



European Space Policy Institute

A NEW PARADIGM FOR
EUROPEAN SPACE POLICY:
A PROPOSAL

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FOREWORD BY THE SECRETARY GENERAL OF ESPI

The European Space Policy Institute (ESPI) located in Vienna (Austria) - which became operational less than a year ago - has been created to address space policy issues in Europe and globally.

ESPI's reflections will focus more on mid to long term strategic issues and not on the detailed aspects of current policy making.

In December 2004, the Steering Committee of ESPI, composed of prominent space, scientific and political figures, entrusted the Institute with the task of examining prospects for a more coherent system of space governance for Europe.

On this basis, in March and June 2005, ESPI convened a panel of experts from various backgrounds and levels of responsibility to provide new insights and synergy among the different space actors and to consider ways of improving the European space decision-making process. Thanks to those inputs, ESPI has been able to compile the present report, which has also benefited from the results of the 1st ESPI international conference held on 21st September, 2005.

After briefly recalling the achievements of Europe in space over the last 40 years, the report presents an analysis of the weaknesses and the challenges facing the continent today and in the coming years. The report suggests a way forward with a model of governance to serve a European space strategy and to deal with key institutional issues. Essentially, EC and ESA should find the appropriate means and share the responsibilities for developing a European space strategy. Equally, budgetary issues,

S&T acquisition, political and public support, and commercial exploitation are examined to match the proposed system of governance and a "re-founded" European space strategy.

As the first report of ESPI, it should be considered as a starting point for future studies on European space policy. The conclusions outlined herein are not meant to be considered as specific recommendations addressed to policy decision-makers. They do, however, reflect the independent views of a range of European space experts and constitute what we regard at ESPI as being the first overview setting an agenda for future work.

I very much hope that the reader will be stimulated by this work and that this will help ESPI to go into more details about one or several issues that have been tackled in this report.

I would like to express my sincere thanks to the panellists who participated in the sessions and prepared this work and also to those who contributed with their comments and ideas. I have to mention more particularly Ms. Elisabeth Sourgens, Prof. Keith Hayward and Dr. Xavier Pasco for their continuous effort to improve the quality of this document bringing it from a draft status to today's version. I want also to express my gratitude to Mr. Herbert Allgeier, the Chairman of ESPI's Steering Committee, for his involvement in this work and for his enlightening remarks, which were of invaluable help to strengthen the credibility of this report.

Serge PLATTARD



EXECUTIVE SUMMARY

The Vienna-based European Space Policy Institute (ESPI) convened a panel of space experts from academia as well as public and private organisations drawn from several EU Member States to consider the key issues shaping space policy in Europe and to indicate directions for its implementation.

Space is viewed as an inescapable tool of technological progress as well as a key element of sovereignty by all of the space-faring nations such as the United States, Russia, China, India or Japan. Notably the recent space successes of China have begun to eclipse Europe's space efforts. It is an objective and indisputable fact that after a period of considerable achievements, Europe is losing its focus on space. The past successes are the result of bold and sometimes difficult decisions taken ten or fifteen years ago. There is now an urgent need to recreate the vision and political leadership that founded the European space effort in the 1970s.

The foundation of tomorrow's successes has to be laid today.

The space community must outline proposals for what Europe should do in space and what role it wants to play on the international stage. Europe and its citizens

The major conclusion of this report is that by working in harmony with a clearer sense of direction and purpose, the technical competence of ESA with the political weight of the European Union could generate a more assertive space policy for Europe.

have a special interest in a coherent space effort that already has a vital impact on their day-to-day lives and which could do even more both to improve their internal and regional cohesion as well as promoting Europe's distinct social and political values within the international community.

In addition, space can support the EU's goal to become "the world's most advanced knowledge based economy", help to achieve the EU security strategy set out by the EU Council in December 2003, and more generally promote its economic interests, its quality and way of life.

However, currently there is no well defined vision for space at a political level.

Historically, France has been a leading European space pioneering country, and while it may still

have the political will to retain its place as the locomotive of European space, without the support from other European countries and the necessary institutional reorganisation, a single national effort will be insufficient. In an integrating Europe, individual Member States cannot be expected to continue to be the sole source of European initiatives.

Equally, the uncertainty surrounding European space policy provides little incentive for industry to launch innovative proposals to fulfil new needs. Europe needs a visionary leadership going beyond the past and existing programmes to re-launch its space endeavour and to offer the rest of the world an alternative to other national models of space supremacy.

Without claiming to offer the miracle solution to break the European stalemate on space, the discussions leading to this report recognised that the institutional re-

For obvious historical reasons, ESA is in the first instance the best placed to propose programmes that will support a European strategy for space. But this strategy also has to be promoted by the European Commission. As the custodian of the European Treaties and processes, the European Commission should propose a programmatic "vision" to the EU Council. A permanent and autonomous space office attached and reporting to the several EC Commissioners interested in space (cf. Enterprise and Industry, Environment, Development and Humanitarian Aid) and also to the EU SG/HR, should be responsible for assembling a detailed European space policy in close liaison with ESA.

foundation for space would be the major challenge facing the European space community. The responsibility for space policy is shared between many different entities in Europe (ESA, Member States, EU and the European Commission) lacking coherence and a clear focus for new initiatives.



40 YEARS OF SPACE IN EUROPE: MANY SUCCESSES AND SOME FAILURES

SUCCESSES IN SPACE ...

Based on decisions taken in the 1970s and 1980s, European achievements in space have been a genuine success story:

- Europe has gained independent access to space through the Ariane family of launchers, which has also proved to be a commercial success: two-thirds of the commercial satellites in orbit today have been launched by Arianespace. Europe has also developed the Vega launcher and in partnership with Soyouz can offer a comprehensive range of launchers to potential customers from Europe spaceport in French Guiana (Kourou).
 - In science and exploration, European programmes such as Giotto, ERS, Envisat, XMM-Newton, Integral and more recently Mars Express and Huygens, have contributed much to mankind's understanding of the solar system and our own planet. The management of those programmes by ESA, national space agencies and the European space industry has led to a high level of reliability. National programmes developed in cooperation with Russia and the United States such as Sigma, Jason and other scientific missions have delivered comparable results.
 - Europe has become a major partner in international space programmes (e.g.:
- Hubble Space Telescope, the Russian MIR space station, the International Space Station, Soho, Cassini-Huygens, NATO-Milstar).
- Since the late 1970s, Europe has been a major contributor to the WMO's World Weather Watch through its Meteosat geostationary satellites. This will continue with MetOp due to be launched in 2006.
 - European telecommunications satellites have had a powerful impact on the marketplace. European space companies such as Alcatel-Alenia Space, EADS-Astrium, are leading world companies in the commercial satellite industry (these companies have won 35% of the international satellite telecom business in a market largely dominated by US companies such as Loral, Lockheed-Martin and Boeing). In other areas, Europe is taking a lead in the development of micro-satellites (SSTL (UK) and CNES (France)).
 - Europe has also developed an autonomous space capacity in the defence and security arena, although rather limited compared to that of the US. However, to date this has been mainly at a national level - at best multi-lateral - with little pooling of capabilities (e.g.: satellite communications: UK with Skynet IV and V, Italy with Sicral, France with Syracuse II and III and Spain with HispaSat ; reconnaissance satellite ser-



vices: France, Italy, Belgium and Spain for Helios 1 and 2, France with Pléiades, Germany with SarLupe, Italy with COSMO-Skymed).

- Consequently, the EU does not have common capabilities and Europe generally has no ELINT, early warning or space surveillance capability. In all of these areas the EU has to rely on other nations (in particular the US). There is nonetheless a tentative 4-country (France, Germany, Italy, Spain) European proposal to pool resources in EO through the 2001 BOC initiative.

- So far, Europe has deliberately taken a collaborative approach to manned space-flight (MIR, ISS).

... DESPITE CONSTRAINTS ...

- These achievements have been made on a limited budget, compared to that of the US and the former USSR.
- Developing the European space capability is the result of a combination of national and Europe-wide policies administered both by the national agencies of the main space-faring nations in Europe (France, Germany and Italy) and ESA.

... BUT POWERED BY A VISION ...

- European space policy has been driven both by the imagination of highly committed scientists and engineers and by the political will of a number of leading European nations, especially France and

the vision of President Charles de Gaulle in the 1960s. Strategic independence and national sovereignty were the driving forces of these original policies and commitments. In particular, the conditions imposed by the United States for launching the French/German satellite "Symphonie" in the early 1970s provided an unexpected incentive to create an independent launcher capability. Events such as these have since underpinned policies to build Europe as a political space entity.

... AND WITH SOME FAILURES

- Those achievements were only possible after a number of problems with the decision process and difficulties in running space programmes in the 1960s and early 1970s were overcome. These included some major failures such as the Europa rocket (under ELDO, 1967); the Hermes mini shuttle (1987-1993) and the absence of a common European EO programme under ESA control in the late 70s, which led France to develop the Spot programme on its own.

At the start of the 21st century, the European space sector is still reliant on the achievements of the pioneering years. Today's core programmes were approved more than ten or fifteen years ago and while GMES and the ongoing Galileo programme provide more positive signs for the medium term outlook for European space policy, there are few new concrete ventures in

sight to provide continuity. This situation is due not only to the inadequacies of European space funding and its institutional structures, but also to a growing divergence between industrial proposals for new programmes and users' needs.

THE OUTLOOK FOR SPACE

The future offers:

On the technical side

New uses and new markets for space as well as further expansion of Earth Observation and telecommunications. This implies the development of new technologies such as:

- ▲ Expert systems/artificial intelligence (learning systems, knowledge discovery and management).
- ▲ Soft computing (unexpected information extraction, information correlation).
- ▲ Information technology (fast archiving, fast retrieval of an increasing volume of data).
- ▲ Telecommunications (near real-time access to distributed data from any point of the globe).
- ▲ New propulsion system and launchers.
- ▲ Private sector including space tourism.

And the combination of data coming from:

- ▲ Earth Observation satellites, at different resolutions in a wide range of frequencies, and in different orbits.
- ▲ Navigation satellites, providing high accuracy time reference and position-

ing, which will multiply the number of services associated with space systems.

- Space is more and more seen as a vital arena for defence and security and for increasing diplomatic influence: developments in these fields (reflected in documents such as "European Space Policy: ESDP and Space" and the report of the Panel of Experts on Space and Security, dated 18 February 2005, are continuing at a fast pace.
- Space Science and Exploration will provide a growing opportunity for further international scientific cooperation and other benefits building on existing ambitious missions such as Rosetta, Venus Express and Aurora.

If it is to maintain its position in the space sector – let alone enhance its capabilities for the future benefit of Europe's wealth and security – Europe, with ESA driving programmes and with the EC providing the political leadership, must agree on a new vision of space reflecting the challenges of the 21st century; challenges that have been so frequently identified in many recent official declarations and publications. This European vision should enhance the European dimension of space over purely national approaches.



On the political side

Space is supportive of and, in some cases, essential to achieving core EU objectives. As a result space must be regarded as a key asset in achieving these goals:

- The Lisbon strategy (2000) emphasises European competitiveness through investment in knowledge. Space is both a major application of technology and an arena generating new and often unique capabilities for knowledge generation. According to the Kok report, in order to become a knowledge-based society, Europe should increase its attractiveness for researchers and scientists, with R&D a top priority and a clear need to promote the use of information and communication technologies (ICTs). Space provides both an important vehicle for the generation of knowledge and a stimulus for ICT development.
- Space (communications, navigation and reconnaissance satellites) is essential to achieve the "Headline" security goals enshrined in the EU Security Strategy, CFSP and ESDP.
- But this depends upon Europe developing enhanced capabilities in space-based reconnaissance and surveillance to facilitate conflict prevention, peace-keeping operations and crisis management. This includes civil and environmental emergencies and the monitoring of arms control agreements. Without a clear European space component, the evolution of the ESDP will be seriously undermined.

- Advanced communications satellites can help close the "digital divide" stimulating the economic development of remote areas. This will be particularly important with respect not only to the new Member States but equally to the poorer regions of the old EU Member States.
- Space contributes to the wider concept of "Human Security". European space capabilities can help improve global sustainability and meet the growing environmental and climate change challenges. They would also facilitate Europe's contribution to the fight against world poverty. Specifically, space should be a major part of the EU Sustainable Development Strategy (SDS) helping to monitor greenhouse gas emissions and be of benefit to the new Environmental Technologies Action Plan for the EU (ETAP) adopted in January 2004.

Some promising signs

Europe can still generate the collective will to develop space programmes. This has been demonstrated by:

- The adoption of the Galileo programme designed to guarantee European autonomy in positioning, navigation and timing. Galileo will be the first public infrastructure programme managed jointly by the EC and ESA, generating explicit commercial and economic benefits as well as implicitly enhancing European security. It is also a pathfinder for large scale European PPP ventures as well as increasing Europe's standing on the international stage as through its contri-

tribution to the security and safety of the global navigation network (GNSS).

- The decision to support GMES, the EU's Global Monitoring for Environment and Security; the objective is to establish by 2008 an autonomous European capacity in this field thereby supporting the EU's political goals in the area of sustainable development and global governance.

The need for a renewed 'vision' for European space

But Europe must ensure that these ambitions are not jeopardised by the self interest of Member States or by the difficulties experienced by the European Commission in exercising its own functions. After 40 years of intergovernmental experience that have produced an array of national bodies, agencies and ministries, each with their own experience, culture and interests, European space policy-making urgently needs a new direction and an infusion of collective energy. In particular, all actors must learn how to work together within the new European setting and to go beyond the existing legal agreements.

- Getting the best out of Europe's space effort and achieving even a modest improvement in European space capabilities will need a collective effort on the part of European policy makers.
- But to do more, to achieve many of the declared objectives of security and prosperity, Europe needs a collective "political

re-foundation" of its space effort – a renewed vision for space equal, if not greater than that shown thirty years ago when the European Space Agency (ESA) was created out of ELDO and ESRO.

- In the first instance this will require all the players to work in the new institutional setting – a challenge which might force existing institutions to adapt or to change radically – implying a revolution in space policy governance - as well as addressing other serious short term deficiencies in the fabric of European Space Policy.



WEAKNESSES AND CHALLENGES FACING EUROPEAN SPACE POLICY

THE WEAKNESSES OF THE EUROPEAN SPACE SECTOR AS OF TODAY'S PERSPECTIVES

Market environment

- After three years of a steady fall in demand (commercial space markets hit an all time low in 2003), the European space industry experienced a rebound in 2004 (a 22.2% growth). But commercial markets are still far below the levels of 2000 or 2001, made worse by the fact that part of the commercial sales growth is due to increased revenues from services. The European space sector still does not generate enough revenues to ensure its long-term survival. The turnover growth of 2004 was supported equally by sales to institutional and commercial customers.

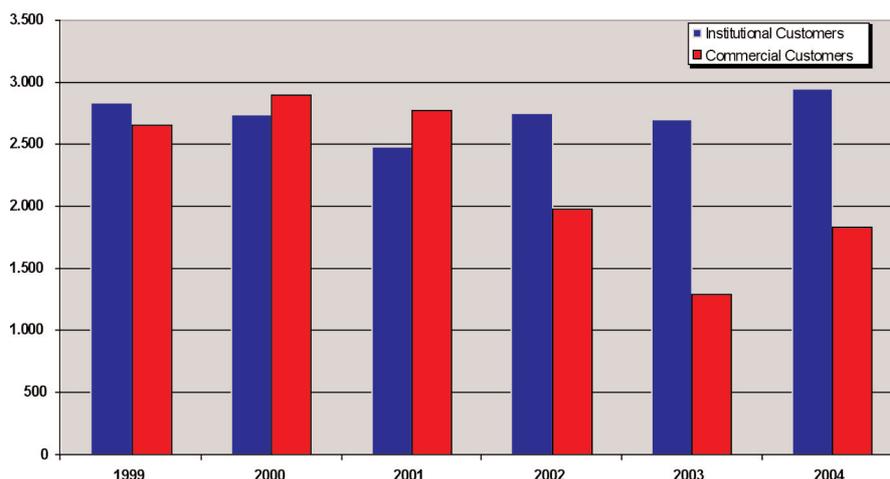
In institutional markets, the 11.6% growth in 2004 was mainly supported by several European governments increasing their investment in sovereign applications:

- ▲ Guaranteed access to space: support for launcher development and qualification activities (cf. ESA's EGAS optional programme).
 - ▲ Defence systems (for telecommunications and intelligence) and societal applications with dual use potential (navigation and environmental observation).
- The European institutional market is supported by European government funding managed by dedicated national and regional public institutions such as the various national space agencies (ESA, CNES, DLR, ASI, etc.), the EC, military procurement bodies (UK MoD, French

DGA etc.) and publicly owned satellite operators (Eumetsat). It is characterised by local demand, high barriers to entry, strong regulations and stringent technical requirements. Products on the institutional market include an

important share of RTD and science.

Institutional vs. Commercial Market, 1999-2004 (M€)



Source: © Eurospace 2005

Consolidated turnover, distribution by market

Customer (million €)	2004	2003	2002	2001
ESA	1.464,46	1.449,13	1.491,73	1.342,48
European Commission	14,71	15,55	27,06	23,85
Eumetsat*	109,24	73,72	77,58	na
Civil Multilateral Programmes**	52,42	75,62	76,68	na
National Civil Programmes	590,98	486,26	576,92	706,79
National Military Programmes	724,08	547,50	470,62	358,25
Total institutional	2.955,89	2.647,77	2.720,59	2.431,37
GEO Satellite Operators***	920,54	657,44	1.114,46	1.772,12
Other satellite operators***	66,84	43,40	89,08	na
Arianespace	533,69	545,45	748,01	947,38
Other launch services providers	29,56	22,65	2,32	na
Total Commercial	1.550,63	1.268,94	1.953,87	2.719,50
Other/unknown****	278,10	117,43	51,72	107,27
Total Consolidated Turnover	4.784,62	4.034,14	4.726,18	5.258,14

*was included in OTHER before 2002

**was included in National Civil Programmes before 2002

***these two categories were bundled as one before 2002

****the amount in 2004 includes a large share (>120 M €) of services sales (mainly TLC services) to customers outside the space sector

Source: © Eurospace 2005

- Arianespace is facing a difficult business cycle due to the simultaneous downturn in the global commercial telecommunications market, strong competition from Russian launchers and world overcapacity in the launch vehicle industry (excluding the launch services offered but not yet accessible by China's Long March series and the Indian GSLV still subject to validation). Despite a recent batch order for 30 launchers by Arianespace, with no new launcher currently on the drawing board, the future of the European launcher industry is at risk. In the final analysis, autonomous European access to space can only be guaranteed through large, mainly institutional funding.
- The European commercial market is primarily supported by private funds man-

aged by commercial satellite operators. It comprises two main segments: satellites primarily composed of geostationary satellites sales, and launchers in Europe centring on Ariane hardware sales and related services. The commercial market is characterised by higher levels of competition, cyclical and volatile effects, changing patterns of global demand and by shorter lead times. Products on this market comprise complete systems, equipments and components.

Industrial policy

- Policy makers of the main European space-faring nations have only a limited understanding of the impact of space on their citizens' daily activities. This has led their national space agencies to concentrate on specific rather than large scale



projects; this is especially true of the main space agencies in Europe, CNES, DLR and ASI – the agencies that have historically driven European space activities. They are concentrating on national projects such as Pléiades or Proteus (CNES), TerraSAR (DLR), Cosmo-Skymed (ASI) which might be pooled as a result of bilateral agreements only at a later stage.

- R&D – the “seed-corn” of future success – is inadequately funded. In the long run, even if we include R&D public

investment in scientific programmes, current levels of R&D funding will be insufficient to maintain Europe’s existing space capabilities. Space R&D has been especially hard hit by reductions in national spending and without adequate investment in new concepts and technology, European capabilities will rapidly decline. Basic indicators related to R&D of particular relevance for the space sector show that Europe seriously lags behind in the area of industrial R&D investment.

Space technology research and development budgets in Europe

Budgets	RTD			Space activities		
	National 2004	to ESA 2004	Total 2004	National 2004	to ESA 2004	Total 2004
M €						
Austria	na	8,40	8,40	na	32,40	32,40
Belgium	0,00	50,00	50,00	5,00	160,00	165,00
Canada	35,60	16,00	51,60	184,20	16,50	200,70
Denmark	na	1,40	1,40	3,20	25,00	28,20
Finland	6,00	3,50	9,50	22,70	17,30	40,00
France	31,00	32,00	63,00	680,00	685,00	1.365,00
Germany	35,00	15,00	50,00	400,00	600,00	1.000,00
Greece	na	na	na	na	na	na
Hungary	0,50	0,50	1,00	1,00	1,00	2,00
Ireland	0,00	3,00	3,00	0,00	10,70	10,70
Italy	28,00	16,00	44,00	436,00	280,40	716,40
Netherlands	5,00	5,00	10,00	30,00	70,00	100,00
Norway	2,10	3,90	6,00	6,80	26,00	32,80
Portugal	0,70	1,80	2,50	0,70	11,10	11,80
Spain	6,80	12,00	18,80	14,50	131,20	145,70
Sweden	2,50	4,40	6,90	19,00	56,00	75,00
Switzerland	1,30	8,60	9,90	2,10	86,30	88,40
United Kingdom	2,00	24,00	26,00	18,00	159,00	177,00
Total Europe	120,90	189,50	310,40	1.639,00	2.351,40	3.990,40
Total	156,50	205,50	362,00	1.823,20	2.367,90	4.191,10

NB. Total Europe does not include Canada, Total includes Canada
 Source: ESTMP September 2004 (for 2004 data) (doc ESA)
 Table compiled by EUROSPACE (Pierre Lionnet)

Space technology research and development budgets in Europe

Budgets	RTD			Space activities		
	National 2004	to ESA 2004	Total 2004	National 2004	to ESA 2004	Total 2004
Austria	na	4,09%	2,32%	na	1,37%	0,77%
Belgium	0,00%	24,33%	13,81%	0,27%	6,76%	3,94%
Canada	22,75%	7,79%	14,25%	10,10%	0,70%	4,79%
Denmark	na	0,68%	0,39%	0,18%	1,06%	0,67%
Finland	3,83%	1,70%	2,62%	1,25%	0,73%	0,95%
France	19,81%	15,57%	17,40%	37,30%	28,93%	32,57%
Germany	22,36%	7,30%	13,81%	21,94%	25,34%	23,86%
Greece	na	na	na	na	na	na
Hungary	0,32%	0,24%	0,28%	0,05%	0,04%	0,05%
Ireland	0,00%	1,46%	0,83%	0,00%	0,45%	0,26%
Italy	17,89%	7,79%	12,15%	23,91%	11,84%	17,09%
Netherlands	3,19%	2,43%	2,76%	1,65%	2,96%	2,39%
Norway	1,34%	1,90%	1,66%	0,37%	1,10%	0,78%
Portugal	0,45%	0,88%	0,69%	0,04%	0,47%	0,28%
Spain	4,35%	5,84%	5,19%	0,80%	5,54%	3,48%
Sweden	1,60%	2,14%	1,91%	1,04%	2,36%	1,79%
Switzerland	0,83%	4,18%	2,73%	0,12%	3,64%	2,11%
United Kingdom	1,28%	11,68%	7,18%	0,99%	6,71%	4,22%
Total Europe	77,25%	92,21%	85,75%	89,90%	99,30%	95,21%
Total	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%

NB. Total Europe does not include Canada, Total includes Canada
Source: ESTMP September 2004 (for 2004 data) (doc ESA)

- It is also essential to maintain European autonomous access to space – currently European planning for the next generation of launchers reveals a dangerous degree of incoherence. More immediately, the relationship with the Russian launcher industry is in a confusing state: there are various cooperation agreements between National Space Agencies (CNES, DLR, ASI) or major industries (EADS, SAFRAN, Ariespace) and the Russian Federation for the development of future launchers as well as cooperation

agreements between ESA and the Russian Federation. The ESA-Russian partnership focuses on two main areas: the exploitation of the Russian launcher "Soyuz" launched from Europe's Spaceport in French Guiana (Kourou) and other areas of cooperation "in kind" directed at research and development for future launchers. ESA and the Russian Federation are also collaborating in developing the technology needed for future launchers and future space transportation systems such as the Kliper programme.



- With some exceptions (e.g. Galileo), Europe-wide space programmes are under-funded. This is due either to a preference in favour of national programmes or a general reluctance by some States to fund space at all (e.g. EGAS, FLPP or Soyuz in Kourou). Yet these are ESA optional programmes of paramount importance in safeguarding European independent access to space.
- Without stronger leadership, fragmentation and “re-nationalisation” of space will be seen as the only viable option and European space may fail fully to exploit novel funding mechanisms such as Public-Private-Partnerships (PPP) or Private Funding Initiatives (PFI).
- Notwithstanding the declarations expressed in the EC Green and White Papers on space (2003), under-funding is due to a failure to appreciate the value of space and the wider benefits it generates for European social and economic development.
- There is a need to achieve a proper balance between national (where there is naturally a powerful incentive to maintain national capabilities) and European levels: EU rules governing monopoly, competition, export control, technology proliferation, procurement, security of supply, do not meet the requirements of space markets. ESA is the only specifically European organisation dealing with space industry applying rules which derogate national laws and existing European regulations (Single Market

competition). The EU needs to acquire the legal and regulatory tools to develop and sustain a more effective and efficient industrial space policy.

Security issues

- The security dimension of space was until recently largely ignored at the EU level. This is despite the fact that key risks to European security identified in the “European Security Strategy” (approved by the EU Council in December 2003) – terrorism, proliferation of WMD, regional conflicts, failed states as well as organised crime – are threats where space-based assets could play a key role. This deficiency also runs counter to the GMOSS network of excellence, an initiative launched by the European Commission in March 2004 as part of the EU 6th Framework Programme. This intends to integrate Europe’s civil security research in order to acquire and develop the autonomous knowledge and expertise base needed if Europe is to develop and maintain an effective capability for space-based global monitoring. Moreover, participation in the ECAP process (European Capability Action Plan launched by the EU Council at the Laeken European Summit in December 2001) remains on a voluntary basis and the whole exercise will lack credibility so long as commitments are not underpinned by the necessary funding.

Europe is failing to make the best collective use of defence-related national space capabilities because ground-based assets are only partially integrated. A more extensive degree of cooperation is necessary to make the best use of these assets.

- More needs to be done to coordinate national capabilities generally and to reduce fragmentation in areas such as military communications, i.e. C4ISR (Command, Control, Communication, Computer, Intelligence, Surveillance, Reconnaissance).
- Europe needs to break down the artificial firewall between military and civilian space programmes and between ESA programmes (which according to ESA Convention are meant to remain strictly non-military), and the more security oriented national or multinational programmes.
- An enhanced military programme would also provide benefits from the dual technology aspects of space S&T and achieve economies of scale that would aid both civil and military applications.
- Any technology developed for civil programmes should be available for defence applications as is, for example, already the case for weather imagery provided by MeteoSat, and EO data from Spot or ERS satellites. A European space policy should therefore carefully consider the effects of restrictions placed on civil pro-

grammes that may limit their defence and security applications (cf. Galileo).

- There is still a need for an increased European commitment to dedicated space-based applications for broadly defined defence and security missions. This is especially important in the area of treaty verification, disaster and environmental monitoring and space situation awareness (space surveillance) and could lead to a valuable strategy of “niche” specialisation.
- The recent Commission initiative – the “Preparatory Action for Security Research” (PASR) – allocates € 65 million funding for R&D, and to support projects aimed at preparing a comprehensive Programme for Security and Research (the European Security Research Programme (ESRP)) for 2007 onwards, it was envisaged that this programme would fund capability-related research projects including demonstrators that will be needed to bridge the gap between civil and military research and which would maximise the benefits of multi-purpose technology.

Institutional issues

- Europe (i.e. the EU and Member States via ESA) is also weak at evaluating space initiatives launched by other powers (cf. the US Moon Mars initiative) or in developing technical positions of its own (cf. the Aurora initiative). Similarly, the Council’s Secretary General/High Representative has no competence to evaluate space issues. There is so far no



defined EU space Council authorised to address those space issues identified by the EU as tools to support wider EU sectoral policies (agriculture, transport, environment, etc.).

- The limited political competence of the existing Space Council (at the moment it only operates as a joint meeting of ESA and the EU Councils, including the ministers in charge of space affairs, internal markets, industry and research) must be addressed.

The Space Council should be the forum for the key political decisions affecting European space.

Currently, it merely serves as a vehicle for general discussion adding a “veneer of space” to EU policies.

European statesmen must take responsibility for the financial and institutional requirements needed to lead and to manage the European “spacescape”.

But to date, the Space Council has failed to show sufficient leadership in space policy issues. It has not yet adequately reflected the increasing role of the EU as a new space player in Europe. As a result, European decision-making in space remains dominated by the individual Member States and national institutions.

International dimension

Europe is weak in addressing the international dimension of space. This is manifest in a number of areas:

- While in the area of space exploration there is a chance of developing equal partnerships with other space players such as Russia or even China, the European contribution to the ISS programme has left Europe fully dependent on US plans especially relating to the shuttle programme and has no independent access to the space station.
- US influence generally remains a key factor in many international space programmes, preventing other major players such as Japan from considering the benefits of full fledged cooperation with Europe as an alternative to relations with the US. In this respect the value of Galileo as the only attractive option for China and India has been fully demonstrated as a means of building a space coalition centering on Europe.

The public image of space

- Communications (Public Relations) is an important aspect of the overall problem of European space. A key action therefore, is to show the European taxpayer that space has a wide impact on life on Earth. Poor communication has meant that Europeans are largely unaware that their continent has flown spacecraft to the Moon, Mars and Titan. This should be a source of collective pride.
- Europe must learn from past mistakes such as the bad presentation of the

Beagle/Mars Express mission: despite its undeniable success, Mars Express's achievements remain little known to the public. A reason for this deficiency is ESA's poor public relations effort compared to NASA's more extensive and sophisticated activities. In the United States this is largely the result of NASA's obligation to the US Congress. In Europe, there is no comparable requirement regularly to account either to national and European Parliaments.

the 1990s, the binding commitments to rigorous economic and budgetary management derived from the Stability Pact have put low-priority areas such as space under pressure. For the last 15 years, European governments have frozen or reduced (in purchasing power terms) their allocations to civil and defence space programmes, with an unchanged overall public organisation. Moreover, European space policy is handicapped by a slow decision-making process.

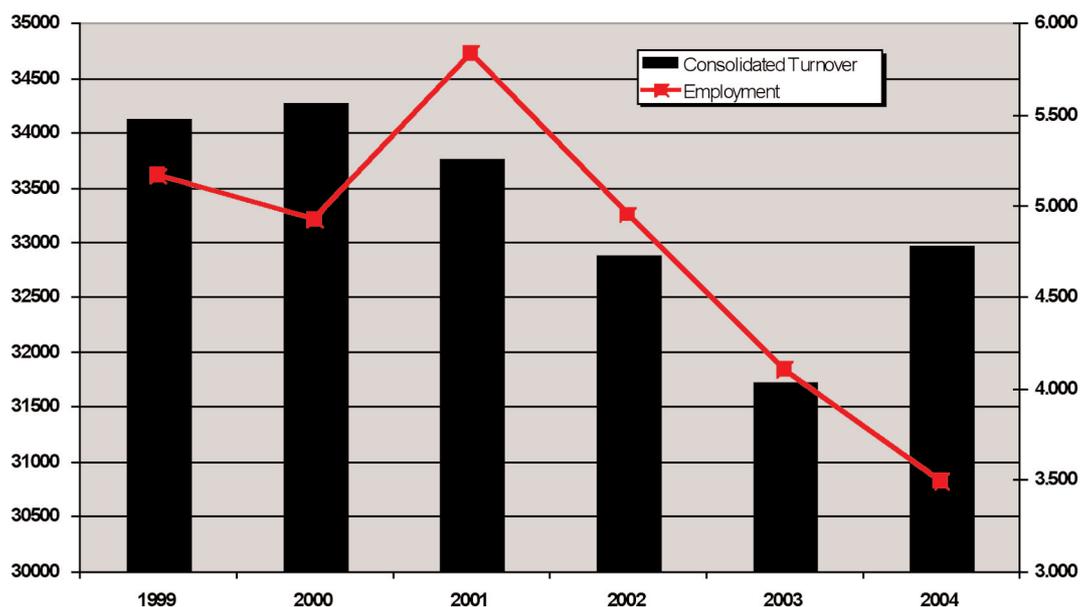
INTERNAL CHALLENGES

Market environment

- The failure to appreciate how vital space has become to many European citizens' daily activities leads policy makers to undervalue space activities and undermines the will even to maintain current levels of spending, let alone to contemplate increases in space budgets. Since

- The commercial market for launchers and satellites is stagnating and a large number of engineers have been laid off by the main European space companies (-30% in the last years for the sole EADS) while employment was further reduced in 2004 to 30 523 (-3.2%). The development of HDTV constitutes nonetheless a hope of fostering new markets for space.

Employment and Turnover (M€), 1999-2004



Source: © Eurospace 2005 Industrial issues



- Commercial space activities are more limited than governmental space programmes. The dominant commercial space activity is space telecommunications (Eutelsat, SES Global, Hispasat); this is followed by commercial space transport (Arianespace). Remote sensing is much less developed in terms of revenues and is largely confined to a few players (such as SPOT Image). About 80% of space-related revenues come from the selling of services by operators who are not part of the space industry. The real size of the commercial sector for the space industry is only about € 20 billion compared to some € 40 billion from governmental space budgets. The increasing importance of “public-private-partnerships” (PPPs) in the space sector blurs the frontier of commercial space and mixes the interests of commercial companies and governments in civilian and military.

Industrial issues

- European space industrial policy is still subject to several constraints and limitations. In ESA, there is still a strong attachment to “juste retour”, which plays an important role in ESA procurement, especially for the smaller Member States of ESA. Moreover, the EU10 (Member States, which joined the EU on 1st May 2004) strongly support an ESA type of intergovernmental structure with its well-defined principle of geo-return. They are very suspicious of a space policy managed by the EU which might dilute the juste retour principle. However, while there is still a need to reflect the expectations and interests of all EU members, these must be reconciled with the need for efficiency and competitiveness in the EU space industry. Industrial policy is an issue, which the EU and ESA will have to adapt in the face of new realities (cf. outcome of the second Space Council in June 2005 where it was agreed that Europe needs an industrial policy for space “tailored to the specificities of a sector subject globally to government influence”).
- The European Space Technological and Industrial Base (STIB) is at risk. Two thirds of the European space industry turnover is dependent on a weak demand from public customers. As a result, it faces a major competitiveness problem compared to US industry. Europe has to maintain its technical investments if only to retain its existing level of competence. European space actors must also be able to collaborate from a position of strength. This requires continuing investment in core technologies. Europe needs to identify and, where necessary, remedy technological dependence on others and limit its vulnerability to external controls over technology transfer. In this respect, US export control is not only damaging to US interests, it also has a negative impact on European space commerce and the prospects for international cooperation. US policy is, however, a further incentive for Europe to develop “ITAR-free” products to attract customers and enhance cooperation with space-faring nations such as Japan, Russia, India and

China. The European Component Initiative taken by ESA together with CNES to develop production lines for systems that are critical to satellites and which are currently available only from US companies, should be applied to other critical technologies. This should be based on a consistent European long term strategy determining the level of technological capacity that Europe would want to achieve over the next decade.

Human resources are a key element in supporting a viable European STIB.

- The EU, as well as the US, is facing a shortfall in the science and engineering workforce. The workforce problem is a “triple-threat” issue as it affects government, industry and European universities alike.
- Europe at large is suffering from a scientific ‘brain-drain’ to better-resourced American laboratories or a more dynamic environment in countries like China and India. Between 1991 and 2000, two-thirds of the 15,600 EU-born doctorate recipients in the US studied science and engineering, and 70% of the Europeans with American PhDs planned to stay there.
- The EU’s economic growth is centred on high tech industry and services. New projects are necessary to keep teams together and to attract and retain the best European brains. A brain-drain from the STIB could lead to the permanent loss of key capabilities.

- Once human capabilities are lost, it would be prohibitively expensive to get back in the game. Europe would also lose the ability to compete in emerging sectors such as space robotics or new propulsion systems. Moreover, the expansion of market-oriented activities such as space-based services would be threatened.

Security issues

The ability of space to enhance security/military capabilities is significantly under-appreciated in Europe:

- An EU space policy should consider the benefits for the European space industry of an expansion in defence and security space programmes which would enable companies to derive benefits from dual technology and from the economies of scale brought by developing common platforms and components.
- Industrial revenues would be improved generally as a result of increased investment in defence-and security-related space programmes.

Institutional issues

The present ESA Director General has remarked upon the large number of institutions and decision-making bodies involved in the development and implementation of a European space policy: these include ESA, the EU, National Agencies, Defence authorities, industries and operators. This heterogeneity undermines the formulation and management of common initiatives. ESA DG has therefore



advanced three guidelines for the decision-making process in Europe:

- ▲ Enhance as much as possible the European component of national/multi-national programmes. Too many space programmes in Europe are run on a national/multinational basis. Although some examples prove unfortunately the contrary (EGNOS and Galileo to be more specific), European programmes should be more cost-effective than national or multinational ones insofar as a common European space policy is meaningful to national governments.
- ▲ Retain the flexibility of cooperation mechanisms: reinforcing cooperation at the EU level while maintaining optional programmes at the ESA level.
- ▲ Improve the coherence of the various centres of decision-making by harmonising political, budgetary and programmatic decisions, which by definition, are taken at different levels of decision-making.
- The problem of divergent national priorities and the potential risk of a “re-nationalisation” of space policy in Europe must be addressed. Examination of national expenditure patterns reveals that there are still some areas where European countries consider it imperative to carry out space missions under separate international agreement or independently. This is the case of dual use Earth Observation projects such as Pleiades or COSMO Skymed and micro-

gravity on board the ISS, where ESA Member States invest in bilateral or multilateral programmes at almost the same level as through the European Space Agency.

EXTERNAL CHALLENGES

- Compared to Europe, most of the other space-faring countries benefit from a coherent national space programme with a relatively simple political framework defining a vision and allocating the appropriate level of funding. This underlines why the European space sector is progressively seeking in the EU a comparable level of political support and commitment.
- The European space sector faces intensified competition from the established space powers, especially the US where space investment (particularly in the defence and security sector) is set to rise dramatically over the next decade. However, this increase is due mainly to ballistic missile defence rather than defence-related satellites, an area where the EU should focus its efforts.
- Following different goals than Europe, China, India and Japan are gaining international recognition and self-confidence in their technological achievements. Contrary to Europe it seems that at least China’s, if not yet India’s - which tripled its space budget between 1992 and 2004 - ultimate aim is to gain space power. Japan for its part focuses for obvious reasons on crisis management and environment monitoring.

- Russia continues to have the cheapest and most reliable family of launch vehicles. The Russian government approved in July 2005 a ten-year development plan (2006-2015) with an overall budget of € 8.64 billion. Although this budget is far from matching the annual NASA space budget (€ 14 billion), it does reflect a renewed commitment by Russia to enhance its space capabilities. But, in almost every area of national autonomy, the former USSR must re-think its position in the world between China and the US. A serious option is a rapprochement with Europe.

China will be one of the main space powers in the years to come. It is rapidly gaining competence and in some areas it has already surpassed European capacities. The People's Republic achieved its second manned-flight in October 2005 and plans to orbit a small space station in 2008. If it can maintain this pace, it could land on the Moon before the US's planned return, perhaps by 2017. This substantially increased effort reflects a variety of motivations ranging from meeting national requirements for domestic development (land management, city planning, disaster management, etc.) to improving its status in the region (in particular vis-à-vis India and Japan) and on the international scene.



THE WAY FORWARD

The idea of a “re-founded” European space strategy implies a need to overcome numerous difficulties and a determination to address contentious areas. Some fundamental ground work will be required to prioritise the elements that would comprise the agenda for a “re-founded” European space programme.

GOVERNANCE

SETTING UP A EUROPEAN SPACE STRATEGY

The European space community’s needs

- Space actors must learn how to operate within the new political framework and with its institutions notably the Commission. This might include consideration of innovative solutions such as turning ESA into an EU Agency comparable to the EDA reporting to the EU Council. Alternatively, more federative-like approaches that include national agencies (a European network of technical centres) might be more appropriate. In any case, the political and legal issues associated with change will have to be closely examined.

The EC and ESA have to work towards a common purpose that goes beyond existing agreements.

A pragmatic solution would be to follow the Wise Men report on space which states that: “the European Commission

should be a contributor to ESA programmes and as such a member of ESA Council”. This would allow ESA to be represented at the appropriate EU level. Since 2000, the only step in this direction has been to allow EC representatives to attend the ESA Council on an ad hoc basis (e.g. when the Galileo issue was on its Agenda EC representatives could participate in discussions only on this topic). The legal feasibility of this proposal should be investigated as a matter of urgency.

- The European space community needs an ambitious set of strategic goals that are both inspirational and realistic with a clear indication of likely costs and benefits within a timeframe for implementation.
- The strategy should set out clearly what is to be done and by whom. In short, it should clarify the degree of subsidiarity between national and EU activities and determine a more efficient regime to link European level (ESA and EDA) and national agencies. However, shared competence implies that the space agencies consider programme matters under the aegis of the EU, but without prejudice to purely national (and bilateral) activities that did not or did not yet form part of the EU space policy. In the final analysis the Commission should define the regulatory framework under which space activities are conducted. This would include representing Europe in worldwide fora such as the United Nations COPUOS, the ITU for frequency and orbital position allocation, and the WTO

for defining market rules, etc. It would also seek to articulate users' interests around common objectives. Above all, the Commission should act as the custodian of any European space policy by guaranteeing a long-term (ten year) plan for funding beyond the normal annual budgetary round.

- EU space competence under ESDP should be exercised using ESA and other institutional capabilities as part of an integrated system. A way forward could be to create a small operational office at the EU Council level to interface with Member States and ESA. This would include the defence and security aspects of space. Moreover, as EDA evolves, it may begin to act as a customer for ESA programmes in the defence and security space sector. This could help promote a parallel development in the European space industry, consistent with the goals, constraints and future developments of European defence procurement.
- In the short term, the EU should develop a capability to respond politically and programmatically to space initiatives launched by other States and agencies (such as the US initiative on exploration or space weaponisation). This deficiency could be mitigated by the development of a technology and policy assessment capacity comparable to the former US Office of Technology Assessment (1974–1995).
- Based on such an institutional structure, a "re-founded" European space policy could reflect a common approach to

international collaboration involving the different European actors and partners outside the Union. This would imply the emergence of a sense of a "European" interest, as in Galileo, to balance the existence of purely national interests that may continue to affect international cooperation (cf. Germany in the ISS and France in the launcher sector).

Issues to be addressed by a European strategy

The following issues include long term needs for European space such as:

- The formulation of new goals for Europe, especially for security, defence and sustainable development, which could stimulate greater political and public attention and which would encourage ownership by politicians willing to act as advocates for European space.
- The need for a specific EU competence in the field of space security issues.
 - ▲ This should include the creation of better links between space policy makers at all levels, including national space agencies, national procurement agencies, ESA where applicable and the European security and defence procurement structures such as OCCAR or the European Defence Agency (EDA).
 - ▲ The latter will be especially important in developing joint operational requirements for space defence and security. This would include sponsoring collaborative programmes with the European



Space Agency and would make a major contribution to the identification of capabilities and the development and management of new military space systems.

- An ambitious set of programmatic goals encompassing, inter alia:
 - ▲ Science and exploration
 - ▲ Access to space including the question of a new launcher
 - ▲ Security and defence
 - ▲ Information society (including tele-education)
 - ▲ Earth and environmental applications
 - ▲ Life sciences (including tele-medicine)
 - ▲ Supporting technologies
- The identification of areas where realistically Europe could achieve a leading role and leverage its resources to its best advantage. For example:
 - ▲ Based on GMES and GMOSS, the building up of a European capability for supporting sustainability goals and for disaster prevention/mitigation.
 - ▲ Unmanned exploration of the solar system, based on international partnership, where Europe could credibly lead exploration projects.
- Launching a technology acquisition programme to catch-up with selected American military applications. In some areas, European industry is too dependent on American technology and without increased investment in defence applications European competence will deteriorate.
- Refocus European collaboration with Russia: working with the Russian space industry offers much, but this must be carefully defined as there is again a risk of over dependence and increased vulnerability to political changes in Russia over the next ten years. The path to be followed should be based on inter-dependence but guaranteeing nonetheless independence in critical technologies.
- Europe should develop new, alternative models of international cooperation with greater flexibility and a wider range of partners. Europe should seek to open its programmes for international participation (Galileo is an example). Unless there is a clear security or other political objections, all new European projects should be open to international partnership.
- The EU should make a special effort to cooperate with developing countries (through DG-Development and NGOs). The European Union should give serious consideration to the use of space as a diplomatic tool and as an effective way of delivering development goals. Europe could, for example, adopt a policy of open, low cost or even free access to EO data. Programmes such as a global disaster warning system and an international scientific network could be developed to enhance a better understanding of the causes and remedies to natural disasters.

DEALING WITH THE INSTITUTIONAL ISSUES

- Europe should merge its present fragmented space policy processes into a single policy process for the benefit of its entire space effort and of its citizens. This should focus on those essential measures of institutional reform that can be achieved as a first step to creating a common framework.
- ESA and the space community must learn how to operate within the new political framework and within the EU institutional framework and particularly establish an effective working relationship with the Commission.
- Following the failure to approve the EU Constitutional Treaty, there has been no progress on implementing art. I-14 and III-254, dealing with "shared competence" for space activities. Most experts agree that the delay in approving the Constitutional Treaty should have limited impact on the setting up of an EU competence in this field as this has already been applied to the Galileo programme and GMES.
- The relationship between the EU and ESA needs to be re-evaluated and re-configured within a common framework and with the support of Member States and other main stakeholders. It is imperative that ESA and EC work together beyond existing agreements to formulate a space policy supported by specific programmes that would become the basis for an EC recommendation that would eventually be adopted by the EU Council.

For obvious historical reasons, ESA is in the first instance the best placed to propose programmes that will support a European strategy for space. But this strategy also has to be promoted by the European Commission. As the custodian of the European Treaties and processes, the European Commission should propose a programmatic "vision" to the EU Council. A permanent and autonomous space office attached and reporting to the several EC Commissioners interested in space (cf. Enterprise and Industry, Environment, Development and Humanitarian Aid) and also to the EU SG/HR, should be responsible for assembling a detailed European space policy in close liaison with ESA.

BUDGETARY ISSUES

Adequate funding for new programmes is the key to Europe's future in space.

- Except for private initiatives, European space activities will remain funded from tax payer's money, through national Agencies, ESA and the EC. A realistic balance between the three channels should be established.
- A European space policy must strive to achieve excellence at an affordable cost, thus implying that financial contributions from European public agencies must be better coordinated and complementary, driven by users' needs and requirements. The European Commission, supported by the space community, must be positioned to transmit a proper cost plan for implementing a European space strategy at the level of the EU Council. The European Commission, Member States



and other bodies associated with the programmes concerned must commit to the necessary implementation mechanisms and procedures.

- The likely cost of implementing a future European space strategy is conjectural at this stage, but conservative estimates suggest a need for a yearly extra €1 billion as a minimum for defence and security programmes and a commitment to a civil space budget increasing by 5% per annum. In the short term, the existing ESA budget should be at least properly corrected for inflation – ideally by an additional one percent to allow some immediate growth (e.g. 1.5% for the French National Space Agency up to 2009).

SCIENCE AND TECHNOLOGY ACQUISITION

- Essential reform of European space governance may take some years to implement. In the meantime, the STIB could be undermined by neglect. As a matter of urgency, key technological requirements should be identified and supported by investment in technology acquisition, development and demonstration also in order to ensure continuity of R&D teams and other human assets. For example, developments in advanced sensor techniques, or in supporting software technologies to sustain them, or the use of nanotechnologies in space or demonstrators such as the French Essaim or other scientific programmes such as the German Terrasar and SarLupe and the Franco-American Jason (1 and 2).
- In order to retain world-class competences in launcher and satellite design, development and manufacture, data management, and space-based services, the European space sector would need:
 - ▲ A dedicated regulatory framework designed and approved at the EU level which would take into account the organisation and size of the European space technological and industrial base, thus giving strong legal footing to the space sector. The EU should also take measures to streamline the standardisation process which are the responsibility of authorities like CEN, CENELEC and ESTI and ISO for Earth Observation.
 - ▲ A continuous run of projects matched by a commitment to a programme of technology demonstration. The latter also has value in reducing the cost and risk of new full-scale programmes.
 - ▲ An adequately funded science and technology acquisition programme to support future activities and applications. Space programmes that bring together many of today's advanced technologies can help ensure that the European high-tech industry remains competitive. As a start, European governments should find a way to increase their commitment to space by spending an additional 50% over the ten coming years, all sectors included. Most of the increase should go to the ESA budget while a substantial amount should go to Commission-run space research programmes, the rest being managed at

the national level as appropriate. In any case available funds should be co-managed by ESA and EC with a strong leadership of ESA.

POLITICAL AND PUBLIC SUPPORT

- Space Agencies should also promote more aggressively the value of space, and lobby National and EU MPs as well as the European Commission on these issues. This is something that cannot and should not be left to industry alone.
- The EU space authorities and all space stakeholders at large must work harder to improve the public view of space and to build a wider political and user community support for space.
- Europe should be able to demonstrate the positive value of space and show the connection between space and the welfare of EU citizens in particular those day-to-day space applications managed by non space agencies such as meteorology and telecommunications. Efforts must be made to redirect the largely national focus of media attention to show the multinational dimension of Europe's space activities.
- Europe needs to establish ways and means of bridging the gap between scientists, the user communities and the political world. This will require a long-term strategy to raise public awareness. This could be achieved through the organisation of multiple debates or fora with representatives drawn from across European countries, through seminars

and conferences designed to expose political decision-makers to the benefits of space applications and to demonstrate their value to European citizens.

- Particular attention must be paid to the new EU Member States, which have yet fully to participate (if at all) in European space programmes. They must be convinced of the benefits of space to Europe as a whole as well as the direct contribution space makes to their welfare and security.

COMMERCIAL EXPLOITATION

- Today, the primary concern for much of the European space activity is the delivery of public programmes; but in order to encourage the commercialisation of space, any barriers to its commercial exploitation (including space tourism) should be identified and reduced. This would include resolving legal issues such as intellectual property rights and security concerns (use of space images or positioning signals by failed states or possibly terrorists).
- Moreover, it is essential that European public authorities favour the development of operators in sectors such as GMES and this in close liaison with users' needs (public/public, public/private). These operators should be tasked to identify space information capabilities and help users' demand to come into existence and reach critical mass. They should also identify the respective level of funding and required synergies between the different users' communities. ■



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ACRONYMS

ASI	agenzia spaziale italiana
BOC	besoins opérationnels communs
CEN	comité européen de normalisation
CENELEC	comité européen de normalisation électrotechnique
CFSP	common foreign and security policy
CNES	centre national d'études spatiales
COPUOS	committee on the peaceful uses of outer space
DGA	délégation générale pour l'armement
DLR	deutsches zentrum für luft- und raumfahrt
EC	european commission
ECAP	european capability action plan
EDA	european defence agency
EGAS	european guaranteed acces to space
EGNOS	european geostationary navigation overlay service
ELDO	european launcher development organisation
ELINT	electromagnetic intelligence
EO	earth observation
ESRO	european space research organisation
ERS	european remote sensing satellite
ESA	european space agency
ESDP	european security and defence policy
ESPI	european space policy institute
ESTI	european telecommunications standardisation institute
EU	european union
EU-SG/HR	european union secretary general/high representative
EUMETSAT	european organisation for the exploitation of meteorological satellites
FLPP	future launcher preparatory programme
GMES	global monitoring for environment and security
GMOSS	global monitoring for security and stability
GNSS	global navigation satellite system
GSLV	geosynchronous satellite launch vehicle
HDTV	high definition television
ISO	international organisation for standardisation
ISS	international space station
ITAR	international traffic in arms regulation
ITU	international telecommunication union
MoD	ministry of defence
MP	member of parliament

NASA	national aeronautics and space administration
NATO	north atlantic treaty organisation
NGO	non-governmental organisation
OCCAR	organisation conjointe de coopération en matière d'armement
PFI	private funding initiative
PPP	public-private-partnership
R&D	research and development
RTD	research and technology development
SPOT	satellite pour l'observation de la terre
SSTL	surrey satellite technology limited
STIB	space technological and industrial base
S&T	science and technology
TUE	treaty on the european union
WMD	weapons of mass destruction
WMO	world meteorological organisation
WTO	world trade organisation

