility and effectiveness of security-related space activities. These three aspects can serve as criteria for evaluating various possible future institutional approaches to space and Security between EU, ESA, other related agencies and national institutions.

3.1 The EU as the Hub of European Security Policy

This focus on a potential supportive role of the European Community, in its space policy as well as in other policy areas, for the EU's security and defence policies had been made possible by the rapid, successful developments that took place in this respect since 1998 in the EU's Second Pillar (where the Commission and European Parliament currently have only marginal roles). Based on the political and military lessons from the Balkans Wars of the 1990s, the decision to equip the EU with a set of military and civilian police tools for crisis reaction had found acceptance by all member states, permitting the launch of the ESDP's Headline Goal initiative in 1999.
The interpretation of the "Petersberg tasks" on which this effort is based has been somewhat at variance in different member states from the beginning. There is today increasing acceptance that a broader spectrum of defence tasks should be explicitly included such as conflict prevention, joint disarmament operations, military advice and assistance, post-conflict stabilisation and combating terrorism (cf. Morillon Report to the European Parliament, March 2003). For planning purposes, it would be advisable to build on the most robust assumptions regarding the possible nature and scope of future EU

operations. This applies even more in the strategic environment after 11 September 2001, where the worldwide range and unpredictable character of possible missions and the need to ensure the necessary ability to act, together with other states, became apparent.
The draft strategy paper "A secure Europe in a better world" presented by Javier Solana in Thessaloniki in June 2003 provides an excellent overview of the challenges -- including international terrorism, proliferation and the collapse of effective state institutions in many parts of the world – and makes the case for a "more active, more coherent and more capable" European Union in response to these challenges, working with partners. For the additional defence and intelligence capabilities required, space is going to be crucial as a field that offers cutting-edge technology advantages, covers the increasing geographical reach of European responsibilities and in effect favours the cost-effective use of scarce funds by providing force-multiplying components and capabilities. The same is true not only for the ESDP's Petersberg tasks but also for other shared European security tasks that do not normally fall under ESDP, such as border and coastal security.
Given the severe deficiencies in Europe, for both military and non-military missions, in certain key areas such as command and control of operations, global secure communications, strategic intelligence (monitoring, early warning, situation assessment), mapping, navigation and positioning, operational surveillance, tactical situation awareness, force protection and effective engagement capacity (all with a space dimension), the main focus of implementation efforts in ESDP has been the process of capability-building. Several capabilities commitment conferences were held, catalogues of available and required capabilities developed, and a European Capabilities Action Plan (ECAP) launched to make good the shortfalls in the areas of capabilities by rationalising member states' defence efforts and increasing synergy between their national and multinational projects.
Essentially, the ECAP methodology combines continued respect for the fundamental role of individual nations in generating guidance, will, means, control, accountability and legitimacy with equally fundamental new approaches to common activities, transforming and transcending the traditional notion of intergovernmental cooperation. While it is the goal of ESDP to strengthen effective sovereignty and the autonomous ability to act in Europe, ongoing capability-building efforts under ESDP are driven more by the desire to rapidly gain effective capabilities for operations in a multilateral context than by the development and acquisition of autonomous assets. This differs in principle from the idea of technological autonomy traditionally employed in European space policy.
In ECAP, 19 working groups were established to examine the most significant shortcomings. None of them dealt specifically with space. However, a number of space-related capabilities have been included in the list of shortfalls, i.e. strategic satellite imagery, signal intelligence and early warning. It was also found that the use of UAVs for surveillance would generate additional communications and bandwidth requirements, including space-based relay.
There is today no structure in place in Europe that could cross-reference such space-related elements and provide an overarching approach for generating the needed assets and capabilities, also with recourse to commercial or public dual-use opportunities and public-private partnership solutions. Above all, it would be necessary to begin to apply the capabilities-based approach with respect to requirement definitions and procurement planning to space on a European level, superseding the traditional platform-oriented approach and the customary separation and rivalry between space assets and air and ground

assets that provide similar or related elements of capabilities. Similarly, the overlaps of required space-related capabilities for defence purposes and for non-defence security purposes (such as border police, coast guard and emergency response) must be recognised and exploited on the national as well as European level. In this context, sufficient attention must also be given to the ground segment. Capabilities derive not simply from sensors and transponders but from the ability to use them in a timely, secure and assured manner under adverse conditions.

One remedy could be the creation of a European security and defence capabilities agency tasked not just with running procurement programmes, but also overseeing and targeting R & D, monitoring national efforts and assisting in the identification of requirements. Key member states of the EU are backing the creation of such an agency, building on existing structures such as OCCAR, and the draft constitution produced by the Convention call for its establishment (cf. Burkard Schmidt, The European Union and armaments, Chaillot Paper 63).

There is no guarantee, however, that such an agency would focus sufficiently on space. The record on the national level in most countries would indicate that the space dimension would likely be marginalized and crowded out by more established concerns of the traditional branches of the military. This poses a serious problem if rapid progress in the utilization of space technology is understood as crucial for adapting European security and defence capabilities to changed requirements.

There may thus be the need to provide a separate framework and impetus on the European level specifically for the security and defence dimensions of space. One such proposal, even more narrowly designed for the military dimension, has been offered by the French MoD (General Gavoty) in the form of a "Eumilsat" agency that would also be in charge of controlling the operational systems, including GALILEO. Much would depend on the way such a military space agency were constructed and positioned. What should be avoided is a further deepening of the existing civil/military divide because this would further undermine hopes for a more intelligent and effective use of limited resources.

For ensuring that a European security and defence space agency could draw on ESA's and its European network's technical expertise, a considerable degree of integration within ESA would appear to be of advantage. Such an approach could also ease the organised involvement of defence and security ministers from national governments in providing political guidance to such an agency at a time when defence ministers can still only meet informally in the EU context for the foreseeable future whereas the ESA Convention provides the flexibility for member states to be represented not only by research ministries, especially under optional programmes (where the EU can also be a participant). ESA has a record of spawning specialised user organisations such as EUMETSAT, and this pattern could prove applicable to the security and defence field, too.

A security and defence authority created by member states within ESA, with EU participation, would also be a good place for developing and implementing European policies for security-relevant regulations on space, such as shutter control for imaging devices in times of crisis.

Given the fact that within Europe there is a strong asymmetry of military space efforts, with France spending more than twice as much as all others combined, the French experience and expectations are certainly going to be a major factor in the future institutional development. If others want to motivate France and the UK into less traditional approaches

for their military space efforts, they will at least have to put attractive levels of additional funds on the table.

One complicating, but at the same time helpful element is the fact that the European capabilities-building efforts in ESDP are closely coordinated with NATO, since most members belong to both organisations and must make sure that their forces are geared at the requirements of both.

This applies even more after the decision in NATO to establish an allied reaction force and push for the adoption of network-centric, transformational approaches to defence among European allies. This new focus is in part the result of the European experience in recent coalition operations, including Kosovo and Afghanistan, of being partially left outside of the allied decision loop because of insufficient technological resources, e.g. in secure communications. In addition, there may be gains in political influence and control for European allies vis-à-vis the US resulting from trusted and tested routine interaction between the armed forces and other security-sector agencies.

Future European decisions and performance in the security and defence applications of space are likely to impact not just on the quality of transatlantic consultation and cooperation in international security affairs but also on other aspects of strategic importance such as Europe's role in the world and the future of Europe's defence-industrial base. In space, the overwhelming US dominance is particularly striking since 80 percent of space expenditures and even 95 percent of worldwide military space expenditure is in the US, leaving European firms at severe disadvantage vis-à-vis their US competitors in aerospace and defence.

Increasingly, only in case these firms gain access to the US market and win a share of the big US cake can they hope to survive economically. The space sector thus intricately linked to the question of defence-market access and export control negotiations with the US and also to the themes recently addressed in the European Commission's communication "Towards an EU Defence Equipment Policy" (March 2003) with a view to creating a European defence equipment market.

In this context as well as in many other respects, the fact that space activities are relevant to a number of different directorates-general of the Commission needs to be taken into account when shaping a future organisational framework for a coherent EU space policy. A certain risk of rivalries, with adverse consequences, may arise between portfolios such as research, development, technology and innovation, enterprise, transport and trans-European networks, information society, environment and external relations in the pursuit of their respective tasks and policies. The Commission, and the EU as a whole, are not yet sufficiently organised for an active, coherent space-policy role. This has also been visible in current space programmes with an EU role such as GMES and GALILEO. It will be necessary in the future to find a suitable assignment of roles and lead responsibility within the EU.

This reflects a familiar problem often encountered already on the national level as a consequence of the cross-section character of space activities that regularly affect several branches of government, especially once the security and defence dimension is introduced. On the national level, after much experimentation, the solution of assigning space to a separate agency has proven itself again and again. Similarly, there is merit for the EU in working towards employing ESA as the EU's space agency in the future to help ensure the

required degree of cohesion and continuity, also in relation to similar agencies in other partner countries.

3.3 ESA as a Dual-Use Space Agency

ESA can offer very attractive infrastructure for the whole range of space projects and has a successful track record. It has traditionally, though, been hindered from engaging in explicitly security-relevant activities by the reference to "exclusively peaceful purposes" in its statute. Tacitly its achievements in providing autonomous access to space had of course also been motivated, as has been true for all other space powers, by the desire – on the part of France – to gain access to the security and defence applications of space such as intelligence gathering from orbit.

The institutional separation of civil and military space activities was historically rooted (similar as with NASA and the DoD) and had originally been based on valid political and legal considerations. However, it increasingly became outdated after the end of the Cold War. In 1993, ESA's International Relations Committee already recommended an open mind towards a role in setting up a WEU satellite surveillance system. ESA has indeed shown flexibility. Not only were the Helios-1 satellites and several other military payloads launched with Ariane. Helios-1 was also tested as ESTEC, and a laser communications link was test between Artemis and Helios.

Recently, ESA has undertaken to officially revaluate the legal meaning of its statute, concluding that the Convention does indeed not restrict ESA's capacity to launch and implement space programmes for defence and security purposes or dual purposes or for national or international public bodies in charge of security and defence. Also, a security clearance system has been installed.

Thus, a changed situation has been created for the discussion on the future institutional structure for security and defence aspects of space. Instead of continuing to rely on national approaches or possibly setting up a special second European space agency just for security and defence, now the potentially attractive option exists to take full advantage of the dual-use nature of space in ESA itself, based on its future cooperative arrangement with the EU. Any such opportunity to avoid intra-European duplication should be welcome as a cost-reducing factor.

On the other hand, one must realistically assume that defence space systems are likely to remain national assets at least for the next 15 years. Even in the longer term, there may always be some defence applications that are deemed so sensitive that they are either not available at all to European cooperation or need to be dealt with in special ways. Given the infant nature of European military space, it is too early to judge to which extent this aspect is likely to undermine the vision of ESA as a single European space agency. In any case (as in the Helios programme) the facilities that ESA can draw on as a service provider – possibly augmented by a progressively consolidating network of currently national space facilities – should be available for specific tasks even in the context of such special programmes.

3.3 Other Aspects of Institutional Development

Space is well suited for innovative approaches such as budget pooling, public-private partnership, joint ownership and joint operation of assets. In this sense. defence space activities could be used as a testing ground for such approaches in the wider defence-industrial sector. This could for example be applied to the Commission's suggestion (in "Towards an EU Defence Equipment Policy") to expand its research activities to the security sector (advanced research agenda) by first launching a preparatory pilot-phase project that would implement some specific aspects particularly useful in carrying out Petersberg tasks.

Both an effort to strengthen dual-use aware, mission-oriented research and technology development in the EU in support of other community policies and to jump-start advanced R & D investment in the defence-space sector with a view to the long term would indeed seem to be particularly urgent and helpful to both gain cutting-edge capabilities and help to sustain a capable and viable industrial base in Europe. Only through fostering the early pooling of European efforts already on the research and technology level can the continuation of the present situation be avoided where systems remain national and are only made mutually accessible (imagers, transponders) as a minimal form of European cooperation.

The Western European Armaments Group (WEAG) provides at the moment the only place where this is attempted to some degree. Satellite surveillance technology has been one of the Common European Priority Areas (CEPA) in this organisation since 1990. In 2000, this was widened to include military space technology as a whole. Projects included, e.g., SAR technology useful for COSMO and ground segment technology useful for SAR-Lupe.

One of the best contributions to putting Europe's space, security and defence capabilities-building efforts on a new level would probably be the launching, preferably by the European Commission, of a European Security and Defence Advanced Projects Agency with small, non-permanent staff and flexible, mission-based activity. Like DARPA in the US, this would provide a framework for pursuing a strategic approach to applied technologies of the future, combining a well-defined vision with highly responsive structures and methods.

Another point concerns the insufficient organisational anchoring of the security and defence aspects of space in Europe both on the national and multinational level. In defence ministries, armed forces and other security-sector agencies, a "space culture" has not taken root except to some degree in France, and space-related considerations often do not have a proper home in the bureaucratic structures that govern policy decisions. A security and defence space user community still has to be created among national defence establishments and at the European level.

Such a user community is needed for interacting constructively in the development of concepts and requirements, the acquisition process and joint exploitation of space systems for security and defence purposes in Europe. It would also come in highly helpful for professional interaction with US space experts and for perceiving developments in US military space policy with more accuracy and timeliness.

Furthermore, a whole range of new institutional and regulatory decisions will have to be taken to deal with new tasks in the field of security and defence applications of space that have not existed in Europe in the past. Galileo and its security implications (cf. G.

Lindström, The Galileo satellite system and its security implications) have already been a wake-up call. Among other things, there will have to be established security-aware policies for access to signals and for their denial, as well as precautions for system protection.
Finally, once there are operational system the need arises to develop European command structures in charge of space systems. They may have to satisfy, at the same time, full military requirements and the specific European desire to exploit the dual-use nature of many space systems for a broad range of security applications. In some cases, parallel user structures will be unavoidable because core security and defence tasks often require a different approach than would be required under a wider notion of security, e.g. for environmental monitoring.

4. SPACE AND SECURITY IN EUROPE: A CROSSROAD BETWEEN POLICY AND INDUSTRY

4.1 Supply – Demand interaction

The overall activity of the space sector in Europe is characterized by a strong interconnection between a fragmented institutional (mostly national) demand for civil, military and dual services, a weak private demand limited to some specific areas (such as communications and navigation), on one side, and a supply side provided by public and state owned (or controlled) companies.

The demand side

On the demand side, an artificial distinction between "purely civil" and "security related" sectors is still in place and is reflected in the multiplicity and in the lack of coordination between different institutional players (namely the different bodies of the EU, the ESA, NATO, the national space agencies and the defense procurement agencies).
The political, legal, social and psychological reasons supporting such a distinction are not actual anymore, since they date back to the cold war period.
In this new context, the legalistic argument against a complete involvement of the European Space Agency in the security activities is still perceived by some actors as relevant, but a radically different view is now gaining consensus.
The evolution of a European initiative in the security and defense area (ESDP) is providing a strong incentive to consider space as a key asset for the autonomy and international leverage of the European countries and the EU as such.
In the meantime, the concept of security has changed dramatically and it now involves a number of activities that once were considered as completely separate from the military sector, such as the fight against non-state actors (international terrorist organizations), the organization of the homeland security and the civil protection.
Therefore, in order to answer adequately to the present security needs of their citizens, the institutions should provide an holistic response that cannot allow the old division to act as effective obstacles on the road to an integrated approach to security.
But the distinction between civil and military is not the only divisive factor: nationality is probably even more important to this respect.
In fact, the space sector provides an important strategic asset and force multiplier, as well as an occasion to develop high level technology; moreover, many activities that derive or employ space services (such as intelligence, as the most relevant example) invest the essence of the concept of national sovereignty.
Therefore, the governments of those countries in which the security use of space or the space industry is particularly relevant, tend to be particularly jealous of their prerogatives.
On the other hand, the lack of funds to finance security activity in space has already given a relevant incentive to develop the assets at least on a bilateral level, to allow for costs sharing.
But most of the multinational activities are held on an occasional basis and should not be considered as satisfactory from the point of view of the accomplishment of the security mission and the better value for money, since those initiatives do not provide the much

needed integrated, stable, predictable and powerful political and institutional answer that is sought by both the European taxpayer and the space industry.
The civil/military and the national distinctions should be considered as a principal cause of decline of the space sector in Europe, compared to the US and Asian activism.
This is particularly true when the institutional demand related to security needs is considered, since it is coming almost entirely from a fragmented institutional demand.

The supply side

The distinction between "civil" and "security" sectors is not present on the supply side, since the very same companies are normally involved both in "civil" and "security" projects.
Moreover, space technology tends to be "neutral" to this argument, as it can be normally applied to satisfy most military as well as non-military requirements.
Ultimately, it is the use and the user of the space asset that determine the category under which it falls. The very same telecom satellite, navigation system or satellite picture can and is normally used at the same time and in the same area by troops, journalists and NGOs.
The fragmentation of the supply side therefore tends to be on national base, while the civil/military cleavage present on the demand side is less important, despite the fact that dual and defense production must follow different European and national rules.
At present, in Europe there are three main different system integrators (EADS-Astrium, Alcatel Space and Alenia Spazio), whose activity is complemented by a large number of smaller companies, subcontractors and service providers.
A process of concentration in the first tiers of the space industry more than probable and the rationalization of the production will most likely generate important savings.
The European governments should therefore support this process, while on the other hand avoiding a situation of monopoly, as well as a "colonization" from non-European companies thanks to dumping or cross-subsidization practices.
To this aim, the establishment of an integrated transatlantic approach represents a key issue.

Lessons learned from a Europe-America comparison

A particular case study that could prove interesting to Europe is the American one.
Previous studies, such as the "three wise men report to ESA", offer a comparative analysis of the US-Europe activity and attitude towards space.
What emerges at first sight is the huge difference in spending in the security and defense related demand; in the US it amounts to many times the sum of the European budgets, while the size of the private demand is comparable.
The space sector in the US is defense dominated; security considerations and needs prevails over commercial ones and the development of technology is usually pushed by the military sector. This generates important positive spillovers to the benefit of the commercial and industrial sector for non military applications.
The European approach is less defined; the civil sector tends to prevail (telecommunications are the main driver), but there is a relevant exception, namely France, in which the development circle is closer to the US model.

The different origin of GPS and Galileo should serve well as example of these different attitudes.
In addition to this, the US markets presents an institutional demand side that is represented by an integrated costumer (despite the presence of some division between the different Agencies of the US government), while the demand in Europe is given by the sum of a large number of national initiatives.
The high number of different payers determines the rise of sunk cost connected with duplication of bureaucratic structures and unnecessary overlap of programs of the same nature.
The institutional activity of ESA represents an important exception to this reality, but a restrictive interpretation of its mission statement has until now substantially excluded the organization from the security sector, despite some technology already held by the Agency could well serve security needs.
Moreover, the intergovernmental nature of the organization has not allowed for a full exploitation of the potential of the organization, while on the other hand the possibility to engage in non compulsory programs has inserted a certain degree of flexibility.

Some conclusions can be drawn on the comparison between the US and European different experiences.
The experience of the American space sector underlines the anti-cyclical role of the institutional spending (in particular from the Department of Defence).
The institutional support of the R&D in this particular sector is critical for any success, given the high level of uncertainty and the long term prospective of the investments.
Moreover, it is important to offer the supply side a common set of regulation and a unified demand, providing a stable, predictable and rich counterpart.
The presence of a strong demand organized around a single actor is therefore a key assets; the segmentation of the demand in different agencies specialized according to their mission should be avoided.
On the other end, a strong political backing of the supply side reform and concentration process should provide the necessary incentives to cut costs.

4.2 Analysis by sectors

The European security requirements potentially could have a major impact on the whole system of space activities. This paragraph provides a general overview of the contribution of each sector to security.

Access to Space

The access to space is toady guaranteed by rockets of different kind and size (low, mid and heavyweight, to reach low, medium or geostationary orbit), while new technology is sought to provide less expensive solution, such as reusable aerospace platforms (shuttles).
Launchers are intrinsically dual, both from the technological and use point of view.

The rocket technology (engine, propellant, navigation system,...) is easily switched to ballistic missile production. Some Russian launchers are actually derived from former ICBMs.
Moreover, launchers are normally used to carry defense related payloads, such as dedicated observation or communication satellite.
Ultimately, the reason behind the decision to deploy an independent European panoply of launchers, instead of relying on foreign capabilities even when it would be cheaper, is linked to the political willingness to operate independently from any foreign supplier.
International coordination in future technologies and applications should be foreseen to guarantee the proper funding of research and development activities.
The institutional intervention and support should not in any case serve as an excuse to avoid cost considerations: competition remains still possible at sub-component level, despite the fact that public subsidization is inevitable.

Communications (SATCOM)

Satellite communication services are widely used for commercial voice and data transfer services; since the number of assets dedicated to security and defense is quite limited, commercial satellites are normally used by armed forces and homeland security organization to satisfy their needs. Communication satellites are the ultimate example of the dual character of space assets and activities.
In the recent past, there has been an exponential increase of demand for wide band communication of data for security purposes. The modernization of the military instruments, the use of remote controlled assets (drones, UAV) and the increased propensity to deploy troops in distant areas account for this growth.
The lack of dedicated platforms at the European and transatlantic level should be seen as an incentive to provide assets enough to satisfy an expanded demand of satcom.
The availability of communication assets is critical not only for our own information society, but also to the full exploitation of the concept of information warfare.
Satcom represents an indispensable force multiplier for the European military forces and are essential for the European autonomy and interoperability.
The prompt and secure implementation of any strategic decision is dependent from the capability to communicate at long distance. Moreover, communication satellites represents an invaluable asset at the operation, tactical level.
The European institutions should launch a project aiming at integrating all the civil and military assets already available, making them available at the authorized user, as well as planning for the necessary expansion of transmission capabilities, in particular in the wideband, high frequency segment.

Observation, data collection

Observation assets serve many different missions: meteorology, monitoring, treaty enforcement, targeting, intelligence, early warning.
At present, few nationally held assets are available; there are some recent initiatives to launch multinational constellations and share the data collected, but this cooperation is far

from being systematic and does not satisfy the growing demand for detailed local and global coverage.
There is a European integration efforts that includes the potential security application, GMES, but it is limited and it lacks proprietary assets.
Situation awareness is a critical element for any activity in the security field, from disaster relief in case of natural catastrophes to the use of military force to deter, prevent or preempt attacks.
The availability of a wide network of space observation capabilities is vital to counter new and old threats, in particular proliferation of weapons of mass destruction and their delivery means.
The whole decision making process depends heavily on the data available; the basic doctrine of deterrence, prevention and preemption are significant only if a continuous flow of detailed information is guaranteed.
A global coverage, multi-mission, multi-sensor, high performance constellation of observation and eavesdropping satellites should be considered as the cornerstone of any European engagement in security matters.
The inevitable link between these space assets and the intelligence sector is the main source of the national jealousy that is responsible for the fragmentation, overlaps and lack of coordination of the sector.
The persistence of this national bias is challenged by the financial problem posed by the development of a proper constellation of satellites, that makes it practically unaffordable for a single country to proceed on a purely national basis.
An integrated approach to the observation sector should therefore be sought; a European initiative similar to what is under way in the GNSS area could be promoted, in order to pool present assets and plan for new ones under the EU-ESA umbrella.
The reorganization of this sector at the European level will probably require some time; in the meantime, the European Space Agency should be tasked to develop and maintain the enabling technologies for this vital applications.

Navigation, Positioning, Timing (GNSS)

The Galileo satellite navigation, positioning and timing system is currently the most important European project in space and its outcome will ultimately determine the success of a new form of cooperation between the EU Commission and ESA.
The private and institutional demand for applications and services running or relying on GNSS systems is foreseen in rapid expansion, making it an essential tool for economic advancement.
A GNSS is a dual tool since it can be used for a vast number of civil application (such as aid to transport networks), as well as for civil protection and military missions, such as weapons guidance, target location and force deployment.
While the American system is of military origin, the European one is rooted on economic and social considerations; this different philosophical approach does not change the dual character of both.
From the security point of view, a GNSS is an essential force multiplier for any kind of military operation; the process of transformation of military forces in the digital era is not possible without this asset.

It remains to be determined who will hold the key of the Galileo signals (in particular of the PRS one, that has specifications similar to the American military M code) and therefore guarantee the integrity and proper use of it.
The problem of coordination and integration of the future European system with the present American one (GPS), as well as with the Russian Glonass, remains unresolved and must be considered a political priority.
Bilateral arrangements with the USA and Russia should determine the proper international political framework that guarantees the non-hostile exploitation of the systems.

Space weapons programs

All the previous activities have a clear dual character.
There are however some particular applications that can be classified as purely military in their scope, such as anti-satellite tools (ASAT, killer satellites), hardening, active and passive protection from attack on space platforms, missile defense in space.
Most of these projects are still in a very preliminary phase and their feasibility is far from being assured; moreover, they tends to be quite demanding in financial terms and are politically controversial, since their impact on the stability of the international system is perceived as negative by many and due to their "aggressive" nature.
The European institutions therefore are not involved in these programs and this situation will likely remain in place for the near future.
On the other hand, since the technology involved in those projects is often connected to non-defense related production, this particular technological aspects could be subject to specific studies; the European Space Agency could well serve as the technology provider.

4.3 Prospective of European integration

The availability of space assets linked with the security needs of the different European countries is quite limited; some national and multinational projects have been launched recently to fill the gap between requirements, expectations and reality.
In terms of economic return and effectiveness, a common European solution to the present and future requirements is considerably better than the sum of many different national programs.

The realm of the Helsinki Headline Goal, determined by the need to satisfy the Petersberg tasks requirements, does not account for the whole spectrum of security needs faced by Europeans.
Therefore, the European interest in space connected with security applications goes well beyond the immediate requirements posed by ESDP.
The space arena is becoming the most important military force multiplier and underpins the whole concept of force modernization according to a network enabled warfare, capable to reach and retain regional or even global dominance.
The US defense and security strategy already takes in due account this factor and foresee a relevant growth of budget devoted to the space sector (the overall 2002-07 space defense budget sum up to 165 billion dollars, according to the GAO).

But the concept of security should be seen as including not only the important and demanding role of supporting the military operations, in particularly abroad, but also the broader area of police and homeland enforcement, whose role in the fight against international terrorism, crime and natural catastrophes is growing in importance.
The institutional demand for space will therefore come from the process of military transformation coupled with the public demand for homeland security.

Therefore, all the relevant Institutions dealing with security issues should be involved in the process of establishing a new, integrated approach to this sector, taking into account the past experience and making present institutions evolve.
The ESA is particularly well placed to serve as the technology and service provider for most of the national and EU security needs; its nature of intergovernmental organization allows for a strong link (as well as possibly integration) in the EU institutional co
In the area of military space, the ESA will have to interact with both national armaments directorates and the new born European Armaments Agency.
Institutional duplication and competition in this sector is particularly damaging and should be carefully avoided; space is an important horizontal issue from which basically any European policy can benefit. The creation of "ad hoc" actors responsible for the "military space" should be avoided, while a specialized procurement sub-agency under the umbrella of the EAA could be established as the transmission mechanism from ESDP political decision to ESA technical arms.

A critical concept and attitude shell be well understood and adopted as a general policy: artificial barriers between "civil" and "military" space assets and applications are detrimental to the effectiveness of the European holistic approach to security.
The space sector is dual by nature and a clear division cannot and should not be made.
The division of labor between the international institutions and the national level, as well as within different players at the same supranational level shell be informed to the principle of subsidiarity.

Table 2 Analysis by Mission

Missions	Assets	Industrial players	Main Institutional players	Security aspect	Problems	Policy
Access to space	Launchers. Shuttle (?) Human flight (?)	Missile producers, rocket engines, launch facilities	ESA, EU Commission	Relevant, dual	Costs, subsidy, low institutional demand	Maintain all-spectrum capability, develop new technology, savings
Communications	Satellites constellations (GEO, MEO, LEO, DRS)	Satellite producers, ground segment, transponders, receivers, services providers	ESA, Nations (F, G, I, S, UK), NATO	Relevant, dual	Lack of institutional demand, distortion of competition, security of data, lack of wideband capability	Coordinate national efforts and civil/mil assets, plan for integrated future expansion
Navigation	GNSS	Services providers, atomic clock producers, receivers	ESA, EU Commission, EU Council, NATO	Relevant, dual	Control over signal, integration with GPS and Glonass, improper use	Clarify chain of command, bilateral agreements with US and Russia
Meteorology	Observation satellites	Satellite producers, ground segment, services providers	Eumetsat, ESA	Relevant, dual	Protection of information	Strengthen existing institutional links
Monitoring	Radar, IR, optic constellations	Satellite producers, ground segment, sensors	ESA, EU Council, Torrejon, Nations (F, I, G, S)	Relevant, dual	Costs, lack of coordination, security of data, legal framework for exploitation	Coordinate national efforts and civil/mil assets, plan for integrated future expansion
Treaty enforcement	Observation satellites	Satellite producers, ground segment, services providers	EU Council, ESA (technology)	Military, preventive diplomacy	Costs, political mandate	Exploit monitoring assets better, provide dedicated ones
Targeting	Observation satellites, GNSS	Satellite producers, ground segment, transponders, receivers, services providers	EU Council, Torrejon, NATO, ESA (technology), Nations	Military only	Lack of interoperability, few dedicated assets, unclear political framework	Coordinate national assets, develop common constellations, procedures, enhance Torrejon
Intelligence (Elint, Comint)	Satellite constellations	Satellite producers, Crypto software, sensors	EU Council, NATO, Nations	Military mainly	Sovereignty issue, lack of coordination, no dedicated assets	Establish political and institutional framework, common assets, exchange information
Early Warning	Observation satellites	Satellite producers, sensors	EU Council, NATO, Nations (F, UK)	Military, preventive diplomacy	No assets available, costs, feasibility	Deploy EU system (additional payloads)
Attack hostile assets in space	ASAT, killer satellites	Rockets, missile, EKV, satellites	ESA (technology), NATO (?), Nations (?)	Military only	No assets available. Costs, feasibility, impact on stability	Study technology
Missile defense in space		Laser, EKV, satellites	ESA (technology), NATO (?), Nations (?)	Military only	No asset available, unreliable technology. Costs, feasibility, impact on stability	Study technology

(?) = Possible, foreseen
Nations in brackets as main players

Table 3 Main Players and Policies

Phase	Demand	Supply	Problems	Policy
Research	Nations, ESA, EU Commission, industry	ESA, Universities, Research centers, laboratories	Lack of public and private funds, no coordination	Develop common institutional framework, increase funding, exploit economy of scale
Technological development	Nations, ESA, EU Commission, industry, NATO, private sector	ESA, laboratories	Lack of public and private funds, no coordination	Develop common institutional framework, increase funding, exploit economy of scale
Requirements	Nations, ESA, ESDP institutions, NATO	ESA, industry	No common requirements, lack of interoperability	Establish common Agency, pool present capabilities, stimulate competition
Procurement, maintenance	Nations, ESA, ESDP institutions, NATO, private sector	Industry	Lack of institutional demand	Establish common Agency, pool present capabilities, increase funding
Services, applications	Nations, ESA, EU Council, EU Commission, NATO	Industry, service providers	Limited private and public demand	Stimulate private sector, unify or coordinate institutional demand
Legal framework	EU Council, EU Commission, Nations		Fragmentation	Establish a common set of rules
Political authority	EU Council, EU Commission, NATO, Nations		Fragmentation	Determine who is in charge of what, clarify links between institutions

Conclusions

There is no doubt that the capacity to operate from extra-terrestrial space has become an essential part of any security and defence policy. Since a long time we have been aware of the importance of space technologies and applications in term of scientific research and economic development. In the last decades, the multi-sector evolution of technologies (IT, computer, observation and warning, communications...) has progressively created new operational opportunities, extremely useful in the contest of a new strategic scenario, not defined anymore nor by internal security nor by the defence of a geographic border of a State. The global dimension of security and defence call for operational, observation and communication capacities, to be applied worldwide, without the support of heavy basis or infrastructures on the ground.
In parallel, some essential security assets such as the defence of environment, the management of strategic resources (water, food, energy, technological networks), transportation control (land, air and sea based) and the global IT and communication network heavily rely on space technologies.

The European Union (EU) cannot ignore Space nor remain out of it. This is well understood by the member countries that have a significant space policy. The creation the European Space Agency (ESA) and the importance of its activities in terms of science, technological and commercial programs illustrates this strategic concern. Then, more "space oriented" European countries have developed an autonomous space activity, with some defence and security space assets. Also the EU, through the European Commission initiatives, has became a space-policy maker, starting with transportation and environment monitoring fields : Galileo and GMES programs, both developed by the European Union and ESA, clearly shows the trend.

Meanwhile, the EU has further strengthened its attempt to define a Common European Foreign and Security Policy (CFSP) and a European Security and Defence Policy (ESDP) and has started acting as an international security player (in Bosnia and Herzegovina, Kosovo, the FYROM and Congo). The EU is a member of the Quartet (with the USA, Russia and the UN) fostering the peace process in Israel and Palestine. European states are present with their own military forces in a number of peace-keeping, state building and anti-terrorist operations around the world. The EU has already discussed a first version of its "security concept" in Thessaloniki (June 2003) and has signed a joint declaration with the UN for cooperation in Crisis Management (September 2003). Moreover, the EU is developing common policies against organized crime and terrorism.

The EU intergovernmental conference will deliberate on a number of proposals made by the European Convention in order to simplify and modify the Nice Treaty, including the strengthening of European solidarity in the security field (for example against terrorism) and some procedures and institutions modifications in order to improve efficiency of foreign, security and defence policy.

Space, and the role of space in the future of Europe, has to be included in that framework. Such a process could overcome one of the main limit of efficiency in European Space policy : player's and strategies fragmentation. This is obvious today in the telecommunication field where Europe has produced three different experiences (Syracuse, Skynet and Sicral) with civilian and military applications. In the defence field some cooperation programs involving small group of countries looks more like the extension of a national logic. Realistically, out of ESA initiatives, only Galileo program can be considered as a European joint-initiative.

Europe is already a very significant space actor, both collectively and thanks to the national space policies of some of its member states. Today European space policy has different leaderships, depending on applications:

- national space authorities are generally concentrated on civilian and scientific research program. Those programs can have a bilateral or multilateral basis, following ad-hoc agreements.
- national defence authorities lead specific programs, which are sometimes connected with civilian space activities but follow a different strategic orientation and have a different budget responsibility. Here too these programs can have a bi or multi-lateral structure.
- ESA operate multilateral programs to gather a number of civilian or scientific European programs, with sporadic contacts with the defence programs, and some specific agreements (service agreements) with national programs outside the ESA framework.
- some EU commission directorates are involved in space programs linked to specific competences.

The relationship with the USA, the space world power, can also lead to fragmentation. In that framework, only important civilian scientific programs are multilaterally managed by ESA with a direct partnership link with American NASA. But these common programs do not show a parity between Europeans and Americans, Europeans being generally junior partner and following strategic and technological choices operated by the US. Nevertheless there is a coherent collective policy maintained by ESA regarding relationships with the American partner but also in terms of European definition of scientific, technological and industrial priorities.

In the commercial field, and more in the defence field, there is no such multilateral framework and each country has a direct and bilateral relation with the US, with the exception of some general agreements (service agreements) managed by NATO in the framework of operations driven by the Atlantic Alliance. Consequently, for example the UK has a special relationship with the USA in the intelligence field, with a direct access of space technology, meaning also the complete acceptance of the technological choices made by the US. On another hand the other European countries have a much more limited and indirect access to such space assets. Specific agreements have been set up between single European countries and the US limited to some services or limited geographic areas.

To overcome those multiples factors of fragmentation might not be easy and fast. This atomized panorama has been the framework of operations since decades, meaning deeply integrated from what is considered to be the "reality of European space policy". To break those strategies and low-level balanced policies means also to redefine strongly strategic, institutional and organization patterns that tends naturally to be conservatives.

For example the idea to finance European space activities with a unified communitarian budget could be extremely counter-productive : today those activities (including ESA multilateral activities) are financed through single national countries budgets, based on existing demand coming from each country, a very different reality from a country to another. ESA respond to that demand with an adequate offer. The same logic is even more necessary for defence budgets. Instead in the EU budget contributions follows an objective logic based on parameters (GNP and population) : it's extremely doubtful that such an "objective" criteria can grow up the space budget.

Enhanced cooperation are a different case: if a group of countries decide to realize a policy in a precise sector, with some key objectives, there is a clear interest from participating countries to finance the achievement of the project, even in a non proportional share. This means in the end that it's not very likely (and might be dangerous too) to pursue in the short term a complete rationalization and unification of European space policies, and that national governments logics and choices are and will be still determinant.

It's possible to plan a European policy (both under a collective or an enhanced cooperation framework) that link all data, components and European choices in the space field and that insures not only (or not at all) a better coordination, but the achievement of some strategic primary objectives, that could provide to Europe knowledge and functions missing today and the possibility to improve coherence and completeness of Europe presence in space.

This is also true for the space programs linked to security and defence policy. Historically in the scientific and civilian sector the multiplicity of funding has generally produced higher level of expenses from the European nation with a "space vocation", enabling the achievement of important goals. In the defence sector the space expenses are included in the shrinking and very tight framework of single defence budgets. National defence budgets define and maintain different priorities, and are not able to promote a competitive technological critical level of capacities. This enable to fully benefit of the enormous operational potentialities offered by space technologies. In other words, no single European country is able today to finance alone the space program needed to modernize its own security forces.

Obviously this situation deepen the gap between Europe and the USA in terms of space technologies. In fact, in that sector the expense ratio EU/USA is in the commercial market 1/2.6, in the meteorological sector 1/3, and 1/30 in the defence sector. This has a huge and instantaneous impact in terms of the European industry competitiveness and technological capacity.

Three connected problems are to be treated in a European logic:

- the insufficient level of the European space expenditures;
- the lack of convergence between different initiatives;
- the structure of the supply (to maintain the competitive capacity).

On the political and strategic side, Europe require necessary space assets in order to achieve its objectives in the security and defence policy but also to be able to maintain its role as global space policy player.

A principle of this policy shall be the continuum of techniques, industries and functions in space activities whether scientific, commercial security or defence. This should enable to conceive a very linked framework of budgeting, planning, realization and management of these programs.

This principle is confirmed by the widespread use of dual technologies, build-up on the same industrial basis (meaning same technological and scientific knowledge) and by the structural convergence between space systems functions (difference are more about data transmission procedures, safety of the systems, dedicated access or not,...more than basic characteristics).

In fact, the term security is comprehensive, it encompasses both civilian and military activities. In the new world after the end of the Cold War, the absence of a dominant military threat against the Western world, the perception of new threats, risks and vulnerabilities has gained importance. Terrorism, organized crime, societal risks stemming from forced or illegal mass migrations, security of supplies and of the main trade routes, availability of strategic resources, protection of the environment and the like, become the main source of worry. Those new threats cannot be confronted by military force only, but require a combination of different means, both civilian and military, better encompassed by the term security than by defence.

Moreover, while high intensity, all military confrontation are still possible, the evolution of military operations and priorities is shifting away from what was traditionally defined as "defence policy" (of the borders, against a well identified and "symmetric" enemy, planning the confrontation between easily identifiable armies, with a high level of legitimacy, etc.) towards crisis management interventions (of a dual, civilian and military, nature), preventive engagements, counter-proliferation and counter-terrorism, support of civilian security operations, peace and state building. Those operations are a significant element of any overall "security and defines policy".

In all these cases, Space assets are very relevant, to the point that it is impossible to conceive an effective defence and security policy without them. Considering first of all "security" operations, Space is certainly essential to perform functions such as:

- defence of the environment;
- reaction to natural disasters;
- defence of key natural resources (energy, food, water ...);
- control of migratory movements and contrast of illegal migrations;
- security and control of the major lines of communication (sea, land, air);
- fight against organised crime, smuggling etc.;
- control of the territory and management of homeland defence.

• global positioning, navigation

- search and rescue;
- redundancy of communications;
- surveillance;

Considering instead more classical "defence" operations, we identify very similar needs:

- surveillance;
- intelligence;
- early warning;
- communications.

• global positioning, target acquisition, manoeuvre

- reconnaissance, evaluation ;
- combat search and rescue;
- integration of operations (networking);

There is a large overlapping of functions and means between the security and defence uses of space. In fact, as already said, space operations can be seen as a continuum, including civilian and military functions as well as security and defence operations. The specific military requirements (such as continuous availability, greater reliability, interoperability, protection, miniaturization, speed, etc.) increase the performance of the Space systems and give a positive push to technological developments that can further increase their utility and competitiveness for civilian and security uses.

The general tendency seems to go in the direction of an increasing internationalisation of security policies (in the EU and globally), which goes hand in hand with the globalisation of the economy and of all kind of services. The war against international terrorism has accelerated this development, already present in crisis management and peace operations, arms control and disarmament policies, fight against the organised crime, etc.

This considerations contrast sharply with the present segmentation of the European Space policies between civilian and military activities, as well as between scientific research and economic or other activities, including security and defence, and between nations.

Transatlantic problems increase the difficulty of identifying an overall, coherent European Space policy: the scientific cooperation between ESA and NASA contrast eith the European military dependence from the United States. Transatlantic differences have emerged when Europe has launched some strategic programs such as Galileo. Communication satellites are conceived with different technologies, creating problems of interoperability. Intelligence satellites become a bone of contention, as well as the perspective of the so-called "network-centred" warfare, etc.. There is the need to identify the basic elements of a transatlantic cooperation policy coherent with the development of a European security and defence policy and with the various new requirements stemming from the operations in which European forces are involved. In general, we can observe that the major space projects have been decided by the major users: and the USA is prominent among them. France, Britain, and now also the EU and ESA, are trying to foster their space activities, but the USA is, and will remain, the main space actor (and the major partner of Europe) for many years to come. The US-European experience has been one in which the Europeans could refuse or accept participation in US-defined and US-led projects, and never the other way round. Even good European ideas have sometimes found their implementation as American-led projects, with a later European participation.

Moreover, the strong American tendency to consider Space as one essential element of the US military dominance, and to make military operations increasingly dependent from Space assets and technologies, diminishes the possibility that the United States will generously share with their allies these same assets and technologies, except on an ad hoc and limited basis and in exchange of a full compliance with American political, economic and strategic priorities. The American presence in Space is conceived to be fully independent from outside contributions and from bi- or multilateral management: it can be used to the benefit of the allies, but there will not be any guarantee that their needs will be satisfied should other national American priorities prove to be in competition with those of the allies.

Finally, differences are emerging between the US and the Europeans on the best way to use Space assets in operations. The American concept of network-centred warfare, based on the use of wide-band communication of a large number of data to the lower possible level of fighting units (ideally, to the single soldier) conceive a delegation of authority and an independence of decision making that is generally refused by European military planners, who prefer a more centralised distribution of selected information (on a "need to know" basis) following the hierarchical line. The Europeans doubt the usefulness of making a complete technological restructuring of their operational units and of their hardware, suggesting that a better compromise could be found on the perspective of their Forces being "network enabled" or at best "network based", but not fully "network centred".

This debate is fuelled also by the different strategic perspectives of the Europeans and the Americans. While the latters maintain a truly global strategic outlook, based on ttheir ability to project overwhelming forces worldwide, the Europeans have more limited ambitions and requirements, focussing on relatively proximate threats and on what will be needed to perform the missions defined by the Petersberg tasks. Such a regional vision does not exclude the possibility of worldwide force commitments, which, however, are not seen as isolate European operations, but in support and with the assistance of other allies, either local or, much more likely, the Americans themselves.

Thus, while a high degree of interoperability is deemed essential, to maintain the possibility of joint operations among allies, a complete technological and operational identity is generally discarded. This choice may indeed reduce the possibility of conducting fully integrated, joint military operations, favouring instead various forms of division of labour and a significant degree

of separation, but seems to be in line with the growing American tendency to downgrade the centrality of coalition warfare operations conducted by fully multinational headquarters. The increasing independence of the Americans underline the importance of achieving a greater European autonomy.

On the other end, considering the global spread of military and security crises and the exploitation of the existing Space assets, the degree of redundancy that could be guaranteed by a greater number of more effective European assets could increase the security of the network and perform a useful function of back up and de-congestion. The fact that in general terms the security perceptions of the Americans and of the Europeans remain very similar, almost identical, favour this development.

Inter-agencies problems complicate the European decision making on Space. There is the need to better define the respective functions and specialisations, in order to allow a more effective integration and policy coherence (and a more efficient use of the limited resources available). While being the focus of European Space policy, ESA cannot really "originate" policies. It can initiate autonomously the study or the proposal of new programmes, but it still needs the approval of the member states before implementing them, or allocating to them a budget.

The future of Europe in Space has to be built on the existing reality. Present European space activities are generally carried through the various national agencies or ministries: national institutions are generally more capable than the international ones to take relevant budgetary decisions past institutional and political obstacles, to lobby for greater space budgets, to gather public support and to identify economic interests and technical capabilities.

The EU is a relatively new actor in space, with the ability of initiating policies and funding them, but without the possibility of substituting all other actors. Its main asset is the possibility of combining overall security and industrial policies with the space policy, thus allowing for a greater degree of coherence and rationalization.

The first basic objective shall be the stabilization of the European presence in Space, in order to guarantee the space European capacity for the future, consistent with its political and economical weight and to be able to fulfill the needs coming from an articulated European security and defence policy. This requires at least :

_to maintain a full autonomy in basic space capabilities (in terms of satellites, launchers, ground segments, technologies and services) in order to guaranty access to Space and its optimal utilization following a European policy. This does not exclude the possibility of agreements with other space powers nor calls for a parity level with the US. Instead it's a sufficient objective with some minimal technological assets.

_to maintain a European industrial and technological basis lively, competitive and diversified in order to develop scientific and technological know-how. This means a guarantee of a volume of production, in the long run, and some public investment programs in science and technology that can operate an anti-cyclical function relatively to the commercial demand.

It's important to identify what could be an essential and minimal presence of Europe in Space, for security and defence purposes. We have roughly indicated a network of satellites in order to match the needs in terms of communication, observation, positioning, electronic intelligence, SSE, early warning : assets that goes with adequate ground segments, and with space segments costs of investment around 8/9 billions of Euros on a period from 8 to 15 years, for a yearly investment below 800 millions of euros (with a part already planned). These assets might not be affordable for

a single European country but are highly compatible with a multilateral investment effort. Such a system would enable also a higher degree of efficiency and autonomy both to CFSP and ESDP and to the European rapid intervention forces.

The identification of such a space architecture isn't new : it's been long-time a knowledge of European governments. The real problem is how to get there.
The last EU evolution might play a positive role. It could be the UE itself to have to better identify and explicit the demand in terms of space assets, gathering the perceptions and choices from various European states (or more precisely a group of states, following an enhanced cooperation logic) and to establish criteria for the burden sharing, management of the systems, It would be the best way to guaranty an equal fruition from users and also to enable the necessary link with the Atlantic Alliance and the USA.

Within such a framework, ESA could act on the offer side, in order to guaranty the necessary technical level and the system kick-off, linking directly with the European industrial base and national authorities.

In practical terms we can imagine the parallel constitution in the ESA context and in the EU Council of Ministers of a "space security" committee in charge of thinking, programming, realizing and managing of such a program, also providing the institutional link between the two institutions.
Also, a European space security and defence level could work by the side of future EU headquarters ; but this need of a higher institutional profile for space security shall not be reduced to defence. Again, the European space is mainly civilian, and space is a dual-use sector. This calls for a "dual-use space security" higher profile, which means that European inter-governmental councils takes specifically space security in charge, on the ESA side (ESA council) and on the Union side (with a development of coordination competence at the Coreper level, a precise mandate given by the European council, with also the structure able to check and to approve all security policy involvements of EU space projects). In the case of an infrastructure like Galileo, the decision to open the participation to a strategic space asset, particularly to the reserved security positioning signal (PRS) has to be cleared by a security inter-governmental authority (a European council of Foreign Affairs, or a committee with a precise mandate given by such a Council). In order to avoid the development of too many institutional space security level, like one dedicated cooperation security council into ESA and other EU council linked to space security, composition of such a council could be the same (Space security being an "optional" program for some ESA country and an "enhanced cooperation" for EU countries), or ESA and EU councils could take a parallel joint-decision to define a joint security space authority, under the responsibility of the EU Coreper or Secretary of the Commission, with competence on the strategic and security aspects of the space security.

At a starting point, UE shall follow for Space the same way that progressively produced CFSP and ESDP : identification of objectives, analysis of the problematic, hypothesis of solution to be evaluated by European Institutions and public opinion. Such a task could be done at its best by a specialized Space Committee, composed by European experts bringing together assessments from space industry, potential civilian and defence space users in the foreign, security and defence sphere. Such a committee could help to determine the optimum level of European ambitions in Space, with regards to the demand and the evolution of the needs. This Space Security Committee would operate a very important public policy work, useful to the identification and the building of the European Space constituency that is needed.

In the end, this committee would present its conclusions to the European Council, in order to start a formal decision-making process in the communitarian framework (with the involvement of interested institutions).

APPENDIX

National Analysis

BELGIUM

Structure and Decision-making process

Political level

Generalities

General decision-making process in Belgium is characterized by three specifics elements:

- Federal Government is always composed by a coalition of at least four political parties;
- Belgium is separated between its North part, where people are Dutch speaking, and its South part, where people are French speaking ;
- Private offices of the Ministries are usually more influential than in other countries.

As a result, decisions in the field of defence may face some difficulties due to the presence of adverse sensibilities inside the federal government. As far as important investment decisions are concerned, one of the main points will be how industrial benefits will be shared between Flanders and Walloon.

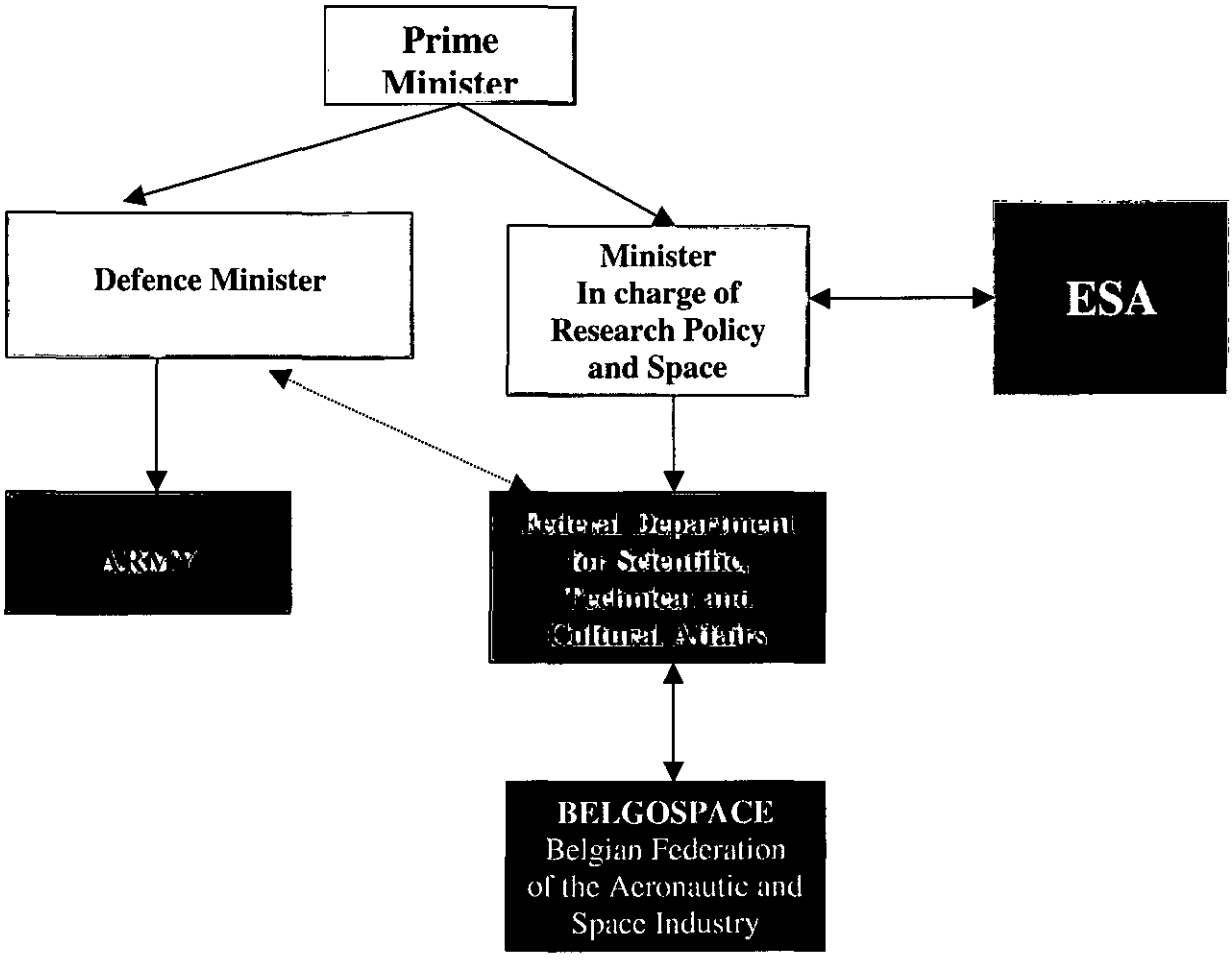
Space policy

Under Article 6a, paragraph 2 of the Special Act on Institutional Reform the federal authorities are responsible for space research within the framework of international or supranational institutions, agreements and actions.
The implementation of the Belgian space programme is the responsibility of the federal department for scientific, technical and cultural affairs (SSTC/DWTC) and the relevant minister. However, the article cited above is not exclusive: the regions can also carry out activities in the space field. Although numerous efforts are under way to provide all the parties involved with more information, certain regions still feel neglected and are asking for:

- greater transparency;
- more direct usable information;
- greater participation in policy decisions;
- and their involvement in setting the percentages for participation in ESA programmes.

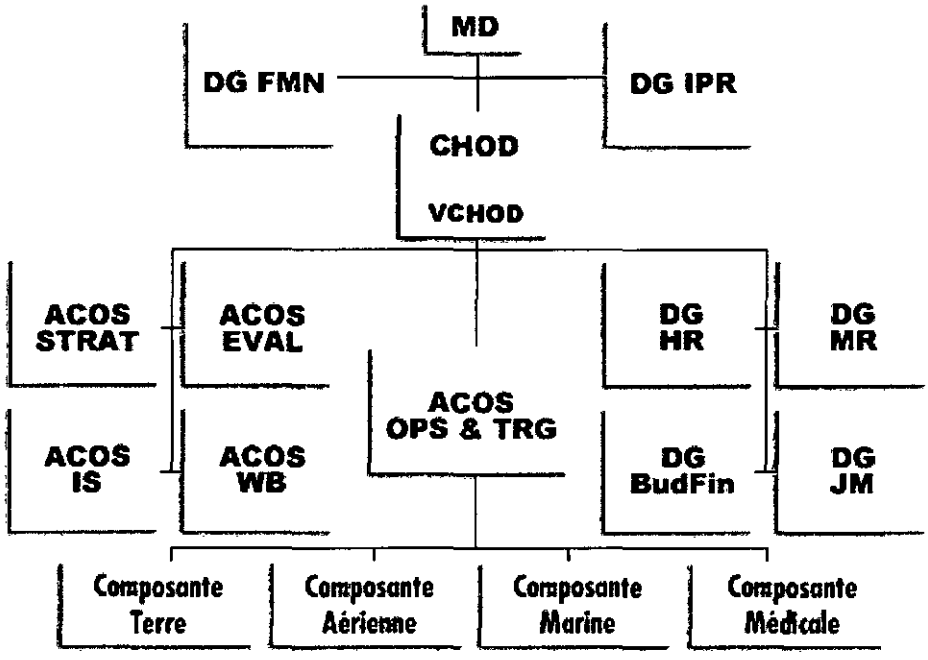
Moreover, the Belgian space budget is almost entirely allocated to the ESA.
Civil and military aspects of space policy are rather disconnected. Even though temporary civil/military committees have been setting up to manage some particular programs such as Helios 2, coordination remains very poor between the two components. Nevertheless, interviews of key actors on both sides show that structural co-ordination could be organised in the eventuality of a Belgian commitment in dual space programs.

Belgian Space Organisation Chart



Military level

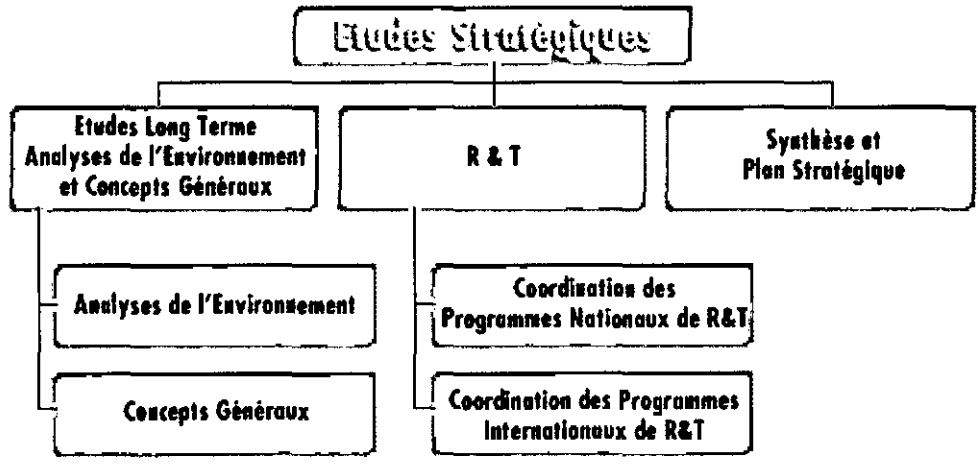
The general structure of the Belgian Army has recently been changed in the frame of the implementation of the strategic plan for the modernisation of the Belgian Armed Forces 2000-2015, which was approved by the Government in May 2000. The new structure is presented on the chart below:



In the frame of the current report, it would be useless to comment this chart *in extenso*. Extensive informations are available on the official website of the Ministry of Defence: www.mil.be.

Regarding space policy, it must be noted that needs are expressed by the different components of the Belgian Army: Ground, Air, Sea and Medical Forces. These components will be the potential users of the informations produced by space intelligence, communication or positioning systems. The needs expressed by components are formalized into a global concept by the Strategy Division. This global concept encompasses all the dimensions required to meet the needs expressed by the components: strategy, technology, finance, human resources. Once the global concept is formalised by ACOS-STRAT, it can be transmit to the political level through the Ministry Private Office.

The following chart shows the Strategy division structure:

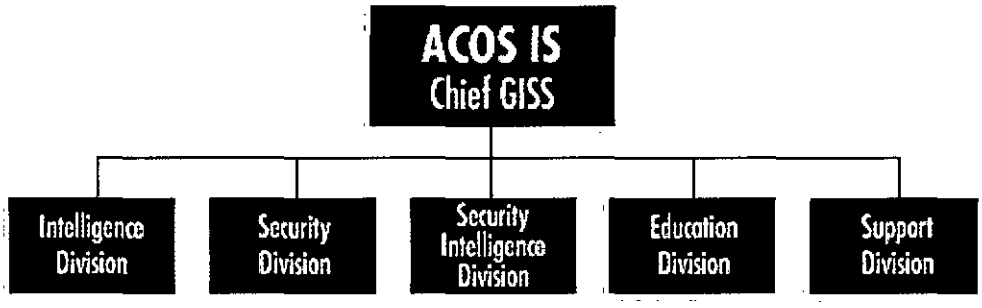


Of course, decisions for material acquisition can also be the result of commitments taken in the frame international organization as NATO or European Union (European Capabilities Action Plan - ECAP).

Nevertheless, the most important decision concerning space strategy results from a demand from intelligence services of the Belgian Army (ACOS-IS in the new structure). It originates in the Central Africa Great Lakes Crises of 1996. At this time, the lack of imagery intelligence (IMINT) caused critical problems to Belgian Army and diplomacy. This powerless feeling was added with bitterness as US intelligence denied access to space imagery of the area. This leads to important decisions aiming to reach a minimal IMINT autonomy:

- Acquisition of a complete up-to-date satellite centre with IMINT competent personal ;
- Decision to step in the French Helios 2 program for 2.5%.

The following chart shows the ACOS-IS structure:



The "Intelligence and Security" staff department is one of the staff departments forming the Defence Staff. The Assistant Chief of Staff for Intelligence and Security (ACOS IS) runs this department. Therefore ACOS IS directly depends on the Chief of Defence (CHOD). He is also the chief of the General Intelligence and Security Service (GISS). His field of competence is intelligence and military security.

The missions of this service are written down in article 11 of the « Organic Law on the Intelligence and Security Services » of 30 November 1998 (Belgian Official Gazette of 18 December 1998). This law appoints the Minister of Defence supervisory authority of the GISS.

The Royal Decree of 21 December 2001 that defines the general structure of the Ministry of Defence and that lays down the attributions of certain authorities, additionally entrusts several other tasks to the Chief of the "Intelligence and Security" staff department.

- He is charged with the organisation of Intelligence and Security support to operations.
- He is qualified for taking care of the foreign Defence Attachés accredited in Belgium, and for the relations with foreign Armed Forces they are accredited for.
- He lays down the regulations related to the classified files of the Armed Forces and enforces them.
- He manages the Defence Attachés and the Military Advisers accredited to the Belgian embassies and legations.

- Without prejudice to the competence of the Director General for Human Resources, he advises the Chief of Defence on the management of the personnel employed in the domain of Intelligence and Security.

For the execution of these missions, the GISS has five subordinate Divisions: Intelligence, Security Intelligence, Security, Education, and Support.
Inside ACOS-IS, the Intelligence Division's role consists in collecting, analysing and exploiting intelligence related to any activity which threatens or could threaten the integrity of the Belgian territory, the military defence plans, the execution of the missions of the Armed Forces, the security of Belgian citizens abroad or any other fundamental interest of the country.
The Intelligence Division is responsible for the collection of strategic and operational intelligence. In this framework, the collection of intelligence is mainly focused on foreign states.
Strategic intelligence contributes to supporting the decision-making process of political and military authorities. The organic law specifies that the GISS shall inform the relevant ministers without any delay and advise the government, at its request, on the definition of its external defence policy. In addition to the Chief of Defence, the "Operations and Training" assistant Chief of Staff and the "Strategy" assistant Chief of Staff, other important authorities or organisations like the Military House of the King, the Prime Minister, the Minister of Defence or the Minister of Foreign Affairs are addressees of the Intelligence reports established by the GISS.

Overall Space Policy

On the civilian side, since the start of the European Space Agency, Belgium has been one of the major investors, taking into account the size of the country. As a matter of fact, Belgium is one of the biggest European investors in space, when considering investments related to GDP. Regarding the ESA budget for the year 2001, Belgium has contributed as high as 3.27% to mandatory activities. This percentage is the result of ESA rules for the calculation of the contribution scale for mandatory activities that represent 18.7% of the total ESA budget. The national contributions to mandatory activities are based on national incomes of Member States.
ESA optional programmes, 77.2% of the total ESA budget, are more indicative of Member states commitment in ESA activities because, in that case, national contributions do not result from a predetermined contribution scale. Belgium, with a 7.95% contribution to ESA optional programmes ranks at the forth place of the highest contributors, just below the three main states that are France (31.15%), Germany (24.25%) and Italy (17.09%) and far above United Kingdom (4.03%). The annual federal budget dedicated to space remains at an average of €150 millions.

Other examples of Belgium's important efforts are:

- the participation in the SPOT observation satellite program in general and its "VEGETATION" application in particular ;
- PROBA, an imagery micro-satellite, launched in 2001, has been developed and managed by a Belgian company.

Some minor but significant bilateral programs are currently running with France and Argentina (radar). Prospective talks are going on with Russia.

Military space strategy

The use of space is one of the principal elements of the Defence Policy of Belgium and of many other nations. Space assets provide – when merged with other means – the civil and military authorities with the essential information needed to conduct an efficient and underpinned Security and Defence Policy and to make informed choices.
The strategic plan for the modernisation of the Belgian Armed Forces, 2000-2015, illustrates this in an explicit way : "The importance of an efficient system for intelligence, for early warning and for situation analysis increases. Advanced telecommunications and observation means delivering information on a permanent basis and in real time, will have a decisive role for the management of modern armed forces."
"The C^4I (Command and Control, Communication, Computers and Intelligence) support of the commanders will be materialised by the participation in a number of projects related to "observation and communication by satellites". Belgium will participate in European programs with the aim of acquiring an autonomous capability for communication and earth observation".
"The acquisition of a strategic intelligence capability, based on the participation in a European satellite capability, and the realisation of information analysis capability" is mentioned as one of the long term investment goals in the modernisation plan.
These policy statements and the support in general for the development of the European Security and Defence, constitute one of the priorities implemented in a consistent and credible way by Belgian Government.
On June 3rd, Belgium inaugurated its Image Interpretation Centre. This centre offers all IMINT capabilities the Torrejon centre can offer and has additional capabilities. Data fusion with data from other sources will allow true intelligence to be generated. This intelligence will be at the disposal of the political and military authorities, the Belgian Armed Forces deployed in operations and other clients.
BEMILSATCOM, the Belgian MoD satellite communication system relies on the use of either commercial satellites as INTELSAT or military satellites as the French SYRACUSE, on which capacity is hired.
With regards to space programs, the following guidance can be derived from the policy stated in the strategic plan 2000-2015:

- exploit to the maximum extent possible the potential offered by "dual-use" assets;
- use space assets smartly in the three domains: earth observation, telecommunications and navigation;
- foster co-operation between European countries and aim at multinational projects.

Due to the size of the country, it is evident that Belgium depends on multinational approach to acquire a significant satellite programming capability. The participation in HELIOS 2, French led, multilateral satellite project, is the most recent example.
The first Helios program is operational since October 1995. It is a tri-national program (France, Italy, Spain) of two observation satellites (Helios 1A and Helios 1B). These satellites carry a high resolution camera and are able to observe a same point every two days. Observations are only possible by day and with favourable weather conditions. Using time sharing rules between the three partners are very complex but globally give satisfaction.
Helios 2 program aims to foster the experience acquired during Helios 1 period. The first satellite, Helios 2A, will be available for launching on March 2004. The total cost of the program was originally estimated at 1 742 millions of Euros but, after the Kosovo war, it was decided to update the resolution to 10 centimetres. This decision leads to an estimated

additional cost of 122 millions of Euros. On 13 July 2001, the Minister of Defence of Belgium announced his decision to participate for 2.5% at Helios 2 program.
The last annual symposium organised by the Belgium Ministry of Defence dealt with "Space Military Strategy" and took place on Wednesday 19 March 2003. This, in addition with the facts and statements mentioned above, shows the commitment of Belgian Government in the field of Space security and its will to participate actively at the building of an European capability in that field.

Industrial Assets

Due to its early and relatively important commitment in ESA programs, Belgium has created the conditions for the development of space know-how and technologies that has produced a highly advanced industrial space sector with Alcatel Bell Space, Alcatel Etca, Alcatel Fabrisys, Newtec Cy, Sabca, Sait Systems, Sonaca, Space Applications Services, Spacebel informatique, Techspace Aéro, Verhaert Design & Development.

	Deliveries			Employment		
	Value 2001 (mio euro)	Value 2002/ 2001 (mio euro)	Volume 2001/2000	2001	2002	2002/ 2001
Aeronautics & space Defense & security	1.462	1.309	-9,8%	8.500	8.455	-2,5%
Total industry	48.543	46.614	-5,1%	243.400	238.245	-3,8%
Total technological industry	66.143	62.914	-6,3%	301.300	296.043	-2,8%

Source: Agoria

Nevertheless, the industrial and technological know-how developed during the last decades is still very vulnerable to conjuncture slow down. Belgospace, the Belgian federation of aerospace industry, express concerns about its future in a memorandum published recently. Industrials note that Europe has to move quickly to catch up with the United States, otherwise it will be subject to a United States monopoly as is the case with GPS (Global Positioning System). This would have serious economic consequences.
Although it has not proven possible to conclude a political agreement among the various countries in terms of integration in the fields of aeronautics, space and defence, there has been a wave of mergers at the industrial level; for example, Alcatel-Thomson/Aerospatiale (satellites), Matra/Aerospatiale (launchers), DASA/Alenia, and others. The large countries unquestionably play a dominant role, and there are genuine risks of seeing two blocs emerge: large countries/ small countries and prime contractors/suppliers.
This trend is borne out in particular by the overwhelming importance which the major countries continue to attach to their national programmes and their captive domestic market in order to protect their own industry.
Belgospace note that the European Union can provide substantial support in the management of space and its applications through the European Space Agency. For exemple, by:

- making space part of a broader technological vision (the Single Act);
- creating new markets;

- exerting a normative influence on the allocation of frequencies, the granting of licenses, and so forth.

Based on these observations, Belgospace believes it is in a position to formulate a number of proposals which can make a positive contribution to strengthening the Belgian position in the space sector.

Focusing strategic political choices on four central points:

- continuing to strengthen positions acquired with difficulty (launchers, energy systems, telecommunications equipment, etc.);
- supporting market-oriented applications which yield a stream of products (telecommunications, multimedia, navigation systems, earth observation system);
- scientific research;
- and space infrastructure for conducting experiments.

Finally, Belgospace calls for a structure must be created in which the various participants (Defence, Transport, External Affairs and others) could meet, the goal being to carry out a joint policy and use the limited financial resources in an optimal manner.

Considerations

As shown by its long lasting and unambiguous commitment in the European space policy as well as in ESDP, Belgium will certainly be an active and loyal partner in any attempt of enhancing European Space and Security Policy. Due its size and to narrow budgetary margins, however, it would be unwise to expect Belgium to assume any kind of leading role in such an attempt.

- On the conceptual side, a wide and open minded concept of security paving the way to dual programs seems to be an attractive answer to lots of institutional and financials dilemmas, both for civil and military actors.
- On the institutional side, it is well known that since the very beginning of European integration, Belgium has always expressed its preference for the communitarian decision process against the intergovernmental one. Of course, this particular attitude is due to its small size. But interest is certainly not the only cause of it. The European attitude of Belgium is, above all, due to deep European convictions that are shared by the whole spectrum of the Belgian political society so that Europe has never been a political issue in Belgium.

As a consequence, it seems reasonable to expect Belgium to participate to any initiative that could lead to a space and security policy in Europe providing that:

- the cost does not exceed its contributing capacity;
- the decision process and the management of the program is fairly balanced between big and small countries;
- the industrial specificities of all the partners are taken into account.

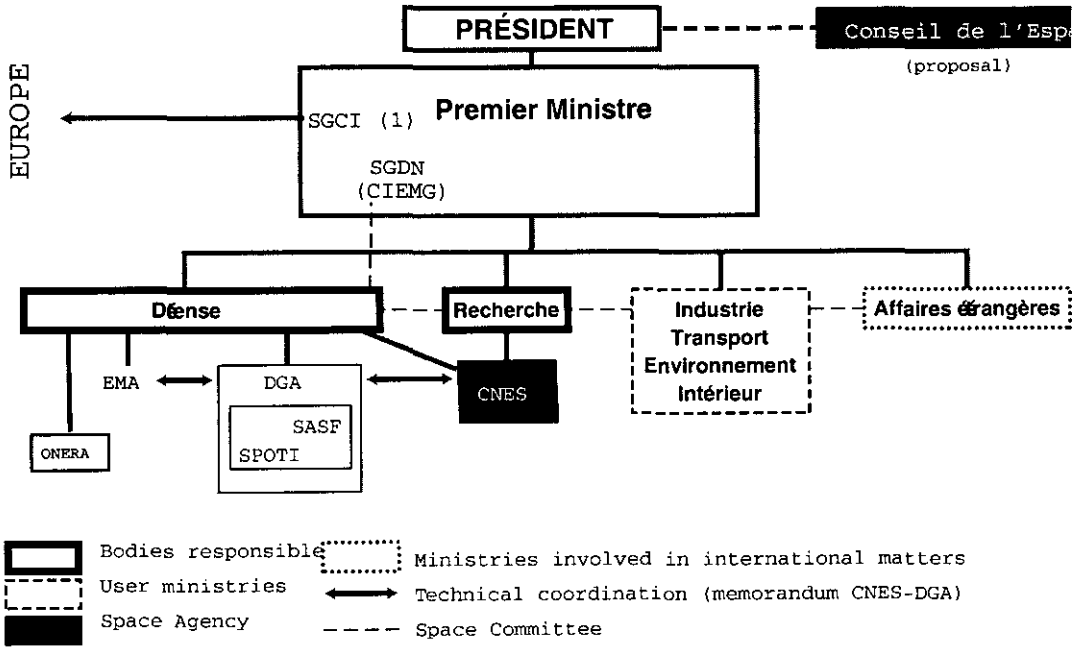
FRANCE

Presentation of the main actors

As a major actor in space European policy since the beginning of national and European programs, France has developed a large capability in the field of civilian, military and dual use activities. This experience has first involved civilian actors then military ones with the decision of developing Hélios reconnaissance program in the middle of the eighties. If the civilian expertise has been developed earlier, it is noticeable that today after more than 10 years of experience, the military side has also acquired his own competence.

If we consider the political and administrative organisation of space activities in France, we can easily identify the key players at the administrative level and give a first hierarchy of the technical bodies with their own particularities.
As far as the political level is concerned, the first point is the major role of the 2 ministries in charge of space from the civilian and the military point of view. The role of the others ministries is mainly due to their user's nature but as space is more and more considered for its efficiency in the management of large fields of activities, this posture may give them a growing influence.

The schema shown below gives a global vision, even if static, of the different actors in the French space policy related to their status in the decision making process.



(1) kind of interministerial comittee, contribute to the elaboration of french propos

ORGANIZATION CHART OF FRENCH SPACE POLICY

The French space agency (CNES) plays a major role due to its implication in the achievement of the civilian and military programs. Both the Ministry of Research and the Ministry of Defense have the political responsibility of CNES management. However the weight of the past and the existence of the "Délégation Générale à l'Armement[23]" (DGA) contribute to the mainly civil image of CNES[24].

On the military side, DGA has in France a very specific role. Responsible of the whole armaments programs, this body has a very high level of expertise and may represent the Minister of Defense at the level of technical cooperation. Furthermore, the "ingénieurs de l'armement"[25] have a special competence in the field of management of industrial programs. For a long time DGA has had its own industrial basis on a quite large scale even if the phenomenon is declining today.
Compared to CNES, DGA offered less specific experience in space matters but has always had stronger relationship with the aerospace companies especially the ones issued from defense domains... Today, DGA has its own expertise. Space issues are considered by two instances : the SASF[26] inside the "Direction des Systèmes de forces et de la Prospective" (DSP) and the SPOTI[27] inside the "services des programs[28]".
The competence in the field of scientific research is also a reality. Many laboratories receive a significant financial support from DGA[29] and Ecole polytechnique a very famous engineering school in France - from which many space engineers are coming from - belongs to the Ministry of Defense and is under the supervision of the DGA.

The existence of ONERA, "Office National d'Etudes et de Recherches Aérospatiales", is a good illustration of fundamental and applied research competence in the Defense sector. The cooperation between CNES and ONERA is far from negligible especially in the field of aerodynamic and optic.

The "Etat-Major des Armées[30]" has a complementary role. It is mainly linked to its operational expertise and its implication is decisive in terms of requirements for space systems.

Decision making process

A first remark has to be made considering the "internal" decision making process, linked to the French national space activities, and the "external" one in relation to the French European space policy. Depending on these different points of views, the role of some ministers, especially the one of "Affaires étrangères" may differ.

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[23] Armament Procurement Agency
[24] The "military" presence in CNES is formal with the existence of a representative of "Etat-Major des Armées" (EMA) as the military advisor of the Président and more informal with the growing number of high level CNES managers issued of DGA
[25] this is the title of the graduates of Ecole Polytechnique who has passed DGA entrance exam
[26] « Service des Architectes de Systèmes de Forces »
[27] « Service Pour Observation, Télécommunications et Information »
[28] The "services de programs" is at the interface of two main directions : DSP "Direction des Systèmes de forces et de la Prospective" and DPM, « Direction des Programs, des Méthodes d'acquisition et de la qualité »
[29] The "military" presence is both formal with a representative of Etat-Major des Armées (EMA) as the military advisor and also informal with the growing number of high level CNES managers issued from DGA
[30] Joint Staff

Ministries

At the political level, the role of the ministries in space matters may be considered according to three main axes: supervision competence, user and customer needs, activity linked to external dimension (cooperation, exportation...). By the way, and as it can be seen in the organization chart, the lack of a strong interministerial body under a clear presidency appear as a main problem in French space policy decision making. This point is underlined in the report of Sénateur Revol produced in 2001 as well as in the more recent report of the "commission de réflexion sur la politique spatiale" conducted by Roger Bonnet[31] who suggests a kind of space council headed by the Président de la République.

- *Supervisors*

Due to the dual use of space systems, the responsibility of space activities is shared by two ministries with different political influence which may cause some problems of hierarchical management... In the recent press conferences, a special accent has been put on the benefit of closer cooperation[32].
On the civilian side, the ministerial body in charge of space may differ. In the course of time, space has been under the supervision of the Ministry of Industry as well as the Ministry of Telecommunications and the Ministry of Education (including Research) or Ministry of Technology and Research. At that time, space depends to the "Ministre délégué" in charge of Research and New Technologies which is part of the Ministère de la jeunesse, de l'éducation nationale et de la recherche[33].
On the military side, the Ministry of Defense develops its own programmatic inside the framework of the PPSM ("Plan Pluriannuel du Spatial Militaire") and has a financial contribution to the CNES budget linked to its dual use programs.
Some others ministries take more and more part in the definition and financing of space programs. The Ministry of Transport, managing both navigation and meteorological matters, can be taken as a good example of this new situation especially in the new European context.

- *Users and customers*

This category includes many ministries with specific priorities like the Ministry of Transport (navigation and meteo), the Ministry of Industry (telecommunication), the Ministry of Environment (Earth observation) and the Ministry of Interior (security tools).
Their specific role evolved in the recent years. In telecommunication, the ministerial approach is relatively declining with the privatisation of this domain while in navigation and environment matters the investment of the ministries is growing up.
The challenge today is the harmonisation of the approaches by sector as well as a more bottom up procedure in the definition of space systems by the traditional technical actors like CNES or DGA to a less extent.

- *Foreign relation*

The Ministry of Foreign Affairs has, of course, the responsibility of the international dimension of space activities. Cooperation as well as exportations represents the main axis of its approach.
To this respect, one can note the role of the SGDN ("Secrétariat Général de la Défense Nationale") belonging to the First Minister services. SGDN is in charge of the authorisation procedure for exportation of sensitive systems which include some part of space systems

[31] see www.recherche.gouv.fr/discours/2003/rapportcnes.pdf
[32] April 15, 2003 see www.recherche.gouv.fr/discours/2003/dpolspatiale.htm
[33] see www.recherche.gouv.fr/ministre/attrib.htm

(sensors, transponders, electronic components...). Its mission gives rise to a formal procedure of coordination with the Ministry of Defense and the Ministry of Foreign Affairs.
In the European space policy, these aspects have an increasing role as security issues are more and more taken into consideration. For instance, the representatives of the Ministry of Foreign Affairs are present both in the ESA instances (with CNES) and in the Joint Space Advisory Group[34] with representatives of the Ministry of Research[35].

French specificities in relation with the development of military space

Nowadays, French actors in the military space domain have to face several key questions that will have to be answered unambiguously if space is to become an important component of any European collective defensive endeavour. These issues can be divided into two categories: One dealing with the French national organisation and policy at the military and civilian level; the other involving the Franco-European relationship evolution.

Despite a role that is commonly viewed as pre-eminent in Europe, space applications cannot be considered as having a key role from the internal French military perspective yet. Even if some attention has traditionally been devoted to space programs in France, in conjunction with the success stories of SPOT or Ariane, they haven't enjoyed a priority status over, say, transport capabilities or other armaments programs in the military field. Several explanations can be given to this situation:

The issue of the military requirements, structure and budget

For a large part of the uniformed military, space assets haven't proved to be the best suited tool to fulfil the forecasted operational requirements for a country like France. Space has regularly been put in perspective with realistic resources models for the future and specific military organization and needs derived from the evaluation of the threat. Developing space military capabilities beyond this line is not considered as a priority, judging by the recent budgetary evolution.

Issue of operational requirements

For years now, it is widely accepted that French military forces will be used in coordination with other allied armed forces, either in the framework of the NATO alliance, or/and in the framework of the future European forces or in side ad hoc coalitions. In such a context, the multiplicity of the military tools that will be at the disposal of any coalition, (especially in the case where the United States are part of it) will allow any of the armed forces involved in the conflict to benefit from a pool of means for mission planning or for the telecommunications needs. It is only recognized that a limited capability linked to a necessary autonomy in the intelligence of in the telecommunication domain must be kept as a minimum requirement. Moreover, using space on a large scale is widely considered as implying a global political and military ambition that nor France, neither any other European country envision today. In other terms, many military argue that France has military requirements that focus on a legitimate European centred security and defense policy, which deals with proximate threats rather than with global threats. At last, space applications remained considered as injecting large doses of high technology in the military system with consequences (technical and organizational and doctrinal) that remain to be understood and assess. As a consequence, the French armed

[34] coordinative body between ESA and European Union
[35] at this level CNES acts as an advisor

forces put the priority on more conventional logistics and military equipment that would be needed to fulfil the "Petersberg tasks"-like missions.

Budget issues

In this perspective, space cannot appear to be a major axis of investment beyond the continuing of the sufficient capability level that consists in intelligence gathering (Helios follow-on) and a hardcore telecommunications (Syracuse III) autonomy. This is reflected for example in the current "Drone versus Satellite" debate that has developed in the military circles in France about interest of using space more largely at the tactical level. Last but not least, this is also reflected in the structure of the French military budgetary process that don't make space a part of an armed service but that leaves it as budget line under no service responsibility. As a result, it is well known that space programs regularly lacks the support other programs such as fighters planes, tanks or aircraft carriers enjoy. The only other example of a "service-budget" free program is the nuclear deterrence which is obviously politically highly protected with a locked budget. In this process indeed, space appear most often as the "adjustment variable" and will inevitably, almost mechanically, be first in line to suffer any budgetary restriction.

In brief, the key notion here remains for France to be able to build a coherent approach at the European level that provides sufficient autonomy to any European military endeavour both without building unnecessary new military tools that may duplicate those existing through NATO for example, but also without giving up completely the military type of capability that remain at the heart of the national sovereignty as seen from the French perspective.

An increasing role for the dual technologies

The evolving relationship between military and civilian space is also an important structuring factor that is taken into account in any reflection on the future of military space. Considering the military reticence to invest too heavily in this field, the dual-use program perspective has been given new considerations at the national level.

An example of a possible synergy

The Pléiades program provides quite a significant example in this respect. Pléiades which is designed by CNES, the French space agency, as the future civilian French earth observation program based on the use of two small platforms, is clearly seen today as an opportunity for the national security users even if Pléiades has as a prime objective to be the successor system of the SPOT serie with the traditional objectives and constraints attached to such systems. Even more than that, the Franco-Italian agreement signed in January 2001 about phasing of the French program Pléiades and the Italian high resolution radar program Skymed-Cosmo has oriented this program towards a greater international cooperation phase. Pléiades is commonly accepted as presenting potential interest also for military purpose, especially in the framework of a nascent European military force. From the military point of view, these kind of undertakings are now seen as complementary to the Helios program that will remain the corner stone of the French strategic observation capabilities. Even if Pléïades-Cosmo will play an adjunct role in the military intelligence gathering activity, it is interesting to note that this program is marking a true departure from past practices that were prohibiting any military related activity to rely on civilian or, more on civilian and (partly) on a foreign technical contribution.

A perspective that may suit the military needs

In the same time, using civilian programs may be seen as a « cheap » way to provide consistency to the political and technical effort of building such a force from the part of a nation that has not decided to put space at the forefront of its military effort. As such, envisioning dual-use programs appears to be in full line with the military thinking described earlier: it may both help to downsize the level of military investment in a constrained budgetary context, while providing military significant capabilities in most of the typical conflictual scenarios that orient now the French military thinking and the associated doctrines

In this logic, new capabilities in remote sensing or in the telecommunication field appearing on the civilian "market" are mainly viewed as positive factors which help enlarge the national security use opportunities without competing for core missions embodied in the national armed forces which use dedicated systems by necessity. Still, any balance between the civilian and the dedicated military capabilities will have to rely on a clear view of the operational requirements and on the level of dependency France, both at the national level and in connection with the CFSP, whatever its form, is ready to give in to space techniques.

- Below the level of an estimated "sufficient strategic capability", which depends of course on the nature of the operational requirements (specific threat assessment, resources, doctrines, war fighting techniques, etc), national dedicated military systems will remain the rule (this is the case for Helios II of Syracuse III for example).

- Beyond this level, any new commercial or civilian, or dual type system can be seen as an opportunity to flesh out a on-going European military structure, in complement to the more classical sharing of national military programs.

The National-European level relationship issue

As previously said, the relationship with the European level has become a keyword for the French Defense planners. No military system today can be designed without being thought in connection with both the collective missions and the collective military means Europe will give itself in the years to come. This is particularly true for the space programs, given their cost and the particular ability to work on a so-called interoperable basis. These programs, especially as they deal with future information technology systems, have to do with integrated communications architecture, both at the European and at the global level.

A narrow path

From the French military point of view, this makes space a specifically important factor for future national military planning that must be considered in a very cautious manner with a double constraint to fulfil the national needs according to this « sufficient strategic capability » criteria, while being in the same time able to interoperate with (at best) or be complementary to (at least) existing or planned systems, both in the civilian and the military field. In the civilian area, this may prove a good basis for the intended architecture in such programs as GMES which require a world system to address truly global environmental issues, as already pointed out in a number of Multilateral Environment Agreements - MEA (Kyoto protocol, Vienna convention, etc).

National military systems designed both to become regional resources usable for some level of military action and to play a complementary role in a larger military architecture will appear more and more as a key element in programmatic decisions. For France, this logic naturally fits in the NATO-ESDP architecture issue as demonstrated by the Syracuse III-NATO satcom possible co-evolution. It could also solve more concrete and relatively short term problems experienced by coalition military operations by making existing national systems to fit with strategic or operational common needs. Again, at this level, French space policy must follow a very narrow path (as in the case of Satcoms for example especially in terms of frequency use and management), and at the European level, France, with all the member states involved, will have to make sure that undertakings as *Galileo* for example also fulfil these kind of needs.

Meaning of the BOC: an example of "enhanced cooperations" concept ?

The BOC concept (*Besoin Opérationnel Commun* or Common Operational Requirements) is widely viewed as a good first step to overwhelm this difficulty. The BOC, which consists in a document co-signed by 5 European countries about the future military needs in the field of Earth Observation, may be considered as an attempt to make the notion of cooperation more substantial by giving it a operational content. Involving the operational military levels in the early stage of cooperation, this document intends to break with the habit of a space cooperation that is usually based on cost sharing with a various degree of involvement in the designing of the program. The BOC document aims at leading towards a real second generation system based on this previous agreement, hopefully easing a political common support in the concerned countries. This BOC agreement could show that bottom-up kind of approaches may be workable, for example in the perspective of possible "enhanced cooperations".

In spite of these new perspectives, the notion of sovereignty remains a leading component of any military planning in France and raises the issue of a possible acceptance at the national level of a program with military implications conceived at the European level. It is particularly true with the Galileo program that now have to secure the support of the national Ministries of Defense, including the French one. Progress must be made at this level to convince the military to pay for their part in a program they were not part from and which remains a civilian program run for a number of different purposes. More over, it is felt that too much military implication in a European program may endanger the political will to support these programs at the European level.

Considerations

National military space

The French approach towards a national military space activity is characterized both by historical and institutional specificities:

Historically, French military space stems from:

- High value attached to political sovereignty and military autonomy since the end of the 2nd World War and the departure from NATO structures. Space has rapidly been recognized as a part.

- The consecutive development of a space activity essentially based on a launcher construction effort and an earth observation orbital capability.

Institutionally, the place of space in the armed forces has been dubious in the context of a dominant "nuclear" oriented doctrine. This comes from the particular French nuclear doctrine that was tailored to its regional role with a priority given to the Defense of the territory in the context of limited financial resources. In this logic, space wasn't perceived as an integral part of the nuclear doctrine, as it was in the U.S. and in Soviet Union.

Three consequences must be mentioned:

- No individual armed force has the responsibility of space developments. As a consequence, space has never been a domain of choice for any of them.
- Space has no reserved resource in the budget. Quite often, space budget plays the role of the adjustment variable, unlike the nuclear activity which is politically secured.
- As military space was not the core of the military strategy, and as it was politically supported in the meantime as an element of France international role, the dual nature of space systems has been strongly pushed.

European security space approach

The French attitude towards a European security space system directly stems from this perception of the role of space.

- A vision based on national experiences

The European effort in security space must contribute to the political autonomy of Europe.

- In France, military space has been first conceived as a political, diplomatic and strategic tool that explains why intelligence satellites and access to space have been prioritized.
- Earth observing systems are considered as an immediate priority and as the current legacy systems. This explains the BOC initiative (*BesoinsOpérationnels Communs, Common Operational Requirements*) that has been initiated under the auspices of France and Germany Defense ministries and signed by six countries up to now.
- A taste for optimisation
  - o As contributors to the European technological and political autonomy; the Galileo and GMES initiatives are strongly supported by the French authorities. In the same time, these initiatives are perceived as good examples of the added-value of potentially dual-use technologies in the context of a new European security concept.
  - o European security developments would reinforce the power of the European industry. Future security space programs could complement a limited civilian space activity while preserving the technological base and the know-how of the European aerospace industry.

Interviews :

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Daniel Gavoty, EMA espace
Joël Hamelin, CSTI
Benoît Hancart, DGA
Emmanuel Lempert, GPE
Gilles Maquet, EADS
Bernard Molard, Alcatel Space
Philippe Munier, SpotImage
Serge Plattard, CNES,
Mathieu Weiss, Arianespace

GERMANY

Historical overview

The debate about a new, comprehensive European space programme in the early 1980s made obvious that space policy – next to research and industrial policy – was becoming an increasingly important aspect of foreign and security policy. As ESA tried to establish Europe as a major player in space next to the US and the Soviet Union, the lacking of an independent space based earth observation system for security purposes was recognised – first by France, very soon also by Western Germany. The necessary technical skill in building such a system, which would also be essential to gain autonomy in this strategically important field, was available in Europe.
The two superpowers had already launched approximately 2300 military satellites, when France pushed the idea of a French-led European earth observation system and invited Germany to participate in this enterprise. As earlier in European space history, the French government initialised a new policy and chose Germany as a natural partner – both for technological and financial reasons. This partnership revitalized Franco-German cooperation in military affairs, as established by the Élysée treaty in 1963 - a clause, which had been sleeping for 20 years. The political impact of this issue was discussed controversially in German politics and by the public, mainly because the US and the Soviet Union had only recently begun a race to place weapon systems in space.
The negotiations between France and Germany began in 1983 on undersecretary of state level. For a long time, the German government had seen its needs fulfilled by receiving global earth observation information from the US – at least when considering the costs for individual efforts in this field. But, as seen during the SDI-debates, the European and American threat perceptions began to differ and the access to detailed and continuous global information in real time became essential for an independent decision-making progress.
In discussing a Franco-German earth observation satellite, which was introduced by the French side in 1982 as "Satellite Militaire de Reconnaissance Optique" (SAMROS), the interests of the still divided Germany lay mainly with the observation of central Europe and troop movements. Furthermore, Foreign Minister Hans-Dietrich Genscher strove to get an instrument for the verification of arms reduction treaties, seeking an independent – and stronger –position during the Geneva talks. In contrast to the French suggestion of an optical device, a radar-operating satellite, independent of weather and daylight, would have been the ideal configuration for the Germans. The German space industry could have handled this challenge, especially Dornier Systems, where the first ESA satellite for civil earth observation (ERS-1) had been constructed.
Even though all parties in the German parliament supported the idea of an earth observing satellite in general, the question arose very soon, whether such a dual programme (a French optical and a German radar satellite) with estimated costs of nearly 2 Billion Euro[36] would be really necessary to meet German security needs. On the one hand, Chancellor Helmut Kohl understood President François Mitterrand's interest in building this system and supported it at the very top level of bilateral negotiations. On the other hand, the American government became more and more irritated by the Franco-German efforts and intervened, to preserve their strategy of global information dominance. Even though Kohl decided that the Americans should not determine the German decision-making progress, differences between the Foreign and the Defence Ministry about the responsibility, the configuration and the use of an

[36] See DORNIER: Memorandum zur Erdbeobachtung aus dem Weltall, Friedrichshafen, October 1982.

individual system, as much as the problem of funding it, lead to the failure of the proposal in November 1985. The French then decided to build their optical system HELIOS with the cooperation of Italy (14%) and Spain (5%) only.
For the moment, an earth observing satellite was not lacking for German security policy. Even though there had been continuing discussions about this issue at lower levels of the administration, there would not have been any budget to bring it into effect - especially not after the unification of both German states in 1990. In this phase, not only the German defence budget was reduced massively, but also the budget for space research and development, mostly due to the high costs of getting over the separation (see table I).
The need for a reorientation of national security policy and its instruments was painfully recognised during the Balkan Wars of the 1990s, when the European states were unable to protect peace in their own neighbourhood without the help of the US. European decision-makers began to consider a new and wider understanding of security, "that covers the entire new threat of life-circumstances in Europe"[37] In this course, German unification generated new expectations about a German role in international conflict prevention and peace-keeping missions, something the Bundeswehr was hardly prepared for. Even though money was short, earth observation was seen as an essential instrument to cope with those modern security challenges, for supporting peace operations as well as strike missions. But American data was not always available, at least not in the extent and detail needed.
As of 1993, France and Germany held negotiations about a bilateral earth observation system for security purposes. This time, Germany not only was the best of all partners for France, but France, with its advanced know-how of optical systems (and its slightly waning enthusiasm for the International Space Station), was also seen by Germany as the ideal partner to put its interests into action - in military earth observation and the welding of continuing European support of the ISS. In contrast, Germany could have reached only a junior-partnership in earth observation with the USA. Great Britain had similar technical expertise in SAR and, because of its *special relationship* with the US, only minor interest in cooperation. Russia, finally, would not have been a stable partner, for financial and political reasons.
Again, Paris and Bonn discussed a two-satellite-system: The French HELIOS II (optical) and the German HORUS (radar) with estimated costs of about 3 Billion Euro.[38] And again, the decision-making process in Germany did not progress well. On the one hand, it would have been problematic to put the Ministry of Defence in charge of the project, if questions not just of military earth observation but of security in general were a focus of the programme. On the other hand, the Foreign Ministry with its responsibility for security policy neither had the budget nor the institutional prerequisites for the management of complex technical systems. The same was true for the German intelligence service, the *Bundesnachrichtendienst*, which after unification had been in a complicated progress of reorientation, reorganisation and personal decline.[39] Adding to these open political questions inside the German government, the USA – again – tried to intervene, this time by offering an observation system for sale, getting cheaper every day. That unsettled the Minister of Defence, whose budget slid into a notorious financial crisis. In the end, all potential users of HELIOS II / HORUS had lost interest – also because of a French decision to reduce their share in the bilateral antitank helicopter TIGER. After a short high, the German part of the programme failed in 1997.

[37] DGAP: Beobachtungssatelliten für Europa. Bericht einer Expertengruppe, Bonn 1990, p. 81.
[38] See DASA: Beobachtungssatelliten-System – konzeptionelle Ansätze, Handout zum DGAP Workshop, Bonn, September 24th, 1994.
[39] See BECHER, Klaus u. KAISER, Karl: Außen- und sicherheitspolitische Aspekte einer satellitengestützten Beobachtung im Rahmen eines europäischen/internationalen Krisenmanagements, Bonn, Dezember 1992, p. 13.

Founding and prioritisation of space policy

After the unification and the end of the Cold War, the German government had to reconsider its space programmes – just like other high cost international involvements. After 1993, the space budget was reduced in a massive scale, for the first time in German history (see table I). As of now, even though figures are stable since the beginning of the new millennium, the budget's real growth rate is not increasing, and probably will not under the current government.

Despite the budgetary restrictions, the basic premise for a continuous engagement in space science and technology survived the change of government in 1998: Space flight is seen as promoting new discoveries, as opening up of new technological applications, as making innovative services possible, as supporting international cooperation and finally as improving the possibility of global weapon reduction and security policy. Due to this perception, its expenditure covers a high level of 16 percent of the R&D budget of the Ministry of Education and Research (BMBF), nearly 10 percent of the entire federal budget for R&D and about 0.5 percent of the federal budget in total. Until now, the Ministry of Education and Research financed about 99 percent of all the expenditure for space flight. Other departments supported only a few programmes like METEOSAT (meteorology) or KOPERNIKUS (communication). The funding of GALILEO will change this pattern, the programme being under the custody of the Ministry of Transportation.

By far the most important framework for Germany's space flight programmes is ESA. 67 percent of the federal space flight budget is linked to the Agency, the highest amount as compared to the large member states. With 25 percent of ESA's compulsory programme, Germany also contributes the highest national share. In total, the German expenditure for ESA is only second after that of France, although the entire French space budget is more than twice as high as Germany's.

At the centre of German interest remain extraterrestrial basic research and the outstanding engagement in human space flight, but with the establishment of ERS-1 and ERS-2, ENVISAT and – later – METOP, Germany also proved its great skills in the field of global earth observation. With the decision for GALILEO, the field of communication and navigation will reach a new peak – areas that had not been continuously supported before. The commercialisation of space applications is more and more desirable, given the dwindling federal funding. Since 1997 Ministry of Education and Research has supported enduringly concepts like PPP, "design to budget" and others, aiming at a more effective transfer of technologies. With this, the administration was not always on friendly terms with France, as seen during the current negotiations about GALILEO and ARIANE-5 PLUS.

Table 1 - Federal expenditure for space in Germany, 1990-2003

Year	Expenditure				Share of the overall federal Expenditure for R&D in percent
	National (in Mill. DM)	European (in Mill. DM)	Ratio	Expenditure in sum (in Mill. DM)	
1990	549,3	838,8	0,7:1	1.388,1	9,1
1991	575,8	964,3	0,6:1	1.540,1	9,1
1992	612,5	1.173,0	0,5:1	1.785,5	10,3
1993	615,1	1.188,4	0,5:1	1.803,5	10,7
1994	581,3	1.040,8	0,6:1	1.622,1	9,9
1995	490,5	1.091,6	0,4:1	1.582,1	10,5
1996	516,7	1.034,0	0,5:1	1.550,7	9,3
1997	450,6	998,5	0,5:1	1.449,1	9,0
1998	462,7	967,0	0,5:1	1.429,7	8,9
1999	491,7	969,3	0,5:1	1.461,0	9,1
2000	491,1	985,0	0,5:1	1.476,3	9,0
2001	498,1	1.029,9	0,5:1	1.528,3	8,6
2002	507,1	1.040,1	0,5:1	1.598,9	8,7
2003	506,0	1.098,7	0,5:1	1.604,7	N.N.

Source: Various Bundesforschungsberichte; Faktenberichte zu den Bundesforschungsberichten; BMBF: Press Release, 18. June 2002; own calculations; for a better overview all figures are given in DM (1 DM = 0,51129 Euro).

Table 2 - German Space Flight Programme, 2001-2004

Programmes	**Volume**
German Space Flight Programme	4.09 Bill. Euro (3.59 Bill. Euro from Ministry of Education and Research)
International Space Station (ISS)	902 Mill. Euro
Earth Observation incl. Meteorology	716 Mill. Euro
Extraterrestric	571 Mill. Euro
Launcher	530 Mill. Euro
Communication / Navigation	252 Mill. Euro
Microgravity Research	210 Mill. Euro
Space Flight Technology	159 Mill. Euro
Management	227 Mill. Euro

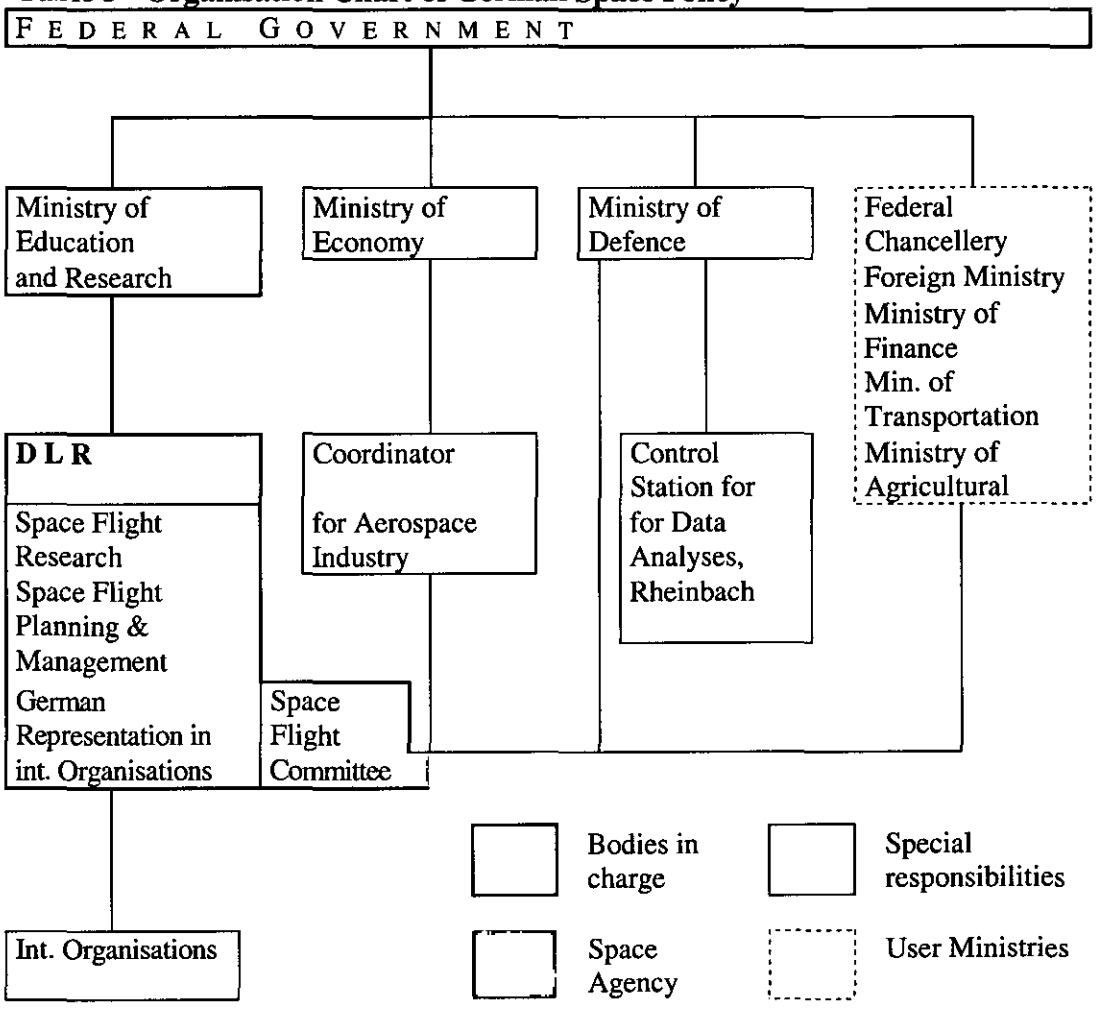
Source: BMBF: Faktenbericht Forschung 2002, Bonn 2002, p. 246; http://www.bmbf.de/pub/faktenbericht_forschung_2002.pdf.

Space flight management

In 1997, the German Space Agency (Deutsche Agentur für Raumfahrtanwendungen, DARA), with about 260 employees, was integrated into the German Centre for Aviation and Space Flight (Deutsches Zentrum für Luft und Raumfahrt, DLR), a federal research centre. DARA was outsourced as an independent management organisation of private law and equipped with

sovereign rights in 1989, under the impression of a growing German involvement in international space flight affairs. An example was the Long Term Programme of ESA. DARA, However, suffered from internal problems to concentrate high level competence in its top management and – even more importantly – lacked the support of the potential user ministries, which were less inclined to use space systems for their concerns. The goal to concentrate all federal space flight activities and interests in one strong agency hence failed.

Table 3 - Organisation Chart of German Space Policy



Management synergies as demanded by ESA's Toulouse decisions of 1995 were then reached with the merger of DARA and DLR.[40] Since 1997, the new DLR consists of two connected directories for space flight management of the former DARA and for R&D, technology and general management of the former DLR (see table IV). Next to them, a "Space Flight Committee" with one member from each space engaged ministry was set up within DLR.[41] Its task is to specify guidelines for space activities and to control their realisation. Furthermore, it debates the long-term space flight planning of the DLR board of directors and controls the centre's neutrality in this process.[42]

With 4.500 employees at 8 sites with 30 institutes and a budget of about 350 Million Euros, the enlarged DLR is an effective centre of competence for the realisation of German aviation

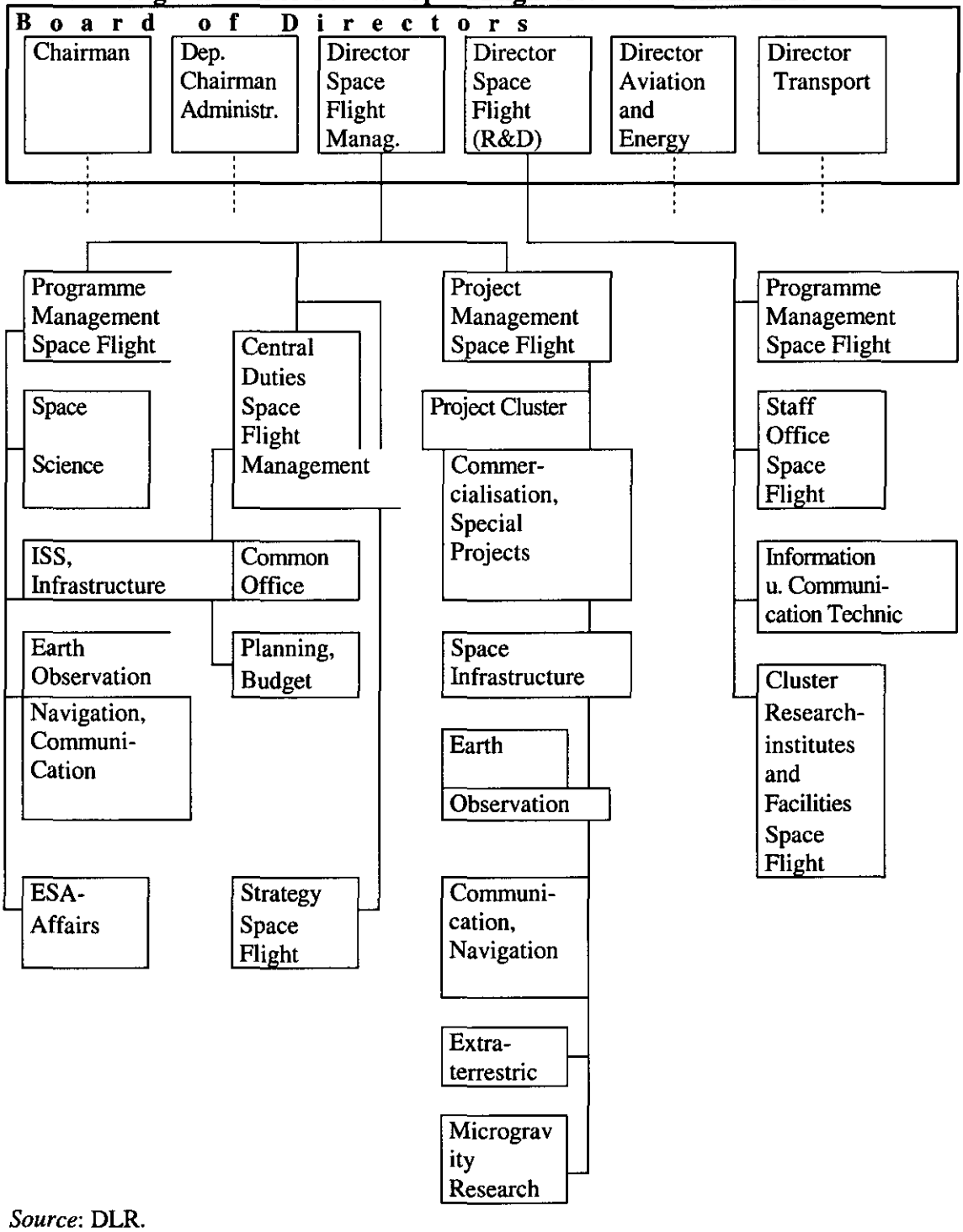
[40] See BMBF: Press Release, July 2nd, 1997 and Oktober 1st, 1997.

[41] During the 14th session of parliament (1998-2002) that had been the Ministries of Education and Research, of Foreign Affairs, of Transport, of Economy, of Agricultural, of Defence, of Finance and the Federal Chancellery.

[42] See DLR-Statute, §§ 16 and 17.

and space flight policies. But beyond its efforts, the growing competition with the dominating American space sector must lead to an even stronger cooperation of the seven national European space agencies, forming a network for the better coordination of the national space flight programmes and the flanking of the merger progress of European space industries.

Table 4 - Organisation of German Space Flight Activities within DLR



Source: DLR.

Importance of the space sector in the military

The end of the Cold War heralded the end of the menace of nuclear confrontation in central Europe and the compulsion of a fundamental reorientation of the shrunken German military that, unlike other European armies, in the past was laid out mainly for the defence of NATO's eastern border, especially the West German territory. Therefore, the use of long-range telecommunications systems never was planned – with the exception of the navy. New missions like those in Cambodia, Somalia but also on the Balkans gave evidence of a new, greatly expanded role of the Bundeswehr in international crisis management.
As a first step to upgrade its capabilities for military operations in the international framework on a global scale, the Bundeswehr had to improve its communications systems. The German military bought customary mobile ground stations, propped up by commercial communication satellites. But when the project of a system together with France and Great Britain (TRIMILSATCOM) failed, ND SatCom started the development of a satellite communications network for the German military, as a mid-term solution, in July 1999. Meanwhile, the DLR consulted the Ministry of Defence and the Federal Office for Defence Technology and Procurement about the management and technical configuration of that new system. Until today, SATCOMBW in its first phase has covered the delivery of 30 mobile and fixed satellite ground stations (14 multi-channel, 26 single-channel) for crisis-reaction forces. Long-term contracts with civilian and military satellite operators (Inmarsat, Eutelsat, Intelsat) meet the demand for satellite transmission capacities. In the long run, a German geostationary satellite for military communication in the X-Band is projected for about 2007.
When the new government came into power in 1998, the Social Democrats and Greens did win the election with the promises to cut down the mass unemployment, to reduce the federal debt and herewith fulfil the Maastricht criteria for the European Monetary Union. Even though this left little space for new expansive technological programmes, pressure towards creating an earth observing system for security proposes grew with the Kosovo War. During this first deployment of German armed forces in an actual war since 1945, Germany experienced the unwillingness of the US to share its intelligence data with the European allies – just like the French had done in 1991 during the second Gulf War. Again, Bonn brought a German radar observation system into the negotiations, to supplement HELIOS and to crucially increase European capabilities. The 2002 flood catastrophe along the River Elbe, with the concurring collapse of most earth bound observation systems, demonstrated impressively that a space bound system would be of high value also for civil proposes. During the US-led war against Iraq in 2003, the conviction grew in German public opinion that a European earth observation capacity for the independent analysis of global threats would be needed. To be sure, the public was less enthusiastic about military use of space applications.
In June 2000, meeting with President Chirac in Mainz, Chancellor Gerhard Schröder a suggested a new German radar system on a bilateral level. Both confirmed the idea at the French-German consultations 2002 in Schwerin, as a contribution to the European Foreign and Security Policy. The costs are estimated at about 300 Million Euro, to be spent by the Ministry of Defence. The Federal Budgetary Committee had released this budget in December 2001. The Bremen-based aeronautics company OHB-System won the contract. For the first time a middle size company is in charge of a major German space programme, subcontractors are RST, TESA Spacecom, EADS/Dornier, Alcatel Space Industries and Saab-Ericson.
The SAR LUPE project (Synthetic-Aperture-Radar) will consist of 5 identical small satellites with a launch weight of about 770 kg. They should provide the German government long with orbital information for at least 10 years. From 2005 until 2007, one satellite should be launched by German-Russian Eurockot vehicles every six months, into three nearly polar

orbits of 500 km altitude. The dissolution of the system will be between 10 cm and one meter, while the systems answering time should be about 11 hours to be above the requested spot. Data transmission will take place in the X-Band. the S-Band will be used for the satellites telemetries. The system, with which Germany will operate its first military space device (being just the third country launching radar satellites for security missions) is open to other European nations to join. This could be done through a financial contribution, in exchange for the transmissions of data, but also with individual satellites and ground stations. Next to the space segment, the ministry of defence established a control station for data analyses in Rheinbach near Bonn, where a crew of about 100 will be stationed.

Considerations

During the last decade, some important steps have been taken in Germany to contribute to a space and security system in Europe:

- The technical skills to plan, build and manage a radar operating satellite system for earth observation are available.
- An overall European space and security system is generally considered an important tool for an independent decision-making process, both for military and civil purposes.
- Even a humble system could only been erected in cooperation with the major European space powers. Since the Kosovo War, at least, there is a consensus among the German parties to realise such a capability, not only for environmental observation but for military purposes as well. It is seen as necessary to meet German security needs.
- The military satellite communication system is constantly being upgraded. In 2000, the Federal Government decided to launch the SAR LUPE programme for radar earth observation, which will be operative in 2005.

Beside these still small, but nevertheless important results the German space policy is afflicted by a number of problems:

- In the coming two years, the German government should solve the questions of who is responsible for the evaluation of the SAR LUPE data and how the other branches of the administration could be integrated in this task, i.e. whether access to first-hand material is open to many administrative bodies, or one agency alone is in charge.
- There is a lack for a coherent federal space policy. Individual ministries hesitate to contribute to space projects with dual-use applications.
- The lack of an overall responsibility for space policy impedes international cooperation in this field.
- Few efforts are being taken to move public opinion in favour of space flight applications.

To overcome these problems, the following measures should be considered:

- A coherent space policy should be formulated, outlining the civil and military purposes of a use of a space and security system within multinational frameworks, setting budgetary priorities.
- The actors involved should clarify, for which purposes and applications they need space flight and satellite information. Such an overview would be precondition for a fair distribution of costs.
- National efforts are embedded in multilateral frameworks. Germany has spent the largest share of its space flight resources within the framework of the EU and the ESA. This has not consistently teen translated into political influence, so Germany could step up its efforts with this regard.

- Last but not least, much more efforts to increase public attention for the space efforts are needed.

Interviews

Prof. Dr. Hans-Peter BÄHR, University of Karlsruhe, Berlin, October 21st, 1999.
Edelgard BULMAHN, Federal Minister of Education and Research, Berlin, December 17th, 2001.
Dr. Herbert DIEHL, Federal Ministry of Education and Research, Manager Transportation and Space Flight, Berlin, June 14th, 2000.
Dr. Klaus ENßLIN, Astrium, Director Earth Observation and Science, Berlin, May 10th, 2001.
Prof. Dr. Joachim HILL, University of Trier, Berlin, October 21st, 1999.
Prof. Dr. Walter KRÖLL, former Chairman of the DLR Board of Directors, Berlin, May 10th, 2001.
Dr. Rolf LESSING, Delphi Information Management, Berlin, October 21st, 1999.
Prof. Dr. Reimar LÜST, former ESA General Director, President of the Max Planck Society und the Alexander-von-Humboldt-Foundation, Hamburg, 26. January 2000.
Dr. Bernhard RAMI and Dr. Karl-Friedrich NAGEL, Federal Ministry of Education and Research, Department of Space Flight, Bonn, October 1st, 1999.
Dr. Kai-Uwe SCHROGL, DLR, Manager Strategy Development, Berlin, September 26th, 2001.
Dr. Wolfgang STEINBORN, DLR, Programme Manager for Applied Earth Observation, Berlin, October 21st, 1999.
Dr. Hartmut STREUFF, Federal Ministry of the Environment, Berlin, October 21st, 1999.
Prof. Dr. Rudolf WINTER, Director of the Institute for Space Flight Applications of the EU in Ispra (Italy), Berlin, May 10th, 2001.

ITALY

Description

The space community in Italy is characterised by a large and multiform variety of stakeholders.
The demand of security-related, space-based hardware and services is almost completely defined by the governmental sector, both at national or local (regional) level.
The Italian industry has a deeply rooted tradition as technology provider and producer of both hardware and services, mainly devoted to the national demand but also to international cooperation, in particular in the framework of the ESA, directly or trough the ASI (Agenzia Spaziale Italiana, the Italian space agency).
Despite the consolidate dual character of the productions, the security demand is still clearly segmented in civil and military one; only recently there have been the first tentative to draw a coherent strategy including both sectors.
The joint EU-ESA Green Paper initiative has triggered a debate on the future of the national presence in the space sector, much needed in a time of severe crisis of the industry.
A progressive reduction of the gap between the different players is ongoing; the result of such process could well determine the definition of a much-needed national policy on space.
However, the present situation remains fragmented as described in the following paragraphs.

Civil Security users

The Consiglio dei Ministri (Cabinet) and the Presidenza del Consiglio dei Ministri (the top-ranking structure of the Cabinet) is in charge of the strategic directive on security, since it is the place where the different Ministers involved in protecting the citizens from natural and human treats of any kind meet and determine any nation-wide policy.
The two main state branches involved in internal security are the Ministero dell'Interno (Ministry for Internal Affairs) and the Protezione Civile (Civil Protection, a Department of the Presidenza del Consiglio).
The Police and the Carabinieri refers to the Ministero dell'Interno for their activity in guaranteeing the internal security and monitoring the territory.
The Protezione Civile is in charge of disaster relief; this department coordinates the efforts of the local Fire-fighters Corps and other regional and local authority as far as major emergency are concerned.
It is in charge also of monitoring the potentially dangerous natural phenomena (such as seismic and meteorological activities); this function is particularly important, given the nature of the Italian topography.
Therefore, there is potentially a vast demand for space based applications, in particular Earth Observation (EO), including meteorology, and satellite based communications.
Currently, the use of these services is quite limited, given the chronic lack of funds and the lack of a cultural backing in favour of the introduction of high-tech tools.
Aside of the security related users, the Italian government currently shape the overall space policy trough the activity of the ASI; the ASI provides the funds for the research and development projects and studies at national and supranational level.
The overall Italian public research sector is currently undergoing a major reform and ASI is certainly involved in this activity.

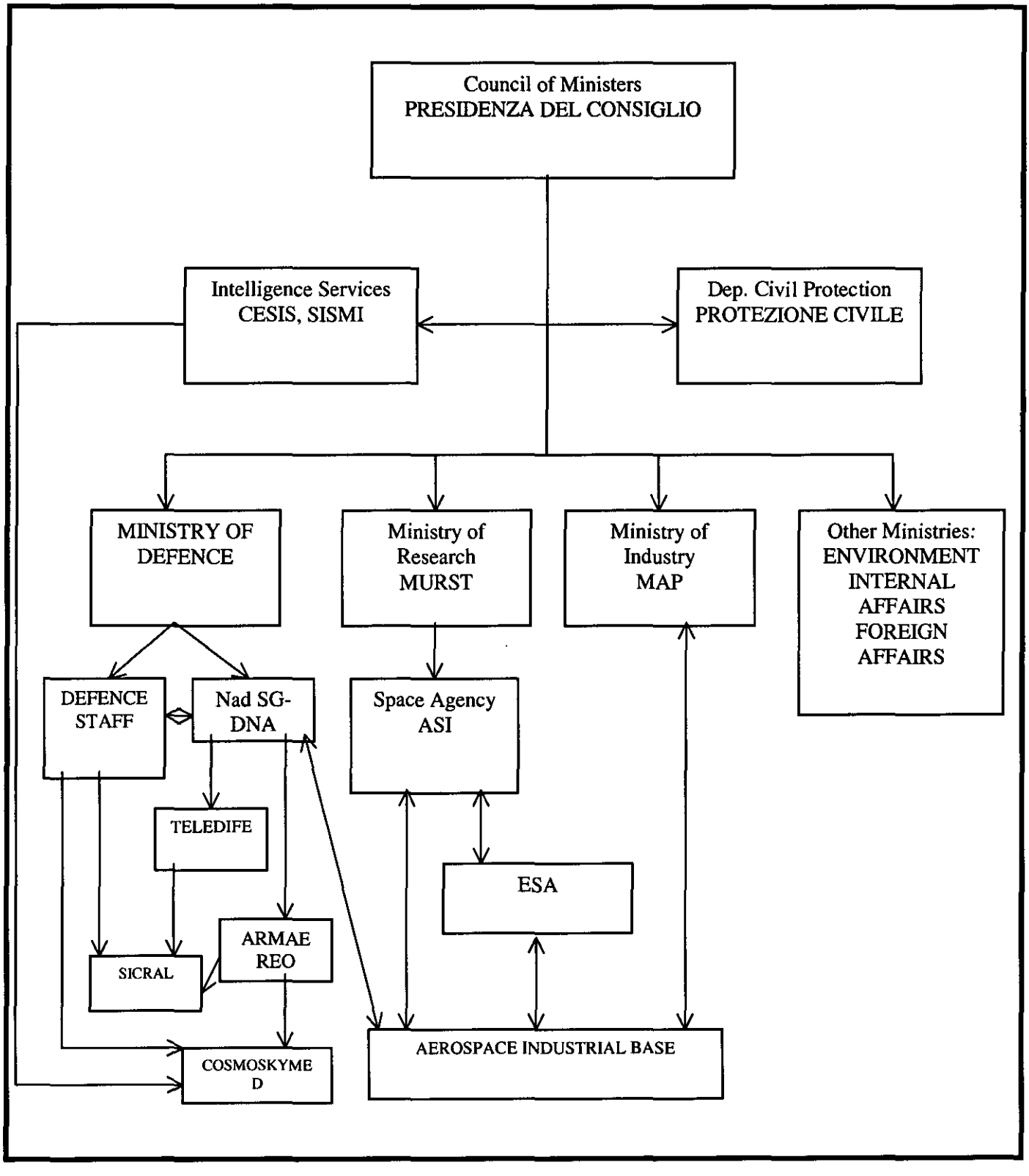
Military players

The Cabinet of the Minister of Defence, together with the Cabinet of the Prime Minister, is ultimately politically in charge of military operations and of the coordination of the activity of the different military Services and intelligence executive branches.
The interest of the military operators in space assets dates back to the pioneering era of space, but it has become relevant only in the last years, with the introduction of a national satellite communication system (Sicral) and the projects of improving the sector of imagery intelligence (Helios I and Cosmo-Skymed).
Currently, there are three main players as far as military exploitation of space is concerned: the Stato Maggiore Difesa (SMD, the Joint Defence Staff organisation), the Direzione Nazionale Armamenti (SG/DNA, National Armaments Directorate) and the Air Force service.
The SMD defines the overall military policy and therefore determines the joint needs in terms of space-based assets and their employment. In particular, the Third Office of SMD (Military Policy), defines the doctrines, while the COI (Comando Operativo Interforze, Joint Operation Command, a structure of the SMD, directed by the Chief of defence Staff) eventually exploit the assets.
There is not a separate "space" office inside the SMD.
The DNA is in charge of procurement programs in all sectors, including space. In particular, two different Directorates are interested in space assets: Teledife (Defence Communications) and Armaereo (Aeronautic Procurement). As seen in the SMD, there is not a separate "space" office in the DNA.
The scope of action of the DNA Directorates is given by the Joint and single-Services requirements, as well as by the limited amounts of funds for procurement.
As far as the operational users are concerned, the COI is potentially the main beneficiary of space based applications, since it stays at the top of the C4ISTAR chain.
In addition to the Joint Staff , each service is a potential user of those capabilities. In particular, both the Air Force and the Navy are particularly interested in the communication sector.
Moreover, the Air Force is also in charge of the day-by-day operationalisation and maintenance of the space assets, such as the Sicral satellite for communications.
Apart from the traditional military users, the role of the intelligence branches should be considered, both inside (SISMI, ROS, ...) and outside (SISDE, CESIS) the Ministry of Defence.
Given the secretive nature of their activities, it is very difficult to determine their operational needs of space based assets, but it is not wise to deny their actual role and potential interest in those issues.
As demonstrated above, the defence operators should not be considered as a monolithic player. The operational commander view of space assets is quite different from the position of those involved in the procurement policy. In general terms, the first seems to be less interested in space services, while the latter tends to be more culturally inclined to introducing these assets, whose performance is clearly enhancing the jointness of the forces.
In any case, an overall assessment of the potential role of space based services in the future, in particular in connection with the evolution towards a Network Centric model, is far from being achieved.

Industry

Italy has a long established experience in space activities; today, Alenia Spazio and Telespazio, both Finmeccanica companies, are important first tier providers of hardware and services respectively.
Carlo Gavazzi Space, an Italian based company owned by the German group OHB, is the principal examples of a mid-sized company with relevant technological skills. It represents an important example of the dynamism of the small and medium enterprises operating in Italy in the space sector.
As far as the launchers are concerned, besides the participation in Arianespace, an Italian company, Avio, is currently working on innovative solutions for smaller payloads.
The industrial sector is currently facing a period of deep crisis, due to a limited demand from the commercial sector that has not been offset by a parallel demand from institutional players.
The presence of a relatively important high-tech space production in Italy is perceived at a political level as an important assets to be preserved. Moreover, the sector is important for social reasons, given the potential impact on the employment level in some region.
For this reasons, the industrial dimension of space activities in Italy attracts the interest of the decision makers, as well as their sustain.
On the other end, this practice has given floor to the introduction of non-business considerations in the process of consolidation of the European space industrial base.
The industry seems to be willing to internationalise its role trough a process of joining or merging with other European and/or American companies, but it is equally fearing to lose the solid grip on the (albeit smaller and smaller) internal Italian market.

Organisation of main Italian Space Activities and Users



Recent Italian initiatives: the European dimension

The national panorama is currently experimenting a phase of growing internationalisation, trough multilateral procurement programs, as well as Europeanisation, thanks to the participation to EU and ESA programs, such as Galileo and GMES.
Even the main national program, Sicral, has the potential to growth into an international cooperation in military satellite communications.
The limit encountered in recent initiatives, both at national (Sicral) and bilateral (Helios I) level could deliver a significant case in favour of an approach to the space procurement and exploitation business in which cost-savings implications becomes more important then the national ownership of the system.
There is a general trend in favour of taking a step in the direction of a further European integration.
The principal ongoing initiatives in which Italy is involved as a main player or relevant partner are:

- Cosmo-Skymed dual system for EO
- small/medium launchers
- Galileo

The case of Cosmo is particularly important, since it represents the first truly dual program, given the co-funding and common interest expressed by both military and civilian agencies within the government. Moreover, it is perceived as a new model of integration at supranational level: the French-led Helios-type exchange model of cooperation will be replaced by an agreement on the exploitation of two constellations, one of which will be owned by Italy.
This cooperation remains anyway far from representing a model for a joint European approach to space assets procurement and management.
On the European level, Italy is fully backing the evolution of the positioning, navigation and timing system Galileo, even if the possible use for hard security (military) purposes has not been fully explored and endorsed.
Despite the above mentioned efforts and experiences, it remains difficult to identify a clear political position determining a well-structured, coherent Italian policy on international space cooperation.
The need to allow the national industry to operate in an international arena and the constant lack of funds provide a significant pressure to the decision makers to follow the path of internationalisation.
There is a growing awareness of the impossibility to perpetuate the present situation of current under funding of the projects, partially connected with a persistent institutional weakness of the sector. There is a growing perception that the reform of the national sector could well benefit from the internationalisation of the acquisition programs, as well as their management.

Considerations

The Italian space security system is afflicted by a number of major and minor problems, namely:

- the absence of a true "system", including all security aspects (military and non-military)
- the absence of a clear "ownership" of the overall space policy
- the absence of a user's community of space technology and services
- the lack of substantial coordination among players at national level

- the lack of funds for research and development and procurement
- the lack of support for space activities by some branch of the military
- the difficulties encountered in managing international bilateral programs

On the other hand, some positive assets should be considered, such as:

- potentially high demand of space services from the institutional operators
- specific interest in EO applications for territorial monitoring purposes
- efforts to modernise the military structure
- presence of an industrial base
- technical knowledge of the sector, albeit declining
- experience in managing dual use technology and assets
- broad political consensus in favour of main EU-ESA space programs, such as Galileo and GMES

It has become clear to most actors that it is not possible anymore to develop an Italian-only way to space. Therefore, any attempt to solve the current crisis should allow for a strong coordination at a supranational level.
A national policy on space should therefore aims at an internal reforms that could enable the country to play a major role in shaping the overall European policy.
Some urgent measures should be considered:

- define a clear strategy for the use of space services for security purposes
- provide a unified, clear high-level political directive to national space players
- provide enough funds for a stable growth of the institutional demands
- develop a coherent Italian position within present European structure
- promote the reform of the supply side of the market, trough alliances and mergers
- improve the decision makers' and citizens' cultural awareness of potential benefit provided by the space sector
- promote the development of SME's space-based services

Interviews

Giuseppe Bernardis, Chief of the 4th Office, SG/DNA, MoD
Vincenzo Camporini, Deputy Chief of Defence Staff, MoD
Silvano Casini, Ceo, European Launch Vehicule
GianCarlo Cecchi, Chief of TeleDife, SG/DNA, MoD
Agostino Miozzo, Vice-President, Protezione Civile
Bartolomeo Pernice, Agenzia Spaziale Italiana
Antonio Simeone, Marketing direction and corporate affaires, Alenia Spazio
Marcello Spagnolo, Vice-President Corporate Strategies, Alenia Spazio
Giuseppe Veredice, Deputy President Business Development , Finmeccanica

SPAIN

Description

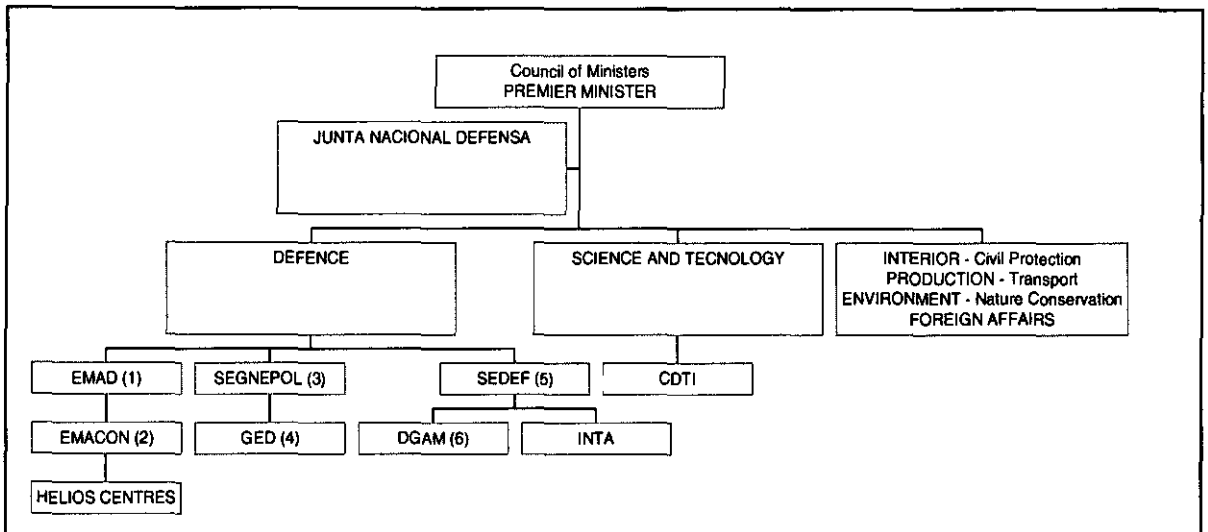
The Spanish view of outer space activities is conditioned by a special environment that puts Spain in a strategic place on the European continent. This reality is associated with an aerospace industrial base:

- The geopolitical aspects draw attention to some of the main Spanish interests.
  1. Geographic issues. Endowed with sea and ocean, Spain is almost completely surrounded by water. The Spanish territory is the passage way between the Atlantic Ocean and the Mediterranean Sea. This geographical location is the source of the preoccupation of authorities concerning illegal immigration and illegal merchandise trafficking. Moreover, Spanish weather worsens the desertification phenomenon and multiplies the forest fires.
  2. Political context. The water, which is scarce in the middle-south of the peninsula, is a precious possession for the people and for the agricultural[43] economy. Spain's two archipelagos and its two provinces in the north of Africa make their southern neighbours just apparently detached. Spain, with such a frontier may have limited means to keep its borders under surveillance.
- Industrial and technical aspects. The industrial lobbies can be of national or regional origin. The regions or Autonomies have a nearly decentralized administrative status as in a federated country. If they do not have an official space plan the regional institutions support the aerospace related industry. They are also associated on a regional basis; it is the case of BAIE in Catalonia, a PPP[44] initiative with the backing of the Barcelona city council in 2000 in an economic situation considerably worsened by the local aerospace industry. We find the public and regional company SPRI[45] and the association HEGAN[46] in the Basque Country. The Government of the Andalusia Autonomous Community is supporting the aerospace industry with 150 M Euros for a period of five years. At the national level there are also groups like AFARMADE, an association of arms manufacturers and defence and security equipment producers or PROESPACIO, which aims to serve as the channel of transmission and dissemination of the common interests of its members (companies that work in space-related activities in Spain), promoting the knowledge of space and its applications amongst institutions, the media, educational centres and, in general, throughout society. All above mentioned associations put forward their mission as representatives of the aerospace industry in front of the national and some times international authorities. The Spanish industries are present in the domain with an increasing importance since 1986, even if they are quite far from some of their European counterparts. The following companies are some examples of national and foreign space systems and component providers: SENER, INDRA Espacio, NTE, GMV, Hispasat, ITP, CASA Espacio[47], ALCATEL Espacio[48], Insa[49], Mier, Rymsa, Tecnológica, GTD, CRISA[50], IberEspacio[51] o GAMESA aeronautica among others.

[43] Wide tradition in Irrigation systems on the Mediterranean coast.
[44] Public-Private-Partnership
[45] The Sociedad para la Promoción y Reconversión Industrial is the business development agency created in 1981 by the Basque Government to provide back-up and services to Basque industry. See http://www.spri.es/web2/eng/
[46] Aeronautics and Space cluster
[47] CASA belongs now to EADS and it is called CASA-EADS.
[48] ALCATEL Espacio belongs to ALCATEL España.

Currently, the Space Sector employs more than 3000 persons, the majority university graduates with high qualifications, and it generates an economic volume of 325 million Euros. Moreover, in R+D it invests no less than 15% of the sales [52].

Main Users



(1) General Staff of Defence
(2) Joint Staff
(3) Secretaría General de Política de Defensa
(4) Grupo Espacio Denfensa
(5) Secretaría de Estado de Defensa
(6) Dirección General del Armamento y del Material

Organization Chart of the Spanish Space Policy

There are different Ministries that demand security related space-based hardware and services: Defence Ministry (communications, positioning or Earth Observation), Production Ministry (navigation, transport and public infrastructures – "Ministerio de Fomento"); Home Ministry (Police, Civil Protection, customs or frontier control); the Environment Ministry (nature conservation and forest fires) and Science and Technology Ministry.
Spain, as an ESA Member and in the context of such an inter-governmental co-operation has marked its space policy on civil programs.
The INTA , Instituto Nacional de Técnica Aeroespacial, is a public institution that began its role of dynamism for the aerospace activities in 1942. The INTA depends, hierarchically on the Defence Secretary of State (SEDEF)[53] and its role is not only to give advice on military space requirements but also to support the responsibility of some specific programs delegated by DGAM.
The biggest space activity remains in the military policy where the DGAM establishes the contents and the INTA contributes to the technical conception and even to the development.

[49] Public company with a commercial aim.
[50] Part of CRISA belonged to MATRA and now Matra belongs to Astrium (EADS).
[51] Shareholders: 50% Snecma and Empresarios Asociados.
[52] See Proespacio web: http://www.proespacio.org/letter_from_the_president/letter_from_the_president.htm
[53] Ministry of Defence

The CDTI, Centro de Desarrollo Tecnológico e Industrial, is an institution that depends on the Ministry of Science and Technology and manages the industrial aspects of the space activity in Spain.
This public institution has access to a variety of national consultancy companies and institutes specialised in space and defence systems. Linked to the Ministry of Defence needs there is ISDEFE[54]: a systems engineering and Industrial Cooperation consultancy for the Defence Ministry, Armed Forces or other interested Ministries and institutions (national and even foreign ones).

Civil Security users

The "Consejo de Ministros" (Cabinet) which meets weekly to coordinate the Government's action is in charge of the strategic directive on security as in many other fields.
The two main state branches involved in internal civil security are the Home Ministry and the Environment Ministry.
Interior Ministry. The main department with space needs and high investment is the DGPC[55] whose functions are mainly the organisation and stock of data base on risk maps, human and material resources to be mobilised in emergency situations; plan making and diffusion of alerts; the regulation proposals on civil protection matters; the coordination of the different competent organisms in emergency cases; they distribute and make their budget and head the operative management of emergencies, specially on the Radioactivity Alert Net[56].
Their space based systems[57] on communications have been operative from the end of the nineties in order to achieve a technical management system; it was realised that the classical telephony communications (fixed or mobile telephones, fax, telex, etc) were not feasible because of the communication problems in catastrophe management . In these situations the telephonic communications are very often overloaded or damaged.
This net will be interoperable with the Emergency Digital Radio-communications System of the State (SIRDEE) which has been developed for the communication among the authorities , mainly the armed forces and civilian security intervention bodies.
Through two transponders from Hispasat that assist in emergency situations, the DGPC has at its disposal the following communications tools: Videoconference, Voice/fax, data and IP services. They found that the European emergency system (satellite communications that in overload situations are only able to transmit email communication tools) did not completely accomplish its operational needs. Moreover, they are in the verification phase of a Latin American civil protection system[58] based on a radial net and a codified list of tools. No imagery is foreseen.
The DGPC has also worked to create an educational institution[59] that provides seminars and courses on the theoretical and practical dimensions of emergency and risk management. It is also in charge of the training of the health, fire extinction, rescue and security forces of the civil service.
The DAIE[60] of the Interior Ministry is the section in charge of Customs. In the "Direccion Adjunta de Vigilancia Aduanera there is the Operations department in charge of the

[54] ISDEFE works mostly for the DGAM(Dirección General del Armamento y del Material) and with INTA
[55] Dirección General de Protección Civil
[56] R.A.R. It is composed of 11 Regional Centres linked to the National Centre through satellite terminals (Inmarsat service) and mobile telephony terminals (GSM), mobile measurements devices (Vehículos de Análisis en Riesgos Industriales y Tecnológicos) and detectors Hörmann.
[57] Corporative net RECOSAT owned by DGPC.
[58] ARCE programme
[59] Escuela Nacional de Protección Civil
[60] Departamento de Aduanas e Impuestos Especiales

monitoring of the illegal merchandise and drugs trafficking. They have their owns planes to accomplish this mission and the Air Force are in charge of the piloting operation.

Environment Ministry. The Nature Conservation office[61], in its Forest Fires competence, is interested in space-based systems. They are equipped with 19 amphibian planes which are piloted by the Air Force[62]; INMARSAT communications services; with a programme of mobiles monitoring[63]; GPS and GIS working parallel to give information concerning topographic measurements in order to guide the work of the helicopters.
The DGCN receives expert data from three main sources: the Spanish INM (Instituto Nacional de Meteorologia) -radiation and humidity level information-, the Laboratory of EO of the University of Valladolid –analysis of the combined data (GPS-GIS) in order to produce accurate maps- and the US NOAA –Imagery data contribution-.
They will probably be engaged in the *Fuego* programme[64]and they are thinking about other proposals presented by the ESA on Catastrophe issues.
On environmental and civil protection matters there is an optional planning power at the local and regional administrative levels. Some Autonomous Communities are well advanced in this task.
The Police and the *Guardia Civil* refer to the Home Ministry for their activity in guaranteeing the internal security.
In this context there is not an urgent need for a specific kind of space system but it is possible that the mentioned civil actors could be interested in higher quality tools through the knowledge of the GMES programme.

The CDTI will soon present the continuation of the National Space Plan (2000-2003). INTA participates in the basic industrial needs and requirements (Dual Use) that Spain may want to have in the next years. CDTI works in co-operation with different ministries, national institutions and aerospace industry representatives:

- They work in close collaboration with the Production Ministry for EGNOS (where AENA[65] is also part of this agreement) and for the Galileo programme.
- The CDTI, delegated by the Science and Technology Ministry, is in charge of the fund distribution in the industry sector of the *Plan Nacional de I+D+I* [66]. They have an agreement with INM about the meteorological space systems.
- They have not yet any agreements with the Civil Protection and Environmental Office on earth observation programs but it is foreseeable.
- Other Collaboration or Co-operation agreements are procured with public organisms that could be in charge of space applications.
- The CDTI is the main bridge for the space industry to participate in ESA programs and to take part in any other industrial return.
- The Foreign Ministry, as a principle to unify foreign national policy, always keeps abreast of the agreements and actions with other countries and organisations.

[61] DGPN: Dirección General de Conservación de la Naturaleza
[62] Agreement of 1971
[63] SAT-LINK. Only such System in the world according to interviewed authorities.
[64] Insa initiative which is in a study process in the ESA to be developed in the near future
[65] Agencia Española de Navegación Aérea
[66] Subsidies and loan integrated in the National Plan on Investigation + Development + Innovation. The scientific party is managed by the Education Ministry

Military players

The "Junta de Defensa Nacional" (JDN)[67] assists the high direction on the top defence matters and its Chairman is the King of Spain.
The former members of the JDN are: the President of the Government, the JEMAD[68], the vice-presidents, the Defence Ministry, the General Staff of the three Armed Forces and the competent Ministers on domestic and foreign matters and any others that the President could feel is necesary. This body elaborates reports, military policy advice and defence proposals when a concrete subject affects different ministries.
Besides the PNE, there is also a military space plan, but its status remains confidential. Little more than the name of the satellites, their applications and the industry contractors involved is made public. The lack of a communication policy regarding space military programs may translate a general lack of doctrine as a whole. Such a hypothesis could cause some obstacles to Spain's own goals should it present space proposals in European instances.
The interest of the military operators in space assets dates back to the pioneering era of space, but it has become relevant only in the last fifteen years. The introduction of a national satellite communications system with the company Hispasat was a landmark. It was from an INTA initiative in 1989 that such a programme found its impulse. Contrary to normal projects at that time, the Hispasat programme combined communications services (civil and military) with direct broadcasting of TV signals. An inter-ministerial board was formed in 1998 involving the MoD, and at that time transportation, communication and industry ministries. The French company MATRA was contracted to deliver two satellite units after the establishment of the company Hispasat. Having achieved a fourth unit, they are now studying the *Amazonas* unit oriented towards the regions of America where the coverage of Hispasat is marginal or non-existent. The subsidiary in charge of this project is Hispamar, located in Brazil.
In 2001, a new company, Hisdesat, was established which is linked to Hispasat, in order to replace the military payloads on board the first two platforms of Hispasat that are nearing the end of their operational lives. XTAR-EUR and Spainsat[69] should be the continuation. The first XTAR-EUR was 49% Hisdesat and managed by the company XTAR. The second XTAR-EUR, which will be launched, at the latest, at the beginning of 2004, was contracted with Space Systems Loral (51%) that currently has financial problems. Spainsat will be managed directly by Hisdesat and fully dedicated to the Spanish MoD even if there could be negotiated a part of its remaining capacity for foreign States military oriented needs.

The Hispasat and defence satellites have been of great benefit to the Spanish industry, since in every case CDTI has negotiated offset programmes representing important business opportunities for Spanish companies[70]
In addition to the above mentioned Spanish communications defence programs, we find the Secomsat, a part of the Spanish Ministry of Defence's integrated system of military transmission SCTM. Its space segment is also on board Hispasat 1B[71]. The second XTAR-EUR and Spainsat should replace them.

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[67] This cabinet can be called to an *ad-hoc* meeting to assist The King of Spain, Chief of State, or to the President of the Central Government.
[68] Jefe del Estado Mayor de la Defensa: Chief of the Joint Staff of Defence
[69] USA satellite contractors
[70] See Dorado, J.M., Bautista, M. And Sanz-Aranguren, P. "Spain in Space". Ed.ESA. HSR-26. August 2002
[71] Some technical specifications have been modified to get it through till the first half of 2004

Spain has invested in Earth Observation mainly through HELIOS 1A and 1B, mainly with European technology, and the next one will be HELIOS 2.
Spain joined first with 6% participation in the French programme. The Spanish utilisation of Helios satellites is based on two centres:

- CRIE – Image reception.
- CPHE – Spanish main Center[72] which participates in the daily programming of the HELIOS satellites activity in a percentage related to the Spanish participation.

Other EO programs are the minisat ISTHAR –optical observation-, NANOSAT –dual use- and MINIFUEGOSAT.
The WEUSC was inaugurated in Torrejón de Ardoz in April 1993 after the Spanish proposal to the WEU Council of Ministers. The competence acquired has not received any political interest in its evolution. After ten years, the Centre's activity has advanced in the quality and quantity of service but the lack of new means is perceived as a standstill for further development.
The Centre only got an Spanish Chief after an English and a French head of the Centre. It could be expected that the previous military career of the present Director can bring a positive influence to the Spanish military orientation to European space based infrastructures.

The European dimension

Spain is determined to play a major role in the European stage process and has found the way in the promotion of the GNSS-2 (EGNOS – Galileo). On the other hand, the IESD and ESCP are clear objectives of the Spanish Government policy. The Foreign and Defence Ministers constantly express their support for the European harmonisation on Security and Defence.
The lack of operational capabilities is denounced and it is reflected in personal public communications or in the latest directives. For example, the one of September 2002 of the Foreign Minister to inform on the general directives of her department, the Strategic Plan (2000-2004) of Foreign Action, the prosecution of the modernisation of the Army, the re-structuration of the defence administration and the Spanish vision of security within the following documents: White Paper of the Defence, The Directive of National Defence (2000) or the Defence Strategic Revision[73] (2003).

- Galileo. The public opinion has got a clear message of the national policy and budget expenses regarding Galileo. It has originated a certain feeling of national prominence in such a brave project, moreover it is appreciate the positive consequence of its European citizenship. The press declarations and the content of official internet websites shows the applications derivatives and, overall the industrial benefits of Spain with the 11% participation achieved in the ESA negotiations.
- The military applications, foreseeable for the future, are not clearly perceived due to the lack of precaution in the current technical specifications.
- GMES. The present satisfaction of the Spanish civil security users regarding to their communications and monitoring systems and the ignorance of GMES doesn't mean that the project could not be well accepted once they realise the new dimension that it could add to their work. The imagery in Spain is well appreciated by the scientific experts, they are even organised on an EO National Association[74]. These associated Spanish experts are required by the ESA for EO advice.

[72] situated in the village Torrejón de Ardoz
[73] See web: mde.es/mde/política/restrategia.htm
[74] Sociedad Española de Teledetección that joints experience every two years in a National Congress. The last one on the 17th September 2003.

An European node of the deep space net has been established at the *Cebreros* Station in the province the Ávila on July 2003. The international agreement between the ESA and kingdom of Spain. The territory is owned by the MoD and they are rent for 75 years to the ESA in support of its activities. One of the projects is the installation of a 35m that will be oriented to the Venus mission tracking. This Station is complementary of the one the ESA has already in Spain: *Villafranca del Castillo.*

The North American dimension in the Spanish space collaboration

The US collaboration or commercial relations is a traditional pillar of the Spanish policy and it dates back to 1953. Recently, in 2002, the main instrument of this bilateralism has been modified[75] in 2002. The agreement emphasizes the collaboration on terrorism, on industry (facilities of mutual access to the internal markets and cooperation on the defence industry and technology assets) and it has created a bilateral defence committee on policy matters.
The declaration from the Foreign Minister about its general directives in 2002 affirms the stake of the US relations among the other general interests of the Spanish Foreign Policy: Latin America, Mediterranean Partners, North Africa, Balkans or Middle-East. As said before, the European Union construction, specially the EFSP and ESDI, are the milestones for Spanish policy.
The Spanish military space policy reflect its wider security and defence policy and it can sometimes be perceived as a particular national option. On one hand, the existence of an ancient partnership with the USA and on the other hand, the construction of a new european pattern in the area of security and defence.
Without abandoning its USA relations, Spain participate actively in the emergence of an European Defence around a franco-german core.

Considerations

Throughout the last decade has demonstrated its credibility as a small power in the space sectorand has become a respected industrial partner on european space projects. This newly acquired status gives further perspectives to the space in Spain. Should it look fordward to achieving even ambitious goals, is it to provide itself with a structure that would answer to the following statements:

- National coordination between the space related industry and recherche.
- A valid speaker with negotiations attributions in supranational fora.
- A budget sum for space with project financing specifications.
- A global National Space Plan with long (20 even 30 years long) term assets and continuity elements.
- Concentration of a technical attribution and the Principal *(maître d'ouvrage)* role.
- Consult and guidance to the legislative actors to accomplish the space related rules and regolamentation.

This tasks have some imminent obstacles:

- The absence of a national space agency with dual-use skills.
- Fragmented competence between CDTI-INTA.
- No actor or organisme as identified interlocutor.

[75] Convenio de Cooperación para la Defensa. See document of the Parliamentary appearance asking authorisation on April 2002: www.mae.es/documento/0/000/000/500/defensa_0804.pdf

- The absence of doctrine makes uncertain the long term objectives and that causes the repliement of the private invests.

Interviews

1. Álvaro Azcárraga Arana (SENER managing director aerospace segment); Gonzalo de Salazar (security advisory at the Embassy of Paris); Juan Pedro Lahore (technical advisory of the International Relations in the Civil Protection -DGPC-); Manuel Montesinos (Customs surveillance -subdirector general de operaciones-); Amparo Segura (technic at the Autonomy emergency service in *Comunidad Valenciana*); Juan Carlos Cortés (Spanish CDTI representative at ESA); Jorge López (CDTI Galileo expert); Enrique Horcajada Swartz (Defence advisory in 1998); Eva Oriol (ESA Department of Science and EO missions applications); Teniente Coronel Moises Fernandez Álvaro (INTA space programs head); one interlocutor from DGAM space system unity and one interlocutor from communications systems in the SEGENPOL.

SWEDEN

Aspects of Swedish Space Policy

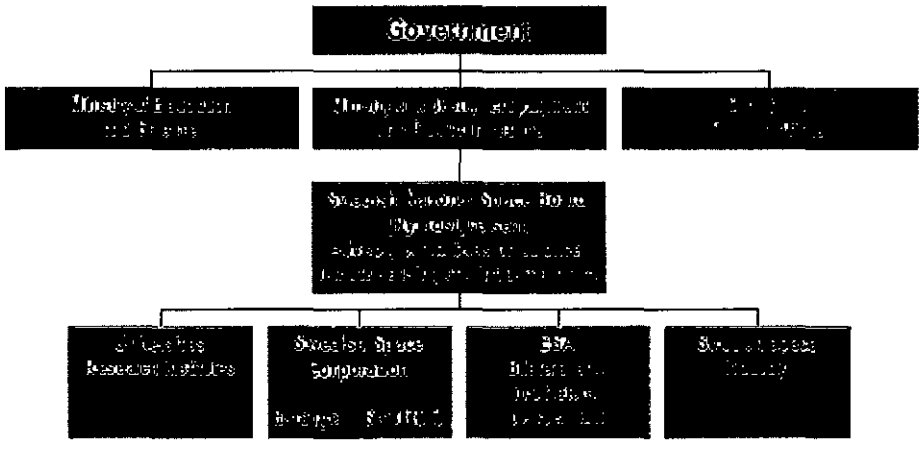
To approach the issue of Swedish space policy is not entirely easy, since Sweden is a technologically advanced nation with substantial stakes in the space industry but currently lacks an official space policy. Some of the Swedish actors in the space business, such as the Swedish National Space Board, have formulated policies of their own in some areas but no official, coherent and comprehensive policy has been decided upon.

In terms of the former area, Sweden and Swedish industry have a very strong standing in space matters. The Swedish National Space Board and industrial firms like SAAB Ericsson Space and Volvo Aero have been successful actors within the international space business writ large. Currently, the Swedish research satellite ODIN has been performing very well for some time and the first European satellite built for research concerning the moon, the Swedish-built SMART-1, will be launched in the autumn of 2003.

Furthermore, Sweden was one of the founding members of ESA (European Space Agency) and has been very actively involved in all kinds of ESA activities. Within the realm of ESA-related activities, Sweden has emphasized the importance both of deepened European as well as global cooperation on space issues, and has supported the close relationship between ESA and the American space agency, NASA.

However, there is no clear-cut, official Swedish space policy. The relevant actors in the Swedish governmental arena, primarily the ministries of commerce, defence, foreign affairs and the Swedish National Space Board, do occasionally and *ad hoc* present views on Sweden and space. The compilation of these views, as presented below, is done by this author alone and does not represent any official Swedish view on space issues, even less so in terms of the more sensitive (in Sweden at least) context of space and security.

Organisation and inter-relations of Swedish space activities



Swedish Security and Defence Policy

Part of the explanation as to why Sweden lacks an official space policy is to be found in its traditional security and defence policy views. The former policy of neutrality, changed more than ten years ago to a policy of "military non-alignment" (1992), still heavily affects much of any discussion on future Swedish policy and Sweden's ability to promote and to join international cooperative ventures with any kind of security implications. Thus, discussions about space issues as security policy reflect this state of affairs as well.

Furthermore, geopolitical factors, in combination with the isolationism that was inherent in the neutrality policy, have contributed to the relative indifference toward space issues that has characterized Swedish policy making regarding space for a long time. Given the non-aligned status of Sweden, the Swedish armed forces' sole area of responsibility has been the territory of Sweden and its immediate neighbourhood, i. e. the Baltic Sea area and the High North of Scandinavia. This is a difficult area to cover with satellite services in any economically sound way. Thus, space systems have not until recently gained any attention neither within the security and defence policy establishment nor in the structures of the Swedish armed forces.

Swedish Defence and Space

Network Based Defence and Swedish Space Demands

Recent developments in Swedish defence policy, though, have increased the interest in space systems within the Swedish military establishment. Two "paradigm shifts" form part of the explanation of this.

In the first place, Swedish defence efforts are more and more focused on international operations, in contrast to the previous Cold War stance. The latter was primarily, if not solely, oriented toward territorial defence. This means that increasingly, Swedish armed forces will serve abroad, at times very far from Sweden. This demands good global communications, something that is achievable through space systems.

In the second place, Swedish defence forces are now transforming themselves in order to become a "network based defence". This is a process very similar to the U.S. process of military transformation, albeit on a smaller scale. It entails the idea of a integrated, C4ISR-based network of defence systems, which almost by definition will increase the demand for space services. Central features of the network centric defence idea are wide-ranging reconnaissance, navigation and communication services, which either will be substantially enhanced by or only achievable through space systems.

These two paradigmatic shifts mean that the Swedish interest, primarily the interest of the Swedish armed forces, in space systems will continue to increase. However, the development of space capabilities entails complexities and financial problems. In this regard, the peculiarities of Swedish defence and security policy might, but does not need to, pose some problems. Space systems, being complex and expensive, will most likely only be developed multilaterally, i.e. in close cooperation with other countries and multilateral actors. The latter might include other European countries, EU programs and multilateral cooperative ventures as well as American partners. Close multilateral defence cooperation easily creates mutual defence and security interdependencies, which was traditionally anathema to Sweden's position of neutrality and military non-alignment. The quite pragmatic stance in defence and security policy issues taken by Sweden on many issues since the early '90s indicates, though, that for a host of *realpolitik* reasons the self-imposed limits of Swedish non-alignment might be interpreted in rather flexible ways. In the long run, one should not exclude a scenario where Swedish security policy in itself might change fundamentally.

Swedish Space Capabilities

In terms of technical capabilities, Sweden draws on its generally advanced technological knowledge and competence, both in the space field itself and in other areas. It has for a very long time been possible for Sweden to develop advanced, complex techological systems on its own, to very competitive prices. Examples include the JAS Gripen fighter plane, the stealthy corvettes of the Visby class, and the Gotland class of submarines. In the space field, the technological infrastructure in and around the Esrange Launch Site in Kiruna, in northernmost Sweden, is another example of this.

The Esrange Launch Site is also the base of Swedish space infrastructure. The site is used for launching balloons and sounding rockets. The Esrange satellite control station is located close to the launcing site and a few kilometers away the ESA Salmijärvi satellite station can be found. Esrange is a natural venue for the command and control of satellites in polar orbits, including the ability to process their collected data. Esrange is also a resource for Sweden to exploit in terms of security policy collaboration; other countries might be interested in using the Esrange facilities for different kinds of space purposes.

Today, Swedish civilian authorities frequently buy satellite services commercially. This, together with the increased demand for space services for security policy reasons, likely indicate that a national space policy will be formulated in the near future.

Sweden lacks, though, a satellite launch capability of its own. Its geographical location, far from the equator, sets severe restictions upon the orbits accessible from a launch from Swedish ground. However, polar orbits would be clearly accessible from a Swedish launch site, but political differences with neighbouring countries have been a hindrance for such a development.This is the primary explanation as to why Sweden for a very long time has taken part in the ESA activities and in the launch capabilities in French Guyana.

The European Commission Green Paper and Future Developments

In January 2003, the European Commission presented a "Green Paper" on European space policy. This document has attracted considerable interest in Sweden, although no official Swedish response to it has been formulated.

From a general Swedish perspective – thus not necessarily an official one – the Commission Green Paper consists of several interesting but also some quite problematic concepts and suggestions. In general, all Swedish instances would welcome a strengthened European space policy. However, as a founding member of ESA, the multilateral aspects of Swedish space interests have traditionally been pursued within that organisation. Any move toward a stronger Europeanisation of space issues should therefore, most Swedes would argue, be in line with the interests of ESA.

Furthermore, the Green Paper also consists of a number of security policy related suggestions and concepts, many of which are problematic not only from a Swedish but also from a general European point of view. Among these are a very clear tendency in the Paper to promote both European independence and autonomy in the space field, in combination with a striving toward European competition, rather than partnership, with the United States. The Paper also promotes the idea of the European Union as a world actor even in the field of defence and security, none of which are fields within the competence of the European Commission.

From the perspective of traditional Swedish security policy making, these are problematic suggestions, for several reasons. In the first place, Sweden emphasises the importance of the transatlantic link. This is something which is regarded to be even more important today, given the obvious tensions between the U.S. and some of its European allies. This means that a European space policy that is built up as an aggressively balancing counterweight to the U.S. space efforts must be considered as a very mistaken approach. The long history of e.g. ESA-NASA cooperation contributes to this conclusion.

In the second place, mutual interdependence – rather than strict autonomy and independence – might be a better way for the future of EU space policy. Swedish foreign policy has often underlined the beneficial aspects of interdependence, since this concept tends to force the actors involved to cooperate, not compete. Thirdly, the Swedish government is very clear in terms of its policies regarding most aspects of foreign, security and defence policies: these are issues to be dealt with by the member states of the governments, not the European Commission. Thus, one might guess that the Swedish response to the Commission Green Paper, when and if it is published officially, could be positive in terms of the technical aspects but fairly critical when it comes to its implications for security policy.

Considerations

One might consider four or five possible but different trends concerning Swedish space policy.

- First of all, things may continue as they stand today: i.e., no national space policy and no national coordination of space demands and needs. The purchasing of space services among domestic military and civilian actors continues in an independent way. This approach is not optimal in terms of coherence and effectiveness.

- A second possible development could entail a national effort based on commercial capabilities. Here, national coordination and a national space policy, for both civilian and military purposes, would be based on the access to commercial space services. This policy could be regarded as highly rational from an economist's perspective, but entails almost total trust in the accessibility of commercial services even in times of war and crisis.

- A third possibility would be a national space policy based on security policy cooperation with other countries and international actors. The access to space services would then be assured through Swedish participation in international joint ventures, both civilian and military, in the space field. This could be done in both the EU and the NATO frameworks.

- A fourth, albeit somewhat remote, possibility would be a purely national space policy that reflects the traditional non-aligned Swedish defence posture. This would consist of a national coordination system, national space R&D efforts, and national control of the whole space service chain – from e.g. the launching of satellites to satellite data processing. Here, one gains independence but likely to a very steep price.

- A fifth possibility, also not very likely, would be a purely multinational space policy according to which Sweden would take part in a multinational body, with the capabilities and competencies to structure the space policies of all participating countries. This could be a international or supranational body on which Sweden and all other partners would draw in the field of space services. This would imply a profound shift in Swedish security policy which at the time of this writing seems less than probable.

UNITED KINGDOM

General overview

UK space policy is different to other European countries of a similar size. Unlike France, Germany, and Italy, the UK does not have a large space industry – BAE systems recently sold its 25% share of Astrium to EADS. Nor does the UK government spend as much on space both in general terms, and more specifically for military space technology. The central reason for this is the UK's access to United States military space technology. British government space policy is primarily focused on the civil aspects of space technology.

Space has never been a significant political issue in Britain. The UK does not have a powerful space lobby campaigning for a bigger space program – although the Science Minister, Lord Sainsbury has declared himself as decidedly "pro-space". There is little difference between the space policies of the main political parties, and few Members of Parliament take an interest in space.

The role of BNSC

The British National Space Centre (BNSC) is the main UK government space policy body. It is a voluntary partnership, formed from 10 Government Departments and Research Councils, to coordinate UK civil space activity. Together their expenditure on civil space amounts to around £170 million per year. The BNSC is a small operation compared to other national space agencies in Europe. The BNSC does have its own budget, and has no facilities of its own apart from offices in one of the Department of Trade and Industry buildings in central London, where it employs about 50 staff.

The BNSC partnership comprises:

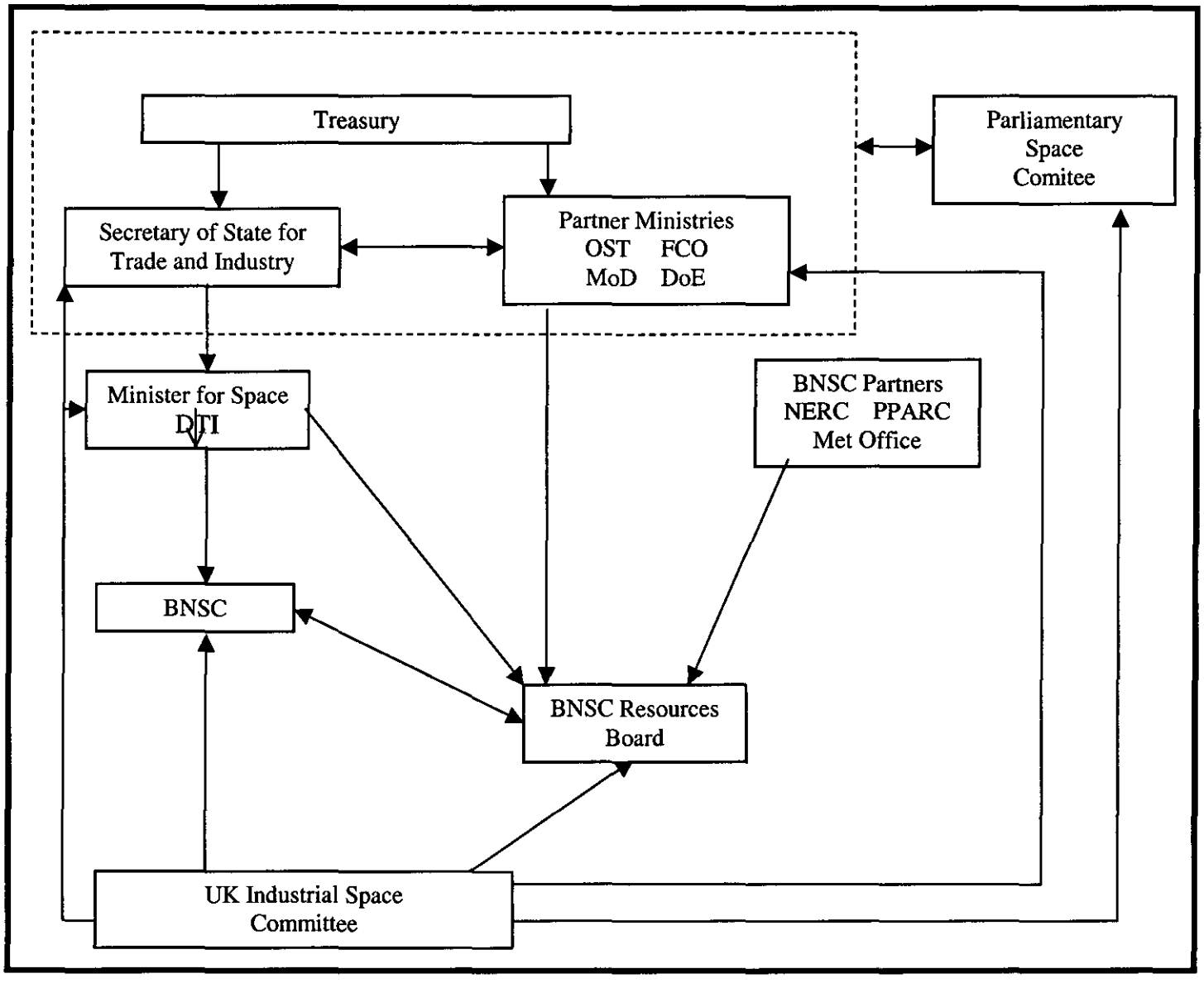
- Department of Trade and Industry
- Office of Science and Technology
- Department for Transport
- Ministry of Defence
- Foreign and Commonwealth Office
- Department for Environment, Food and Rural Affairs
- Rutherford Appleton Laboratory
- Natural Environment Research Council
- Particle Physics and Astronomy Research Council
- Meteorological Office

Britain started to spend less on space and focus on specific commercial technologies over 30 years ago, when it abandoned its 1960s Blue Streak rocket program. In 1987, the then-Conservative government pulled out of European Space Agency efforts to develop both new European launch vehicles based on the Ariane program and Europe's role in the International space station.

BNSC aims to get the most scientific and economic value out of its activities in space. This is why the UK's civil space policy focuses strongly on cost-effectiveness in space programs and investment is largely in areas with the greatest commercial potential, such as Earth observation (Envisat and the GMES program), satellite communication and navigation (the Galileo program). The UK civil space industry, with an estimated workforce of around 6000 people, has a turnover some three times government expenditure, a ratio that compares favourably with the US.

BNSC's principal objectives, were formulated jointly by all the Departments and Research Councils with interests in civil space and are set out in detail in the 'Space Strategy 1999-2002: New

Frontiers'. The new Space Strategy is currently being developed. Approximately 60 percent of UK civil space expenditure is channelled through the European Space Agency (ESA), and the UK was a founder member of ESA.



British Space Policy-making Process , cf Suzuki Kazuto, *Policy logics and institutions of european space collaboration,* Ashgate, London, p.178

Space and security in the UK

However, the BNSC has little – if any – say on UK military space policy. The Ministry of Defence is the dominant actor in this policy domain, in particular the MoD procurement agency (DPA) and science and technology bodies. Again unlike other national defence ministries of similar size, the British MoD has no official body or agency dedicated to military space.

For security and defence space technology the UK is very reliant on the United States. For example, the UK has privileged access to imagery from US spy satellites, which makes the British reluctance to develop its own system for satellite photography understandable. Some British officials assume that the French obsession with satellites is driven, in part, by industrial policy. "It

is all about getting the Germans and the other Europeans to subsidise French aerospace companies", says one. Other British officials accept that, in an ideal world, it would be nice for Europe to have its own satellites. But they argue that, given the pressure on defence budgets everywhere, there are many other more urgent priorities – such as transport planes, battlefield communications equipment and friend-or-foe identification systems.

The British are also dismissive of the performance of France's two Helios 1 satellites, pointing out that their putative one-metre resolution is no better than what is available from commercial satellites. America's military satellites are much more powerful. "If the EU tried to replicate what we get from the US or what is available to the EU via NATO, it would be very expensive and of lower quality," says a British official. The British pay about £1 million a year towards the running of the WEU satellite centre, but complain that during the 1999 Kosovo conflict its output was slow in coming and of poor quality.

Anglo-American collaboration and space

In addition, for navigation systems the British Ministry of Defence was the government department that most opposed spending money on a new European system (Galileo), preferring to continue to rely solely on the US GPS system. The Treasury joined forces with the Ministry of Defence to question the wisdom of building a European version of a system already available, America's GPS. Not for the first time, they were opposed by the Foreign Office, Whitehall's most overtly pro-European department, and the Trade and Industry department. In the end Tony Blair came down on the European side. The UK government will provide £86m towards Galileo's development, giving Britain a quarter stake in the project.
Anglo-American collaboration on weapons programs is particularly strong in the nuclear area – unlike France, the UK does not have a truly independent nuclear deterrent, and depends on US technology. The UK is one of the main international partners in the US national missile defence system (NMD).

And the Anglo-American relationship is at its closest in intelligence. There is much co-operation on human intelligence ("humint") between the CIA and Britain's Secret Intelligence Service (the SIS, also known as M16); on defence intelligence between America's Defence Intelligence Agency and the British Defence Intelligence Staff; on "overhead" intelligence – that deriving from satellite photos, reconnaissance aircraft or unmanned aerial vehicles – between America's National Reconnaissance Office and Britain's equivalent, the Joint Aerial Reconnaissance Intelligence Centre (JARIC), which is part of the Defence Intelligence Staff; and on signals intelligence ("sigint") between America's National Security Agency (NSA) and Britain's General Communications Headquarters (GCHQ).

Signals intelligence is the most special part of the special relationship – and has been ever since 1941, when American and British code-breakers started to work together at Bletchley Park. Britain's GCHQ and America's NSA exchange many dozens of staff with each other. Each organisation takes responsibility for certain parts of the world. The British have listening posts in places like Cyprus, where the US has none, so the Americans regard the British contribution as very useful. But in "sigint", as in other forms of intelligence, the British services have no doubt that they get more out of these sharing arrangements than they contribute and are happy to rely on US space assets.

Telecommunications satellites : national capacities and European choice

However, for its national telecommunications capacity, the United Kingdom uses its own Skynet system, a constellation of three dedicated satellites with worldwide coverage for the British armed forces. In August 1998, the British government decided to develop Skynet V, a new generation of military telecommunication satellites. Skynet V is being developed under the Private Finance Initiative (PFI), whereby the system is fully dedicated to the national authorities in times of crisis, but the managing organization can commercialise the capability for the rest of the time.
The British awarded a European space consortium called Paradigm (led by Astrium) the $2 billion Skynet contract to modernise its defence communication system, only the third time since World War II that the Cabinet overturned an MoD recommendation on a defence contract. The Ministry of Defence and the Treasury had firmly overruled the Department of Trade and Industry and the Foreign Office over the Skynet contract which was set to go to a US-led consortium. Prime Minister Tony Blair's decision to back the European space consortium on the Skynet contract was a landmark moment, bitterly fought to the last in an unreported Cabinet sub-committee battle by the Eurosceptic Treasury.
And the UK does co-operate in some aspects of military space technology with other European governments. The UK and France signed an agreement in 1995 to extend the coverage of their telecommunications systems and to lend each other their capabilities in case of a defect in one or the other. In fact, several cooperation architectures have even been suggested for communications technology, from a US-European option (dubbed Inmilsatcom) to an all-European option (Eumilsatcom) with a reduced version, Trimilsatcom, which was co-planned by France, Germany and the UK. One reason for the Trimilsatcom idea was the converging replacement schedule for both the British and the French space segments, Skynet and Syracuse. These co-operation projects were finally abandoned as the UK was facing increasing financial constraints, giving birth to new procurement strategies (such as the Smart Procurement Initiative, the Private Finance Initiative), while NATO was also defining a new space segment for its own telecommunications, NATO Satcom Post-2000. The UK is also part of a European military imagery group called the "Strategic Imint Action Group", created in 2002 along with military representatives from Belgium, France, Germany, and Spain.

UK, a European partner for "dual-use" security programs?

While it is true that for many military space assets, such as satellite photography and navigation, the UK Ministry of Defence is happy to rely on US technology, it is not correct to characterise UK military space policy as anti-European. The UK is a partner in the Galileo navigation system, which has obvious military potential, and has been to the forefront of deepening European co-operation for military telecommunications. In addition, UK civil space policy depends to a very large degree on European co-operation. Hence the UK focus on civil technologies such as navigation, Earth observation, and satellite communication, with a view towards involvement in European projects such as Envisat, GMES, and Galileo. Given the "dual-use" potential of these civil systems for security and military use, we can expect the UK to be increasingly involved in European space security policy in the future.

Considerations

The UK space security system is afflicted by a number of major and minor problems, namely:

- A relatively small space industry for a European country of its size

- A lack of funds for research, development and procurement
- The lack of political attention paid to space
- A less influential space agency compared with those in other European countries
- A hesitation to develop European military space systems due to the UK's privileged access to US technology, (with the exception of telecommunications)
- the difficulties encountered in managing international bilateral programs

On the other hand, some positive assets should be considered, such as

- competitive industry for commercial and non-military applications
- potentially high demand for space services from institutional and commercial operators
- specific interest in telecommunications applications, and Earth observation
- a strong interest in ensuring compatibility between European and American military space systems
- experience in managing dual use technology and assets
- strong government commitment to main EU-ESA programmes, such as Galileo and GMES

The biggest challenge facing UK space policy is how to ensure its commitment to European dual-use programmes compliment its arrangements with the US. Therefore, the UK in particular will insist on compatibility between any future European military projects and American systems. In addition the UK government must try to improve the decision makers' and citizens' awareness of potential benefit provided by the space sector, and the importance of collaboration at the European level.

The Joint Research Centre's contribution to

Global Monitoring for Environment and Security

GMES

An initiative of the European Union and the European Space Agency

EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre

contents

foreword

GMES is one of the European Commission's flagship initiatives, together with the European Space Agency, to enhance Europe's technological strength at the service of the EU's policy objectives. Building a capacity for global monitoring should help the EU to ensure sustainable development, fulfil its responsibilities arising from international treaties, provide more effective humanitarian aid and improve our ability to deal with natural and man-made disasters. In short, GMES is about federating our know-how to help make the planet healthier and safer for all citizens.

A key element in the GMES programme is the definition of user requirements for an operational system providing enhanced quality data and information. Its understanding of EU policy drivers enables the Joint Research Centre (JRC), a Directorate General of the European Commission, to contribute to this task. The JRC's contribution to GMES is a good illustration of its mission to provide scientific and technical support for the development, implementation and monitoring of EU policies.

The present brochure provides an overview of the JRC's contributions to GMES. All tasks are carried out by means of direct actions in the context of the EU's Sixth Framework Programme for Research and development. The JRC cooperates strongly with other Commission services as well as with the European Space Agency, the European Environmental Agency, the European Organisation for the Exploitation of Meteorological Satellites, the European Centre for Medium-Range Weather Forecasts, Member States, Acceding countries and other international organisations.

I am pleased to see that the JRC is a full partner in the design and establishment of the GMES initiative.

Philippe Busquin
European Commissioner for Research

policy context

In 2001 the EU and ESA Councils emphasised the strategic importance for Europe of independent and permanent access to global information relating to environmental management and monitoring, risk surveillance and the enhancement of safety and civil security. In this framework a European capacity for global monitoring of environment and security to support the Union's political goals regarding sustainable development and global governance will be established by 2008. This will be GMES[1-2].

At the end of 2003 the Commission reports to the Council and to the European Parliament on the definition of a system for GMES, based on users' requirements, the expected services, the possible support to the various Community policies, the results obtained from the pilot services, the economic and social benefits, the possibilities for international cooperation at global level and the possible scenarios for an organisational framework[3].

At the first Earth Observation Summit, Washington DC, 31st July 2003 the European Commission and 34 nations adopted a Declaration promoting the development of a comprehensive, coordinated, and sustained Earth observation system or systems to understand and address global environmental and economic challenges[4]. GMES will be one of the means whereby Europe fulfils its commitment to the Declaration.

1. COM (2001) 718 final "Towards a European Space Policy", European Commission and European Space Agency Joint Task Force Report.
   COM (2001) 264 final Communication from the Commission "A Sustainable Europe for a Better World: A European Union Strategy for Sustainable Development".
2. White Paper – "Space: A New European Frontier for an Expanding Union"
3. 2001/C 350/02 Council Resolution of 13th November 2001 on the "Launch of the Initial Period of Global Monitoring for Environment and Security (GMES)"
4. http://www.earthobservationsummit.gov/declaration.html

introduction

The JRC has been a catalyst in the GMES process since it began, paying particular attention to the long-term strategic importance of such an initiative[1]. The JRC supports the development of GMES in four key areas. First, through our work with policy Directorates General the JRC assesses and develops institutional demand for data and information services, identifies shortcomings in present monitoring infrastructures and checks the feasibility and effectiveness of proposed new solutions. Present JRC activities that will particularly benefit from the GMES initiative include those in support to

- **Europe's commitments to monitoring the global environment** through land cover assessments, deforestation, biodiversity, sustainable forest management, fire, ocean productivity and the atmosphere;
- **Environmental policies with a European geographic focus** through monitoring water and air quality, land-use change and forestry, urbanisation, soil condition, nature protection sites and the implementation of the EU's Kyoto reporting obligations;
- **European civil protection** through flooding alert systems, fire risk maps, risk assessment from landslides, databases arising from the Seveso Directive and marine oil-spill monitoring;
- **The Common Agricultural and Fisheries Policies** through monitoring area-control measures, forecasting crop production – both inside and outside Europe – and detecting and identifying fishing vessels;
- **European Union external aid and security policies** through provision of mapping and decision support services for aid, reconstruction and demining and development of tools for verification of non-proliferation treaties.

Secondly the JRC is undertaking many of those applications in full coordination with the **INSPIRE - Infrastructure for Spatial Information in Europe** initiative; we maintain a leading role in the establishment of a European Spatial Data Infrastructure through close association with DG Environment.

Our third area of input involves in-house development of remote sensing science and a close working relationship with European (and other) space agencies. Our work to advance the science underpinning **monitoring from space** benefits JRC policy support and scientists in the wider community.

Finally our heritage of participation in **global research and observation programmes,** our activities in the European Research Area and our framework programme 6 partners give us unique insights into the possibilities for international cooperation at global level and the possible scenarios for an organisational framework for GMES.

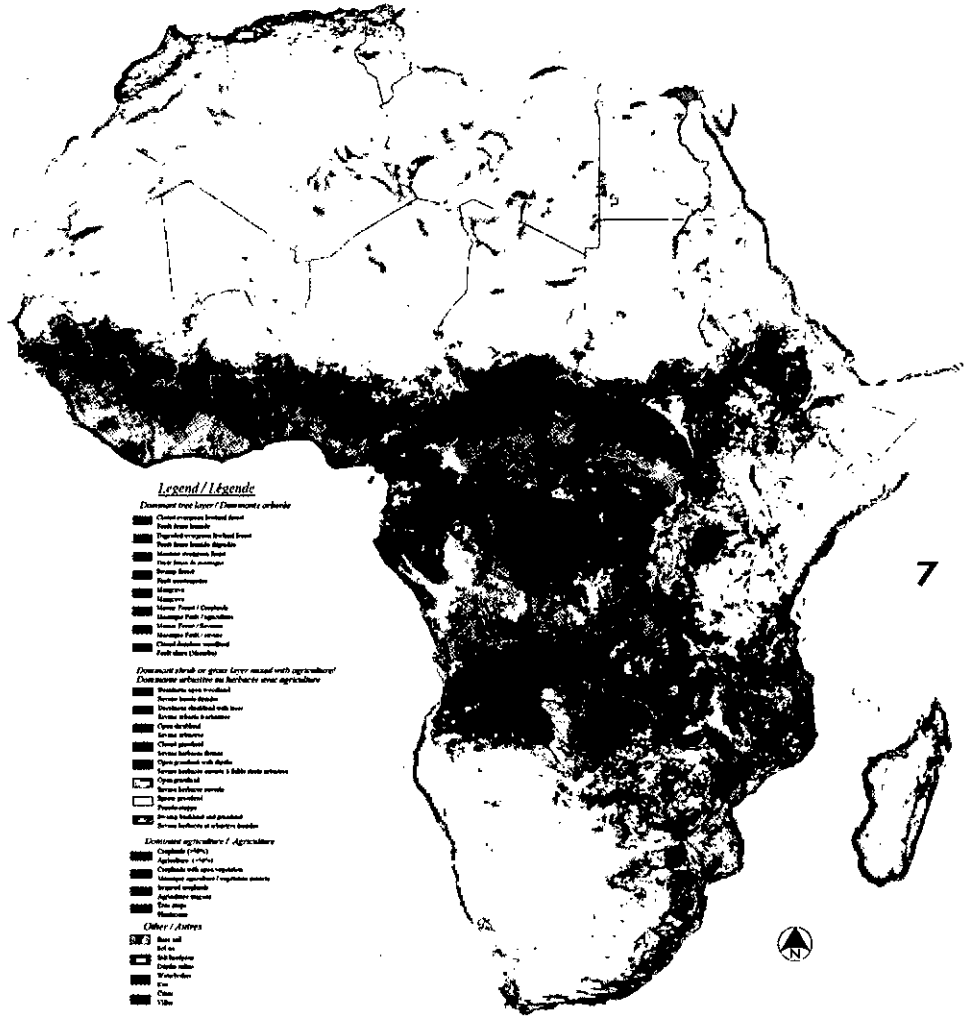
1. "Global Monitoring for Environmental Security: A manifesto for a new European course of action", Baveno, Lago Maggiore, Italy, May 1998.

monitoring the global environment

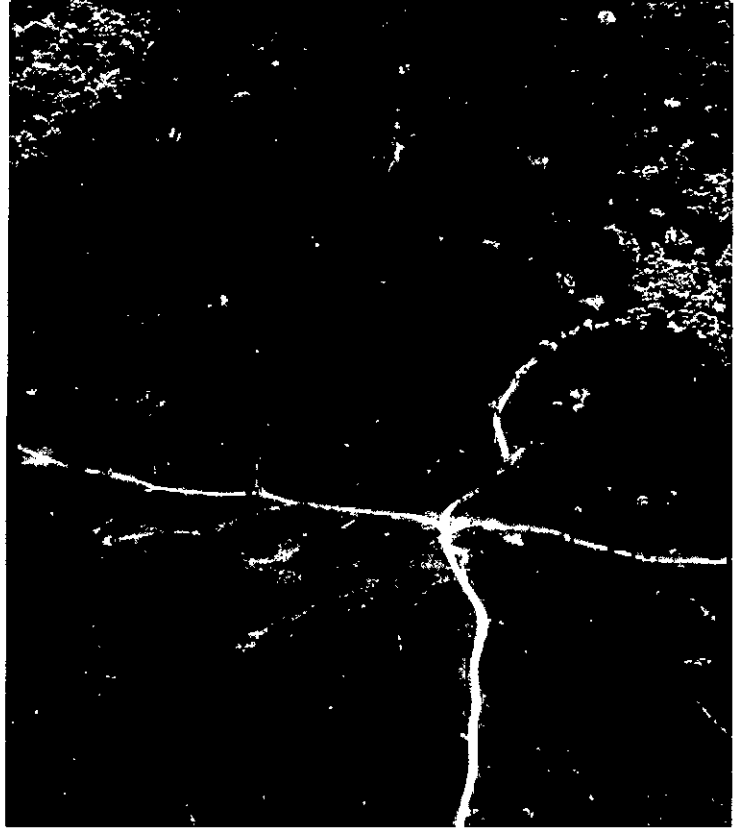
Maintaining current knowledge on the state of resources and the environment worldwide is essential for the implementation of a range of policies of strategic interest to Europe. GMES will acquire, analyse and use data documenting the condition of the Earth's resources and environment on a long-term (permanent) basis. It will do so to stimulate better global governance and to assist in situations where security is at risk. The JRC has created a number of global databases to help these policy orientations and to meet the growing requirement for global information arising because of legislation and through international commitments. Among other domains JRC's global monitoring work addresses the need for monitoring and transparency associated with Forest Law Enforcement, Governance and Trade (FLEGT), building a programme for African Monitoring for Environment and Sustainability (AMESD), the commitments for international action for water, for monitoring biodiversity, land degradation, desertification, deforestation, sustainable forest management as expressed by the Commission at the World Summit on Sustainable Development, or the commitments to strengthen international co-operation on global observation entered into at the 2003 G8 Summit in France and the first Earth Observation Summit in Washington, July 31st 2003. The global dimension of GMES will both provide Europe's policy makers with information they need and form an explicit European contribution to international environmental monitoring endeavours. Some key JRC products are highlighted hereafter.

Global land cover

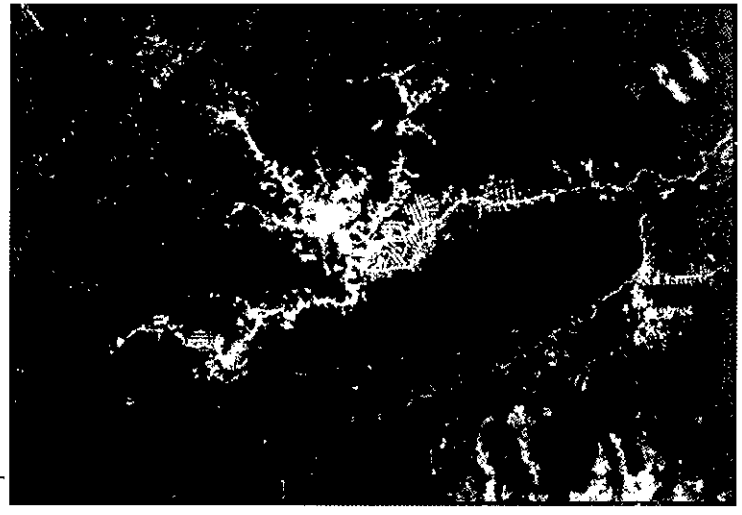
In 2003 a partnership led by the JRC completed a database documenting the state of the World's land cover at the turn of the Millennium; the Global Land Cover 2000 project (GLC2000). Mapping used daily observations from the VEGETATION sensor on the SPOT-4 satellite. The partners (major users of land cover information and experts in land cover mapping) mapped each region in the way that best described the local land cover. Using a system developed by the United Nations' Food and Agriculture Organization (FAO) and United Nations Environment Programme (UNEP) detailed regional maps could be aggregated into a consistent global product. The JRC used the regional products to create the GLC2000 database. This documents 22 land cover types. FAO and UNEP are co-sponsoring publication and distribution of the final maps with the JRC. The Millennium Ecosystem Assessment, launched by UN Secretary General Kofi Annan in 2001 to provide assessments to the UN's Environmental Conventions, uses GLC2000 as their Land Cover reference to support their work on assessing impact of ecosystem change on human health and poverty, biodiversity, and environmental quality. France's national meteorological service, Météo-France is integrating the GLC2000 data into their ecoclimate database as part of their weather forecasting models and their global climate modelling. JRC continues to develop Land Cover and Forest Change issues in the context of a new 6th framework programme Integrated Project, GEOLAND.



The African regional map from the GLC2000 project. This important new database supports the work of the Commission on African Monitoring for Environment and Sustainable Development (AMESD), and provides information for Forest Law Enforcement, Governance and Trade in the region.



Logging activities in Amazonia. Global deforestation rates maybe less than 0.5%, but in some hot spots rates can be well in excess of 4% per year.



Satellite image from Europe's SPOT-VEGETATION sensor (taken in 2000) showing the city of Rio Branco expanding into the surrounding Amazon forest. More than 12 million people now live in cities within the boundaries of the Legal Amazon.

Monitoring deforestation throughout the tropics

JRC has just completed a four-year research programme (TREES[1]), run in conjunction with the Commission's DG Environment exploiting the global imaging capabilities of satellites to provide the most complete, up-to-date set of maps available of the humid tropical forests. Results show that in 1990 (the Kyoto Protocol baseline year) there were 11,800,000 km^2 of tropical forest, yet between 1990 and 1997 approximately 6 million hectares were lost each year. A further 2.3 million hectares per year of forest are becoming increasing fragmented, heavily logged and / or burnt. Although the statistics document the trends up to 1997 the maps from 1999 and 2000 provide no grounds to believe that this situation is improving. These new data will help reduce uncertainties in dealing with carbon sink issues associated with the Kyoto Protocol, provide accurate baseline views of this hugely valuable global resource and help in planning strategies for effective conservation of it's biological diversity.

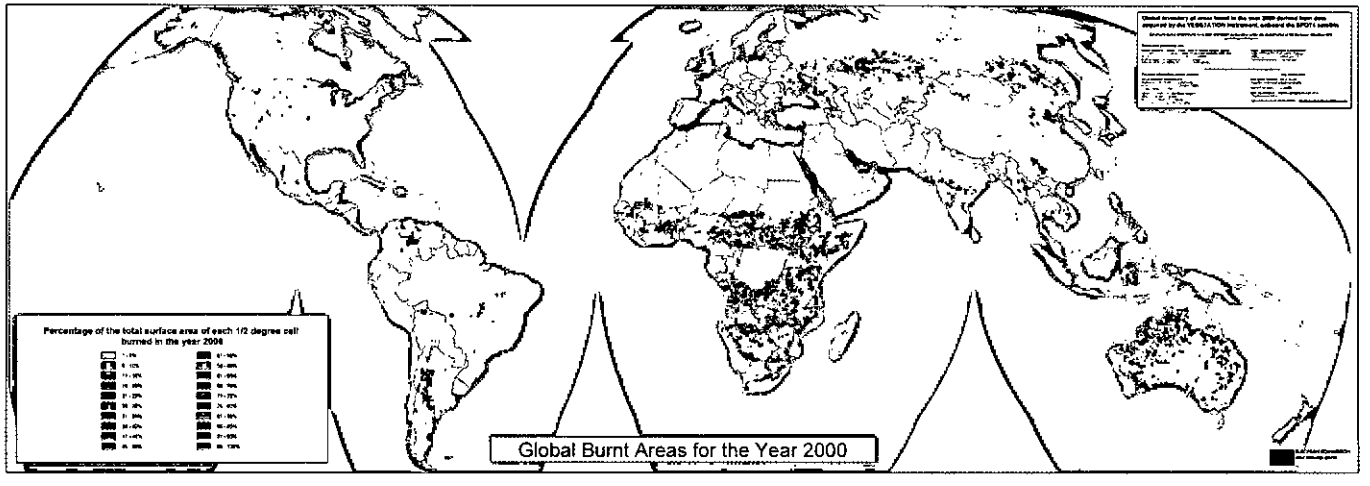
1. TREES: TRopical Ecosystem Environment observations by Satellite.

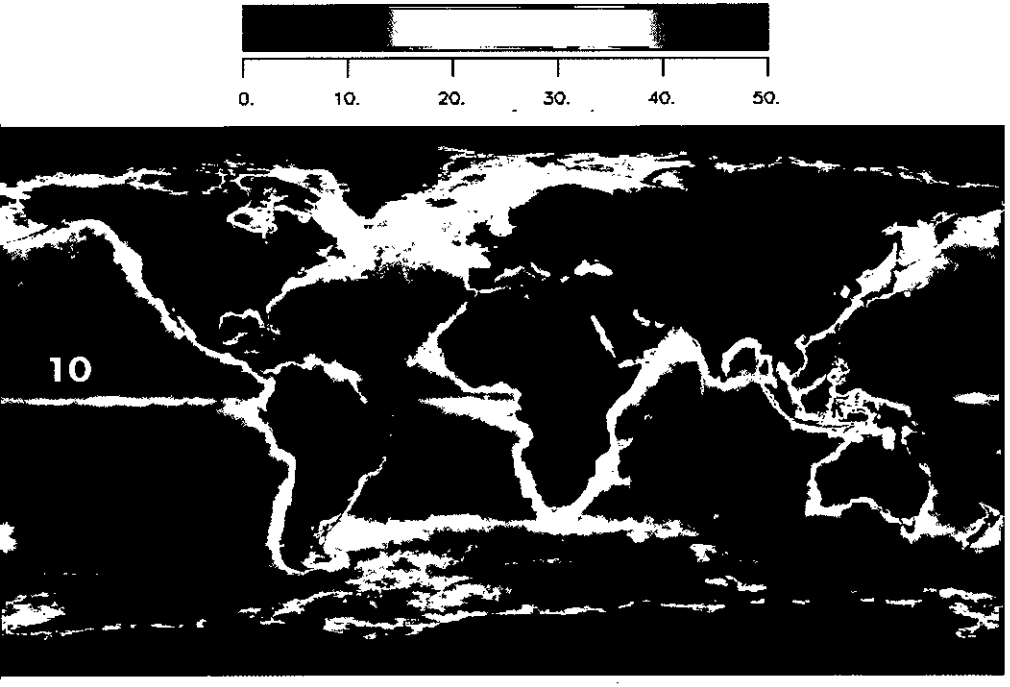
Bush fire in an African savannah. More than 3.5 million km² burn globally each year. Around 65% of this occurs on the African continent.

Global fire dynamics

Virtually all terrestrial ecosystems (except deserts and ice caps) are affected by fire. In addition to the threats to life, property and natural resources emissions from biomass burning significantly contribute to the injection of greenhouse gases and carbonaceous aerosols into the atmosphere affecting the radiation balance, the acidification of precipitation and air quality. Fires also alter local, regional and global carbon source/sink balances and can drive land degradation. The JRC, in partnership with other leading fire research centres around the world has documented the area of land burned each day across the whole planet for the year 2000. Both JRC and the United Nations Environmental Programme disseminate these data to policy makers and the scientific community. Analysis of global burnt area is currently being extended to cover four more years, and is complemented by a global data set dating back to 1982, which records the location and date at which active fires occur.

Global patterns of biomass burning for the year 2000 as detected with the VEGETATION sensor on the SPOT-4 satellite.





Global Ocean Annual Productivity – 1998 (in g Carbon x m²)

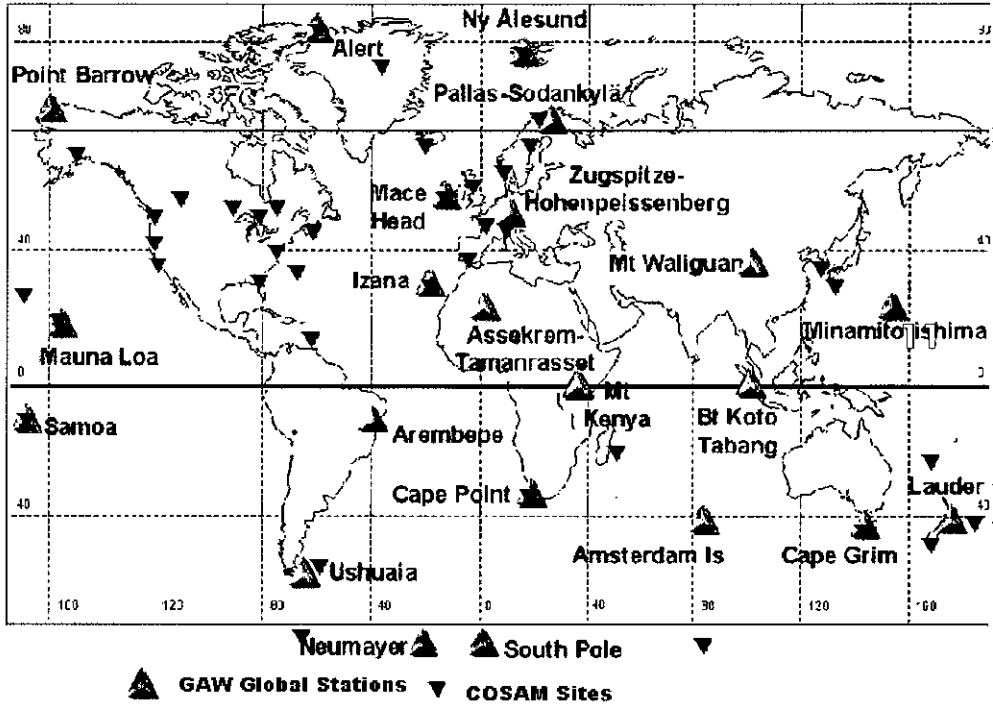
Global marine biogeochemistry

Earth observation data now provide the potential for detailed and accurate information on the functioning of marine and coastal ecosystems at the European and global scales, as well as the marine carbon cycle. The JRC has developed expertise in the analysis and integration of remote sensing techniques for understanding and monitoring biogeochemical processes in the marine environment, mainly from the determination of the ocean biomass and productivity. Those biological quantities define the first trophic level in the marine food web, and therefore set the main characteristics of the marine ecosystems from phytoplankton to fish; in addition, they are as important as their terrestrial vegetation counterparts for assessing the carbon cycle budget. Key to this monitoring capability is the provisions of a continuous data flow describing the marine optical characteristics (ocean colour) as derived from remote sensing and advanced algorithms. Further elaboration leads to the synoptic mapping of the phytoplankton stocks in the upper ocean. The distribution of this vegetation pool and an accurate determination of the light field at the sea surface and its propagation down the water column, are used to derive the carbon assimilation (primary production) of the phytoplankton with models of photosynthesis. The derived time series of biological products and the associated know-how are a basis for regional-to-global scale analyses of trends in marine ecosystem sustainability and the global carbon cycle.

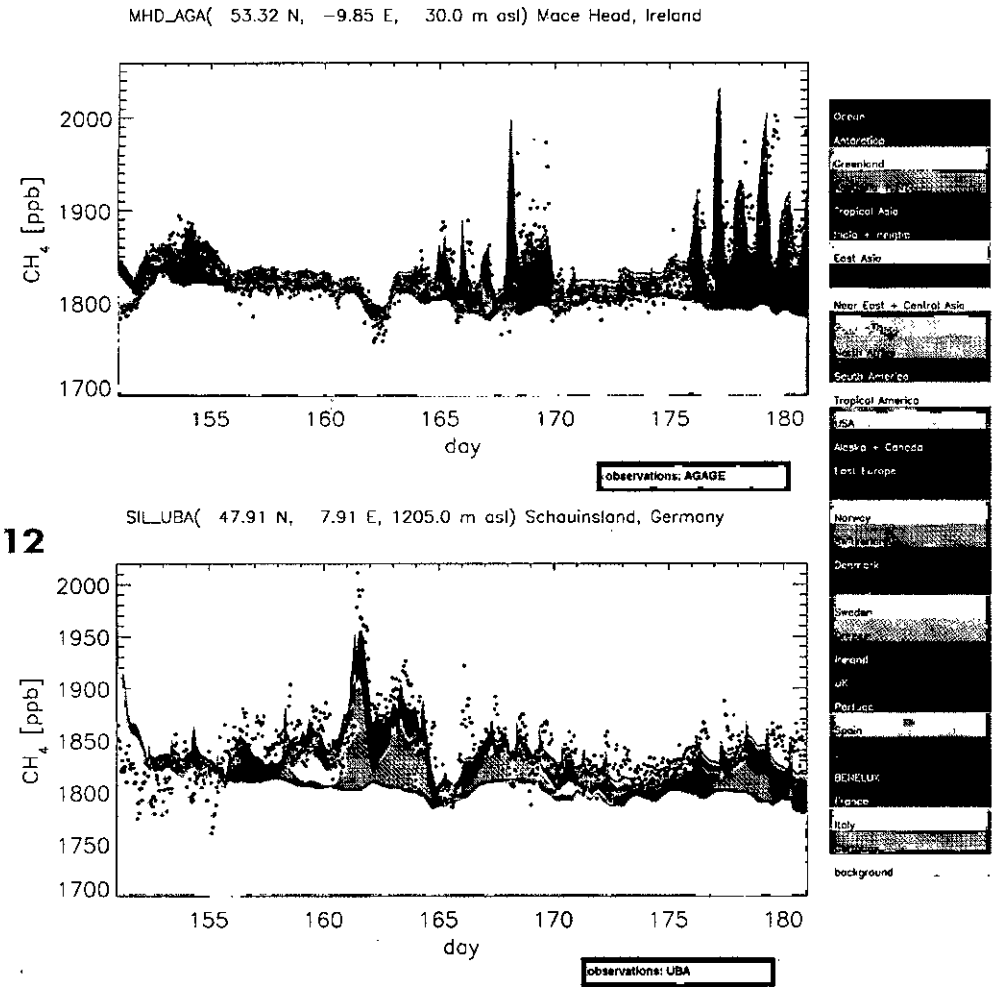
World Data Centre for aerosols

JRC is developing techniques to monitor and evaluate fluxes and concentrations of the greenhouse gases regulated by the Kyoto Protocol, and other climate relevant atmospheric trace components identified by the Intergovernmental Panel on Climate Change. The 'Second report on the Adequacy of the Global Observing System for Climate in support of the UNFCCC[1] identifies a clear need for improvements to the existing observation networks for greenhouse gases, ozone and aerosols, to provide continuous homogeneous observations and support improved use of satellite derived observations. The JRC works with World Meteorological Organisation's Global Atmosphere Watch (GAW) and the UN Economic Commission for Europe's European Monitoring and Evaluation Programme (EMEP) to collect, harmonize and integrate empirical data sets related to greenhouse gases, regional and global air pollution. The JRC manages the World Data Centre for Aerosols as a contribution to GAW and operates a long-term monitoring station at Ispra as a contribution to the EMEP and GAW monitoring programs.

1. UNFCCC: UN Framework Convention on Climate Change.



Locations of the GAW global stations, together with sites providing aerosol data supporting a study comparing and benchmarking sulfate aerosol models.



High precision in-situ CH_4 measurements are made by several networks. The graphs show observations and model results from Ireland and Germany, highlighting the influence from different European countries (and larger global regions).

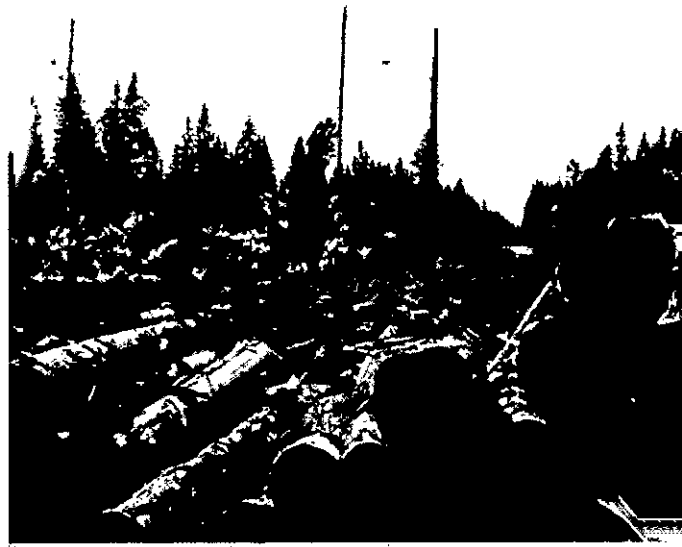
Assimilation of *in-situ* and satellite observations for greenhouse gas emission estimates

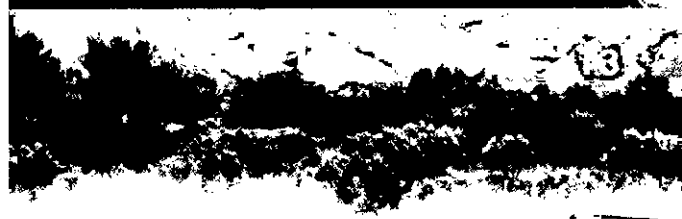
JRC develops unique methodologies that integrate global atmospheric modelling, in-situ and space observations to obtain the best possible assessments of the emissions and atmospheric pollutants and their burdens in the atmosphere, and an element of this is the development of inverse modelling tools to provide top-down estimates of European and global CH_4 sources. Central input for the inverse models are global observations of CH_4 mixing ratios from in-situ measurements and satellite-derived total columns of CH_4. A key project for the latter is EVERGREEN[1], which will provide total columns of e.g. CH_4, CO_2, and CO based on the SCIMACHY instrument. EVERGREEN has a comprehensive inverse modelling work-package (CH_4, CO_2, and CO) with the JRC providing the inverse modelling of CH_4.

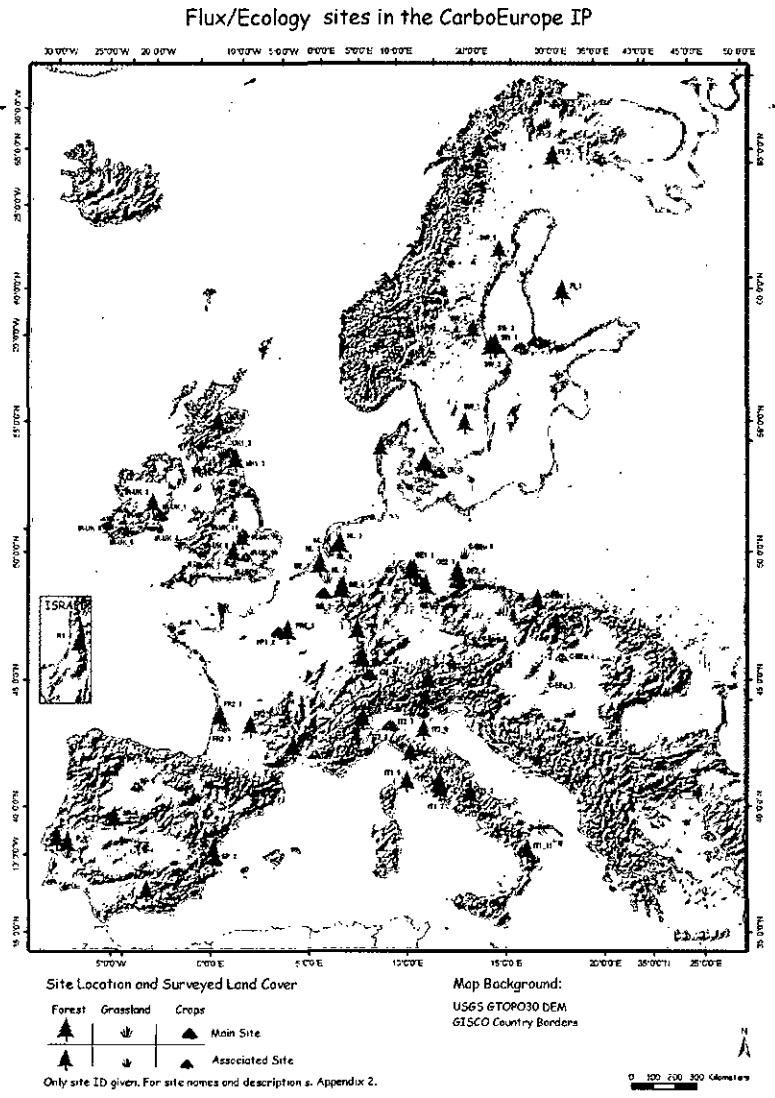
1. EVERGREEN: EnVisat for Environmental Regulation of GREENhouse gases.

european environmental policies

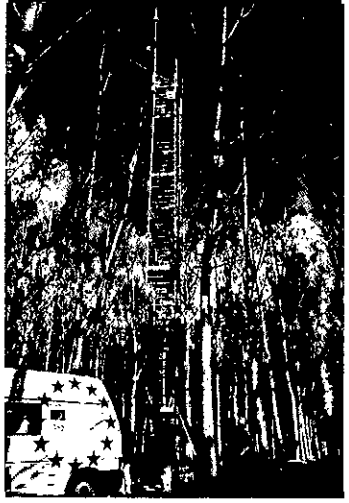
The knowledge-based approach to policy making advocated by the 6th Environment Action Programme (EAP) requires quality information on the state of the local and global environment to be readily available. Such data are called for in specific pieces of legislation and in some cases are vital to mitigate the risks due to natural disasters (with climate change a driving factor), man-made hazards and societal pressures on the environment, particularly in areas of high vulnerability such as the coastal zones. In addition to the introduction of a more coherent and efficient reporting system, the 6th EAP refers to the reinforcement of the development of spatial information systems, of space monitoring applications and support to Member States in setting up adequate data collection systems. The JRC's research supports a range of Directives and other policy instruments, as shown in the examples below. In all of these cases the implementation of the strategy and/or Directives calls for reliable and comparable spatial information at various geographical scales yet covering the entire EU territory. This includes the ten new accession countries, as well as future candidate countries. These spatial datasets describe current conditions, and all call for repeated and regular update so as to document changes and trends resulting from natural processes and human activities and to measure progress towards policy goals; the long-term, operational nature of the observations foreseen in the GMES process would thus be invaluable.







Flux tower for measuring the exchange of Greenhouse Gases (GHG) of a poplar plantation near Pavia, Italy. The tower is part of the JRC Kyoto experiment in Parco Ticino; goal is to develop tools for monitoring the full GHG balance associated with land use changes (transition from virgin forest to poplar plantation and rice fields). The flux tower is a JRC contribution to the Carbo-Europe network of DG Research for assessment of the European carbon balance.

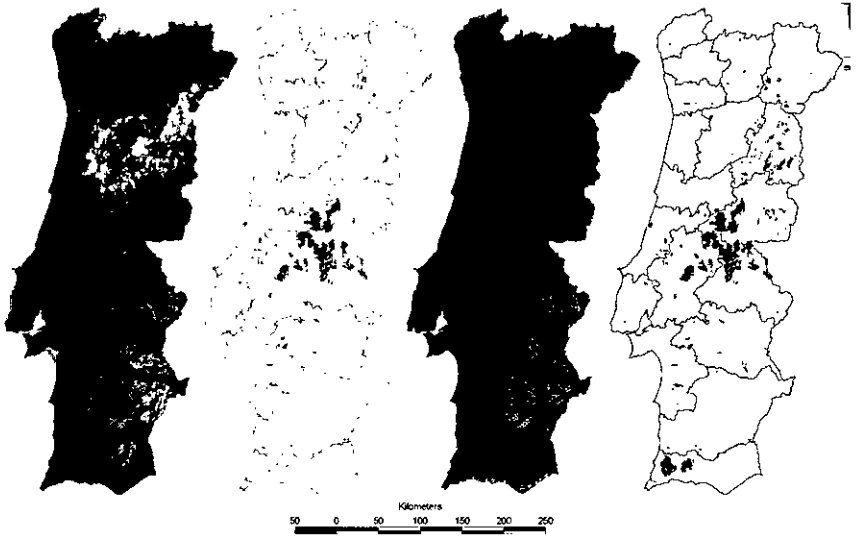


Monitoring the implementation of the Kyoto Protocol

The JRC supports DG Environment, the European Environment Agency and the EU Monitoring Mechanism Committee in meeting the EU's Kyoto obligations by developing a data quality system for reporting of greenhouse gas emissions and sinks. Focus is on the greenhouse gases and sectors that contribute most to the uncertainty on the overall greenhouse gas budget. They include the emissions and uptake of carbon dioxide through land-use and land-use change, and the emissions of methane and nitrous oxide by agricultural practices. The JRC works to make the variety of monitoring methodologies in the Member States more comparable, and is engaged in the development of new monitoring methodologies, that have EU applicability. Such methodologies are based on integrating modelling, *in-situ* and space borne observations. Particular attention is paid to the role of forestry in carbon sequestration projects. The JRC also maintains and develops techniques for monitoring greenhouse gas (GHG) emissions from the energy and other industrial/economic sectors at the global scale. This involves data gathering and harmonisation of statistics from a variety of sources and a world-class energy-environmental-economic model. Results provide a comprehensive and coherent view of the long-term trends in GHG emissions, identifying opportunities for environmental policy implementation and cost efficient abatement measures.

Forest and nature protection

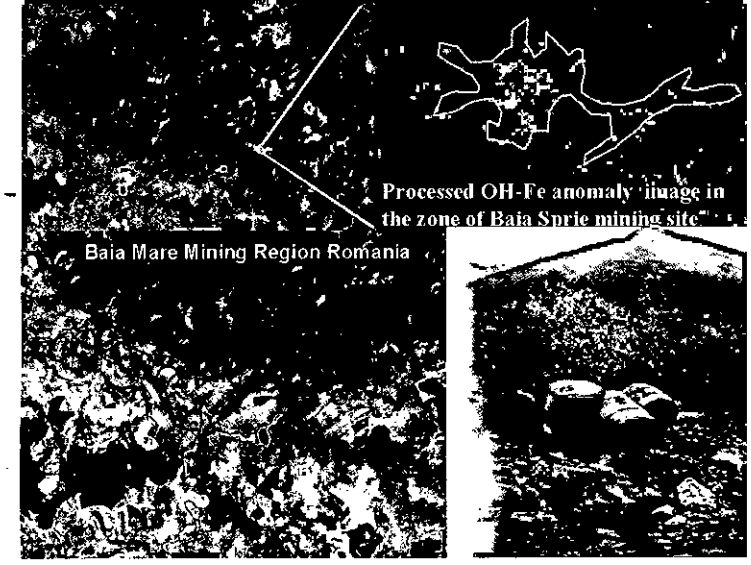
The forthcoming legislation, "Forest Focus", brings together the monitoring of forest biodiversity, carbon sequestration, forest soils, and the protective function of forests along with the protection of forest against fire and atmospheric pollution. The JRC provides scientific and technical support to Forest Focus through mapping forest fire damage and the study of forest diversity. At the end of each year's fire season (usually end of October), the damage caused by forest fires is evaluated through the analysis of satellite imagery. The resulting digital maps are forwarded to the Member States. The maps of burnt areas and the analysis of forest fire damage in Europe for fires larger than 50 hectares have been produced for the years 2000, 2001, and 2002. Forest Focus will develop a European Forest Fire Information System (EFFIS) storing the information produced by the JRC and data provided by the Member States in compliance with Forest Focus legislation. The Habitat Directive with the network of Natura2000 protected sites forms the EU's main legislative instrument for nature protection, though the Forest Focus will augment this. The JRC uses satellite remote sensing to develop indicators of landscape biodiversity including main habitat type, forest habitat loss, measures of naturalness, habitat connectivity and heterogeneity, forest / grassland fringes, forest regeneration and landscape closure. Digital maps at 1 ha spatial resolution for such attributes are produced so that changes on a 10-year basis and cause-effect relationships can be evaluated.



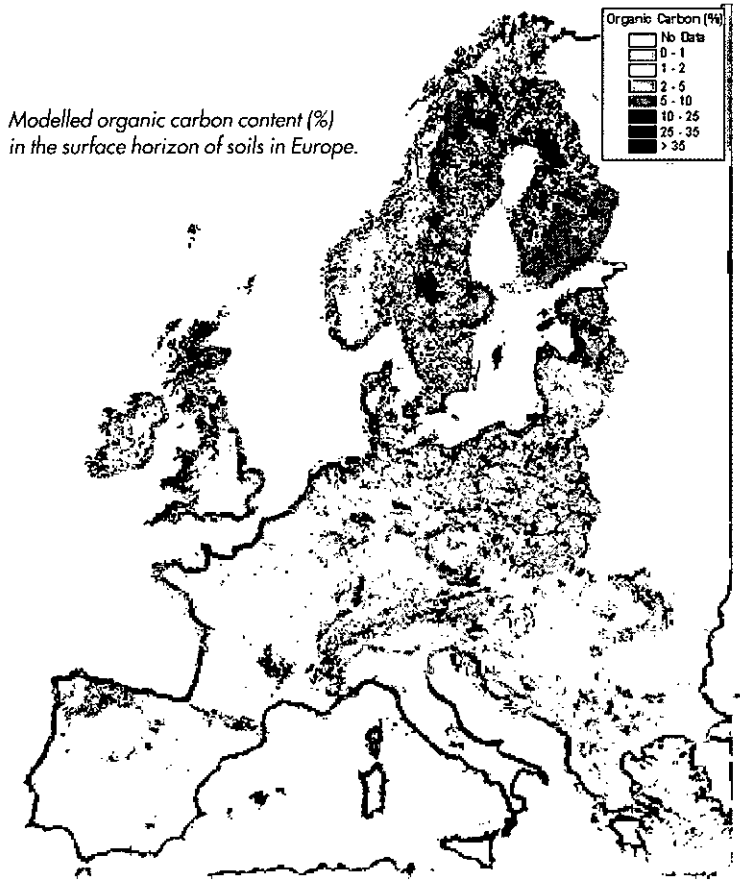
a) WiFS Satellite image of Portugal (8th of August 2003) showing the large forest fires (in dark) in the centre of the country. Cloud cover is also seen (in white).
b) Map of the burned areas in Portugal by the 8th of August 2003 (in red).
c) MODIS Satellite image of Portugal (20th of August 2003) showing the large forest fires (in dark) in the centre and south of the country.
d) Map of the burned areas in Portugal by the 20th of August 2003 (in red).

Very high resolution Ikonos imagery of Portugal (Pinheiro Grande) during August 2003 showing burned forest around a residential area.

One third of Europe's surface is covered by forests and other wooded land. The sustainable management of Europe's forests with regard to their economic and ecological resources requires high quality up-to-date spatial information.



Soil contamination from mining waste seen from space (source PECOMINES project).



Modelled organic carbon content (%) in the surface horizon of soils in Europe.

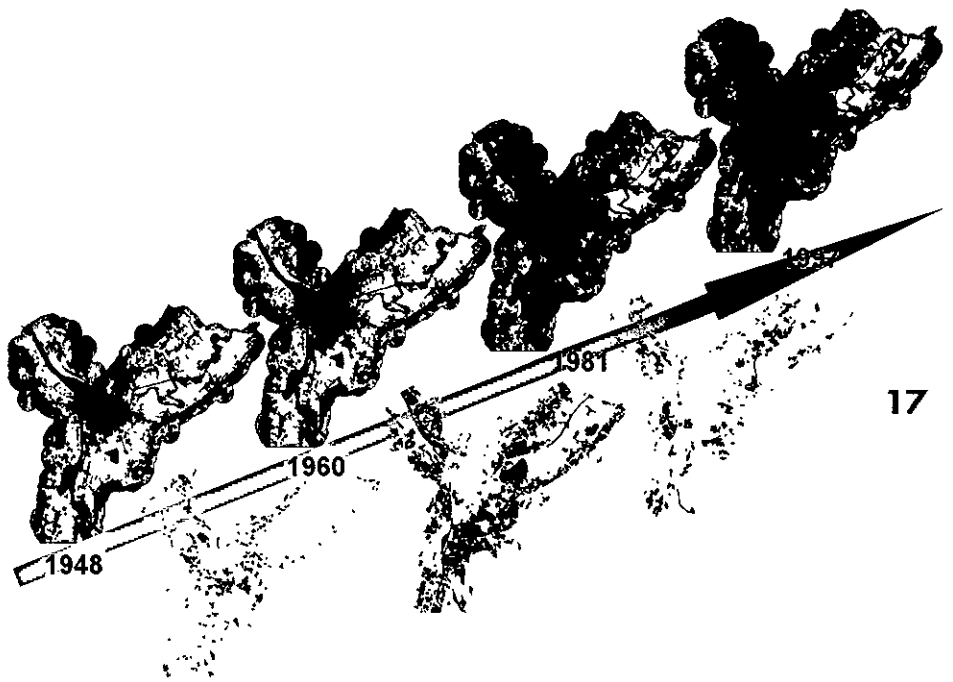
Soil monitoring and protection

The EU Thematic Strategy for Soil Protection is setting a policy framework to protect European soils from degradation. To support this, the Commission needs improved information concerning soils on a regular basis. The JRC's MOSES[1] and PRISM[2] actions help providing this information and support DG Environment not only in the implementation of the Soil Thematic Strategy but also in the preparation of the forthcoming Soil Monitoring Directive. The JRC in partnership with the European Soil Bureau network and in support to DG Environment has shown that operational, harmonised monitoring and impact assessment of the major soil threats require a high degree of data integration at European level. There is an increasing demand for dynamic input from Earth observation data. New methods using remote sensing are being developed to make soil organic matter estimates, model soil erosion, soil sealing, soil salinisation and to inventory specific sources of local contamination such as mining wastes and associated industrial areas. The JRC works on the integration of land cover change trends derived from remote sensing with land degradation and soil erosion risk modelling as part of the GMES LADAMER[3] and the PESERA[4] projects. The JRC's PECOMINES[5] project has been developed for countrywide screening and assessment of localised soil contamination from mining waste using satellite remote sensing integrated with other databases.

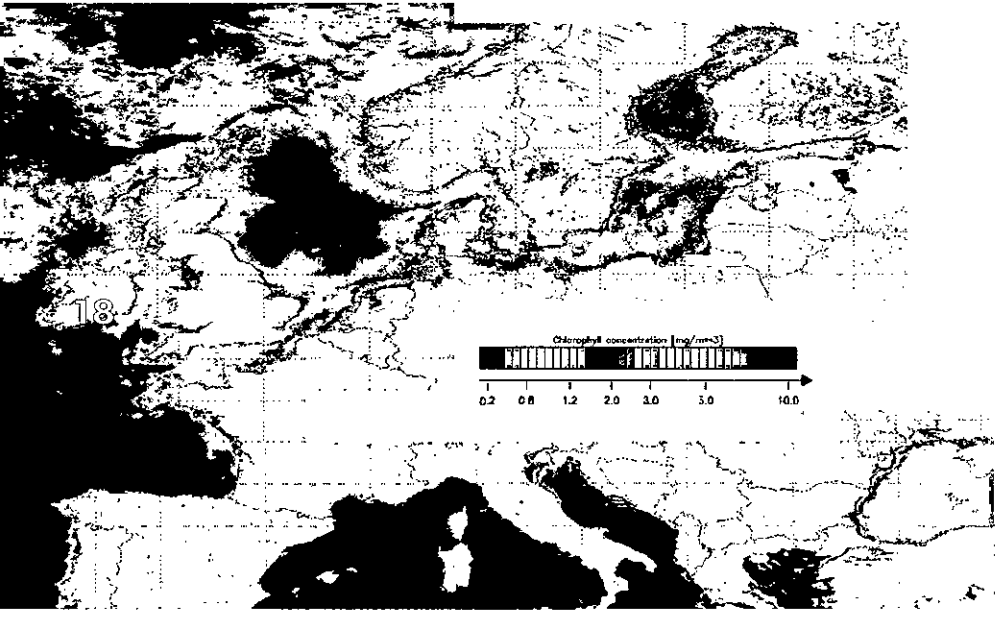
1. MOSES: MOnitoring the State of European Soils.
2. PRISM: PRessures and Impacts of Soil protection and waste Management.
3. LADAMER: Land Degradation Assessment in Mediterranean Europe.
4. PESERA: Pan European Soil ERosion Assessment.
5. PECOMINES: Inventory, regulations and environmental risks of toxic mining wastes in pre-accession countries.

Sustainability of urban developments

The EU's Urban Thematic Strategy aims to prevent unsustainable paths of urban development. This will set in place a cycle of evaluation, target-setting and monitoring for European towns and cities. For several years the JRC has been involved in the monitoring of urban expansion throughout Europe, focussing on the current status of urban areas and their evolution over recent decades, as well as providing predictive scenarios. Measurements include urban sprawl, green urban areas, landscape fragmentation, transport planning, accessibility to services, etc. Data from satellite remote sensing and aerial photographs, integrated with other ancillary data, have been used extensively to achieve harmonised and comparable assessments at a European scale. The work supports DG Environment, DG Regional Policy's European Spatial Observation Network programme, and the European Environment Agency.



Urban land use development and corresponding increase in artificial surfaces for Grenoble (France) from 1948 to 1997. This is part of the JRC's satellite-derived urban database for modelling future land use development in European urban areas.



Surface biomass estimation (mg/m³) in European Regional Seas derived from SeaWiFS satellite data - August 2001.

Water quality monitoring

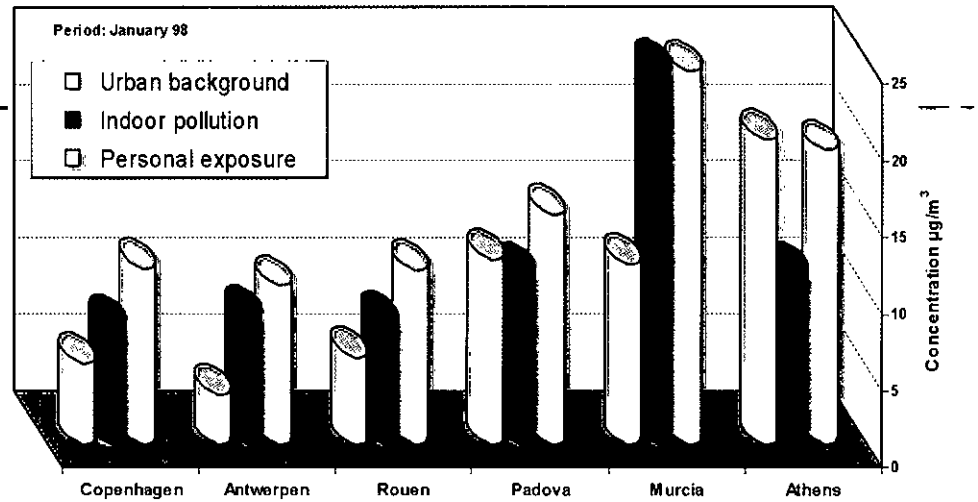
The EU continues to develop and implement water protection policies covering inland, coastal and marine aquatic ecosystems (e.g. the Water Framework Directive, Nitrates Directive, Urban Waste Water Treatment Directive and Marine Strategy). These call for provision of a great deal of data, by both the Commission and the Member States and of course these data have to be of comparable quality, collected in comparable ways and integrated into scientific models in a consistent manner. The JRC, through the ECOWAT[1] Project is mapping the status of natural water ecosystems so as to characterize the effects of pollution caused by nutrient over-enrichment. This induces high levels of algae production, which leads to aquatic ecosystem disturbances (i.e., eutrophication). Hypoxia is the most common impact of eutrophication around the world and has expanded rapidly during the last 50 years. Ecosystem responses to nutrient over-enrichment lead to various alterations in the food web structure, often with a decrease in its complexity, and a loss of species diversity with an increase in the presence of opportunistic species. The required identification and mapping of eutrophicated areas in European regions result from the integration of bio-physical models and products such as sea surface temperature or ocean colour obtained from Earth observing satellites. The results help to identify spatial and temporal trends in the ecological quality of our waters, and hence support the monitoring of the implementation of EU water policies and legislation.

1. ECOWAT: Monitoring and Assessment of the Ecological Quality of Inland and Marine Waters.

Air quality monitoring

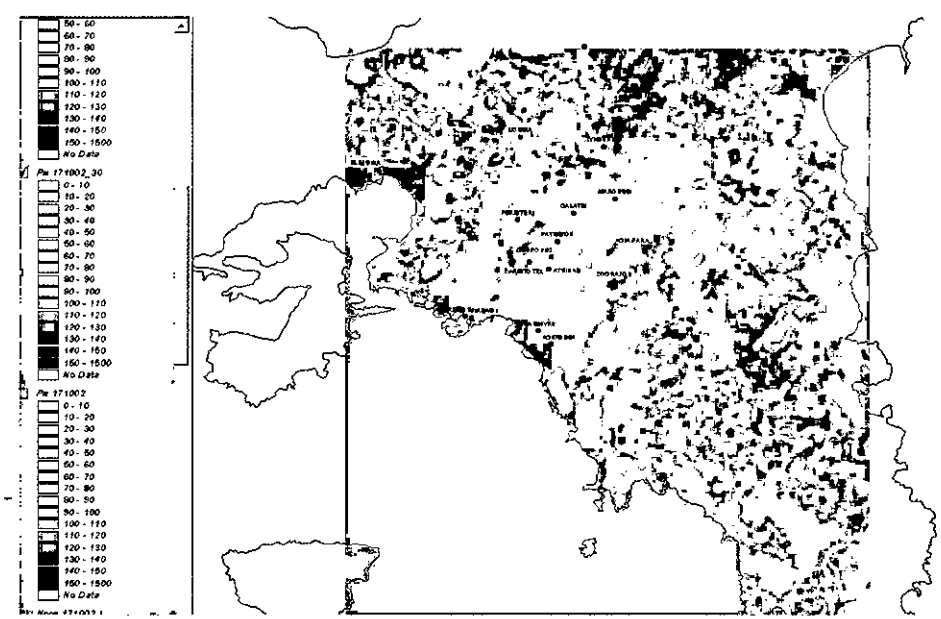
With European partners JRC is developing an innovative system for monitoring and managing urban air quality and the related health risks. ICAROS-NET[1] uses information from satellite-borne sensors to monitor the concentration of harmful particles in the air, caused by heavy industry, traffic and household heating systems. It is the first time that ultra-fine pollution particles have been detected from space with accuracy and precision. Pilot trials of the ICAROS-NET system are under way in Athens, Milan, Munich and Budapest. Early results from the Athens project indicate that the system is as reliable as land-based alternatives while providing better environmental information. Research has also demonstrated that environmental policy initiatives, such as reducing sulphur in diesel and introducing fuel alternatives such as natural gas, have been successful in reducing pollution levels. The JRC has also created the European Reference Laboratory of Air Pollution (ERLAP) in 1994 to support the development and implementation of EC air quality directives. Today this contributes to the Clean Air for Europe (CAFÉ) programme, especially to harmonise air quality assessment in the EU. ERLAP conducts inter-comparison and inter-calibration exercises of air quality measurements, in collaboration with national reference laboratories, so as to improve the quality and the comparability of measurements in the EU. Air quality measurement campaigns have been conducted in numerous EU cities to support Member States implementation of EU air quality regulations. These measurement campaigns now also include the assessment of human exposure to air pollutants. The JRC has also extended its activities towards the monitoring of health effects from air pollutants (APHEIS[2] project) by assessing mortality and morbidity resulting from exposure to fine particles in 26 EU and Accession Countries.

1. ICAROS-NET: Integrated Computational Assessment of urban air quality via Remote Observation Systems NETwork.
2. APHEIS: Air Pollution and Health – European Information System.

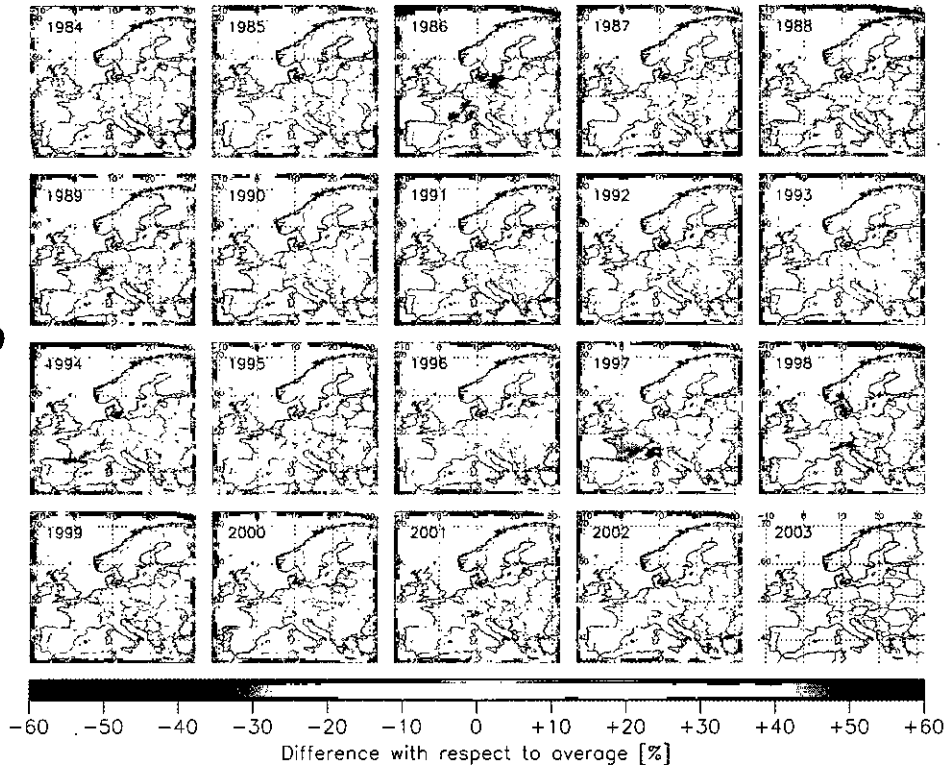


Monitoring of ambient benzene concentrations in European towns and homes (source MACBETH project).

Spatial distribution of anthropogenic aerosol concentration (in terms of µgr/m³ of PM10, i.e. fine particles of diameter lower than 10 µm) over the greater area of Athens in October 2002. The spatial resolution of the aerosol estimates is 30 m and the error less than 10% (source ICAROS-NET project).



UV Radiation. Relative deviation of the monthly averaged erythemal daily dose with respect to the 1984-2002 mean (April).

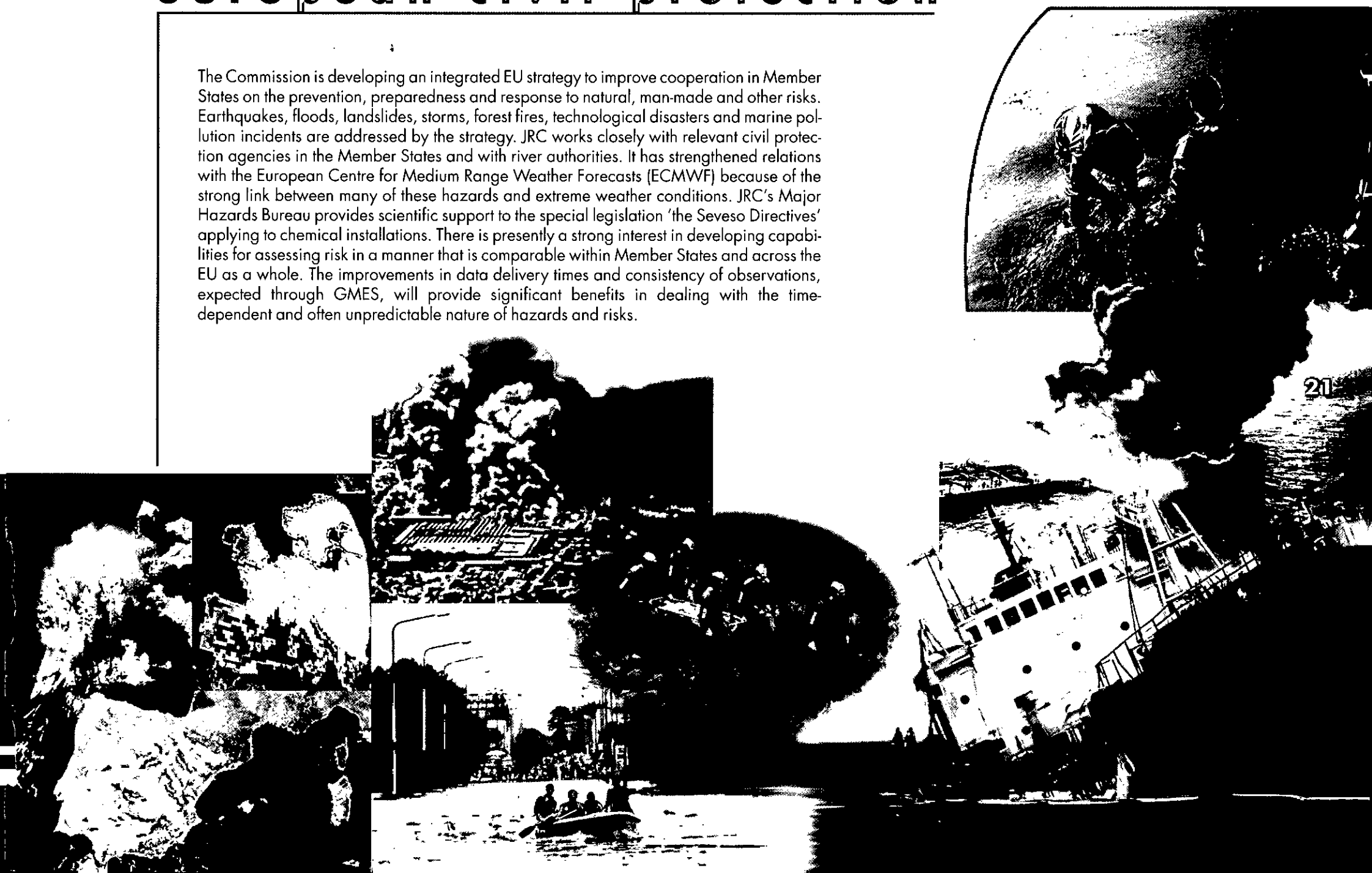


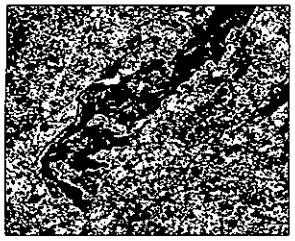
Monitoring levels of natural UV radiation

Documenting the levels of natural UV radiation is important for environmental impact studies, protection of human health (e.g. prevention of skin cancer) and to support the implementation of the Montreal protocol on ozone depleting substances. To support the Commission's DG Environment, DG Research and DG Health and Consumer Protection on these issues, the JRC operates the European reference Centre for UV Radiation Measurements (ECUV). ECUV provides calibration and QA/QC services for a large network of European laboratories that measure and monitor the UV radiation. In parallel, JRC is building a UV radiation climatology based on modelling and using satellite data to quantify the factors that determine the surface UV radiation strength (ozone layer, clouds, aerosols, etc.). The climatology consists in daily UV dose maps (e.g. the erythemal dose for the effects on human skin) covering the whole of Europe. The data set includes daily maps from January 1st 1984 to October 31st 2002, and is in the process of being brought up to date. Among other applications JRC is currently using these measurements and data to realistically estimate human exposure to UV radiation, taking into account behavioural factors (time spent outdoors, occupation and the like).

european civil protection

The Commission is developing an integrated EU strategy to improve cooperation in Member States on the prevention, preparedness and response to natural, man-made and other risks. Earthquakes, floods, landslides, storms, forest fires, technological disasters and marine pollution incidents are addressed by the strategy. JRC works closely with relevant civil protection agencies in the Member States and with river authorities. It has strengthened relations with the European Centre for Medium Range Weather Forecasts (ECMWF) because of the strong link between many of these hazards and extreme weather conditions. JRC's Major Hazards Bureau provides scientific support to the special legislation 'the Seveso Directives' applying to chemical installations. There is presently a strong interest in developing capabilities for assessing risk in a manner that is comparable within Member States and across the EU as a whole. The improvements in data delivery times and consistency of observations, expected through GMES, will provide significant benefits in dealing with the time-dependent and often unpredictable nature of hazards and risks.





Flood Damage Report	
Date	10-Jul-97
River	Oder
Countries involved	Czech Republic, Poland, Germany
Flooded Area	500 km2
- urban area	50 km2
- industriel area	30 km2
- agriculture/grassland	420 km2
average depth of flood (m)	2.4
expected economic losses	very high

Flood depth

Land use flooded

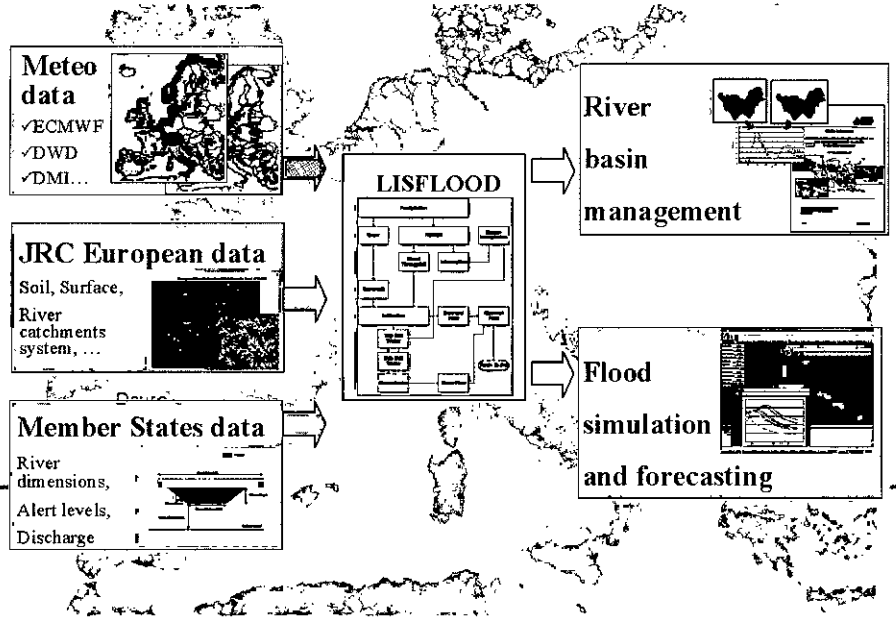
Damage map

Flood extent mapping and flood damage assessment.

Floods prevention, forecasts and flood extent mapping

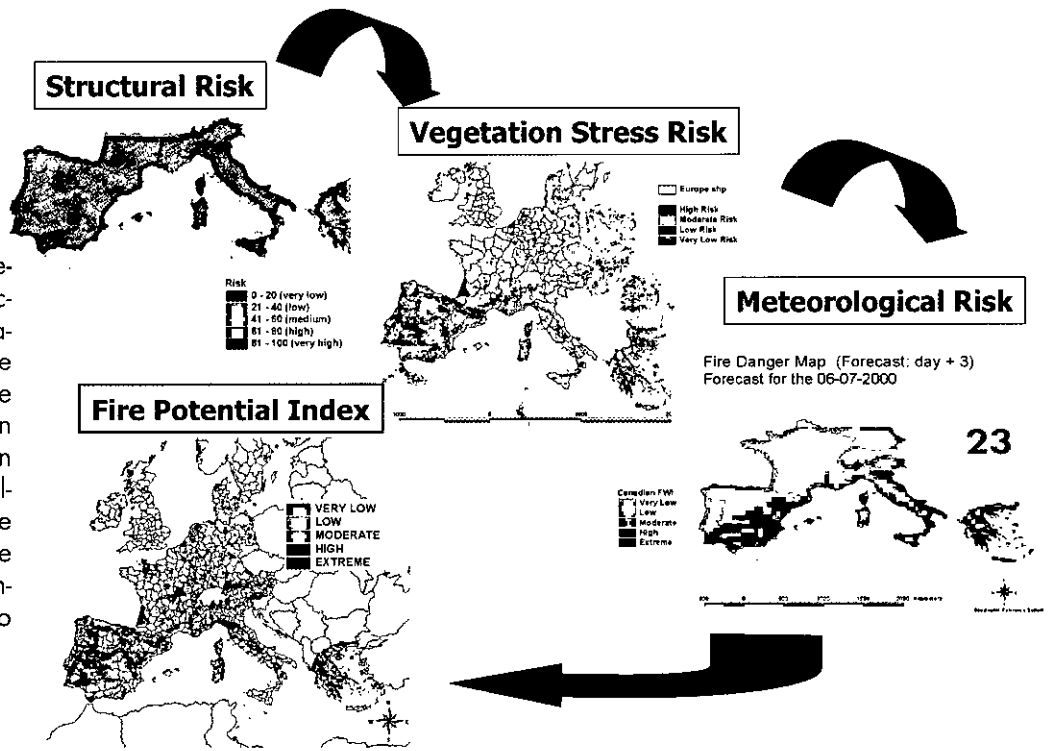
The JRC has developed models to evaluate flood defence strategies in trans-national catchments (LISFLOOD). The LISFLOOD models involve river basin-wide studies on technical measures for flood control and prevention, on land-use change and climate change. A European Flood Early Alert System (EFAS) is currently also under development. This will provide flood alerts to local, regional and national water authorities responsible for flood forecasting, aid organisations and the Commission services, using medium-range weather forecasts provided by meteorological organisations. EFAS has a 1x1km resolution and provides flood forecasts of 7 to 10 days. The hydrological forecasting component uses weather prediction model outputs, which depend on variables measured using satellite and *in-situ* observations. For the aftermath of major flood events JRC has developed post-flood analysis using satellite imagery to evaluate flood extent and damage.

The JRC's LISFLOOD modeling system: a tool for river basin flood management (scenario modeling) and flood forecasting.



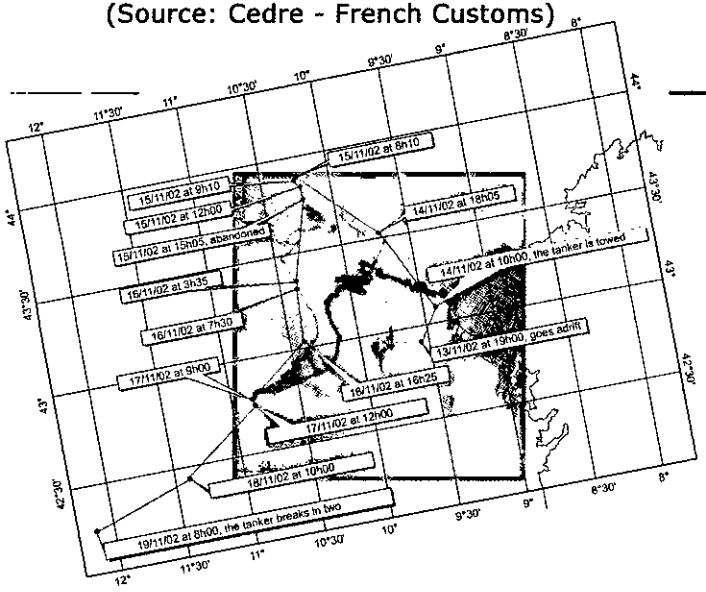
Forecasting forest fire risk

The JRC has developed a pre-operational system providing 1, 2, and 3-day fire risk forecasts for all of Europe. Risk is assessed from a fuel map depicting vegetation type and structure and its susceptibility to fire ignition and spread, satellite observations to estimate relative greenness of the vegetation, and meteorological forecast to determine fuel relative humidity and the moisture content. The resulting risk maps are made available to forest fire and civil protection services in the Member-States and DG Environment's Civil Protection Unit in Brussels every morning via Internet. This service will also be fed into the European Forest Fire Information System (see Forests and nature protection, page 15). The JRC is collaborating with EUMETSAT concerning future use of data from their satellites to improve the retrieval of vegetation condition and to increase the frequency in the update of the forest fire risk maps. The national meteorological services are also part of this collaborative effort under the auspices of EUMETNET. Any eventual operational system would be transferred to EUMETNET.



Examples of different types of risk maps for Europe. While Vegetation Stress Risk and Meteorological Risk can change daily, Structural Risk changes on a longer time scale. The combination of the information used to derive these types of risks can be combined to obtain more developed risk indices such as the Fire Potential Index.

Positions of Prestige Tanker
(Source: Cedre - French Customs)



The Prestige oil tanker incident mapped against a wide-swath ESA Envisat-ASAR image acquired on 25 November 2003. The extent of the dramatic oil spill is marked in red.

Marine oil-spill monitoring

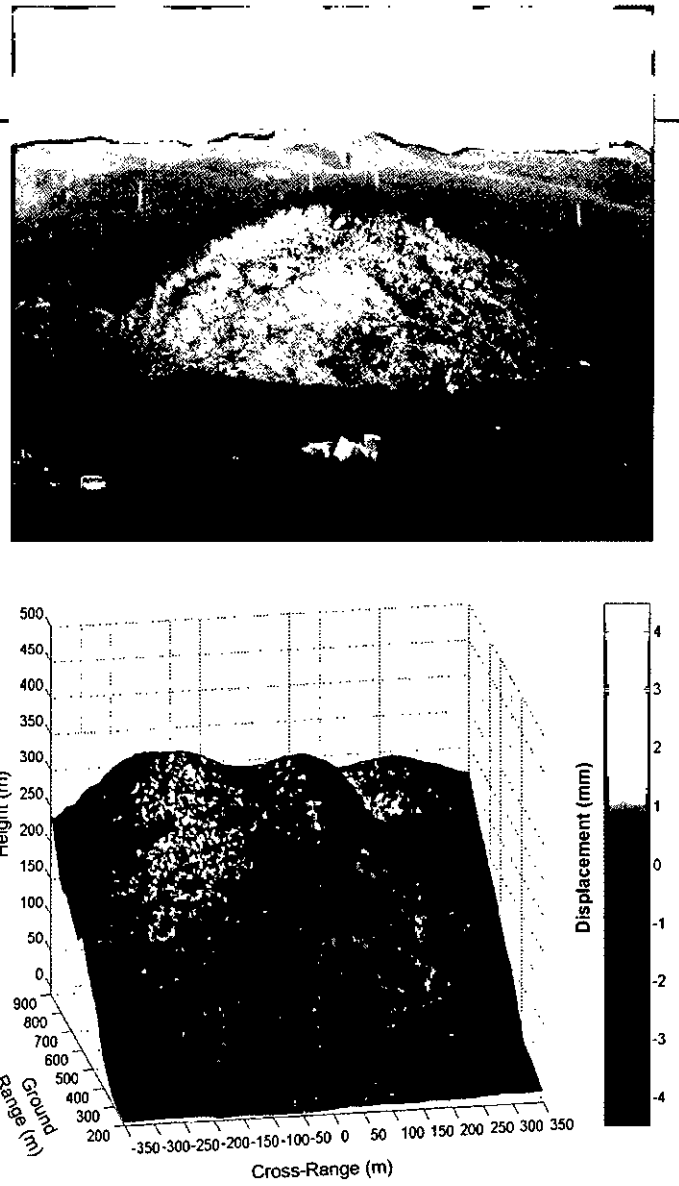
As the world's largest crude oil market, Europe is particularly vulnerable to tanker disasters. Fortunately such occurrences are rare, but oil is still spilled or pumped from ships every day into European seas. The JRC is using data from Synthetic Aperture Radars (SARs) on polar orbiting satellites (ERS, RADARSAT and Envisat) to detect spills. Once spills have been detected models of the oceans' dynamics can be used to predict their movement. This work has been partly to support relief operations after accidental spills and partly to map deliberate ones. In the aftermath of the Prestige tanker accident JRC analysed SAR images on behalf of the Commission's Civil Protection Unit in DG Environment. These were obtained through the International Charter mechanism, which coordinates the fast acquisition of imagery from a number of European and non-European space agencies in the event of a major disaster. The JRC has mapped spills throughout the Mediterranean, and together with partners in the OCEANIDES project, it has developed a harmonised reporting system for oil spills and is laying the scientific foundations for a better quantification of oil spilled annually in European waters.

A same day false colour fusion image of a RADARSAT-1 ScanSAR Narrow image and an Envisat Wide Swath image with a 4 hour time separation on 21 July 2003. Two oil-slicks are clearly visible, one as a hockey-stick shaped slick towards the Finnish coast in the north and a slim curved slick west of Estonia in the south. OCEANIDES aims at near real time supply of SAR-derived oil slick information to coast-guards in the region.

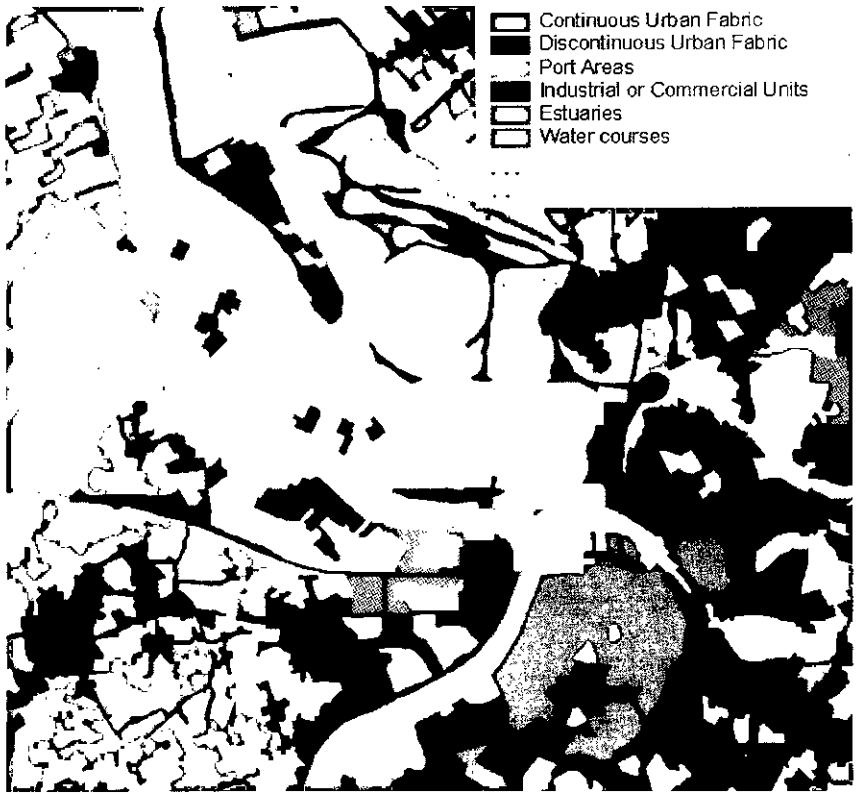
Landslide risk assessment

Landslides hazards pose a serious threat to life and property as well as to cultural and natural heritage. The changing climate means that regions considered of low risk may no longer be so. The challenge is to assess risks and provide early warnings. The innovative LISA[1] radar instrument, designed and implemented at the JRC, allows a precise and continuous monitoring of slope stability. LISA has been successfully tested on the unstable slopes of the Stromboli volcano and offers potential as a core element of an early warning system for landslide emergency management. The objective is see how it performs on landslides and to scale up to a wider area by complementing the in-situ LISA measurements with meteorological forecasts, GPS-based monitoring of specific points and satellite radar interferometry.

1. LInear SAr ©



Photograph of landslide of Cortenova (Northern Italy) and the corresponding displacement map on the digital elevation model measured with a ground-based synthetic aperture radar.



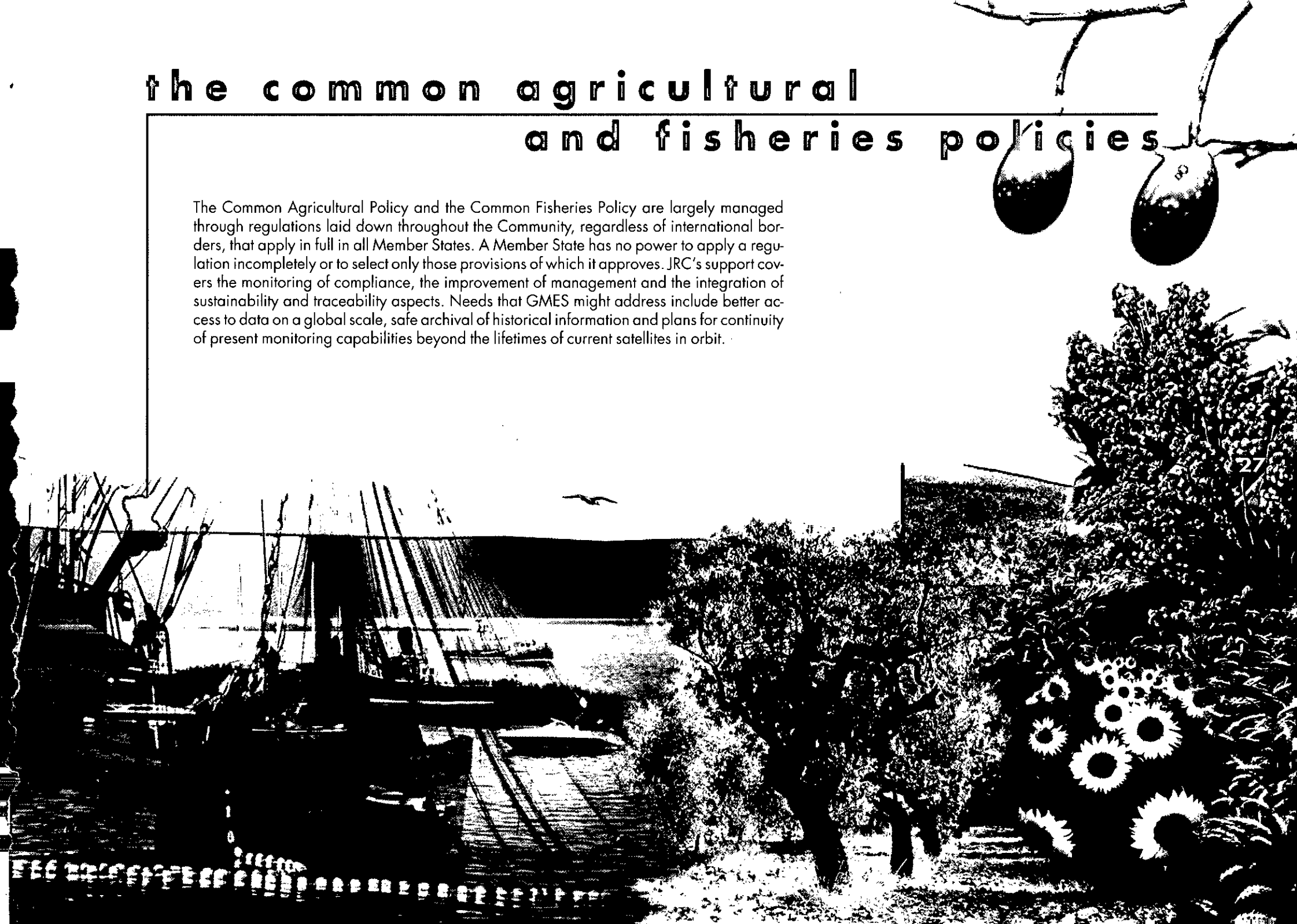
CORINE Land Cover data for the Port of Antwerp which has a high density of Seveso plants. Working with this satellite derived data can reveal the proximity of the plants to vulnerable areas such as populated urban areas, water bodies, marshes and nature reserves.

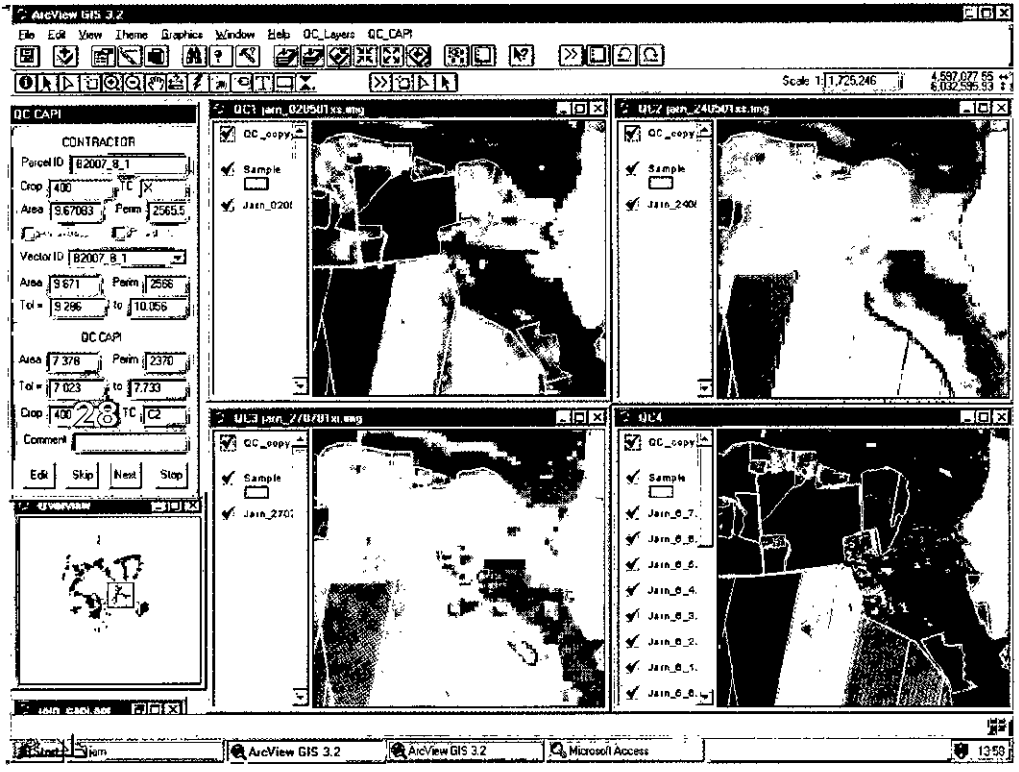
Supporting the Seveso Directive

Under the proposed amendment to the Seveso Directive, Member States are obliged to provide the Commission information on the geographical location of all industrial plants containing dangerous substances above a certain threshold amount. JRC has used spatial analysis to identify particularly vulnerable areas such as populated areas, water bodies or nature reserves. The combination of the presence of dangerous substances with natural risks such as flooding or fire and the changing nature of the risk due to urban encroachment are currently matters of concern. The European Commission and Parliament have asked JRC to set up a working group to produce recommendations on the second of these issues.

the common agricultural and fisheries policies

The Common Agricultural Policy and the Common Fisheries Policy are largely managed through regulations laid down throughout the Community, regardless of international borders, that apply in full in all Member States. A Member State has no power to apply a regulation incompletely or to select only those provisions of which it approves. JRC's support covers the monitoring of compliance, the improvement of management and the integration of sustainability and traceability aspects. Needs that GMES might address include better access to data on a global scale, safe archival of historical information and plans for continuity of present monitoring capabilities beyond the lifetimes of current satellites in orbit.



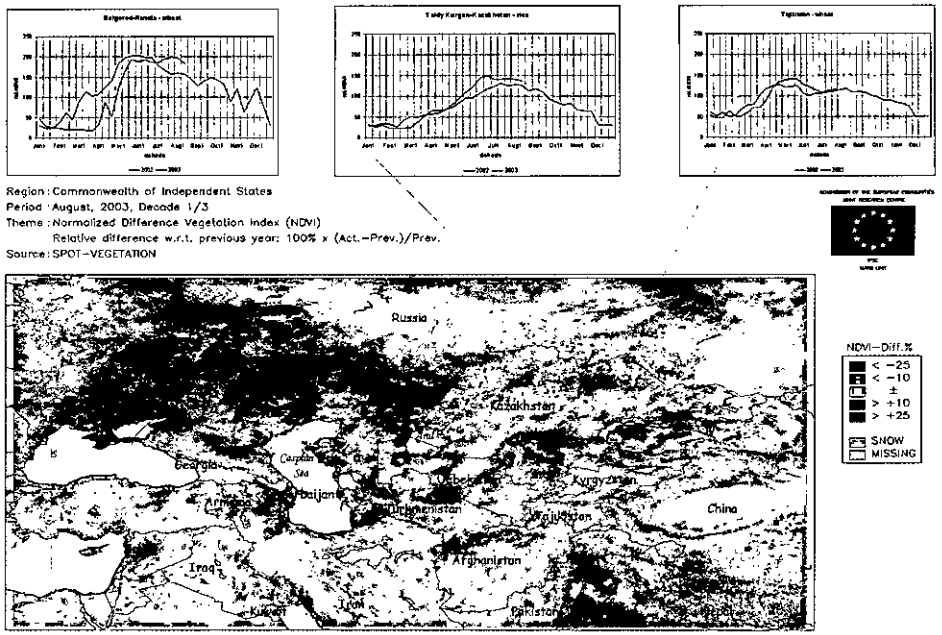


Multi-temporal, multi-source satellite imagery of agricultural fields allows a detailed assessment of crop occurrence, including area measurement. While currently primarily used to verify claims for agricultural aid (in the EU) this methodology can be readily deployed to access actual crop cultivation in any part of the world.

Checking area-based subsidies

Earth observation satellites have been used by the JRC for the management and control of area subsidies in the Common Agriculture Policy for the past ten years. This involves measurement of field areas with orthoimagery and crop type identification using a time series of high-resolution satellite images (Landsat TM, SPOT-1/4/5, IRS, RADARSAT, QuickBird, Ikonos and EROS). The JRC also provides support to the upgrading of the EU's baseline land parcel identification system to make it more interoperable, more digital and more up-to-date. Complete European coverage of orthoimagery will be available by 2005, with procedures for regular updating every three to five years and mechanisms to disseminate the information to farmers or to inspectors in the field through satellite positioning technology integrated into hand-held devices. Future research will be concentrating on tools to help farmers check compliance with new environmental legislation and measures to improve the traceability of products entering the food chain back to their point of origin.

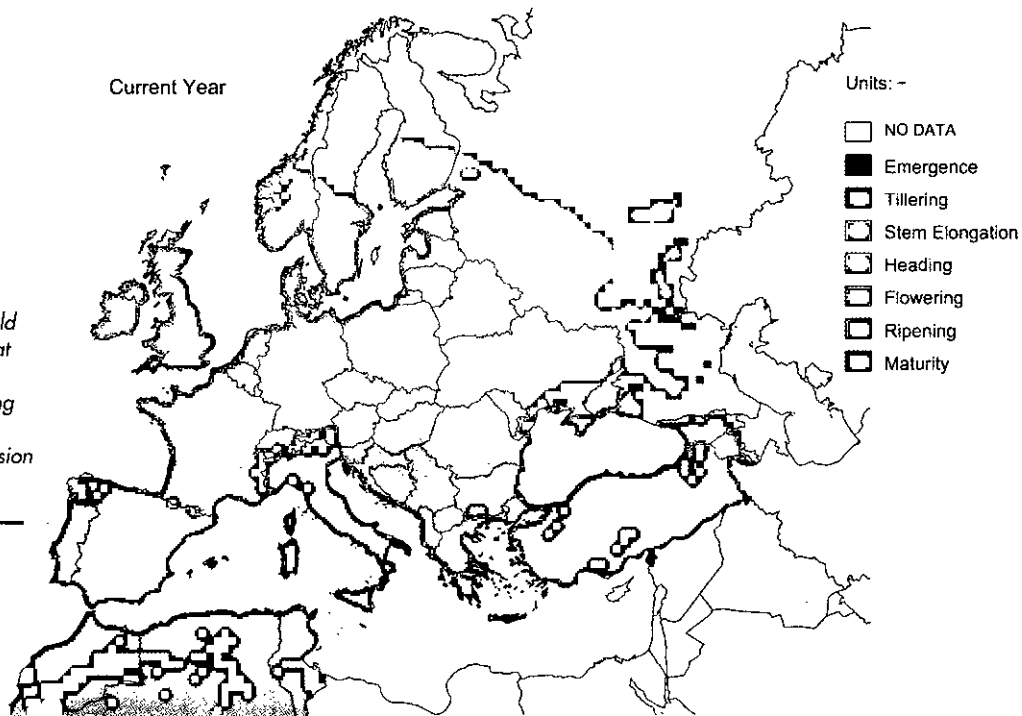
Regional crop specific Normalised Difference Vegetation Index (NDVI) signatures highlight advances or delays in crop development in the current vegetative season compared to the previous season, and assist in estimating imminent food scarcity in selected regions of the world.

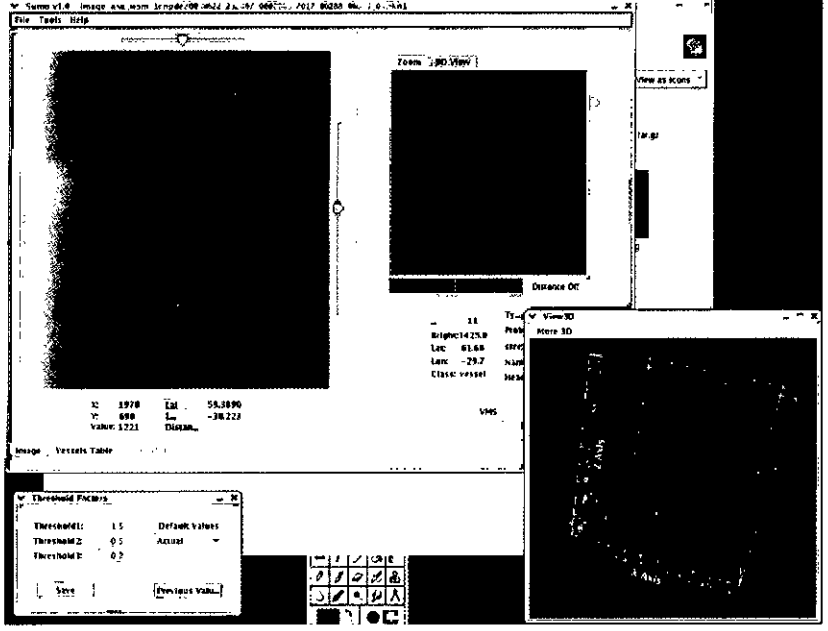


Crop monitoring

The JRC's crop yield forecasting system provides plant-growth simulations and crop-yield simulations for 11 different crops. This covers the whole Union, plus the Accession Countries of Central and Eastern Europe and the Maghreb countries. The basic network of meteorological monitoring stations is on a 50km grid and has been operating since 1975. Supplementary earth observation data improves the calculation of the spatial distribution of crop growth phenomena and an independent check on the agro-meteorological outputs. JRC uses data from the VEGETATION and NOAA AVHRR sensors. The accuracy of the yield forecasting over the past ten years has been to within 5% for April and 3% for September. This level of accuracy allows the Commission's Directorate General for Agriculture to programme its interventions in advance. European food aid and food security policies need the same information for countries outside Europe but here the challenge is greater because of sparseness, low resolution and uncertainties in all the input parameters. Despite these difficulties the JRC now issues on a regular basis (monthly or bi-monthly) crop status bulletins for four areas - Eastern Africa, South America, the Mediterranean basin and Russia & Central Asia. More detailed and frequent information (10-daily) are provided for Somalia and forecasts for Sudan will be available in the near future. The information derived in this way provides a useful input to the Commission services responsible for food security issues.

The Crop Yield Forecasting System produces crop yield forecasts and crop growth analysis in near real time at pan-European level. As part of this system the Crop Growth Monitoring System allows simulations showing the impact of climate on current season's crops. The system's output are made available to European decision makers starting already early in the growth season.

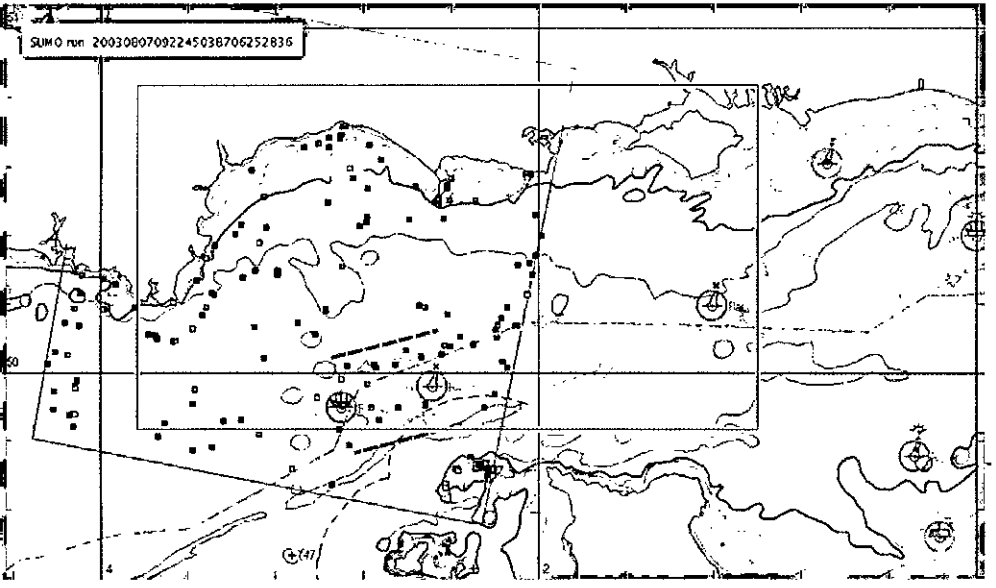




The JRC vessel detection algorithm applied to an ENVISAT ASAR wide mode image of June 22, 2003 has detected a large number of targets in the red fish area South-West of Iceland, lined up against the Exclusive Economic Zone boundary. The full image covers an area of 400 by 400 km². System tools allow a more precise characterization of individual targets in the image and a comparison to known VMS positions.

Fishing vessels detection and identification

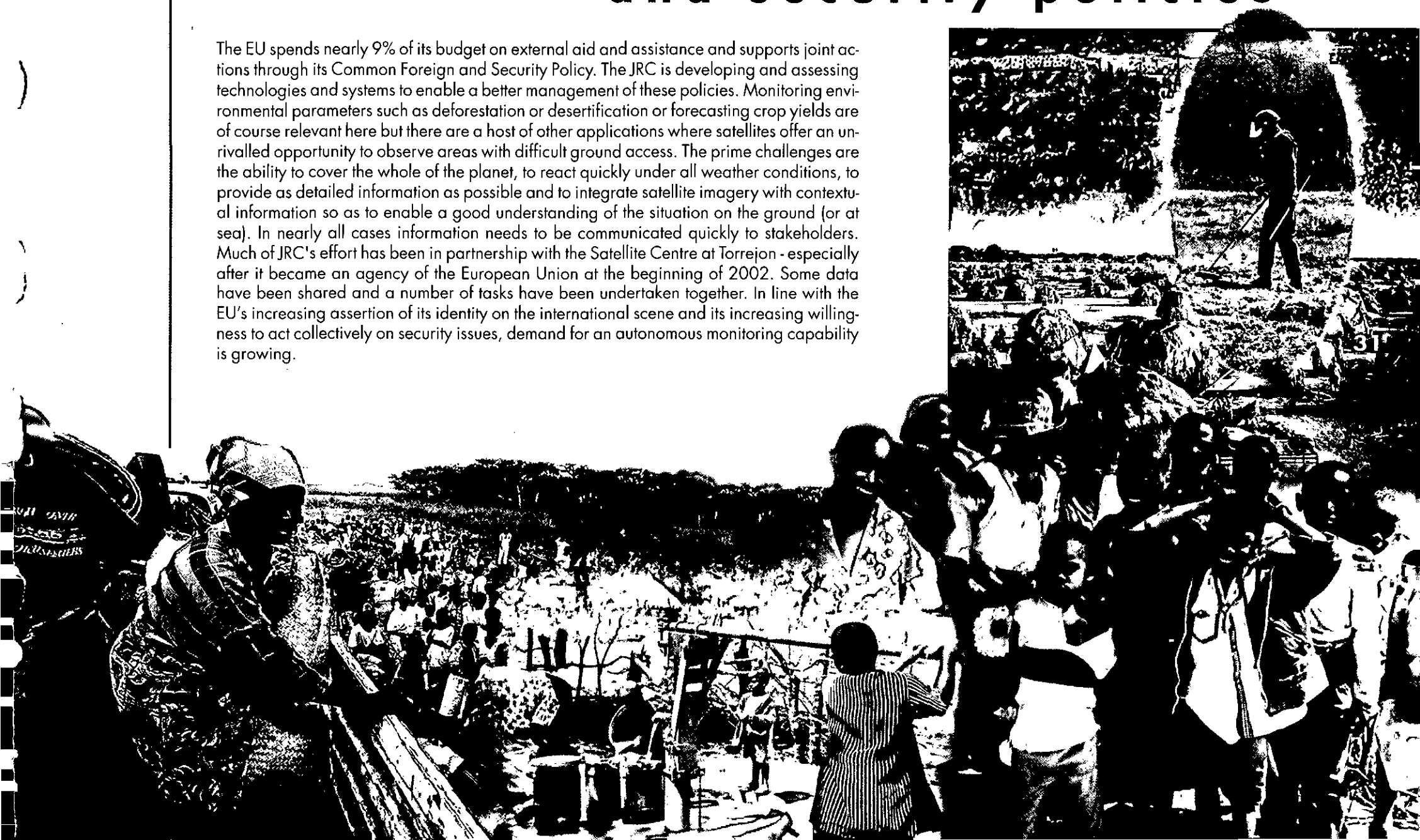
The EU's main instrument for monitoring the position of fishing vessels is the Vessel Monitoring System (VMS). This is compulsory for all vessels over 24 metres in length registered in the EU or fishing in EU waters. This on-board system transmits the vessels' position to the flag state and the coastal state on a regular basis – the typical period between reports being about an hour. The JRC has been investigating how satellite imagery can help detect and identify vessels whose VMS is not functioning. Trials have been conducted in the Flemish Cap, North Sea, Bay of Biscay and the Azores with synthetic aperture radar (SAR) images from the Canadian RADARSAT satellite. Virtually all steel-hulled boats subject to VMS can be detected. By correlating their positions with VMS-derived positions, vessels not carrying a working VMS can be identified. Swaths 300 km in width can be monitored in open ocean but narrower swaths are needed in coastal waters where the vessels are smaller. A benchmarking exercise, with 17 partners, to determine the performance of algorithms for vessel and wake detection with both SAR and optical imagery started in May 2003. In the summer of 2003 new trials with a consortium of industrial and academic partners using satellite communications showed that it is possible for fisheries authorities to receive the vessel positions less than 40 minutes after image acquisition. It is expected that the new Envisat ASAR instrument will also be useful for fisheries monitoring.



Output from JRC's Vessel Detection System (VDS) is automatically forwarded to Fishing Monitoring Centres approximately 35 minutes after the SAR image has been received at JRC via a satellite uplink. The VDS image source is a RADARSAT extended mode image of August 7, 2003 over the Channel.

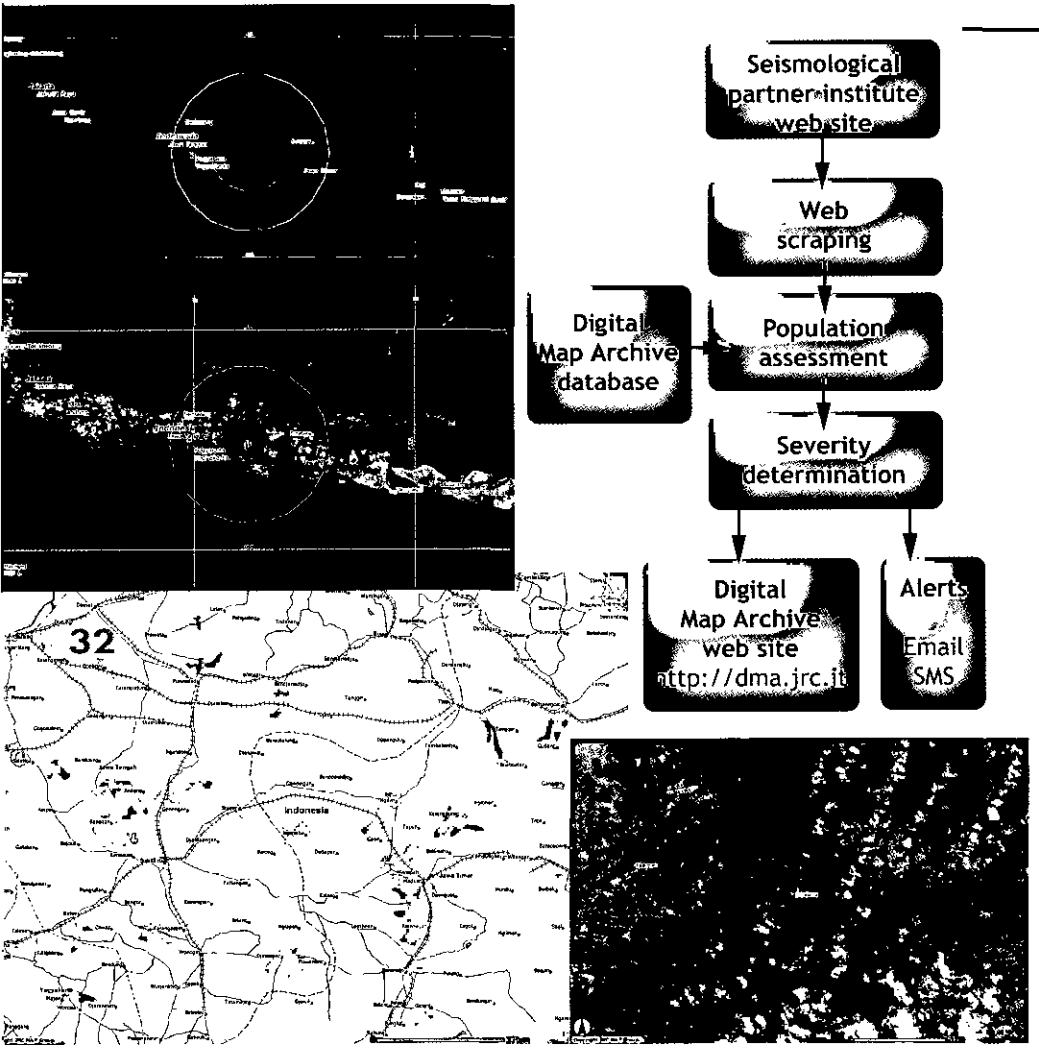
european union external aid and security policies

The EU spends nearly 9% of its budget on external aid and assistance and supports joint actions through its Common Foreign and Security Policy. The JRC is developing and assessing technologies and systems to enable a better management of these policies. Monitoring environmental parameters such as deforestation or desertification or forecasting crop yields are of course relevant here but there are a host of other applications where satellites offer an unrivalled opportunity to observe areas with difficult ground access. The prime challenges are the ability to cover the whole of the planet, to react quickly under all weather conditions, to provide as detailed information as possible and to integrate satellite imagery with contextual information so as to enable a good understanding of the situation on the ground (or at sea). In nearly all cases information needs to be communicated quickly to stakeholders. Much of JRC's effort has been in partnership with the Satellite Centre at Torrejon - especially after it became an agency of the European Union at the beginning of 2002. Some data have been shared and a number of tasks have been undertaken together. In line with the EU's increasing assertion of its identity on the international scene and its increasing willingness to act collectively on security issues, demand for an autonomous monitoring capability is growing.



Crisis alerts and situation assessment

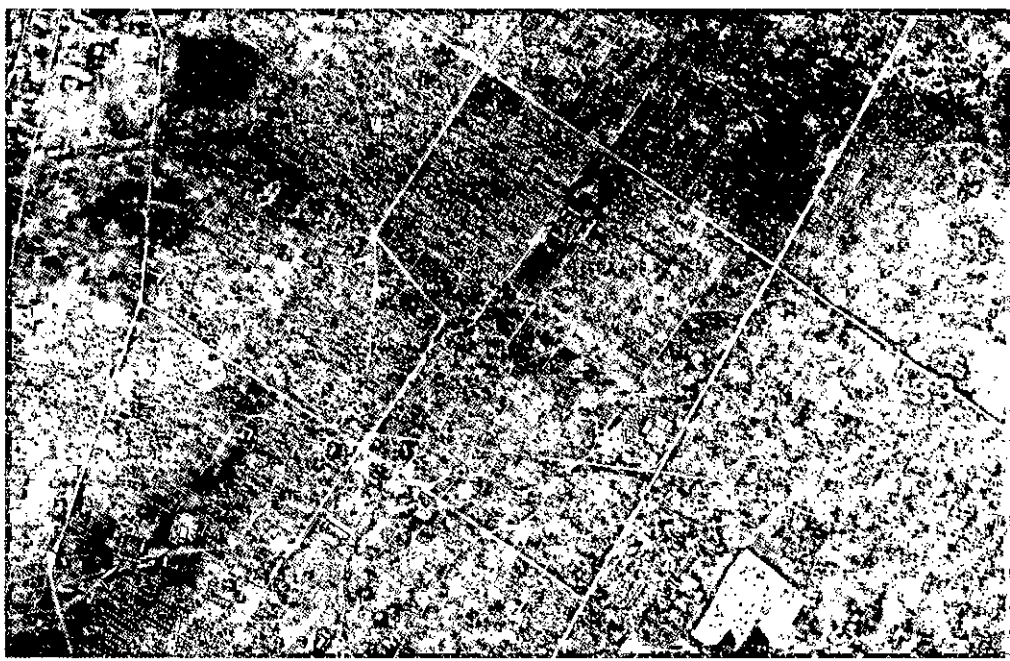
JRC is providing the Commission Services responsible for humanitarian aid and assistance with tools and analysis so that they can react promptly to crises and rapidly assess situations. An on-line information system, the Digital Map Archive, developed for the Commission's humanitarian aid office (ECHO) provides geographical information including digital maps and satellite imagery at different spatial scales. The map archive helps locate crisis areas and determine lines of access thus facilitating more timely assessment of the crisis. The Digital Map Archive also supports a number of specific tools. For example software automatically detects event information posted by seismic monitoring networks and combines it with population density data to provide an estimate of the likely number of people affected within two to three hours of the event. Information is then transmitted by e-mail and SMS to those ECHO officials responsible for deciding on the need to allocate resources quickly for rescue operations. In the developing world the population density data is partly derived from land cover data, road networks, lights at night and other information derived from satellite images.



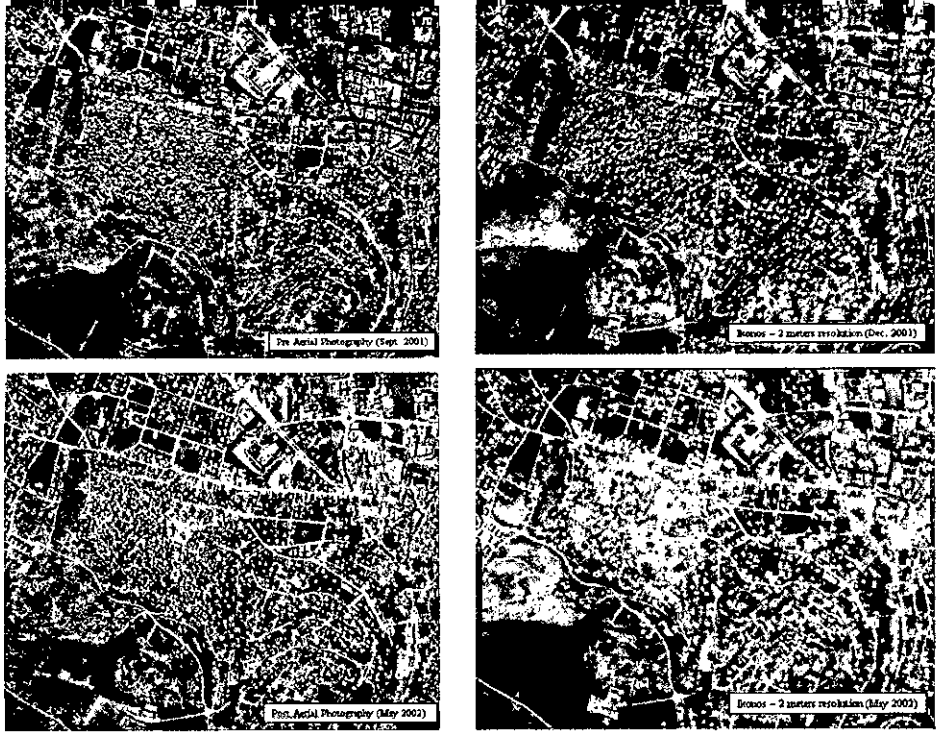
Digital Map Archive (Earthquake). Through web scraping of partner seismological institutes' web pages, crossing this information with a large geographical database on infrastructure and population, the JRC Earthquake Alert Tool sends out SMS and email alerts automatically informing decision makers of the potential humanitarian impact of an earthquake within hours after the event.

Monitoring vulnerable populations

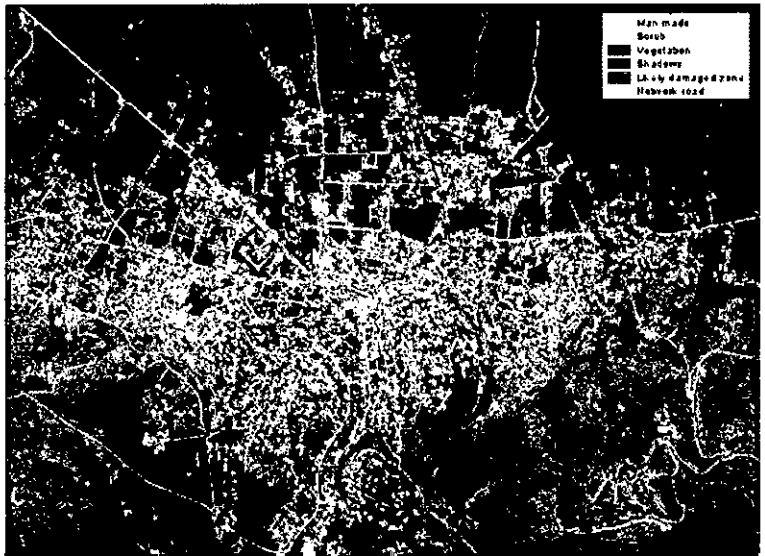
It is a prime requirement in any humanitarian operation to be able to determine the whereabouts and number of people that have been affected by a particular disaster. This is particularly difficult in the developing world where censuses are out of date, where there are large movements of population in short periods of time and where communications are poor. If analysed appropriately imagery from Earth observing satellites can provide timely information on the location, and even density of mobile, yet vulnerable populations. JRC successfully estimated the number of people in a refugee camp in Lukole, Tanzania, using very high-resolution satellite imagery from Ikonos. Automated pattern recognition algorithms distinguished tents from other objects and estimates of the population were made from these. Setting up mathematical algorithms for recognising a particular feature presently requires a non-negligible effort. Future research, in collaboration, with other partners, aims to further automate procedures in order to provide a faster response. This will then be used to estimate population density in other refugee caps around the world.



Refugee counting. In the aftermath of man-made crises, refugees (or internally displaced persons) cluster in relatively safe areas that rapidly become refugee camps. The maintenance of these camps is one of the challenges to which the relief community has to respond. The figure shows an Ikonos satellite image collected on 24 September 2000 over the Lukole refugee camp in Tanzania. The figure shows 100 ha of the camp that extended over a total of 1120 ha. Automated image analysis at JRC provided estimates of the refugee population within the range of the camp authorities' count of 129840.



a) *pre- and post-conflict aerial 20 cm resolution images of the Jenin refugee camp.*
b) *pre- and post-conflict 2 m resolution Ikonos images of the Jenin refugee camp.*
c) *damage map of the Jenin refugee camp derived using very high resolution satellite data, mathematical morphology and GIS.*

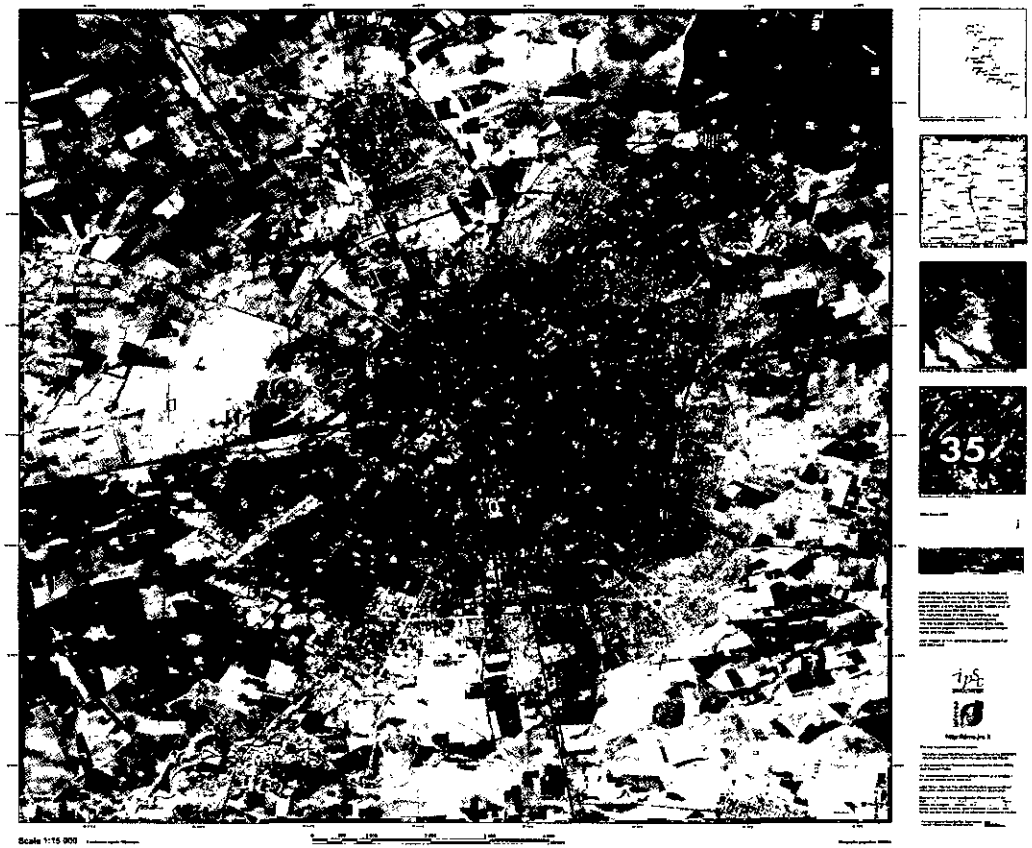


Post-conflict damage assessment

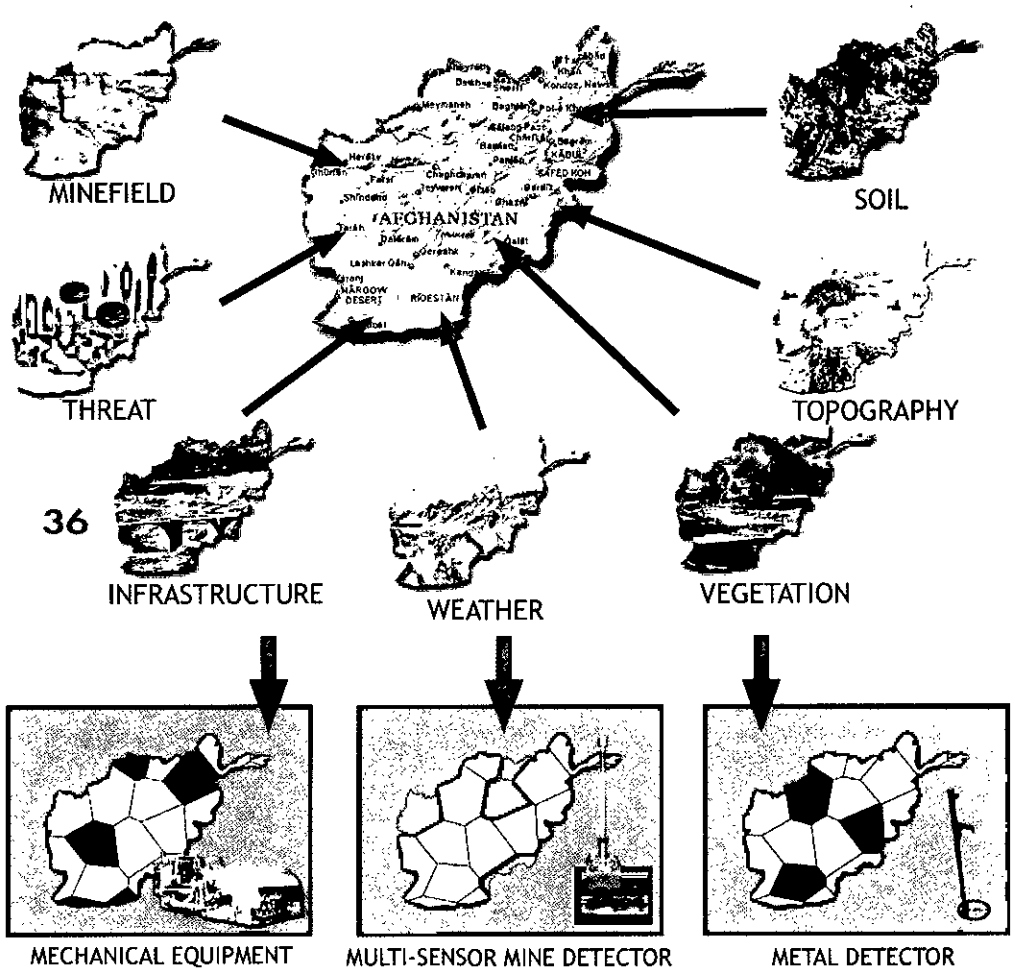
The EU is a significant contributor to post-conflict reconstruction — both of public infrastructure and of private housing. Problems encountered by damage assessment teams include a lack of knowledge of the pre-conflict state of a particular building and a difficulty in obtaining ground access immediately after the conflict due to military restrictions or landmines. Case studies carried out by the JRC in the Former Yugoslav Republic of Macedonia, the West Bank of Palestine and Baghdad showed that analysis of very high resolution optical imagery from Ikonos or QuickBird satellites provides a good indication of damage to buildings. Work is underway at JRC with a consortium of partners to automate image interpretation processes and to include analysis of synthetic aperture radar images thus allowing structural damage assessment in regions where cloud cover reduces the opportunities for optical image acquisition. Providing imaging systems can be deployed quickly enough and archived (pre-conflict) data made available, timely assessments of post-conflict damage can be made.

Mapping for the UN and humanitarian needs

The JRC, through the EU's Rapid Reaction Mechanism, has been producing up-to-date maps and vector layers of the main cities in Afghanistan and Iraq from 1 metre resolution Ikonos satellite data, topographic maps and *in-situ* information as well as lower resolution maps of the countryside from Landsat and SPOT-5. These maps were handed over to the European entities and to the United Nations organisations working in these war-affected countries for decision making, reconstruction, rehabilitation and minefield clearance. Cartographic training was given to Afghan nationals in order to help them use and further develop the products. Similar mapping projects are planned for other countries.



Small scale topographical maps of conflict areas are being produced under the "rapid response" mechanism on behalf of DG External Relations in the shortest possible time frame. These image maps are key inputs to post-conflict damage analysis to coordinate humanitarian aid efforts. This photo map covers Arbil, Iraq.



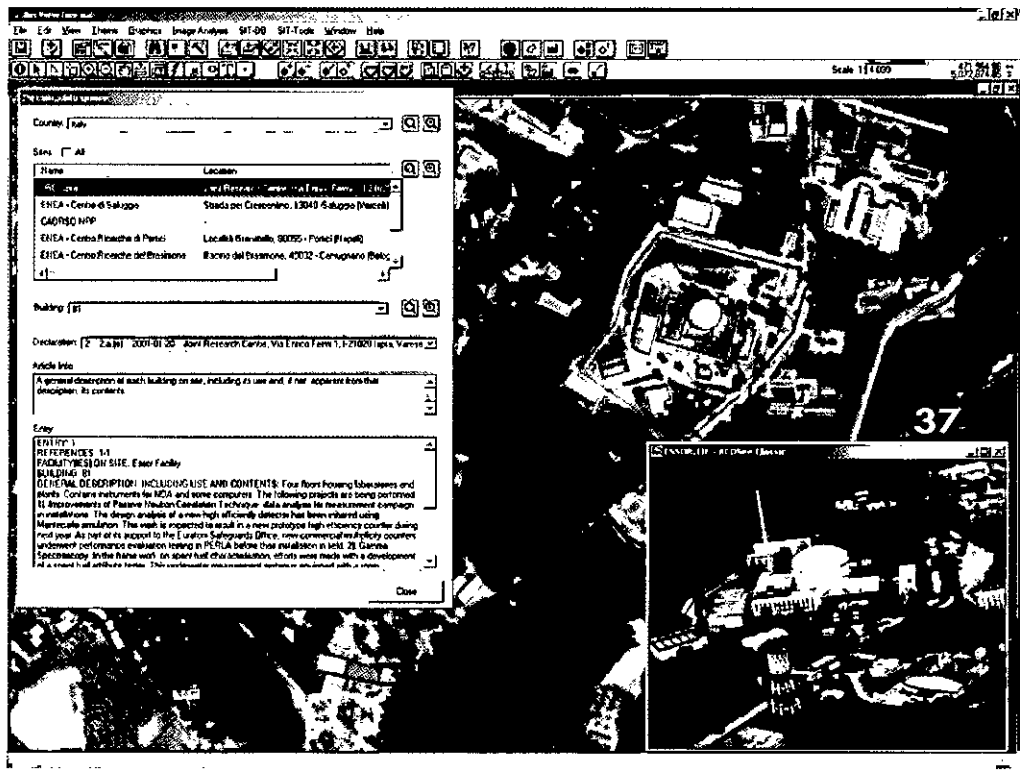
Equipment suitability maps will take into account the performance and limitations of the demining equipment as a function of the environmental parameters like the threat, vegetation, soil, topography, weather, and infrastructure.

Assistance in humanitarian demining

In support of EU efforts to reduce the impact of landmines on the communities of people living in post conflict areas and facing the daily scourge of anti-personnel landmines, the JRC is developing common standards and test and evaluation procedures for tools to be used in mine clearance. Different sensors work better under different conditions. For instance mechanical methods cannot work on steep slopes or woodland. So part of this effort involves characterization of the terrain and the development of suitability maps in mine-affected countries. In post-conflict regions where such information is needed, parameters such as slope or land cover are normally derived from earth observation data.

Monitoring of non-proliferation and nuclear safeguards

In response to evolving customer priorities, JRC is increasing the system analysis and information treatment aspects of its work supporting and underpinning EU policies related to the non-proliferation of nuclear weapons. This includes (1) requirement analysis and system engineering for Nuclear Material Accountancy and control in civil fuel cycle facilities (2) the deve-lopment of an open source knowledge centre on non-proliferation (3) the development of data management systems for treaty verification integrating Geographical Information System (GIS) technology and commercial very high resolution satellite imagery.

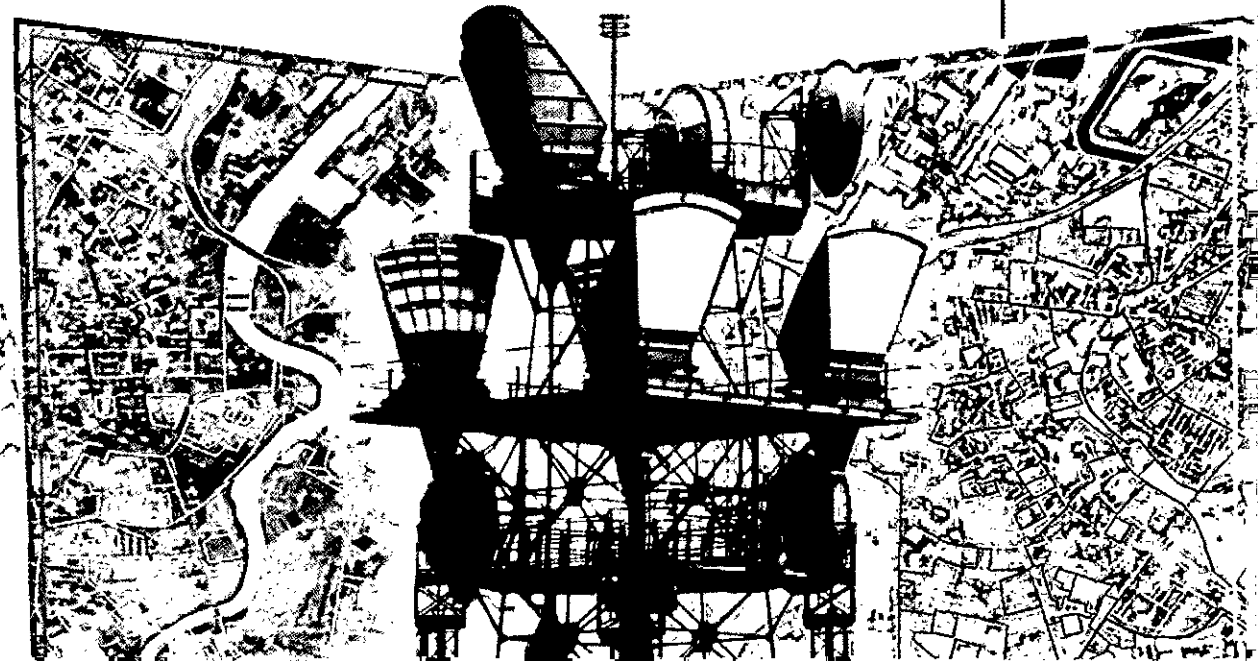


The Site Investigation Tools program for verification of the Additional Protocol declarations uses very high-resolution satellite images. The layer of buildings to be verified, rectified with the Ikonos satellite image of the Ispra site is shown, together with the aerial photo of the ESSOR reactor and its declaration.

infrastructure for spatial information in europe

The INSPIRE[1] initiative has been conceived to promote greater coherence between various European policies, especially those linked to the European Sustainable Development Strategy. The guiding principles are (1) that data should be collected once and maintained at the level where this can be done most effectively (2) that it must be possible to combine seamlessly spatial data from different sources across the EU and share it between many users and applications (3) that it must be possible for spatial data collected at one level of government to be shared between all the different levels of government (4) that spatial data needed for good governance should be available on conditions that are not restricting its extensive use (5) that it should be easy to discover which spatial data is available, to evaluate its fitness for purpose and to know which conditions apply for its use. INSPIRE will provide a means by which to co-ordinate and structure EU-wide spatial data and services needed for the implementation of specific policy instruments and those data generated by such policy instruments. It will provide spatial data harmonised specifications, a data policy framework and data discovery and sharing mechanisms.

1. INSPIRE: INfrastructure for SPatial InfoRmation in Europe.

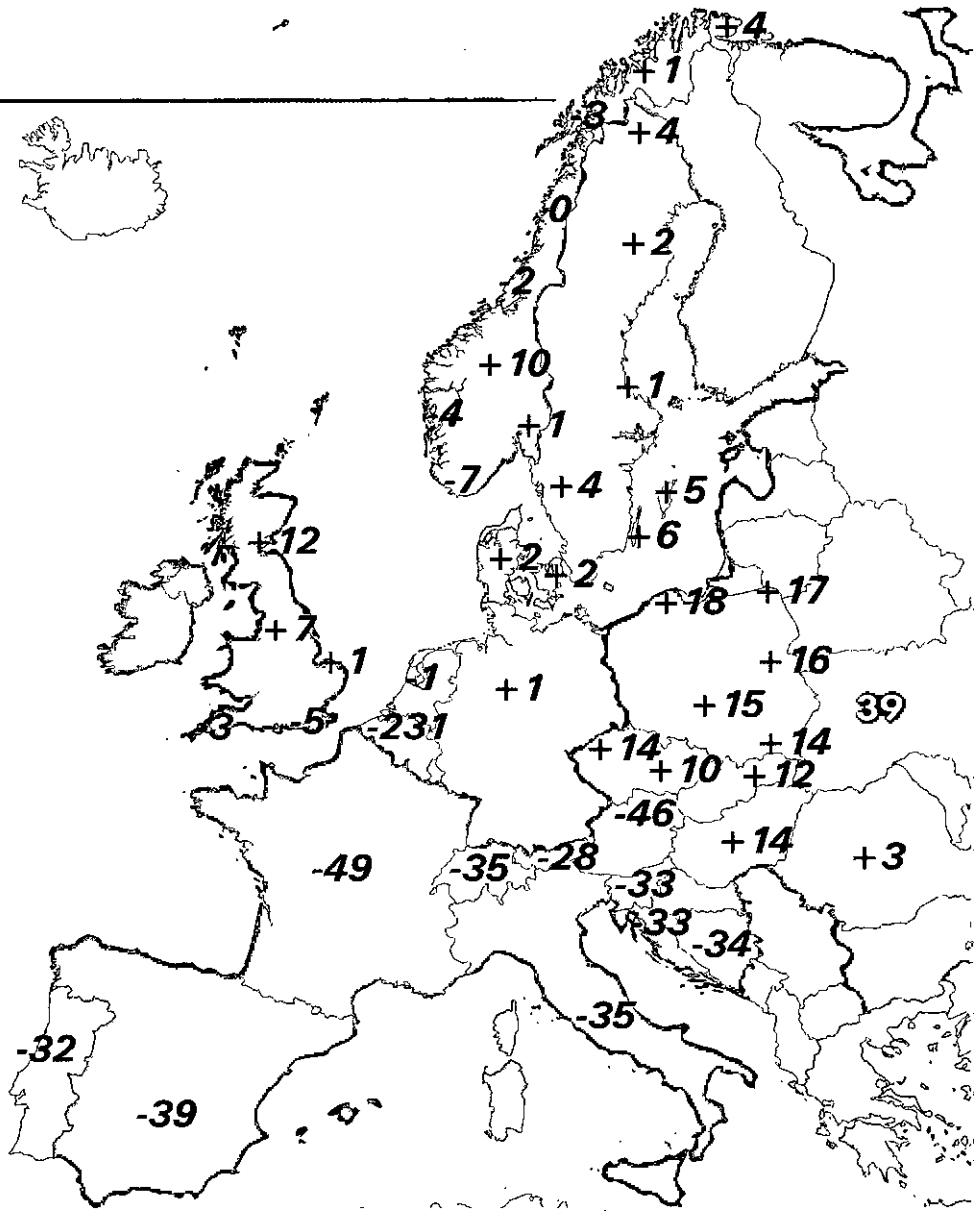


infrastructure for spatial information in europe

European Spatial Data Infrastructure

The JRC provides technical coordination of the INSPIRE initiative, and helps drive the process towards the realization of a European Spatial Data Infrastructure (ESDI). ESDI addresses both technical and non-technical issues, ranging from standards and protocols, organisational issues, data policy issues including data access policy and aims to secure access to geographical information for a wide range of themes. Because Europe is a patchwork of countries with different geographic information traditions, issues related to data harmonisation and semantic interoperability must be resolved as an integral part of building a common infrastructure.

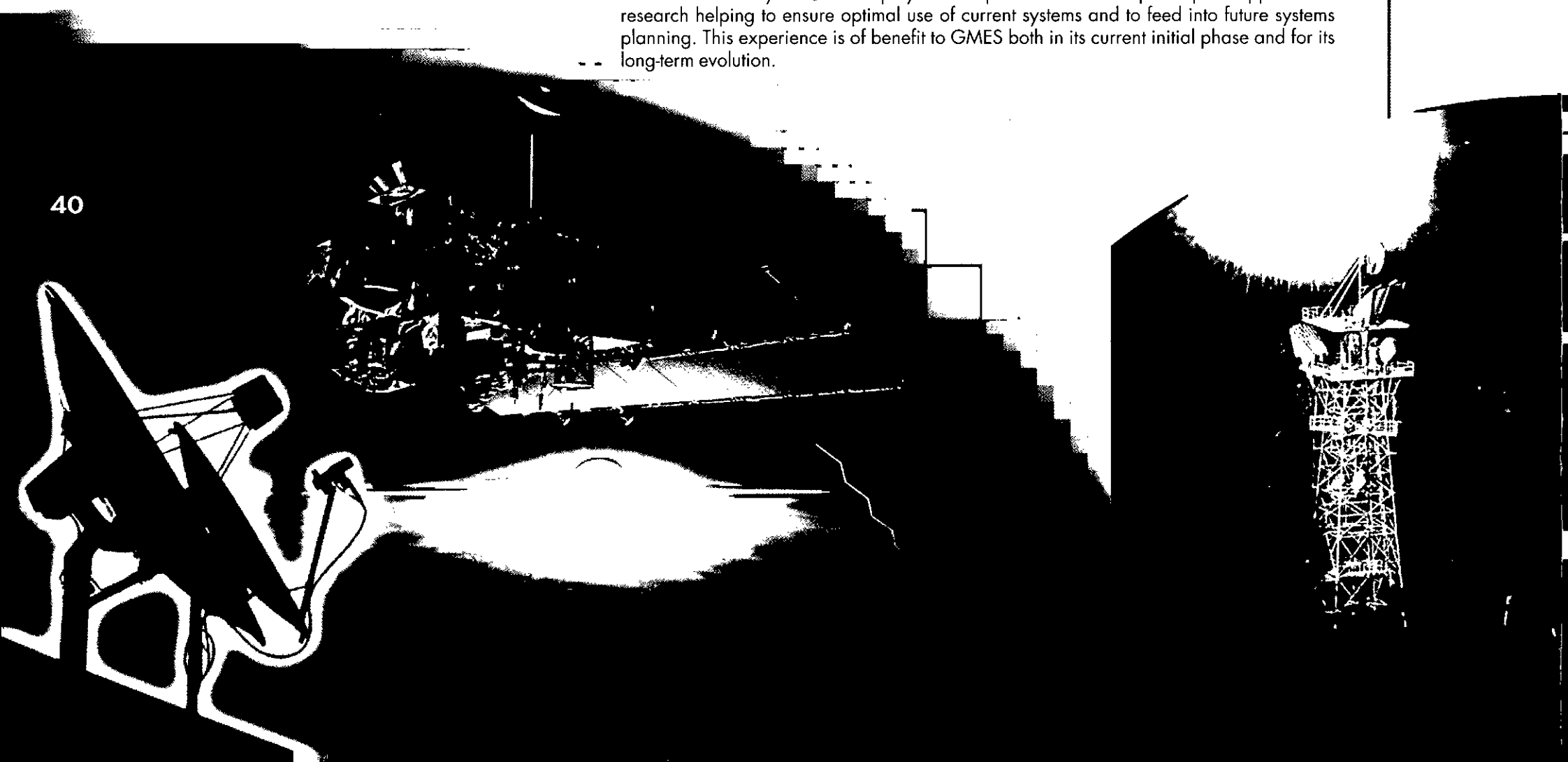
The JRC is involved in consensus building processes, in collaboration with CEN, ISO and the OpenGIS Consortium, developing common data models and standards to be adopted, launching or supporting pilots and demonstrators, conducting a technology watch and research in the field of spatial data interoperability and developing tools that will reduce the cost and facilitate the INSPIRE implementation. In addition JRC in collaboration with new or existing Geo-Spatial interest groups is playing a key role in the cross-thematic coordination that aims to establish common data requirements of various policies.



Need for a European Vertical Reference System: examples of differences (cm) between national heights and the United European Levelling Network - UELN (source: bkg).

monitoring from space: the enabling science

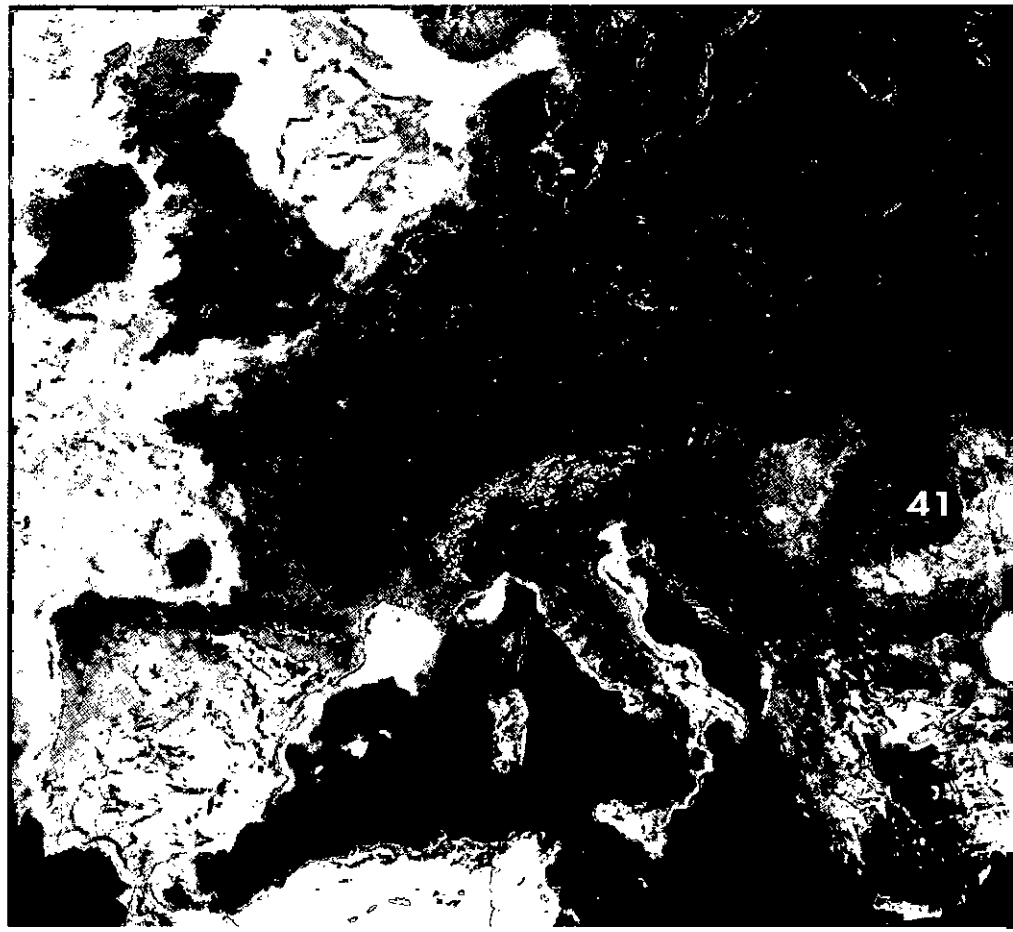
GMES by no means relies exclusively on observations of the Earth obtained from space-craft, but as demonstrated by the previous sections of this brochure information derived from space-based assets forms a major part of the services provided to meet institutional demand. For the last fifteen years JRC has played an important role in European space applications research helping to ensure optimal use of current systems and to feed into future systems planning. This experience is of benefit to GMES both in its current initial phase and for its long-term evolution.



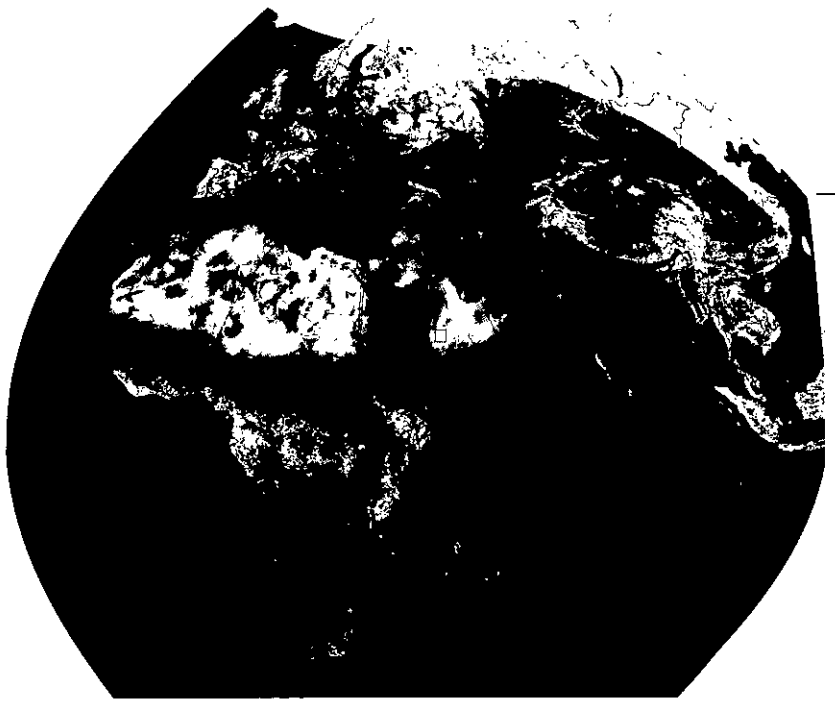
monitoring from space: the enabling science

Methodological research

Earth observation from orbiting platforms relies exclusively on the measurement of radiation quantities, and the proper interpretation of these data hinges on the availability of appropriate tools to extract the desired information. The JRC has acquired extensive experience and made substantial contributions to this field, in particular in the development and exploitation of a suite of advanced algorithms to optimally exploit the large archives of remote sensing data accumulated over the last decades. For instance, a suite of algorithms has been developed to estimate the Fraction of Absorbed Photosynthetically Active Radiation (FAPAR) and marine chlorophyll concentration from the VEGETATION / SPOT, SeaWiFS / SeaStar, MERIS / Envisat, MISR / Terra, and GLI / ADEOS-II systems, to retrieve land surface albedo from Meteosat data or to build continental scale mosaics of imagery from space-borne RADARs. Algorithms for automated pattern recognition in very high-resolution satellite imagery are also under development.

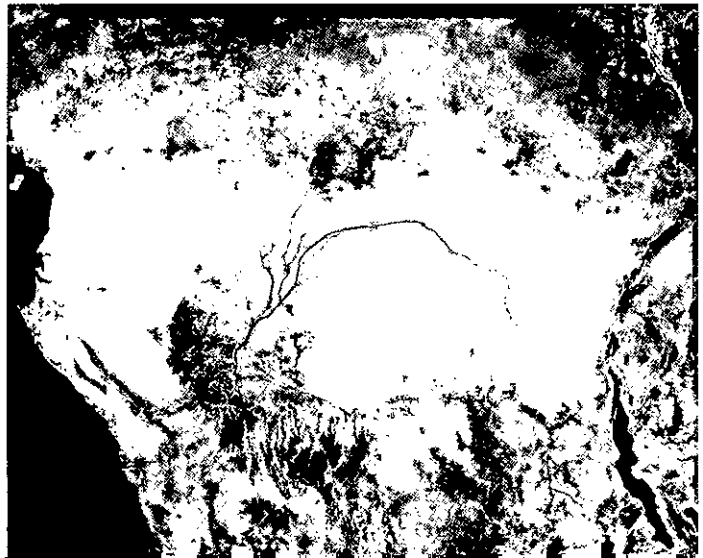


Marine chlorophyll concentration over Europe's seas, determined from the SeaWiFS sensor using JRC algorithms. The image also shows Fraction of Absorbed Photosynthetically Active Radiation over the land. Both are produced together at JRC.



Surface Albedo as observed by the Meteosat-5 and Meteosat-7 satellites. Part of a collaborative project between JRC and EUMETSAT to build a multi annual albedo database for use in climate models.

A mosaic of RADAR imagery from the JERS-1 satellite over the central African rain forest. Produced by JRC as part of a collaborative project with the Japanese Space Agency NASDA and USA's NASA. These data have proved invaluable for mapping important swamp forest ecosystems around the world.



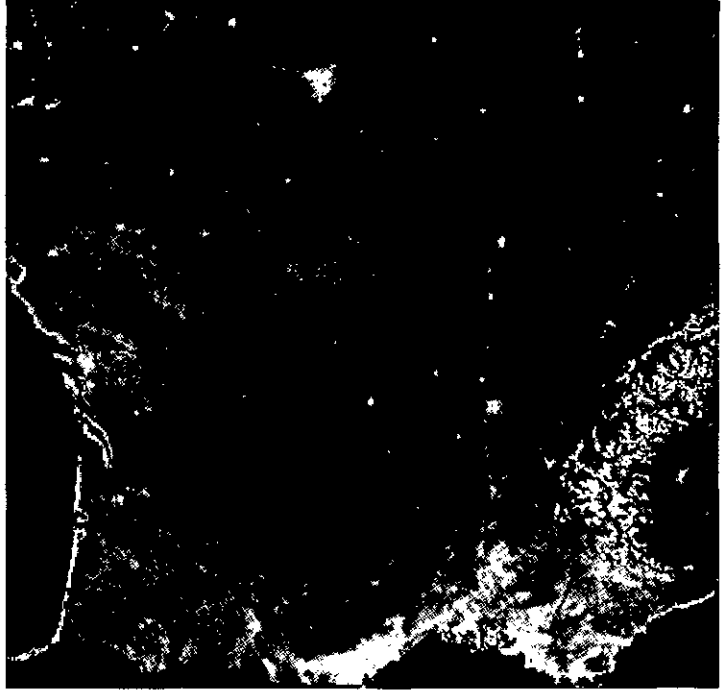
Collaborations with Space Agencies

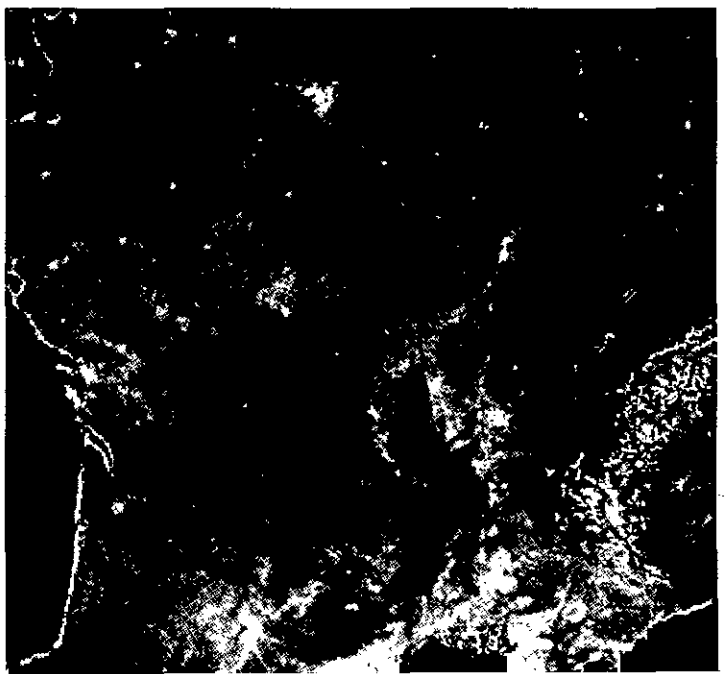
The JRC has developed close collaborations with many national and international Space Agencies — including the European Space Agency (ESA), the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), the French space agency CNES, the German aerospace centre DLR and both the US National Aeronautics and Space Administration (NASA) and Japan's National Space Development Agency (NASDA) — for well over a decade. These efforts have resulted in the implementation of JRC's algorithms in the ground segments operated by these agencies (e.g. land surface albedo production by EUMETSAT), which ensures the systematic, operational generation of high-level products and their distribution to current and prospective users of remote sensing products. JRC scientists regularly participate in advisory groups to support the design of future instruments, thereby ensuring that the needs of the users are taken into account and that the latest advances in retrieval technologies are exploited by new sensor/system designs. JRC and space agencies have shared exploitation of data (for example in the preparation of continent wide radar data sets for the tropical rain forest mapping programme[1]) and shared support for global monitoring exercises (such as fire and land cover).

1. A joint European, Japanese and US initiative. Now extended to also cover the boreal forests of the world.

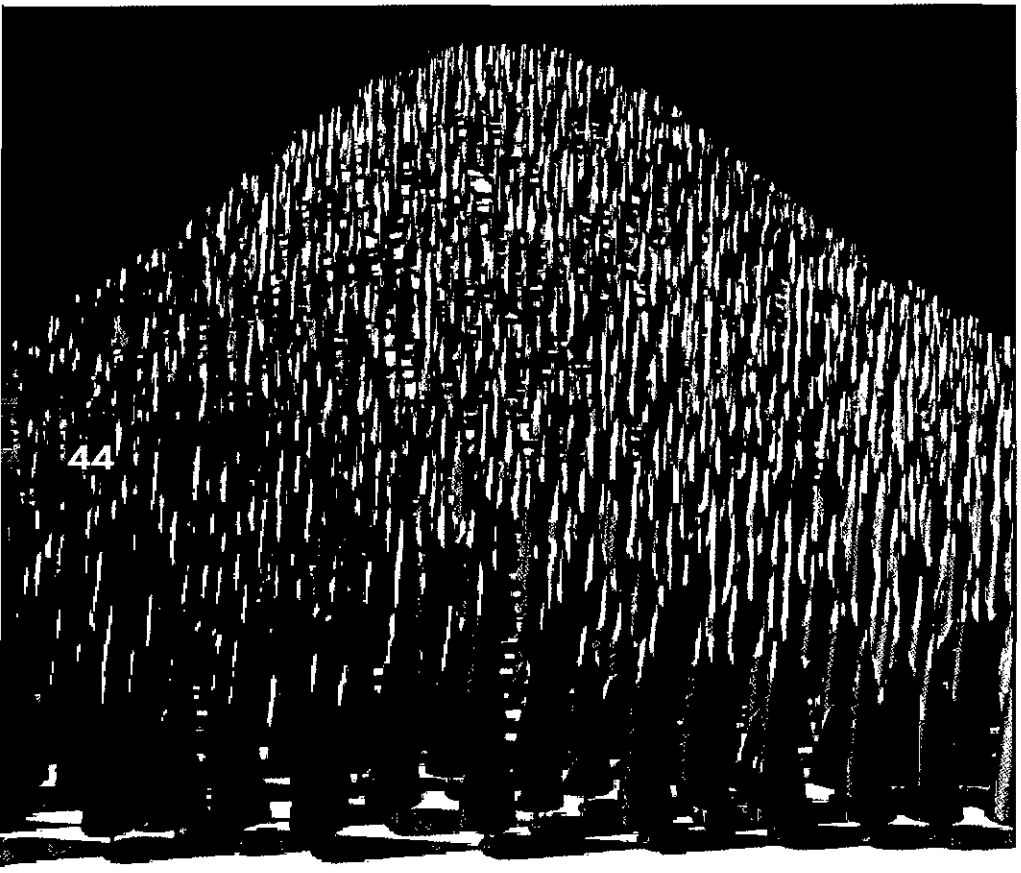
Harmonised global and European products

The JRC has the capacity for in-house generation of quantitative products from satellite observations such as measurements of biological activity. Such measurements form the primary building blocks for further scientific analysis both within JRC and in the broader scientific community. Examples within JRC include land cover, agricultural yield estimation, or marine phytoplankton biomass and productivity, whilst external users include the CarboEurope network for their work on estimation of carbon stocks and fluxes, and other consortia aiming at the development of an operational monitoring and forecasting of ocean physical and biogeochemical state around Europe and globally.





Advanced algorithm used to calculate fraction of absorbed photosynthetically active radiation from SeaWiFS data over central France, June 2002 (above) and June 2003 (bellow). The scale for each image is identical. White areas show low levels of plant growth (the Alps and Paris for example are clearly visible in each image) Dark greens and reds indicate high levels of plant growth. The impact of the high 2003 summer temperatures is clearly seen in the lower overall level of much plant growth.



Computer model of a coniferous forest generated by the JRC's radiation transfer model. Among other applications these model outputs are used to retrieve quantitative estimates of forest stand density from satellite observations.

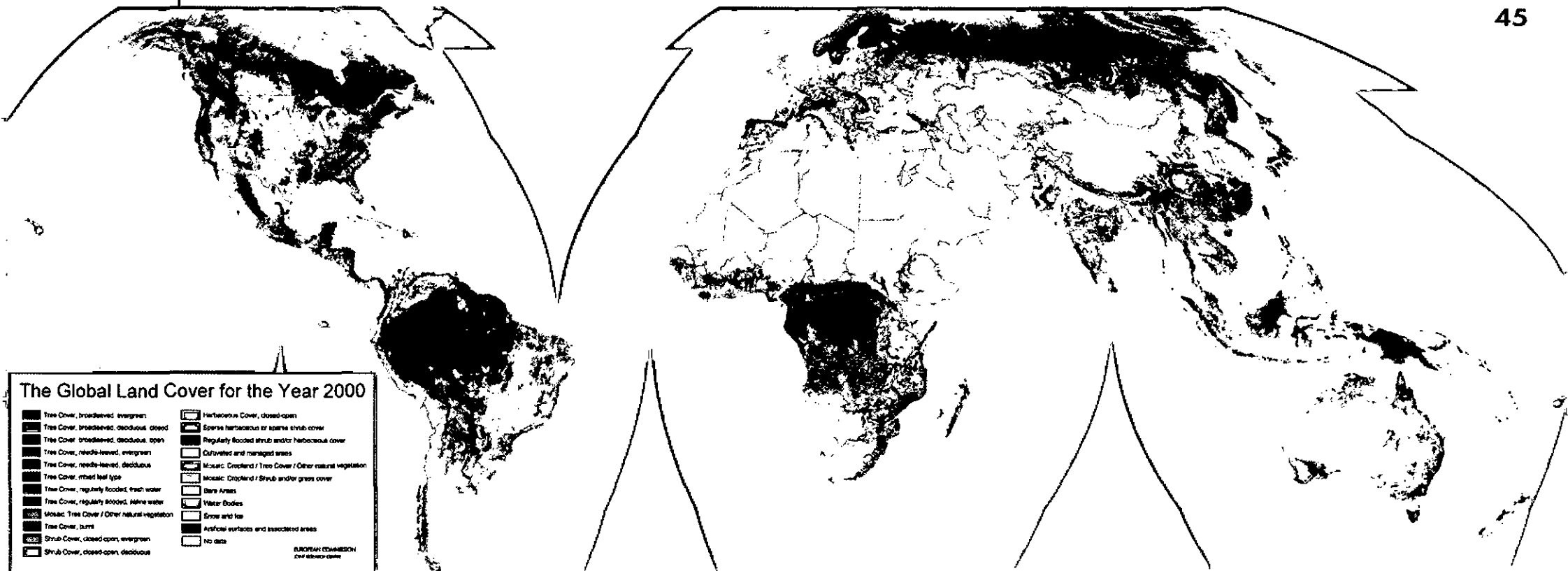
Quality standards

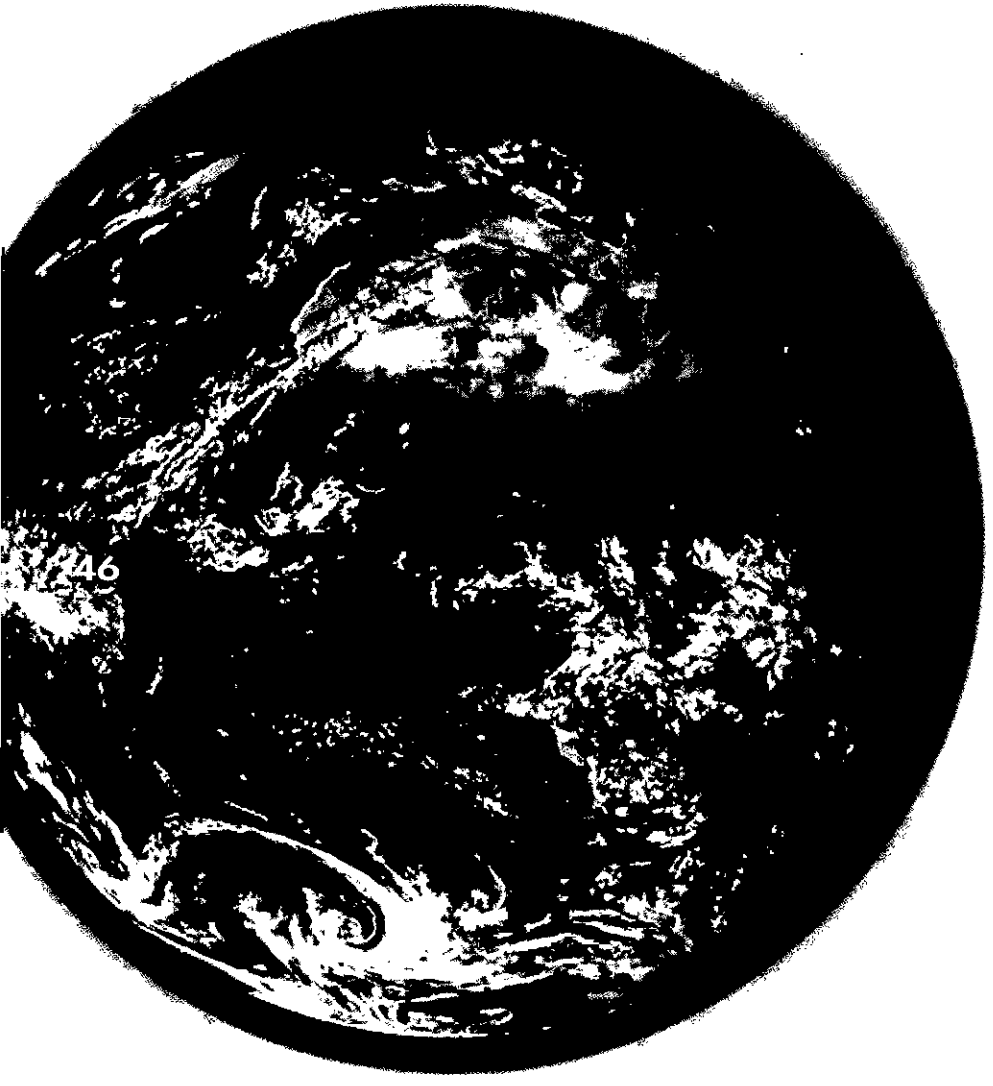
The JRC is leading and hosting the Radiation transfer Model Inter-comparison (RAMI) project, a long-term model benchmarking campaign that has been endorsed by the International Radiation Commission. The aim of this project is to establish standards of quality and define tests of validity for the radiation transfer models that are used to retrieve reliable, accurate, quantitative information from remote sensing data. The main outcomes of RAMI include significant improvements in the participating models, increased reliability of the tools available, and full documentation, in particular through peer-reviewed publications, of the experimental protocols and of the benchmarking results. The JRC is also playing a major international role in the calibration and validation of remote sensing data and products, for instance through the maintenance and operation of major field stations (both at sea and on land), extensive comparisons of products from various sensors, and inter-comparisons of advanced satellite models for marine process studies.

global research and observation programmes

Eleven years ago the Rio Earth Summit's Agenda 21 stated, "Relevant international organisations should develop practical recommendations for co-ordinated, harmonised collection and assessment of data at the national and international levels." Ten years later the Plan of Implementation arising from the Johannesburg World Summit on Sustainable Development reaffirmed the need for the nations of the world to work together, calling for "international joint observation and research, through improved surface-based monitoring and increased use of satellite data". Throughout this political process the global research and observation programmes have provided scientific and technical guidance concerning the type and nature of the observations required. JRC scientists participate in a number of these programmes.

Global land cover for the year 2000. Produced by the JRC in association with the UN's Food and Agriculture Organisation, United Nations Environment Programme and United States Geological Survey on behalf of the GLC2000 partnership of 30 organisations from around the world.





Meteosat's view of the Earth. JRC is working with EUMETSAT and DG Development to ensure availability of these data throughout Africa as part of the PUMA (Preparation for the Use of Meteosat second generation in Africa) Programme.

global research and observation programmes

Recent activities include:

- The Intergovernmental Panel on Climate Change (IPCC), recommending reporting standards for the Framework Convention on Climate Change.
- The Global Climate Observing System (GCOS) reporting to the Conference of the Parties to the Framework Convention on Climate Change on the adequacy of current observations for climate.
- The Global Terrestrial Observing System (GTOS) assessing the adequacy of observations for modelling and analysis of terrestrial ecosystems to support sustainable development.
- The International Ocean Colour Coordinating Group (IOCCG) promoting the application of remotely-sensed ocean-colour data through coordination, training, liaison between providers and users, advocacy and provision of expert advice.
- The International Geosphere Biosphere Programme concerning the acquisition of basic scientific knowledge about the interactive processes of biology and chemistry of the earth as they relate to Global Change.

JRC's first-hand involvement in these programmes helps the Commission to assess the possibilities for cooperation at international level (as requested by Council), ensures that those products generated in house have relevance in the scientific / user communities outside the Commission's own services, means that the GMES process is fully aware of key observation gaps (and potential redundancies) and that we are actively contributing to the development of internationally-accepted measurement, reporting and monitoring standards.

The need for international co-operation was reaffirmed in June 2003 at Evian, France where the G-8 Heads of State set themselves the objective of developing close co-ordination of their respective global observation strategies for the next ten years and identifying new observations to minimize data gaps. Plans to advance such co-ordination were confirmed and supported by 34 nations and the European Commission at the first Earth Observation Summit, Washington, DC USA in July 2003, where GMES was presented as an important European contribution. As a result of the Summit an international Group on Earth Observations (GEO) was created to produce a 10-year plan for the required co-ordination. This plan is to be completed by the end of 2004. Scientific and technical subgroups dealing with issues including data utilisation and user requirements are associated with the GEO and JRC participates in these.

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European Commission
Joint Research Centre

This report was compiled and edited by
A. Belward, F. Pignatelli and I. Shepherd

News on GMES may be found at:
http://www.gmes.info/

More general information about the JRC:
http://www.jrc.cec.eu.int/

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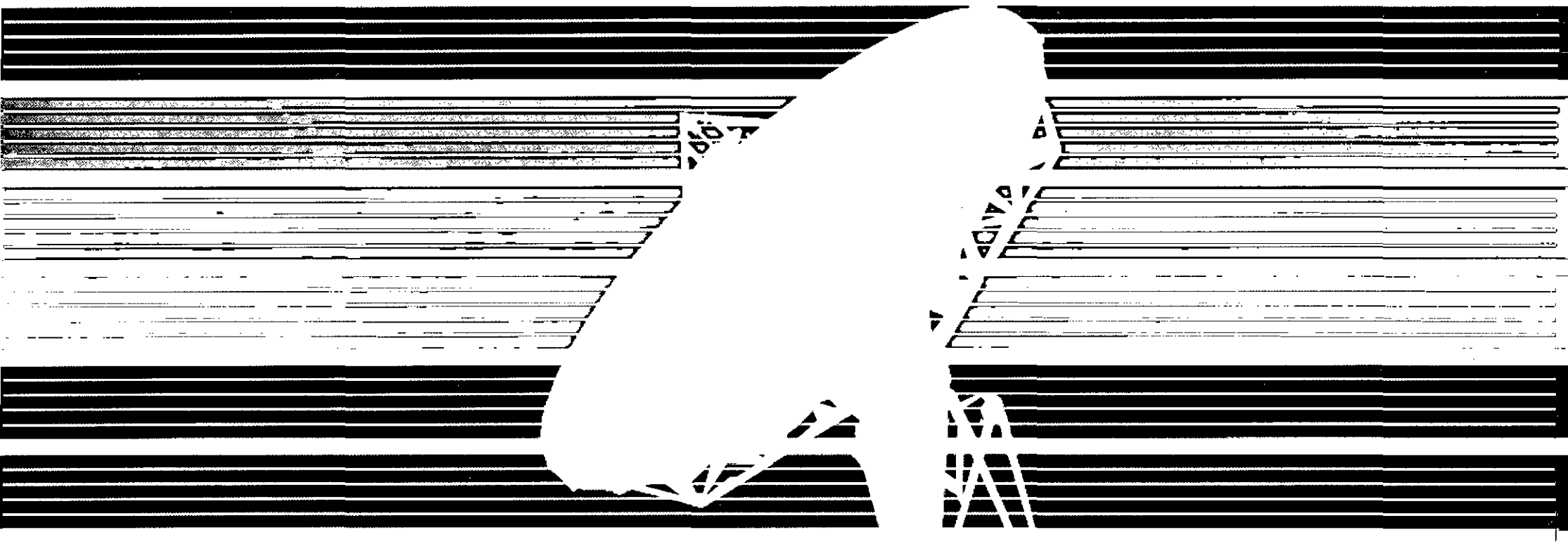
LB-55-03-091-EN-C

JRC Mission

The mission of the Joint Research Centre is to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of European Union policies. As a service of the European Commission, the JRC functions as a reference centre of science and technology for the Community. Close to the policy-making process, it serves the common interest of the Member States, while being independent of commercial or national interests.



EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre