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THE EUROPEAN SPACE SECTOR IN A GLOBAL CONTEXT

– ESA's Annual Analysis 2003

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This report provides an overview of the European space sector in a global context. It takes into account the geopolitical and economic changes that occurred in the World during 2003, since the December 2002 meeting of the ESA Council, where the Agency's 2002 analysis was made available to the Member States.

Once again, the purpose of the report is to provide facts and figures that map the prevailing global situation and thereby put the evolution of the worldwide space sector during the last year into context. As the title indicates, the report endeavours in particular to analyse the current status of the European space sector in relation to that of the USA and other space powers.

Data coming a variety of sources have been used. In the great majority of cases, figures are expressed at current economic conditions, either in Euros or in US dollars. Average exchange rates over the reference year (Interbank rate) between the two currencies have been applied for years 2002 (1€=0. 93276$) and 2003 (1€=1$) up to 31/10/2003.

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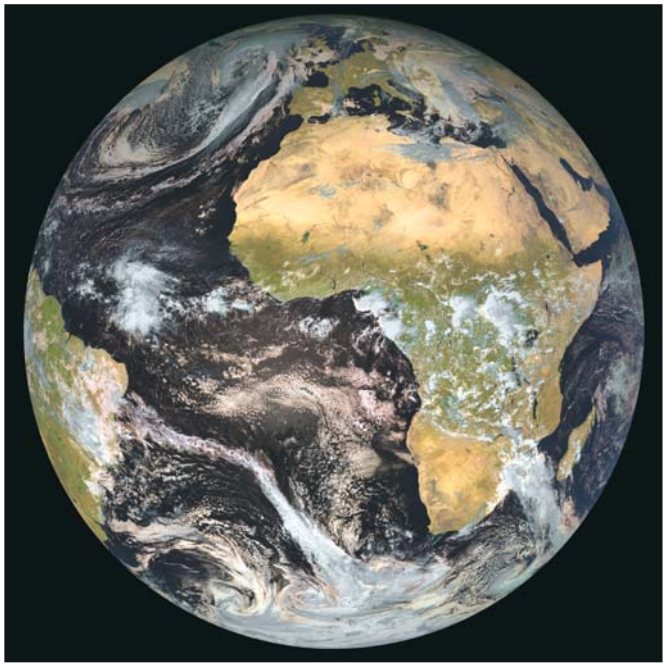

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Introduction

2003 was a year laden with events that have influenced, directly or indirectly, the World's geopolitical scenario and as a consequence, the European space sector.

At the political level, two major events have characterised the year just passed. The War in Iraq, with its consequences for transatlantic links, and the failure of the European Union's member countries to successfully conclude the Intergovernmental Conference by 2003.

As far as space is concerned also, two major events can be identified in 2003: the Columbia accident, with its major implications for US manned spaceflight policy, as well as the continuation of ISS assembly; and the re-vitalised worldwide interest in space exploration.

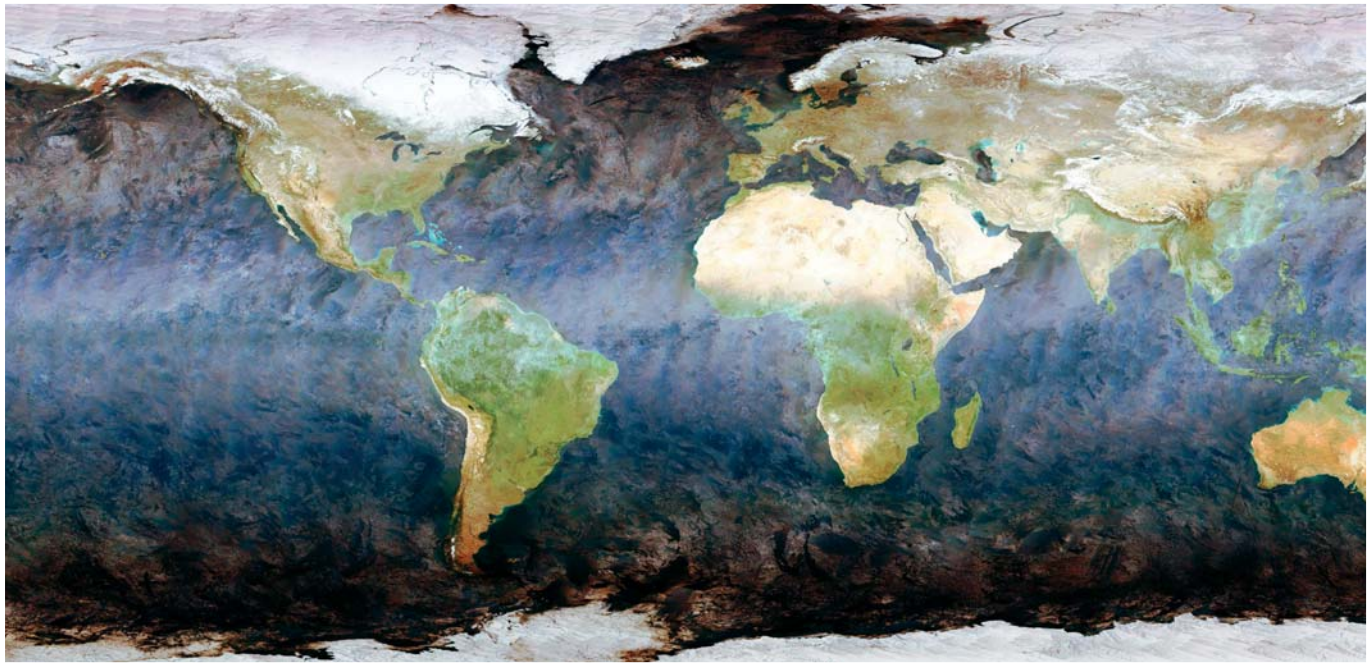
In that context, the emergence of China as a leading space actor was also a major event, with the ambitious Chinese manned programme stimulating renewed US ambitions towards the Moon and Mars.

In the European context specifically, 2003 was by the European Commission's Green and White Paper exercises, conducted in close co-operation with ESA. The White Paper, adopted in November 2003, marks the European Union's involvement in space policy, and is the result of the Green Paper consultation exercise, which mobilised an impressive number of actors across Europe.

The signature on 25 November 2003 of the Framework Agreement between ESA and the European Community also emphasised the Union's involvement in space matters. The Agreement is to establish a framework providing a common basis and appropriate operational arrangements for an efficient and mutually beneficial cooperation between ESA and the European Community.

Earlier in the year, the ESA Council Meeting at Ministerial Level in Paris in May had already sent a very strong political signal to the European as well as to the international space communities, by adopting a Resolution envisaging governmental support to guarantee European independent access to space (EGAS Programme).

PART 1 - THE GLOBAL CONTEXT



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Global Political and Economic Trends in 2003

2.1 Global economics

After a long-lasting period of fits and starts, a palpable recovery has finally taken hold across the World's most developed countries. The strong momentum already achieved in Asia, North America and the United Kingdom provides ample evidence of the renewed strength of the global economy. Despite lingering domestic weaknesses, continental Europe is also on its way to joining the recovery.

	2003	2004	2005
Real GDP *– Percentage changes from previous year*			
EU	***0.7***	***1.9***	***2.5***
Euro Area	*0.5*	*1.8*	*2.5*
USA	*2.9*	*4.2*	*3.8*
Japan	*2.7*	*1.8*	*1.8*
China	*8.4*	*7.8*	*7.4*
Russian Federation	*6.3*	*5.0*	*5.0*
Unemployment *– Percentage of labour force*			
EU	***8.0***	***8.1***	***7.9***
Euro Area	*8.8*	*9.0*	*8.7*
USA	*6.1*	*5.9*	*5.2*
Japan	*5.3*	*5.2*	*2.0*
China	*N/A*	*N/A*	*N/A*
Russian Federation	*N/A*	*N/A*	*N/A*
Inflation			
EU	***2.1***	***1.8***	***1.7***
Euro Area	*1.9*	*1.7*	*1.6*
USA	*1.6*	*1.2*	*1.2*
Japan	*-2.5*	*-1.3*	*-0.8*
China	*0.6*	*1.0*	*1.5*
Russian Federation	*13.0*	*11.0*	*9.0*

Table 1 - Projection from OECD Economic Outlook (November 2003)

This turn for the better stems from a variety of factors. Since the spring, the geopolitical environment has steadied, allowing oil prices to stabilise and confidence to grow. In the United States, the stimulus provided by monetary and fiscal policies has been very powerful and past excesses in business investment had been largely worked off. The US economy has begun to recover, with investment starting to take over the baton from consumption. More fundamentally, the US economy will greatly benefit from strong productivity gains and high potential growth over the next few years.

The Euro zone, where domestic demand has remained weak for longer, will receive some support from the global recovery, but is unlikely fully to work off its considerable slack over the next two years. Economic growth, which is estimated to have slumped further to a small 0.5% in 2003, should pick up in the coming years. However, the combination of large public and external deficits in the United States could be a source of exchange-rate instability, and a further exchange-rate appreciation could stifle a fledgling European recovery. The unemployment rate is expected to peak at 9% in 2004, with inflation remaining subdued. In the European Union (EU), activity in the United Kingdom has accelerated, while output in the other major European economies has either fallen or stagnated.

The American upswing has coincided with a marked and better-than-expected improvement in Japan, driven in large part by better investment prospects in the manufacturing sector and fast-growing markets in neighbouring Asian economies.

Looking further ahead, the most likely scenario for the next two years is one of sustained growth in the United States and progressive recovery in Europe and Japan, in a context of low inflationary pressures and with a gradual reduction in unemployment.

Looking at developments in other economies, China's economic activity has rebounded strongly following the containment of the outbreak of SARS in June, and economic growth is showing its fastest pace in several years. While growth in the southeastern Europe slowed somewhat in 2003, it accelerated in the newly independent states, led by the strong pick-up in growth in Russia. Economic activity increased to somewhat more than 6% in 2003, mainly driven by oil and related sectors. Growth is likely to ease in the coming two years, but should still remain strong.

2.2 Politics

2.2.1 The European Union

GENERAL

The year 2003 has in many respects been momentous for the Union. Major achievements in the Union's work were the European Convention's proposal for a European Constitution, the finalisation of the Accession Treaty for the ten new EU Member States, and the start of the Intergovernmental Conference. At the same time, a foreign policy rift opened between Members of the Union, linked to the US-led war in Iraq.

The EU Presidency was held by Greece from January to June 2003, when it was taken over by Italy. In January 2004, Ireland has taken over the Presidency.

THE EUROPEAN CONVENTION

Mandated by the European Council at Laeken, the Convention on the future of Europe, presided over by former French President Mr Giscard d'Estaing, began its work in February 2002. The Convention has been seen as a novelty compared to the traditional process in EU affairs, because its members include representatives of national parliaments and governments as well as representatives of the European Parliament.

Decisions were taken by consensus (no objections) instead of unanimity.

In June 2003, the Convention presented its 'Draft Treaty establishing a Constitution for Europe', aiming at reinforcing the efficiency and the legitimacy of the institutions of an enlarged Union.

The Draft Constitutional Treaty proposes major developments of the EU institutions:

President of the European Council: The European Council shall elect its president for up to five years (two possible mandates of 2.5 years) to chair summits and drive forward its work. The presidency of Council formations, other than that of Foreign Affairs, shall be held by Member States on the basis of equal rotation for periods of at least a year.

Foreign Minister: The EU Foreign Minister shall conduct the Union's common foreign and security policy, sitting in the Commission with access to its resources, but answerable to Member States. He shall be appointed by the European Council with approval from the Commission. This position is seen as an amalgam of the posts of External Relations Commissioner and High Representative of the EU.

Defence: New legal bases will be created: a solidarity clause between Member States (relevant in the case of terrorist attacks or natural/manmade disasters), the frame for 'structured cooperation' in defence matters, and the creation of the European Armaments, Research and Military Capabilities Agency.

European Commission: From 1 November 2009 onwards, the Commission shall consist of 13 commissioners selected on the basis of a system of equal rotation between the Member States, a President and a Minister for Foreign Affairs as Vice-President. The Commission President shall appoint non-voting Commissioners coming from all other Member States.

European Parliament: The European Parliament's size shall not exceed 732 members. The number of areas where the European Parliament can co-legislate with Member States will almost double to 70.

Simplified Legislation: The Draft Treaty proposes to reduce the number of legislative instruments and calls them more easily understandable names, such as European Law, European Framework Law, European Regulation and European Decision.

Voting Power: From 2009, decisions will be taken by double majority, representing at least half of the Member States and 60 percent of the Union's total population. The national veto will be preserved in a few politically sensitive areas, such as taxation and foreign policy.

Economic and Monetary Union: Significant changes include the establishment of an explicit link between the coordination of economic policies and the coordination of employment policies, and the strengthening of provisions specific to Member States in the Euro area (arrangements covering the Euro Group are set out in an attached protocol).

Exit Clause: For the first time in the Union's history, there will be an exit clause for countries that want to leave the Union. This reflects the practical difficulties of a growing Union, which could eventually have over 30 Member States.

Other: The Preamble refers to the cultural, religious and humanistic inheritance of Europe. The Union will have a legal personality, allowing it to sign international treaties.

Its Charter of Fundamental Rights will be legally binding.

THE INTER-GOVERNMENTAL CONFERENCE

The Draft Constitutional Treaty proposed by the European Convention is examined by government representatives in the Intergovernmental Conference (IGC), which will take the final decision on how the EU Treaties will be revised. The IGC was officially launched on 4 October 2003 under the Italian Presidency.

To be adopted, the Draft Treaty has to win the unanimity of 25 European States, each having veto rights.

The goal of the Italian Presidency was to have the draft Treaty agreed by end 2003, which proved impossible, mainly due to the adamant refusal of Poland and Spain to change the voting system into a 'double majority' system better reflecting the sizes of the Member States' populations. The task thus falls on the Irish Presidency to try and find an agreement on the Constitution acceptable to all, preferably before the European Parliament elections in June 2004. The stalled Constitutional talks means that the EU is losing precious time for its deeper integration, especially since other burning issues are sure to be on the agenda in a short time-frame (e.g. the Union's next budget for 2007-13). But so far it is more a question of the time needed rather than of any questioning of the European integration as such, and the wait might turn out to have little impact in the end.

EU POLICIES

LISBON STRATEGY

The Lisbon European Council (2000) set the strategic goal of the Union becoming the most competitive and dynamic knowledge-based economy in the world within the next decade.

PROGRESS ON THE LISBON STRATEGY

In its annual report[1] to the spring European Council on the progress on the Lisbon Strategy, the EC establishes that while progress has been seen in almost all areas of the strategy, it has generally neither been fast enough nor sufficiently co-ordinated to produce the results that Heads of State and Government signed up to three years ago.

On the positive side, the best performing Member States serve as a benchmark of often world-beating performance. The structural and sectorial indicators developed through the open method of co-ordination promoted by the Lisbon Strategy provides a valuable tool for mutual learning and sharing common solutions to common problems.

[1] COM(2003)5 final.

There are also strong signs that reforms over the last five years have produced important structural changes in many, but not all, European labour markets. During 2002 alone, around 500 000 jobs were added. Nevertheless, performance varies considerably between Member States and reforms have not been pursued in a sufficiently comprehensive way in all of them. Without additional efforts, the Union looks set to miss its intermediate employment rate target for 2005 (67% of the working-age population).

Union GDP per capita measured in terms of purchasing power rose slightly from 70% of the US level in 1999 to 71% in 2002. This gain can be explained by a rise in the EU employment rate, which was largely offset by a decline in EU labour productivity relative to that in the US. There is no sign of a narrowing of the productivity gap between the Union and the US, neither in terms of labour productivity per hour worked (which stayed at 97% of the US level), nor in terms of hours worked per worker.

Progress on delivering further market reforms has been mixed so far. Much has been done by the Commission, the European Parliament and by the Council to overcome the 'delivery gap' at EU level signalled by the Barcelona European Council. There have been notable recent successes, such as those in the opening of energy markets, the Single European Sky and postal services. But some of the most pressing reforms are still being delayed in the EU. The Community Patent, and pending proposals on tax and on procurement, are examples.

The insufficient integration and competition in product markets is a serious cause for concern. Slow investment growth in areas such as R&D and education, which are key to creating a knowledge-based economy, also endangers the Union's future growth and competitiveness. The disappointing increase in industry-financed R&D in the Union between 1999 and 2001 and the stabilisation of public spending on education are also factors in the lower innovative capacity of the Union in comparison with the US. Another area for improvement is the overall environment for frontier and other leading technologies.

Positive developments that could be mentioned are the adoption in 2002 of the Regulation for the European Aviation Safety Agency (EASA), the re-launch of the defence debate, the coming into force of a new telecommunications regulatory framework in mid-2003 and the launch of the Galileo development phase and creation of the Galileo Joint Undertaking. The European Investment Bank has also contributed to the Strategy during 2003 with its Innovation 2010 initiative.

SUSTAINABLE DEVELOPMENT IN THE LISBON STRATEGY

Sustainable development was incorporated in the Lisbon Strategy at the Göteborg European Council. With only little time since then, the pace and direction of progress in this area is difficult to assess. Certain industrial sectors have succeeded in cutting emissions while increasing output. There are positive signs in terms of policy development and implementation - particularly in terms of developing the global perspective of sustainability. But on the basis of the data available for 2000, the worrying trends that were observed at the time of the launch of the Union's sustainable development strategy have continued.

RESEARCH

In line with the Lisbon goals and the creation of a European Research Area, the Commission and the EU member states are concerting efforts to increase investment in research and development activities to 3% of GDP by 2010. In order to attain this objective, the EU R&D effort would have to increase by more than 50% (from 1.9% to 3% of a rising GDP). In April 2003, the Commission put forward a second communication, 'Investing in Research: an action plan for Europe', which sets

out the actions required at national and European level to create a stronger public research base and to attract more private investment in research and innovation to the EU.

In January 2003, the Sixth Framework Programme for Research and Technical Development entered into force. This programme introduces two new instruments: networks of excellence (aiming at progressively integrating the activities of partners networked through 'virtual' centres of excellence), and integrated projects (of substantial size, aiming at constituting a critical mass in research activities focusing on clearly defined scientific and technological objectives). The total budget for FP6 is 17.5 billion Euro. Aeronautics and space is for the first time included as one of the priorities, with a budget of 1.075 billion Euro.

However, measures in the Member States to increase the volume of, and improve the environment for, research investment have been fragmented and sluggish. In some countries, the proportion of public spending devoted to research has even decreased.

STAR 21

In October 2003 the Commission published a communication[2] as a response to the 'STAR 21 Report' (European Advisory Group on Aerospace). The STAR 21 group was set up in 2001 to analyse the political and regulatory framework for aerospace in Europe, to highlight deficiencies, and to make proposals for further improvement[3]. In its communication, the Commission fully endorses the Report's main finding, namely that an aerospace industry that has consolidated on a European scale needs a coherent policy framework with a European perspective. The current political and regulatory framework needs to be much improved in order to bridge the gap between Europe's political and economic ambitions and the capacity to deliver the required results. The Commission considers that the areas of defence, research and space deserve particular attention in this context.

DEFENCE MEASURES RELATED TO THE LISBON STRATEGY

The European Council in Brussels (March 2003) recognised the role that defence- and security-related R&D could play in promoting leading-edge technologies and thereby stimulate innovation and competitiveness, and welcomed the Commission's communication 'Towards an EU Defence Equipment Policy'[4]. Furthermore, the Thessaloniki European Council (June 2003) tasked the Council to undertake the creation during 2004 of an intergovernmental agency in the field of defence capabilities development, research, acquisition and armaments. Although still a sensitive area of cooperation, it is clear that the Union cannot ignore the role that defence markets will have to play in an overarching and efficient drive towards enhanced competitiveness.

EUROPEAN INITIATIVE FOR GROWTH

Against this background of difficulties of attaining the Lisbon goals both the Commission and Member States have presented initiatives for growth. Italy has presented ideas focusing on reinforcing transport links, while France and Germany in a joint initiative in September identified ten large investment projects. In December 2003, the European Council endorsed a European Action for Growth presented by the Commission in cooperation with EIB and Member States. The initiative aims to support growth and integration by increasing overall investment and private-sector involvement in Trans-European Networks and major R&D projects. Targeted areas are energy and transport links, broadband communications and investments in leading-edge technologies (including space technologies and their applications). Since the Community funding as usual would only cover parts of the projects, private investment in these areas is also meant to be boosted. A budget from mixed public/private sources amounting to approximately 220 billion Euro up to the year 2020 is foreseen. A 'quick-start programme' has been established under the initiative, giving a provisional list of projects that are ready for immediate launch. The quick-start programme includes several space-related initiatives (see section 'Space within the European Initiative for Growth').

[2] **COM(2003) 600 final**

[3] **The Group consisted of seven aerospace industry chairmen, five European Commissioners, the Council High Representative for Common Foreign and Security Policy, and two Members of the European Parliament. It presented its findings to the President of the Commission in July 2002 and made a review of progress in June 2003.**

[4] **COM (2003) 113(01) 'European Defence – Industrial and Market Issues – Towards an EU Defence Equipment Policy'.**

ENVIRONMENT AND SUSTAINABLE DEVELOPMENT

The Union has chosen to take a leading role in promoting sustainable development on a global scale, and has been at the forefront in setting the international agenda in recent years.

In June 2001, the Göteborg European Council agreed a strategy for sustainable development that completed the Union's political commitment to economic and social renewal, added an environmental dimension to the Lisbon Strategy, and established a new approach to policy making.

CLIMATE CHANGE

The EU and its Member States ratified the Kyoto Protocol Convention on Climate Change on 31 May 2002. In February 2003, the Commission presented a communication on the monitoring of greenhouse gases to ensure that the EU and its Member States would measure and report their emissions accurately. Since 1990, the EU has reduced total greenhouse-gas emissions by 2.3%. However, recent data from the European Environment Agency showed that, for the second year in a row, emissions have increased instead of going down, making it more difficult for the Union to reach its -8% target by 2008–2012. Another alarming signal was the consensus projection by the Intergovernmental Panel on Climate Change[5] that global average surface temperatures will rise by 1.4–5.8°C by the end of this century if 'business continues as usual'. Such an increase could lead to flooding of coastal areas and cause a greater frequency and severity of extreme weather conditions.

Whether the extreme heat waves that struck Europe during the summer 2003 would be related is left unsaid, but they did cause considerable loss of income and even human life.

A Directive[6] of the European Parliament and of the Council of 13 October 2003 establishes a scheme for greenhouse-gas-emission allowance trading within the Community. The EU allowance-trading scheme is the major cornerstone of the Climate Change Programme and will play a crucial role in the EU implementation strategy for the Kyoto Protocol. It will be up and running on 1 January 2005.

Other environmental topics addressed by the Union during 2003 include the introduction of the 'REACH' system to Register, Evaluate and Authorise new Chemicals, under the supervision of a new Chemical Agency. Under the REACH system, the burden of responsibility for testing goods will lie with companies and not with authorities. The ozone depletion (following up of Montreal Protocol) and maritime safety, where the Brussels European Council called for rapid implementation of measures reinforcing controls in ports, restricting the carriage of heavy fuel-oil in single-hulled tankers and accelerating the timetable for the withdrawal of such tankers, if possible at a world-wide level. In addition, on the subject of environmental technologies, an Environmental Technology Action Plan has been prepared by the Commission for adoption by the EU Council during the first half of 2004.

ENLARGEMENT

The European Council in Copenhagen (December 2002) was an historic milestone for EU enlargement with the conclusion of accession negotiations with the ten new Member States. The Accession Treaty for the latter was signed in Athens on 16 April 2003. The new Member States will joint the Union on 1 May 2004, while having an 'observer status' with regard to the EU up till then. The new Member States will participate in the May 2004 European Parliament elections as members. They will also participate fully in the IGC.

Efforts to reach a settlement on the unification of Cyprus have continued; Cyprus is expected to join the Union by 1 May 2004 even if no settlement can be found. The Commission has put

5 The World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) established the Intergovernmental Panel on Climate Change (IPCC) in 1988. It is open to all members of the UN and WMO.

6 Directive 2003/87/EC.

considerable pressure on Turkey to agree to a settlement, failing which its own EU aspirations could be seriously affected.

Bulgaria and Romania were not able to finalise their accession negotiations in Copenhagen, but detailed roadmaps have been agreed for the two countries, which offer them the perspective of membership from 2007. Bulgaria and Romania participate in the IGC as observers. In October 2003 Romania voted positively to a change in its constitution, not least to further its EU membership application.

Turkey is treated as a candidate State, which could join the Union on the basis of the same criteria as applied to the other candidates. The European Council has recalled that Turkey must live up to the relevant political criteria, requiring achieved stability of institutions guaranteeing democracy, the rule of law, human rights and respect for and protection of minorities. It is up to the European Council in December 2004 to establish whether Turkey fulfils the Copenhagen political criteria. The Union will open accession negotiations with Turkey without delay as soon as the country is seen to comply with the criteria.

Enlargement of the EU will seemingly not to be over even after the current 13 enlargement countries have joined. Indications have been given that a future enlargement could include the Western Balkans. The Brussels European Council (spring 2003) stated that: 'The future of the Western Balkans is within the EU'. The Commission has indicated that the EU might open membership talks with Croatia as early as June 2004. A first official statement by the EU about the future possible membership of Ukraine has also been made.

ECONOMY AND THE EURO

The Euro has been strong against the dollar and the yen in 2003 and has clearly established its place as one of the World's leading currencies. Overall, the ECB interest rate has been historically low, while the recovery of the economy has gathered some pace towards the end of 2003, but not yet materialised in a decisive way.

The big argument regarding the Euro has been the political debate on the Stability and Growth Pact (SGP). The SGP is based on the objective of sound government finances as a means of strengthening the conditions for price stability and for strong sustainable growth conducive to employment creation.

The main discussion between the Member States has been whether the pact should be strictly adhered to or interpreted in a more flexible way, taking into account factors such as the economic downturn.

ENLARGING THE EURO AREA

The ten new EU Member States will have to spend at least two years in the Exchange Rate Mechanism for candidate countries (known as REM II) prior to adopting the single currency, during which time they would have to meet the Maastricht Treaty economic convergence criteria. Hence the first theoretical possibility for the new members to join the Euro is in 2006.

In September 2003, Sweden held its national referendum on adopting the single currency, where the no-vote won with 56.1%. Sweden, Denmark and the United Kingdom currently the only EU Member States outside the single currency. The UK has still to take a decision on when a referendum could be organised.

COMMON FOREIGN AND SECURITY POLICY AND EUROPEAN SECURITY AND DEFENCE POLICY

Important progress has been made in the development of a real European Common Foreign and Security Policy (CFSP),

including a European Security and Defence Policy (ESDP). This was true also during the height of the Iraq crisis (see below). Important points of progress in 2003 were the launch of the first autonomous EU military operation and the convergence of especially the British and French views on ESDP - both bilaterally and in the European Convention. The Union has also developed its first full strategic concept for the CFSP.

CONVERGING MEMBER STATE VIEWS ON ESDP

Defence is one of the fields where the Member States are still the main driving forces, and there have been important developments in Member State positions in 2003. The convergence of the French and British views on ESDP has given rise to both debate and speculation about the Union's relationship to NATO, and more globally Europe's relationship to the US.

In April 2003, an initiative to create a 'core of collective planning and operational capabilities' for the EU without using NATO assets and capabilities was presented by Belgium, France, Germany and Luxembourg. The idea was initially met by strong criticism from the UK (and externally from the USA), being perceived as threatening the future of NATO. Especially the proposal to build a separate European military command headquarters at Tervuren, east of Brussels, met with criticism.

However, at a trilateral meeting in Berlin in September, between British, French and German Heads of State and Government, the UK softened its opposition and an agreement was reached between the three, stating that the EU 'should be endowed with a joint capacity to plan and conduct operations without recourse to NATO resources and capabilities'. Such a planning and implementation capacity could be achieved either with all 25 EU members, or within a (smaller) circle of interested partners (so-called 'structured cooperation'). Operational planning could be accomplished within or possibly separate from the NATO framework, or through the national headquarters of one of the states involved (while there is agreement that the new planning capacity will be compatible with NATO, the exact meaning of this is still to be defined). This converging position on defence could prove to be a breakthrough for the ESDP.

DEVELOPMENTS IN THE EUROPEAN UNION

The Thessaloniki European Council welcomed the recommendations for an overall CFSP strategy presented by SG/HR Javier Solana. The Council furthermore endorsed a declaration on non-proliferation of weapons of mass destruction. Another major point was the tasking of the EU Council to establish an intergovernmental agency in the field of defence capabilities development, research, acquisition and armaments.

The security strategy document *'A Secure Europe in a Better World'* represents the first time in its history that the Union has set about drawing up a common strategic concept for its foreign policy. The strategy proposed rests on three main pillars: firstly, extending the security zone around Europe by contributing resources to establishing economic and political stability in the neighbourhood; secondly, establishing an effective international order (respecting the UN); and thirdly, calling on the Union to strengthen its civil and military capacity to deal with the global threats of terrorism, proliferation of weapons of mass destruction and organised crime.

Through the security strategy and the Action Plan to fight the proliferation of weapons of mass destruction, the Union has gradually acquired its own, specific strategic identity. The Iraq crisis can even have acted as a catalyst for this development.

The European Parliament in its Report on the new European Security and Defence Architecture[7] considers that the Petersberg tasks should be expanded to include conflict prevention, joint disarmament operations, military advice and assistance, post-

[7] **Report on the new European Security and Defence Architecture - priorities and deficiencies (2002/2165(INI)).**

conflict stabilisation and combating terrorism. Civilian crisis management should be placed on an equal footing with the military aspects of the Petersberg tasks. The Parliament also notes that the development of a common security and defence policy enjoys overwhelming support among EU citizens (71% in favour, 16% against).

The European Convention's work related to security and defence is paramount for the future of the CFSP and the ESDP. Three important items related to security and defence in the draft Constitution are a solidarity clause, the option of structured cooperation, and the European Armaments Agency. The Convention also gives a broader definition of the well-known 'Petersberg tasks' (Art. III-205).

EU CRISIS MANAGEMENT OPERATIONS

The *'Berlin plus'* agreement between the EU and NATO that was welcomed by the European Council in December 2002 opened the way for the Union to have recourse to NATO assets and facilities for its crisis management operations. The peacekeeping missions undertaken by the Union in 2003 have enabled it build a closer relationship with both NATO and the UN.

Three ESDP operations have been conducted in 2003: the European Military Operation in the Democratic Republic of Congo (DRC), the 'Concordia' Operation[8], and the European Union Police Mission in Bosnia and Herzegovina.

In particular, DRC was historic, since it was the first autonomous EU military operation not having recourse to NATO assets and facilities. The operation, code-named 'Artemis', was conducted in accordance with a United Nations Security Council Resolution[9] and was aimed, inter alia, at contributing to the stabilisation of the security conditions and the improvement of the humanitarian situation in Bunia. France acted as the 'framework nation' for the operation, which was deemed a complete political and military success by the Union. It indicated that recourse to NATO assets does not necessarily have to be the rule in the future. Also, other Member States such as the UK, Germany, Italy and Greece have indicated that they could be ready to act as a 'framework nation' in future autonomous EU military operations.

[8] The Concordia mission expired on 15 December 2003 and was replaced by a new EU police mission, dubbed 'EUPOL Proxima'.

[9] Resolution 1484 (of 30 May 2003).

[10] See Letter of 30 January 2003; www.caabu.org/press/documents/euro-letter-times.html

THE IRAQ CRISIS

The diplomatic part of the Iraq crisis came to pass not only bilaterally between the States concerned, but also within the frameworks of NATO, the UN and the EU. It led to a division both in the transatlantic link, and between European States themselves.

In January 2003, a letter was published in leading international newspapers, signed by the Heads of Government of five EU Members, calling for European States to rally behind the United States in the fight against terrorism and the proliferation of weapons of mass destruction, focussing on the 'clear threat to World security' that was represented by 'the Iraqi regime and its weapons of mass destruction'[10].

In February 2003, the deepening divisions over Iraq turned into a crisis of relationships as NATO saw its Member States divided over whether to support a bolstering of Turkish military defences on the border with Iraq. The US-backed proposal was vetoed by Germany, France and Belgium, who did not want to send a signal to Iraq that war was already inevitable, but give the weapon inspectors more time, resources and sharper mandates.

Subsequently, the crisis played out notably in the UN Security Council. UN Resolution 1441, supported by all countries mentioned, demanded the weapons inspectors be allowed back into Iraq and that the Iraqi leaders provide full disclosure of their arsenal of weapons of mass destruction. But the attempts led by the United States to have a second resolution voted by the Security Council, focussing on the need to intervene with military force, did not find a majority in the Council. Even if that had been the case, three of the five permanent members with veto rights (Russia, China and France) held more or less matching positions not in line with that of the US.

The EU members thus found themselves deeply divided on the issue of the conditions and timeframe necessary for supporting a military intervention in Iraq, as well as on the role of the United Nations in such a conflict. EU Member States not subscribing to the January letter, with Germany and France at the forefront, put greater emphasis on the work of the UN inspectors and the importance that they finalise their work and present their results before any military action was initiated. They also thought that a new and specific resolution in the UN Security Council would play a key role in legitimising a decision to actually go to war against Iraq.

The subsequent war and its continuing aftermath, with serious instability and military casualties surpassing the losses from the actual invasion itself, have in principle not mended the division in the transatlantic alliance or in Europe, although the topics on the agenda have shifted and important developments in European integration have taken place, including in the ESDP.

The Iraq conflict was clearly an 'earthquake' in the political landscape of European foreign and security policy. But strikingly enough, it did not seem to affect the other important developments of the CFSP and ESDP, such as the launching and conducting of two military operations and one police operation, or the agreement on a common strategy for the CFSP/ESDP. On the contrary, in many ways the crisis acted as a sort of catharsis and catalyst for the development of a European defence policy, unequivocally putting the issue at the top of the political agenda and injecting a new stimulus into the process of reaching a creative compromise solution. It is therefore too today early to say what long-term effects the Iraq conflict will prove to have had on the ESDP, but it might finally have been one of progress, even if painful.

2.2.2 The United States of America

At the beginning of 2003, the lingering effects of the corporate-governance scandals, rising oil prices, and growing uncertainties about the economic consequences of a possible war in Iraq were holding back the nascent recovery of the US economy from the 2001 recession. On the political side, when the Congress took office in January 2003, following national elections on 5 November 2002, the Republicans had majorities, for the first time since President Bush's election, in both Houses.

In his State-of-the-Union Address, at end of January 2003, President Bush proposed a plan to strengthen the economic recovery and bring prosperity to every corner of America. His plan mainly centred on relying on tax cuts for the economy, and the private sector for health care, promoting energy independence for the country, launching new initiatives in fighting terrorism and internationally, on building momentum towards a war in Iraq. On this occasion, in the context of measures to protect the country against the 'threats of a new era', President Bush outlined the creation of the Department of Homeland Security, which with a budget of approx. $40 billion/year and a staff of 170 000 people, constitutes the most extensive US federal government reform since 1947.

The American-led war against Iraq began on 19 March, with missile attacks on the Iraqi leadership in Baghdad. Only few weeks later, on 1 May, President Bush announced the ending of major combat operations in Iraq. Shortly afterwards, by the end of spring, the US economy rebounded faster than even the most optimistic of prognosticators had predicted. Supported by highly stimulating fiscal and monetary policies, growth picked up and surged to its highest level (+8.2% in the third quarter) since 1984. Acceleration in worldwide demand and the depreciation of the dollar (in November, the dollar fell to an all-time low against the Euro of almost $1.20) are also expected to further contribute to growth in GDP, with a most likely scenario of sustained growth for the next two years. The 'Bush boom' has, however, been almost totally ineffective in generating employment gains, and the unemployment rate is now at about 5.9%, still almost two percentage points higher than three years ago. The fiscal deficit remains one of the major concerns of the US Administration. With a sharp increase on the spending side worsened by the two supplemental budget requests related to military operations and reconstruction in Iraq and Afghanistan, the federal budget deficit is expected to widen from 3.5% of GDP in FY 2003 (455 billion US$) to almost 4.5% in FY 2004. When the Administration took office, in 2000, the federal budget surplus represented 2% of the GDP.

Promoting free-trade agreements was one of the main points, alongside tax cuts, in the President's plan to boost the economy. After having imposed, back in March 2002, 'safeguard' tariffs on many steel imports, in October 2003 the World Trade Organisation pronounced America's actions illegal. Consequently, on 4 December, 16 months earlier than originally planned, the President announced the dismantling of America's tariffs on imported steel.

Still on domestic issues, in November the US Congress passed the most significant changes to Medicare, the health-insurance programme for the elderly and the disabled, since its inception in 1965, making prescription drugs cheaper for participants. On the other hand, the passage of the controversial energy act has been temporarily halted and it will be put to the vote again when Congress reconvenes in January 2004.

On taking office, in 2000, President Bush vowed to make the missile-shield a defence priority. As recently announced, the US will unveil its anti-missile defence system in 2004. The first rudimentary pieces of the system are due to be deployed in 2004, and though the new 'shield' may not make Americans much safer at first, it could well represent a substantial shift in defence strategy for the years to come. The next element scheduled to become operational, in 2005, is designed to destroy short- and medium-range missiles with interceptors fired from ships.

On 24 November, President Bush signed the 401 billion US$ fiscal 2004 Defense Authorisation Bill. It includes 9.1 billion US$ for ballistic missile defence, 74 billion US$ for procurement, and 63 billion US$ for R&D.

With the presidential election less than nine months away, the political focus in America has currently shifted from the war in Iraq to the home front. Both the primary and general elections are focussing on a few high-profile issues, with national security, health care and the state of the public finances being chief among them.

2.2.3 Relations between the European Union and the United States

2003 was a time of tension between the World's two biggest trade powers. The EU has challenged the US over the 'foreign sales corporations provision', which was ruled illegal by a WTO panel in 2000. Consequently, in late 2003 the Commission 2003 proposed sanctions - increasing monthly over time - against the US if it continues to fail to comply. Brussels and Washington have also held differing views on how to rescue the stalled WTO trade round after its impasse in Cancun, Mexico. Another long-running trade dispute that continued during the year was that regarding exports of hormone-treated beef. The EU and the US have also clashed on genetically modified crops and chemical-industry regulations.

The Commission has warned the US Congress that it could spark a fresh transatlantic trade dispute if it adopts draft legislation urging the Pentagon to buy all essential weapons parts from US manufacturers. The 'Buy America' defence procurement bill has angered the aerospace industry on both sides of the Atlantic.

In June 2003, the EU Council gave responsibility for conducting key air transport negotiations to the Commission, including in particular a mandate to begin negotiations on a new transatlantic air agreement.

In foreign policy terms, the relationship has to a large extent revolved around the Iraq crisis and its aftermath, but the EU has also expressed differing views with the US on the Israeli-Palestinian conflict: the Union has taken a much more critical stance towards for example the building of an Israeli defence wall that would disregard internationally accepted borders. In late 2003, Eurostat revealed poll results showing that Europe's citizens are in fact very preoccupied by the foreign policy of Israel and the US, ranking Israel as the greatest threat to global peace, with the US itself ranking not far behind together with countries such as North Korea and Iran.

Washington has renewed its criticism of the EU efforts to defend the International Criminal Court (ICC). The EU is against bilateral immunity agreements that would exempt US citizens from being subject to the jurisdiction of the Court. The US has threatened to cut off military aid to countries that do not comply with its view.

2.2.4 The Russian Federation

President Putin continues to strengthen the role of the State in view of the presidential elections in 2004, for which preparations have already started. A first test for President Putin was the gubernatorial elections in Saint Petersburg as well as the elections in Tchetchnia, where the two elected candidates are close to the President. The election of the Duma demonstrated the weakness of the Russian opposition. At this point in time no strong alternative contestant has emerged for the next presidential election.

The intimidating tactics used by President Putin against the potential opposition has led to deteriorated relations with both the US and Europe. However, the last EU - Russia summit that took place prior to the 300 anniversary of Saint Petersburg in June 2003 provided the opportunity for both sides to reaffirm their commitment to further strengthening their strategic partnership through an expansion of economic and political ties. The purpose of the cooperation is to create 'in the long term a common economic space, a common space of freedom security and justice, a space of cooperation in the field of external security, as well as a space of research and education, including cultural aspects'. This reinforced cooperation will be consolidated through the existing partnership and cooperation agreement, or road maps with reciprocal arrangements in each area.

The new idea and objective is that, through these 'common spaces', the EU and Russia focus on the areas where the two sides have a common interest and where a strategic link is possible. The two sides will then deepen the discussions in order to have a common position on these topics.

In 2003, President Bush invited President Putin to Camp David for informal talks. The Russian position on Iraq has not changed and President Putin continues to call for the international communities' involvement in and acceptance of responsibility for the post-war reconstruction of Iraq.

The economic situation in Russia has been one of continued growth. In 2002 the country had a 7% growth in GDP, and the results for 2003 could even surpass this figure. From a 40 billion US$ debt in 1998, Russia has reversed the situation and will this year have a foreign currency reserve of 65 billion US$. Another important item that will further boost the Russian economy is the recent upgrading by the Moody's Investor Service of the Russian Eurobond ratings. This upgrading will send a signal to potential investors regarding the stability of the Russian economy that will most likely lead to more foreign investment in the country. Mr Putin was nevertheless severely criticised for the heavy-handed arrest of the Yuko Chairman in late October. This arrest could lead to a loss of confidence on the part of the international business community.

Finally, at a global-warming conference in Moscow in September 2003, President Putin expressed his country's reluctance to sign the Kyoto Protocol, despite the positive signals given the previous year at the Johannesburg Summit. If Russia chooses not to sign it, the Kyoto Protocol will not come into effect, as it needs ratification by 55 countries, representing at least 55% of the global emissions covered by the treaty. The EU has announced that it would anyway continue with its climate-change policies.

2.2.5 China

Following the political changes of last year, president Hu Jintao has strengthened his political base. It seems that he has worked to increase his own profile and to distance himself from his predecessor Mr Jiang Zemin. The new leadership of China has also taken a much more active role in regional and international affairs than before. The Chinese government took a very active role in trying to find a solution for Korea. This affirmation of China in World affairs is a new indicator of its Government wanting to play its legitimate role in international relations.

What is changing is the perception of China, particularly in Southeast Asia. Until recently, China was perceived as a threat, whereas the United States guaranteed security. Today the situation is changing and the US, with its security concerns, is more and more perceived in Southeast Asia as heavy-handed, whereas the Chinese agenda regarding expansion of trade is being welcomed.

Similarly, China took an active part in the diplomatic work leading to the new Resolution on post-war Iraq that was voted in October 2003.

One of the major events in China in 2003 has been the launch of the first Chinese manned space vehicle, and the enormous interest that it generated. The motivation seems to have been political: to emphasise China's place among the leading nations of the World, to demonstrate its technological and technical capacity. This political message is directed as much to the internal as to the external public. The launch also took place immediately after an important national meeting of the Chinese Communist Party, thereby demonstrating the invincibility of the Chinese political system.

2.3 Main indicators relevant to space

This section analyses three fields – research and innovation, aerospace, and telecommunications – which are traditionally, but for different reasons, close to the space sector.

2.3.1 Research and innovation

Looking at the space sector from an institutional standpoint, one sees that budgets are often historically linked with research and development financial lines.

In 2000, the European Union gross domestic expenditure on R&D activities as a percentage of GDP was 1.9%, against the 2.8% of the United States and 2.3% of OECD countries (source OECD).

Overall in 2000, the EU could count 6 researchers per thousand employees, whilst there were 9 in the USA and 10 in Japan.

Finally, in 1998, the Union had around 0.03 patents per thousand capita population, against more than 0.05 in the USA and 0.08 in Japan.

The accompanying figures indicate the sources of R&D financing, as well as who is actually carrying out the research in Europe and the USA.

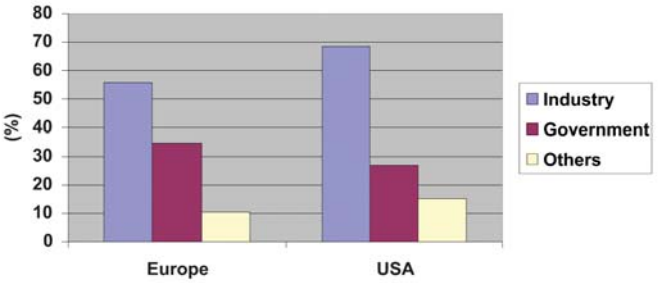


Figure 1 – Sources of Research and Development financing (Source: OECD)

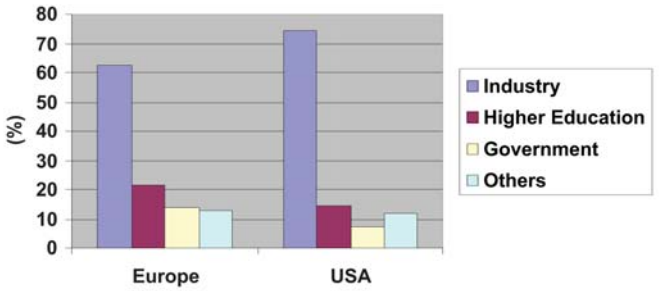


Figure 2 - Research and Development actors (Source: OECD)

2.3.2 Aerospace

Looking at the space sector from an industrial standpoint, one sees that the space industry is very often linked with aeronautics. Therefore the available information concerning the aerospace sector often includes both aeronautics and space.

The aerospace industry is relatively small. According to the OECD, the aerospace industry accounted for less than 4% of total manufacturing value-added industry in all the G7 countries, and less than 0.6% of the economy-wide value-added, in 2003.

In 1997 the aerospace production of the USA represented 61% of the total production in G7 countries (it represented 70% in 1991).

2.3.3 Telecommunications

Space communications represent the major, if not the only, commercial market accessible to space industry. The great majority of commercial satellites and launches are associated with the telecommunications market, in particular for broadcasting services.

According to the International Telecommunications Union (ITU), forecasts for 2003 for the global telecommunications market were around 1400 billion US$, with 78% for services and 22% for equipment.

The accompanying figure shows the market breakdown for the last ten years.

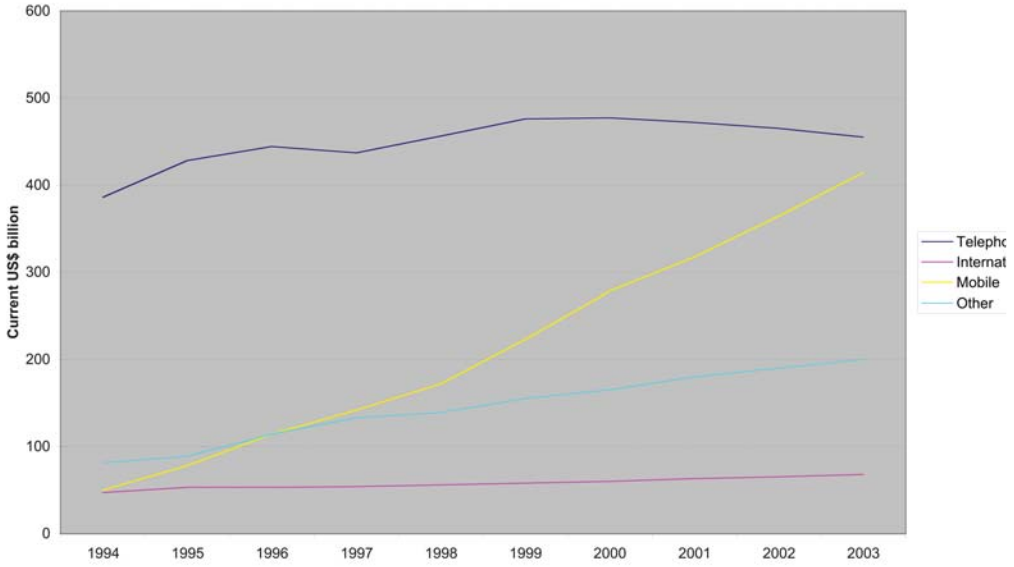


Figure 3 - Telecommunication services revenue breakdown (Source: ITU)

PART 2 - THE SPACE SECTOR

3

Sizing the World-Wide Space Sector

The value of the worldwide space sector in 2003 is estimated at about 144 billion Euro. This figure includes the institutional budgets of governments and space agencies for space-related civil and military programmes and activities, and the revenues generated by the commercial space applications in the fields of telecommunication, Earth observation, and navigation.

The World's institutional budgets for space programmes and activities in 2003 are estimated at about 43.5 billion Euro. Considering the strong depreciation of the US dollar against the Euro, this budget represents an increase of about 11% over 2002 expenditure (expressed in US$). Civil applications represent the larger part of such institutional budgets, with some 25.2 billion Euro (58%), while military programmes have been financed with about 18.3 billion Euro (42%).

Three main space powers dominate the institutional market, accounting for about 95% of global public funding for civil space activities (23.6 billion Euro in 2003): the United States, with its about 16 billion US$ space civil budget in 2003 (+8%), Europe[11] with about 5.5 billion Euro (-1%), and Japan with 2.4 billion US$ (+18.5%), which benefited from the re-organisation of the public space sector. Europe is thus maintaining its firm position as the World's second largest space power in the civilian field.

Looking at the military budgets, they are almost completely concentrated in the USA (17.5 billion US$), which accounts for 96% of the World's public funding. France is the second highest spending country with about 480 million Euro, i.e. 35 times less. The military space budgets for the whole of Europe totaled only 650 million Euro in 2003 (-20%).

It remains difficult to analyse the Russian Federation, given the difficulties of comparing economic conditions. Following severe funding cuts suffered in the early nineties by the national space budget assigned to Rosaviakosmos, the Russian Aviation and Space Agency, the situation has been somewhat stabilised from 1995 onwards. Despite Russian economic difficulties, the space programme activities have never been halted and the maintenance of in-orbit spacecraft has never been stopped, even if kept at a minimum level.

The space budget for 2003 requested by Rosaviakosmos, and voted by the Duma before the end of 2002 was about 280 million US$.

China and India are emerging 'space powers' with ambitious programmes and growing budgets, but still far from reaching the level of the first three actors.

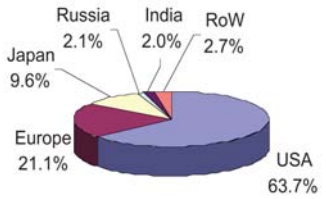
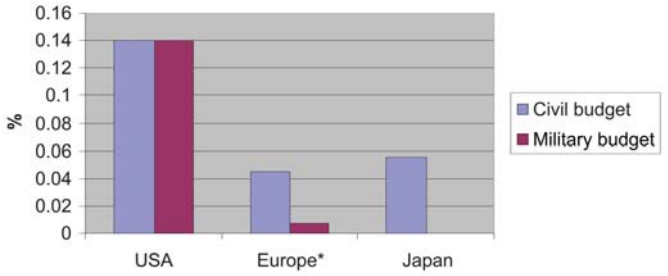


Figure 4 - Civil space expenditure estimates for 2003
(Source: ESA and Euroconsult)



* ESA Member States

Figure 5 - Civil and military space budgets as a percentage of GDP
(Source: ESA and Euroconsult)

[11] ESA, national and Eumetsat.

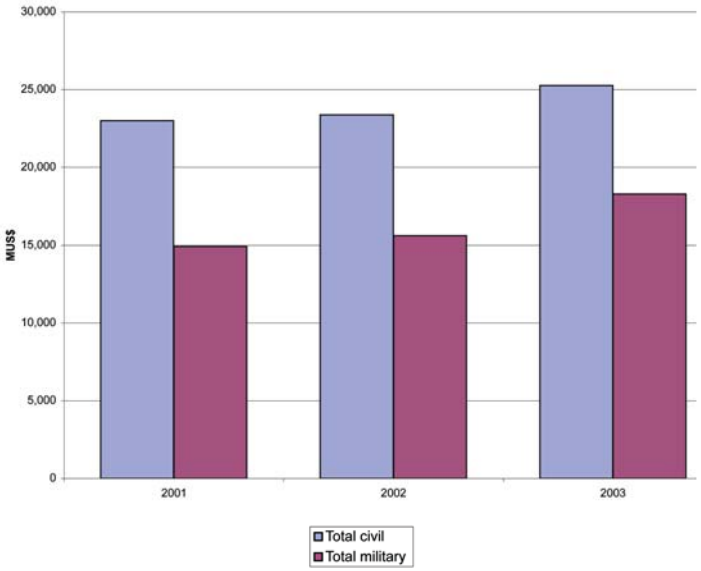


Figure 6 - Total civil and military space expenditures in the last three years (Source: ESA and Euroconsult)

Despite the existing large gap between the percentages of GDP invested in space by the USA and by the other two main World space actors, analysts detected a trend to reduce it, particularly in the civil space programmes. For instance, India has made the most impressive progress in increasing its civilian space budget. Between 1992 and 2003, it tripled and in terms of spending as a proportion of GDP India overtook France, spending 0.094% of its GDP on civil space, compared to France's 0.083%.

For the sake of comparison, the 2002 public space expenditure was about 44.4 billion Euro (39 billion US$). The United States had 29.7 billion US$ (34.2 billion Euro) for FY2002, almost equally divided between civil and military expenditure: 14.8 billion US$ (15.9 billion Euro) of civil expenditure (budget authority), representing about a 5% increase over FY2001, and 14.9 billion US$ (16 billion Euro) of military expenditure (46% unclassified and 54% estimated for intelligence projects by the National Reconnaissance Office), representing an estimated 6.4% increase over FY2001.

The European public space expenditure for 2002 was about 6 billion Euro, largely civil (91%). Expenditure was already decreasing slightly over 2001 due to the reduction in military expenditure in Europe.

Japan was the third player with a public civil expenditure of about 2 billion US$ (2.14 billion Euro), with a significant decrease of about 17% over 2001. This was partially due to the financial situation of the country and to the deep re-organisation of the space sector, which is seeing the grouping of the three public agencies involved in space programmes and activities.

In addition to the public budgets, commercial space applications for telecommunications, Earth observation and navigation are estimated to have generated some 100 billion Euro of revenues (infrastructures and services) in 2003, a 6% decline with respect to 2002 (about 106 billion Euro). This amount does include any of the added-value-chain revenues generated by space services in those fields.

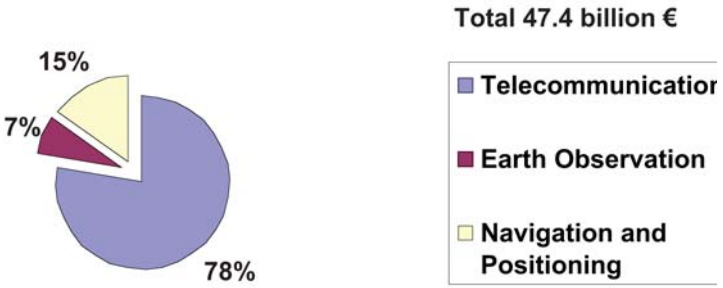


Figure 7 - Space value-added-service revenue breakdown for 2003 (Source: International Space Business Council)

The value-added-services market can be divided as follows: telecommunications 37 billion Euro, Earth observation 3.2 billion Euro (considering also the publicly-funded space segment), and navigation 7.3 billion Euro. The same market was about 55 billion Euro in 2002.

Finally, as far as the space industry around the World is concerned, it continued to be affected by the global economical downturn as well as by specific market difficulties, notably in the telecommunications and aeronautical sectors, which are traditionally at least industrially linked to space.

About 250 000 persons were estimated to be working in the space industry worldwide in 2002, half of them concentrated in the United States. About half of the total work in the satellite manufacturing industry. The manufacture of ground equipment and the launch industry accounted for some 90 000 employees in 2002.

The European space industry employed some 35 000 persons in 2001, a figure likely to be dramatically reduced by job cuts made by companies in 2002 and 2003. Current estimates indicate the European space industry workforce to be around 30 000 employees.

Finally, the European space industry logged about 5.3 billion Euro of consolidated turnover in 2001, according to Eurospace[12]. The same year, the ratio between the total consolidated turnover and the total cumulated turnover, measuring the degree of concentration of a sector, was about 0.7. In 1994, it was 0.4.

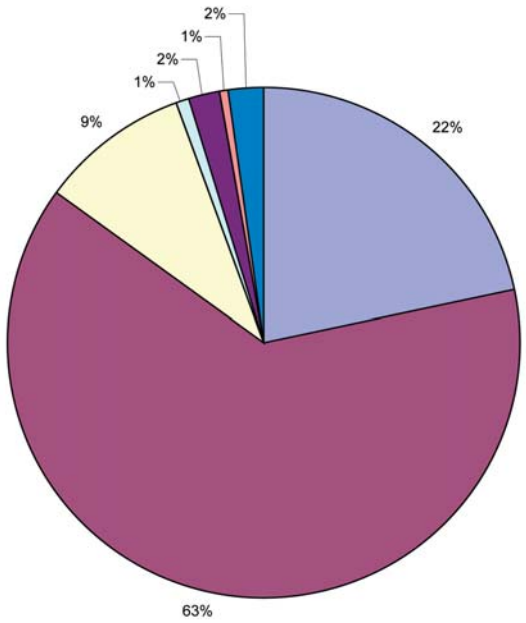


Figure 8 - Civil space expenditure per major countries in 2003
(Source: ESA and Euroconsult)

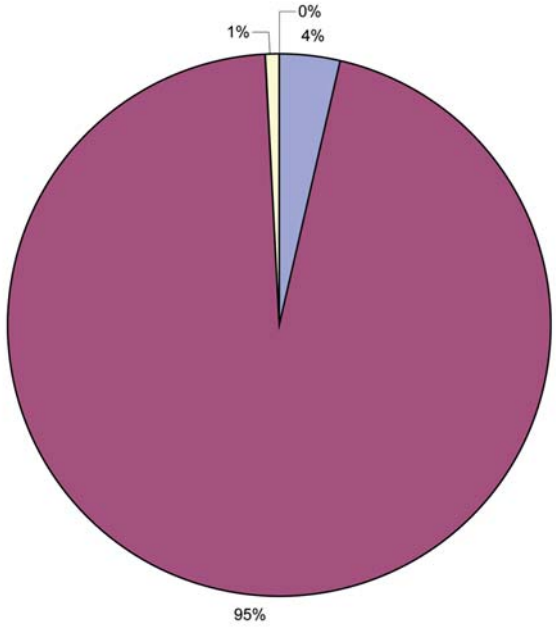


Figure 9 - Military space public expenditure per major countries in 2003
(Source: ESA and Euroconsult)

[12] **Eurospace *Facts and Figures 1996-2001* (March 2003).**

4

The European and US Space Sectors

European countries and the USA have never shared the same ambitions in their undertakings relevant to the space field. Therefore, although the United States is by far to be considered the World reference when analysing the space-sector situation, we should keep in mind that the European space sector is the result of a completely different political approach and of a totally different level of public investments.

Nevertheless, in the following chapter a detailed and sometimes comparative analysis of the space sector in Europe and in the United States is provided. Budget and employment figures are objective criteria of comparison, but they are not enough to provide a complete assessment. Aspects such as political guidelines, legal instruments, organisation and distribution of roles are also instrumental for the conduct and the implementation of an effective space policy.

4.1 Governments' space policies and strategies

4.1.1 Europe

SPACE AND THE EUROPEAN UNION

A long period of sporadic interest in space-related matters on the part of the European Commission started in the late eighties with the first communication on the subject, but was definitively ended in 2003 with the adoption of the ESA-EC Framework Agreement and the inclusion of space as a shared competence of the Union in the European Convention's proposal for a new EU Constitutional Treaty.

Also during the year a consultation between all the European interested actors was started with the adoption of a Green Paper on European Space Policy. The results of that consultation contributed to the drafting of the recently adopted White Paper, which is expected to pave the way towards the progressive involvement of the European Union in concrete space-based projects.

THE ESA-EC FRAMEWORK AGREEMENT

A milestone was reached in the ESA-EU relationship in October/November 2003, through the adoption by the respective EU and ESA Councils of a Framework Agreement that will regulate their cooperation in the years ahead. The Agreement gives recognition to both parties, emphasising that they have specific complimentary and mutually reinforcing strengths, and commits them to working together while avoiding any unnecessary duplication of effort.

The Framework Agreement has two main aims. The first is the coherent and progressive development of an overall European Space Policy, which will specifically seek to link the demand for services and applications using space systems in support of Community policies with the supply of space systems and infrastructure necessary to meet that demand. The second aim of the Agreement is to establish a framework providing a common basis and appropriate operational arrangements for an efficient and mutually beneficial cooperation between ESA and the European Community, fully respecting their institutional settings and operational frameworks. The Framework Agreement was signed on 25 November 2003.

Once the Framework Agreement has entered into force, likely to be by May 2004, the current ad hoc structures of cooperation (the ESA-EC Joint Task Force and the Joint Space Strategy Advisory Group) will be replaced by a new cooperation structure under Article 8 of the said Agreement. The setting up

of the new structure will develop the ESA-EC relationship whilst respecting the existing structures for Galileo and GMES. The new ESA-EC 'Secretariat' is expected to be set-up during the second half of 2004.

THE GREEN PAPER ON A EUROPEAN SPACE POLICY

The Green Paper on space was prepared by the European Commission in response to the January 2002 resolution of the European Parliament entitled 'Europe and Space'. The European Parliament requested the Commission to produce a White Paper on space *'setting out the main objectives of the policy to be implemented in the medium and long term.'*[13] As a step towards the White Paper, the European Commission, in cooperation with ESA, elaborated the Green Paper on Space Policy. The Commission adopted the Green Paper in January 2003[14]. The objective of this document was to stimulate a Europe-wide debate on space policy and launch a process of consultation meant to gather inputs from all relevant actors in Europe.

The ESA/EC Joint Task Force was given the responsibility to organise the consultation process following the Green Paper's publication. An opening conference in Brussels was followed by a series of consultation workshops, taking the debate to many Member State capitals, including in the future EU Member States. In addition, many written inputs were received and a web-forum for consulting European citizens was set up. Several ESA/EU Member States also held national meetings on the Green Paper.

All in all, over a thousand representatives of governments, international organisations, companies, European institutions and universities - and individual citizens - actively took part in the consultation process. A joint ESA/EC report[15] on the outcome of the whole process was published in November 2003. Together with the reports produced by the five 'rapporteurs' of the consultation workshops that were organised, this joint report will remain a reference not only for the formulation of an action plan for an extended European Space Policy, but also for the planning of the space programmes to be carried out under that Policy.

THE WHITE PAPER

On 11 November 2003, the European Commission adopted its White Paper on space. The White Paper was prepared in answer to the request from the European Parliament (see above). Both the EU and ESA Ministerial Councils in May 2003 had addressed this initiative in their respective Resolutions[16] and had specified that the Commission should draft the White Paper in cooperation with ESA.

The White Paper was introduced to the EU Council in late 2003 and is expected to be discussed during the first half of 2004.

The White Paper, 'Space: a new frontier for an expanding Union - An action plan for implementing the European Space Policy', builds on the successful Green Paper consultation on options for European activities in space. In the White Paper the Commission proposes the implementation of an extended European Space Policy to support the achievement of the European Union's policy goals. Europe needs a more demand-driven, extended space policy, able to exploit the special benefits space technologies can deliver in support of the Union's policies and objectives: faster economic growth, job creation and industrial competitiveness, enlargement and cohesion, sustainable development and security and defence. The policy would be implemented within a multi-annual European Space Programme, which will set objectives and frame budgets.

The policy would require an increase in overall expenditure to develop and deploy applications and to support the research and development, technology and infrastructures. If Europe

[13] P5_TA(2002)0015.

[14] COM(2003)17 final, http://europa.eu.int/comm/space/doc_pdf/space-green-paper_en.pdf.

[15] ESA Brochure BR-208, October 2003.

[16] ESA/C-M/CLXV/Res. 3 (Final); EU Competitiveness Council 13 May 2003; European Space Policy Resolution; 9039/03 (Presse 124).

does not adopt the proposed approach to space policy, it will decline as a 'space power' and would risk losing large parts of its space-related industry.

SPACE IN THE DRAFT CONSTITUTIONAL TREATY FOR EUROPE

The Draft Treaty worked out by the European Convention proposes a constitutional reference for space activities. Following Article 13.3, space is a 'parallel' shared competence between Member States and EU: 'In the areas of research, technological development and space, the Union shall have competence to carry out actions, in particular to define and implement programmes; however, the exercise of that competence may not result in Member States being prevented from exercising theirs.'

Specifying this competence, Article III-155 stipulates that:

1. To promote scientific and technical progress, industrial competitiveness and the implementation of its policies, the Union shall draw up a European space policy. To this end, it may promote joint initiatives, support research and technological development and coordinate the efforts needed for the exploration and exploitation of space.

2. To contribute to attaining the objectives referred to in paragraph 1, European laws or framework laws shall establish the necessary measures, which may take the form of a European space programme.

3. The Union shall establish any appropriate relations with the European Space Agency.

Whether space will finally be included in the Treaty as a new EU competence will be decided in the Intergovernmental Conference. During the drafting of the Treaty, some members of the Convention proposed that space should rather be featured as a 'supporting action' of the Union, which would lie closer to the idea of the Union supporting space by *adding* its strengths and resources to the European space sector.

SPACE WITHIN THE LISBON STRATEGY

As suggested in Chapter 2 on the Lisbon Strategy, space has an important role to play in fulfilling the objectives directed towards a competitive and knowledge-based economy. Space sciences and research contribute to a knowledge-based society and help in pushing for new technologies and innovation - crucial for industrial competitiveness. Space R&D is part of a larger value chain, which stimulates R&D in other sectors and leads to commercial applications. There are also a number of specific space-related initiatives that have been mentioned in the framework of the Lisbon goals.

The European Council in Brussels (March 2003) asked for a boost in the momentum of the information society, which requires accelerated broadband deployment, and called on Member States to put in place national broadband/high-speed Internet strategies by the end of 2003. Satellite tele-communications are part of a technology portfolio that may deliver broadband access to the approximately 20% of the European population where it cannot be easily made available in the medium term; this is especially true for rural, peripheral and island regions. Satellite telecommunications can contribute to closing the 'digital divide' in Europe, as a complement to terrestrial solutions. The enlargement of the Union also puts these opportunities in a new perspective.

The Galileo system for navigation, timing and positioning by satellite has a wide range of categories of applications in a wide variety of commercial services. They cover areas as diverse as transport, energy, finance, insurance, fisheries,

agriculture, environment, geology, science and public works. Galileo is also expected to be a new example of public-private partnership. A Joint Undertaking established by the European Commission and ESA is managing its development phase. Later on, private companies are expected to operate and manage the system under a concession scheme.

The GMES (Global Monitoring for Environment and Security) initiative will ensure that Europe can rely on independent means for gathering data and information - it responds to recognition of the fact that the design, conduct and evaluation of policies must be based on appropriate knowledge. The GMES capacity is geared towards the delivery of sustainable services supported by observation systems that may be in space, on the ground, in the air, or sea-borne. Its potential and range could be significantly increased through combining it with positioning systems and telecommunication satellites.

SPACE WITHIN THE EUROPEAN INITIATIVE FOR GROWTH

Linked to the Lisbon Strategy, the European Council meeting in Brussels in December 2003 endorsed the European Action for Growth and welcomed the work carried out by the Commission, the EIB and relevant Council formations on the establishment of a 'Quick-start Programme' identifying a provisional list of projects of European interest in an enlarged Union for immediate action.

The Quick-start Programme targets projects that are 'ready to launch'. The Galileo satellite navigation system is one of the 'networks' supported. As a broadband quick-start project, a 'digital divide' project is proposed, which will focus over the next two years on delivering broadband connections in remote and rural areas using a variety of technologies, possibly including satellite technology. Two other quick-start projects seek to boost the EU presence in space: support for GMES, and a launch facility for Soyuz rockets from Kourou, the latter in order to extend the European space launch capabilities in terms of type of launch vehicle and size of payloads.

SPACE AND SUSTAINABLE DEVELOPMENT

Earth observation from space can support sound environmental management and protection by providing basic, homogeneous observations with unsurpassed coverage in terms of climate and weather, oceans, fisheries, land and vegetation. Therefore, Earth-observation satellites constitute a key tool for achieving sustainable development goals, such as those laid down in the Strategy for Sustainable Development adopted by the European Council in Göteborg (June 2001).

The Global Monitoring for Environment and Security (GMES) initiative was launched in May 1998 and adopted by the ESA and EU Councils in June and November 2001, respectively. It is a joint initiative between the European Commission and ESA to provide independent, operational and relevant information in support of a range of policies, serving sustainable objectives such as environment, fisheries, transport and regional development. A sustainable agricultural model could also benefit from the use of Earth-observation tools. Control of the application of the Kyoto Protocol, to take a concrete example, will benefit from European independent space capabilities. Observation from orbiting satellites presents advantages for monitoring, as they are global tools that can repetitively observe every corner of the Earth and provide global assessments as well as detailed views of specific locations.

GMES is thus expected to contribute to many European policies, some of them specifically of environmental concern, of which the two overarching initiatives are:

- the 6th Environmental Action Plan (2004-2010), which addresses four priority issues: Climate Change, Nature and Biodiversity, Environment and Health, and Natural Resources and Waste
- the EU Strategy for Sustainable Development (COM(2001)264), which specifically calls for 'establishing by 2008 a European capacity for global monitoring of environment and security (GMES)'.

For the GMES Initial Period (2001-2003), efforts have been implemented according to a shared ESA/EC Action Plan. GMES preparatory activities have been undertaken by the Commission under the 6th Framework Programme for RTD, and by ESA in the context of the GMES Services Element Programme. The Commission and ESA have drafted a joint report on this initial period. Drawing lessons from this initial phase, an Action Plan is to be presented in early 2004 for the Implementation Period (2004-2008).

GMES will, furthermore, be used as the European contribution to international efforts to understand the functioning and evolution of the Earth system, as expressed in existing multilateral agreements and initiatives, such as begun under the auspices of the World Summit for Sustainable Development in 2002 and the Earth Observation Summit in 2003.

The part of GMES belonging to space observing systems will be subject to the European Space Policy, as expressed in the 2003 White Paper on Space.

COMMON FOREIGN AND SECURITY POLICY AND SPACE

SPACE AS A TOOL TO ENHANCE EUROPEAN INDEPENDENCE AND SECURITY

As laid down in the White Paper on Space, to be credible and effective any Common Foreign and Security Policy (CFSP) and European Security and Defence Policy (ESDP) must be based on autonomous access to reliable global information so as to foster informed decision-making. Space technologies and infrastructures ensure access to knowledge, information and military capabilities on the ground that can only be available through the capacity to launch, develop and operate satellites providing global communications, positioning and observation systems. Space-based systems can also provide a higher level of security for citizens, allowing, for example, a better enforcement of border and coastal control and identifying humanitarian crises in their early stages.

Space technology, infrastructure and services could therefore be an essential support to the CFSP, including the ESDP Most space systems are inherently capable of multiple uses, and taking better advantage of space applications would significantly strengthen the credibility of the above policies. Suitable space-based systems and services can bring the ESDP both strategic capabilities and a capacity for autonomous decision-making.

THE CALL FOR SPACE ASSETS TO ENHANCE EUROPEAN SECURITY AND DEFENCE

The European Parliament, committees of the EU Council, the European Commission, as well as European multinational initiatives, have all recently called for space to be better used in enhancing European security and defence.

The conclusions of the European Parliament report on European Space Policy[17] state that if Europe is to be stable and prosperous, it must endow itself with the means of guaranteeing its security - and space represents one of those means.

The European Union Military Committee has clearly stated that space assets can be efficient tools for crisis-management operations. For its part, the EU Political and Security Committee has recommended further reflection on how to ensure that

[17] 10/09/03 ref.2003/2092(INI).

security and defence aspects are taken into account in the determination of space policy and programmes.

The European Commission in its White Paper on space recommends, inter alia, that a working group composed of representatives from the EU, ESA, member states and space organisations (regrouping civil and military space users) work out a report by the end of 2004 on the current EU needs for multiple-use capabilities, the link with the European Armaments Research and Capabilities Agency, and the potential role of the EU Satellite Centre and the role of ESA.

The Commission also suggests, in its communication 'A Coherent Framework for Aerospace - a Response to the STAR 21 Report'[18], that space could support several objectives under the Common Foreign and Security Policy:

- to make use of the existing and planned infrastructure, which is mainly national, but includes the EU Satellite Centre, to support the Petersberg tasks of humanitarian aid, rescue and peacekeeping. The security elements of GMES should be dedicated to that objective;

- to continue building a space defence and security information capacity in Europe for surveillance, reconnaissance, command and control, tele-communications and positioning, benefiting from Europe's space assets and broadening the experience of the Satellite Centre;

- to encourage NATO to consider a European solution when commissioning its military telecommunications satellite and launch needs.

CAPABILITY SHORTFALLS AND ECAP PROCESS

At the Helsinki European Council in December 1999, EU Member States set themselves the headline goal of being able, by 2003, to deploy 60 000 men for 1 year within 60 days in the frame of the Petersberg tasks. To this end, at the Capabilities Commitment Conference (Brussels, 2000), Member States committed to making national contributions to EU rapid-reaction capabilities.

The comparative analysis of both the Helsinki Headline Goal Catalogue (specifying the operational requirements for the Petersberg tasks) and the Force Catalogue (setting national commitments) revealed considerable shortfalls in national capability commitments. At the Laeken European summit (December 2001), the EU Council decided to launch the European Capabilities Action Plan - ECAP, to address these shortfalls.

From March 2002 onwards, 19 panels of national experts[19] developed possible solutions. The panels presented their final reports in March 2003, bringing the ECAP process into a new phase where ten Project Groups were established, focused on concrete projects, including solutions through acquisition or other solutions such as leasing, multinationalisation and considering possibilities for role specialization. One Project Group is working on 'space-based assets'.

In 2003, Member States have refined their contributions and a new analysis of progress made was included in the Helsinki Progress Catalogue 2003.

Space-based assets by their very nature could constitute a fundamental asset notably for C4I systems (command, control, communications, computers, intelligence) - being one necessary element for closing remaining shortfalls.

To fully meet the security objectives of a stable and prosperous Europe, further developments are needed in the field of global monitoring, positioning, navigation and timing and communication, signal intelligence, early warning and space surveillance. A large part of the observational requirements stemming from security and defence needs are planned to be fulfilled by the services that will be delivered through GMES. Not least, GMES could contribute to humanitarian and rescue tasks, peacekeeping and supporting combat forces in crisis-management tasks, including peacemaking. A specific effort might also be needed to ensure that Europe has the capacity to supply the different users with critical information on solar flares, near-Earth objects, space debris, ('space weather' prediction).

[18] **COM(2003) 600 final (13.10.2003).**

[19] **The Headline Goal Task Force (HTF), composed of national experts and officers from EU military staff, coordinated the work of the panels. There is also an 'HTF+', in addition including NATO representatives.**

The multinational military initiative, 'Common Operational Requirements for a European Global Satellite System' represents a possible instrument for defining a European approach vis-à-vis ground segment and infrastructure.

A NEW INSTITUTIONAL ACTOR: THE EUROPEAN DEFENCE AGENCY

The creation of a European Defence Agency[20] (EDA) is seen as one of the most consensual points of the future Common Foreign and Security Policy. Article III-212 of the Draft Treaty establishing a Constitution for Europe is related to the EDA. But already the Thessaloniki European Council (June 2003) has tasked the Council to undertake the creation, in the course of 2004, of 'an intergovernmental agency in the field of defence capabilities development, research, acquisition and armaments'. The European Commission has supported the creation of an EDA notably through its communication 'Towards an EU Defence Equipment Policy'[21].

An ad-hoc working group was set up in September 2003 to implement the Thessaloniki conclusions and to lay the groundwork for the EDA. Many questions of fundamental nature will have to be dealt with, such as the institutional nature, the competence and the autonomy of the EDA, and its insertion into the very complex institutional European landscape (OCCAR, WEAG, LoI, relationship to ESA).

Following the final report of the Working Group VIII 'Defence' of the European Convention (CONV 461/02), known as the 'Barnier Report', the setting up of such an Agency should 'ensure the fulfilment of operational requirements by promoting a policy of harmonized procurement by the Member States, and to support research into defence technology, including military space systems.'

Following the European Parliament report on Space Policy, EDA will 'create an environment conducive to a more competitive European industry, especially in the space sector, working in collaboration with the ESA where research, technological development and boosting industrial supply, and independence as regards strategic technologies are concerned.'

SPACE AND THE EC PREPARATORY ACTION FOR SECURITY RESEARCH

A preparatory action for security research (with a 65 MEuro budget for the period 2004–2006) is being launched by the Commission, which will publish a related Communication early in 2004 on a European Security Research Strategy. In the short term, research covered under the Preparatory Action is expected to be mission-oriented. Space expertise could be used in 'mission-oriented' activities, such as for the protection of satellite surveillance systems over sensitive areas (water tanks, nuclear sites, etc.) and for the protection of ground-based and satellite communication systems.

GALILEO

The final breakthrough for the Galileo satellite navigation system came in May 2003. The agreement reached between the ESA Member States at the ESA Council at Ministerial Level in Paris (27 May 2003) cleared the way for the official launch of the development phase, and the setting up of the legal entity (Joint Undertaking) ensuring the management of the development of the programme and preparing for the management of the deployment and operational phases. The Joint Undertaking will make the necessary preparations for the concessionaire that will eventually be responsible for deployment and commercial operations. In October 2003 the Joint Undertaking issued a first invitation to tender for the Galileo Concession.

The first experimental satellite, developed by ESA, will be launched in the second semester of 2005. The system will be fully operational in 2008. A first signal in space has already been achieved through the EGNOS (European Geostationary Navigation Overlay Service) system, a precursor to the comprehensive satellite navigation system to be provided by Galileo.

[20] As proposed by Italian Defence Minister Antonio Martino at the EU Informal Defence Ministers Council in Rome on 3/4 October 2003, the name of the future intergovernmental agency in the field of defence capabilities development, research, acquisition and armaments could be simplified to the European Defence Agency - EDA.

[21] Brussels, 11.3.2003, COM(2003) 113 final.

Galileo is a worldwide system and maximising its benefits means making international co-operation a fundamental part of the programme. Europe is currently examining a number of technical issues with the United States related to interoperability and compatibility with the GPS system. Negotiations on co-operation scenarios with the Russian Federation, which has valuable experience in the development and operation of its GLONASS system, are also ongoing.

International co-operation will ultimately promote widespread use of this technology. It is also in line with the objectives of the EU with respect to foreign policy, co-operation with developing countries, employment and the environment. Since the Council's decision to launch the Galileo programme, even more countries have expressed the wish to be associated with the programme in one form or another.

In this context, the EU entered into a cooperation agreement with China on Galileo, signed during the EU-China summit on 30 October 2003. The agreement opens the way for China to invest around 200 million Euro in the programme through a stake-holding in the Joint Undertaking. The agreement provides for co-operative activities on satellite navigation in a wide range of sectors, notably science and technology, industrial manufacturing, service and market development. The EC, ESA and the Chinese Ministry of Science and Technology have also decided to establish a training, cooperation and information centre for satellite navigation in Beijing.

THE ESA COUNCIL AT MINISTERIAL LEVEL

The ESA Council at Ministerial Level meeting in Paris on 27 May 2003 took decisions on the restructuring of the Ariane launcher sector, on restoring the competitiveness of Ariane-5, and on taking further steps in the preparation of future launchers. Although the decisions taken on the European launcher sector played a central role, Ministers also ruled upon unblocking funding for part of the exploitation programme for the International Space Station and adopted a Resolution on the relations between ESA and the European Union.

RESTRUCTURING THE ARIANE LAUNCHER SECTOR

Following the request by the ESA Council Meeting at Ministerial Level in Edinburgh in November 2001 to reorganise the launcher sector in order to achieve a better balance between the role of public and private players, Ministers took bold decisions on the restructuring of the Ariane sector and gave a long-term perspective to the launcher sector at the Council Meeting at Ministerial Level on the 27 May.

Ministers also took also measures for completing the qualification of the Ariane-5 ECA launcher so as to improve the launcher's competitiveness while also ensuring continuity of the launch service through generic Ariane-5 versions and defining a cost-efficient backup.

Furthermore, the reorganisation of the Ariane launcher sector decided by Council established a rationalised industrial organisation by assigning a single launcher system prime contractor for both the manufacturing and future development of Ariane-5. Arianespace, on the other hand, will remain in charge of the execution of the production phase, ensure launch operations, bear the responsibility vis-à-vis launch customers, and procure the launchers from the launcher system prime contractor.

On the other hand, the public-sector side was also streamlined insofar as ESA was put in charge of launcher project management, using existing competences and workforces in national space agencies, while a mandate was also given for the Agency to propose a new organisation for launch operations at the Centre Spatial Guyanais (CSG).

To guarantee access to space with Ariane-5 to European user institutions for the launch of their missions, and to maximise institutional use of this access to space by offering the best market prices and launch priority to European institutions, Ministers decided to carry out the EGAS Ariane Programme as an optional Agency programme. EGAS will cover selected fixed-cost activities associated with the production of Ariane-5 batch PA, thereby placing European industry and Arianespace on a level playing field with international competitors.

2010 PERSPECTIVES FOR THE EUROPEAN LAUNCHER SECTOR

Ministers also stressed the fact that the restructuring of the Ariane sector should be associated with a perspective for the European launcher sector for the 2010 timeframe deciding on the initiation of preparatory activities within the Future Launchers Preparatory Programme (FLPP), while reaffirming the importance of initiating international cooperation and welcoming Russia as the first partner in the long-term cooperation on access to space.

The FLPP Programme is aimed at developing European technological capabilities, hence enhancing the long-term competitiveness of European launchers, and thereby avoiding the risk of Europe having to respond, from an inadequate technological base, to a major non-European technological breakthrough, and at permitting the progressive restructuring of the industrial organization for the next generation launcher.

Already in June 2002, the ESA Council meeting in St. Hubert (Canada) affirmed the interest of cooperating with Russia in the field of launchers on two pillars: the cooperation without exchange of funds on future launcher preparation, and the exploitation of Soyuz by Arianespace from CSG. On 27 May 2003, the Council reaffirmed the importance of such cooperation, with the partnership with Russia to begin with the preparation of future launchers within the FLPP Programme and the exploitation of Soyuz by Arianespace. The FLPP and the exploitation of Soyuz at CSG constitute two complementary and interlinked aspects of Europe's cooperation with Russia in the launcher sector. While, as already mentioned, the first programme pursues the strengthening of the launcher R&D base in Europe through the development of technological capabilities, the exploitation of Soyuz will complement Ariane-5 and Vega in the medium-weight payload class for low-earth orbit (LEO) and, for geostationary transfer orbit (GTO) missions, will provide Arianespace with increased mission flexibility and optimise the commercial exploitation of Ariane.

THE ESA DIRECTOR GENERAL'S AGENDA 2007[22]

The rapprochement between the European Union and ESA has achieved major milestones in 2003, such as the signature of the Framework Agreement and the adoption by the Commission of the White Paper on a European Space Policy.

This means the emergence in Europe of new users of space infrastructures and new demand for services and applications based upon space technologies. ESA is therefore called upon to adapt to this new environment including the new industrial set-up. This is the reason why the new ESA Director General prepared a plan called Agenda 2007 in which he sets the objectives for the Agency to be achieved during the four years of his mandate.

Three types of objectives have been identified:

- increasing by 30% the budget for space programmes managed by ESA by 2007,
- adapting the ESA structures and procedures to the new environment, and
- improving the Agency's internal organisation and management.

[22] ESA Brochure BR-213, October 2003.

In order to cope with these objectives, a new organisation for the Agency is going to be put in place by 1 April 2004, whereby a matrix of horizontal and vertical competences will be implemented.

4.1.2 USA

The United States combines a political vision for space and a financial commitment to space-related activities that is without comparison in the World.

Its claimed leadership role in space matters throughout the World (US National Space Policy, September 1996) calls for an integrated national security space architecture, the protection of US space systems, a robust US space industry, and a strong forward-looking technology base (US DoD Space Policy, July 1999).

On 28 June 2002, the National Security Presidential Directive NSPD-15 called for a phased review of national space-policy topics. Nevertheless, on the one hand the events of 11 September stimulated or accelerated a number of political undertakings in order to reinforce the use of space technologies and systems in the fight against terrorism, while on the other the Columbia accident in February 2003 caused the White House to embark on an interagency review of US space priorities. Thus, such events have prompted a more comprehensive review, in turn putting on hold the report regarding several national space-policy topics.

The most visible undertakings are reported in the following paragraphs.

NATIONAL SECURITY STRATEGY - EVOLUTION OF RELATIONS BETWEEN NASA AND DOD

The war in Iraq demonstrated an intensive use of space systems by the DoD, and this deeply influenced US space priorities and activities: early warning, navigation, reconnaissance, surveillance, intelligence, command and control, force deployment, strike precision, etc. As anticipated by the US Secretary of the Air Force, James G. Roche, space became the 'fourth dimension in national security operations together with air, ground and sea operations'. Space assets are considered to be more and more critical to US national security. The US space doctrine is evolving toward a 'space control' doctrine, aimed at deterring and defending against any hostile act directed at US space assets. Integration is key to achieving such an aim, thereby calling for further interagency cooperation and participation. The strengthening of ties between the different organisations has been carried out in particular within the framework of the Partnership Council, in which NASA, the US Air Force, the National Reconnaissance Office and other Pentagon agencies have been holding regular meetings.

The Air Force, designated as the 'executive agent for space' within the Pentagon, is the most important space actor in the US. Its space budget amounts to approximately 18 billion US$ for FY 2003 and 20.4 billion US$ for FY 2004. The development of several defence space systems was started or pursued this year: advanced telecommunications (the DoD is often requesting more bandwidth for future conflict management), GPS modernisation (with the GPS block IIF and III), surveillance, intelligence, reconnaissance, missile warning and tracking, etc.

THE COLUMBIA ACCIDENT'S CONSEQUENCES

The accident to the Space Shuttle 'Columbia' on 1 February 2003 had a profound effect on the US civil space sector. It led to a complete reassessment of the US national space policy and to changes at NASA.

On 26 August, the Columbia Accident Investigation Board (CAIB) released its final report. The investigation found two causes of the Columbia accident that are equally critical: (1) the foam debris, and (2) the loss within NASA of its 'independent safety checks and balances system'.

The final report contains three sets of recommendations: (1) near-term recommendations that cover return-to-flight issues, some of which should be implemented before NASA can proceed to any Shuttle launch; (2) mid-term recommendations that are linked to the continuity of Shuttle flights; and (3) long-term recommendations regarding necessary changes in the 'NASA culture' and the future direction of US human space flight. Obviously, the accident has had important repercussions on the International Space station (ISS), e.g. reduction to a 2-person crew, delays in the ISS assembly sequence, etc. The identification of the consequences of the Shuttle's grounding, and the delays incurred, for ESA in general and for ESA's human spaceflight programme in particular were reported to the ESA Council in December 2003.

POLICY TOWARDS GPS/GALILEO

Concerning positioning, navigation and timing (mainly GPS-related), the White House's National Security Council initiated a policy review in March/April 2003. The outcome of that review has yet to be released.

POLICY TOWARDS COMMERCIAL REMOTE SENSING

Following the National Security Presidential Directive issued in June 2002, a review of commercial remote sensing and foreign access to remote-sensing space capabilities was released on 25 April 2003. The fundamental goal of that policy is 'to advance and protect US national security and foreign policy interests by maintaining the nation's leadership in remote-sensing space activities, and by sustaining and enhancing the US remote-sensing industry'. The implementation of the national security needs is led by the US National Imagery and Mapping Agency (NIMA), while NOAA looks after the civil remote-sensing capabilities.

The US Administration initiated the Earth Observation Summit on 30 July 2003 in Washington DC. Representatives from 35 countries and 22 multilateral organisations met at the State Department with the purpose of improving cooperation on Earth observation and removing barriers to the exchange of information between countries and organisations. The participants called for the development of a 10-year implementation plan by the end of 2004 for nations and organisations to move towards a comprehensive, coordinated and sustained Earth Observation System.

POLICY TOWARDS SPACE TRANSPORTATION

The National Security Presidential Directive NSPD-15 called for recommendations in the area of the US's space-transportation policy to be reported to the National Security Council Deputies Committee by 31 December 2002. It has, however, been put on hold pending the 'Columbia' accident investigation and the release of a new US national space policy. In this context, it is worth mentioning that the Chairman of the CAIB stressed the

need for a clearly stated national commitment to a US human spaceflight programme before NASA starts designing a new vehicle. This commitment would then be the basis for acquiring sufficient budget to develop and operate the Shuttle and future NASA vehicles. Furthermore, the CAIB recommended that NASA should use unmanned spacecraft to carry cargo to the ISS and develop a Shuttle replacement for crew only. These recommendations will no doubt have implications for the functions, the timing and the budget for the Orbital Space Plane.

As regards the dual EELV track strategy, encompassing Boeing's Delta IV and Lockheed Martin's Atlas V, following allegations of wrongdoing by Boeing during the Evolved Expendable Launch Vehicle source selection process in 1998, the Air Force carried out an investigation that culminated in July 2003 with the suspension of Boeing's Integrated Defense Systems arm from eligibility for new government contracts in the EELV programme. Additionally, the Air Force:

- suspended three former employees from eligibility for new government contracts;
- reallocated launches within the existing EELV contract (Buy I), revoking 7 of the 19 contracts awarded to Boeing for the EELV in 1998. The total number of Delta IV launches is reduced to 12 and those of Atlas V increased to 14. This shift represents about 1 million US$ worth of business. The first shifted launch is set for 2005;
- announced the results of its EELV Buy II decision whereby Boeing is disqualified from award of 3 Buy II launches, launches from Vandenberg AFB which are to be awarded to Lockheed Martin;
- permitted Lockheed Martin to develop a 200 million US$ launch pad at Vandenberg by upgrading an existing launch facility in order to compete with Boeing for West Coast launches.

Such penalties have a further effect on Boeing's operations as they came after the company's announcement, on 15 July 2003, of its strategic decision to focus the Delta IV programme on the government launch services market. Nevertheless, the Pentagon's action against Boeing seems to be dimensioned so as to keep up with the dual EELV track.

Although the EELV was initially conceived by the US Department of Defense as a course of action to reduce the rising costs of space launch services, as a result of the current market slump, during the Strategic Forces Subcommittee of the Senate Armed Services Committee on 18 November 2003, the Air Force Undersecretary Peter Teets, has predicted that the future costs of launching US DoD satellites into space will rise by 20 to 50%. Consequently, the clause in government contracts according to which the US Government would receive from both Boeing and Lockheed Martin the lowest cost relative to commercial launches, has been waived due to the extremely depressed commercial marketplace.

Indeed, according to the United States Department of Defense's Selected Acquisition Costs September 2003 reporting period, the EELV programme has experienced a net acquisition cost increase of 511.8 million US$ compared to the previous reporting period (June 2003). Such an increase has in fact been due entirely to the reallocation of the seven EELV missions from Boeing to Lockheed Martin resulting from the Procurement Integrity Act remedy leading to increased prices for the EELV Buy II mission awards.[23] Within Buy II, the sole Boeing mission consists of an NRO payload from VAFB in 2005, which was awarded by the US Air Force on 30 September 2003 to Boeing, although no deadline for lifting the suspension on Boeing has been announced so far.

[23] Within Buy II, the increase would represent a rise of 72 million US$ per launcher awarded.

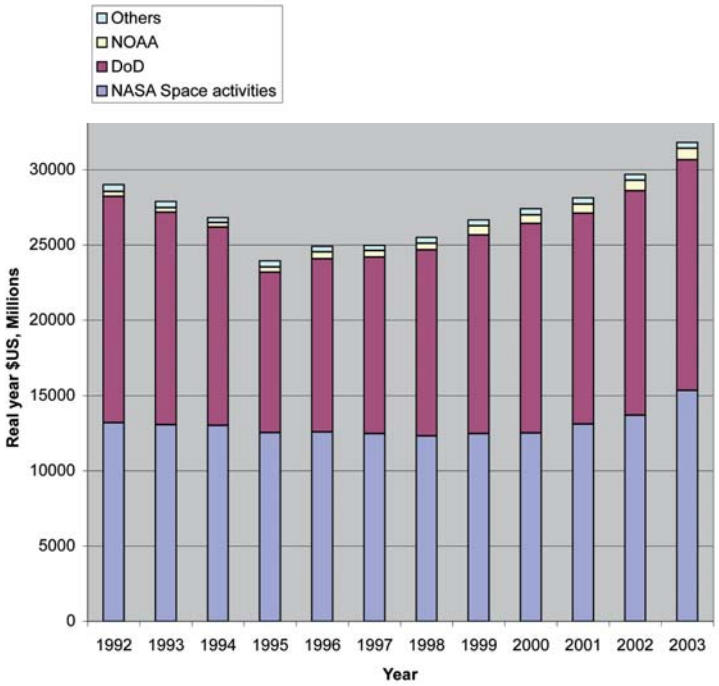


Figure 10 - US public authorities budget evolution
(Source: ESA and Euroconsult)

Following the Procurement Integrity Act remedy, Lockheed Martin has thus been awarded 10 additional launches (7 Buy I and 3 Buy II), resulting in an increase in programme acquisition costs of 511.8 million US$.

Buy III procurement is expected to take place in late 2003 or early 2004, with the award of 15-20 launches.

4.2 Organisation of the demand

4.2.1 Institutional markets

The United States has one coherent space policy, leading to a clear sharing of responsibilities between two major public actors, which manage most of the space budget:

- NASA for space and Earth science, microgravity, advanced and risky technologies, and manned programmes;
- DoD for end-to-end navigation, telecommunications, and Earth observation systems, and for operational expendable launchers.

Although the DoD is mainly acting as a user, i.e. the largest user of space technologies in the World, and NASA is rather an agency for research and development, an important rapprochement between the two major US space institutional actors is actually on-going.

In addition to these two major actors, more specialised actors, such as NOAA for meteorology, play a dedicated role, although closely coordinated with those of the major players.

NASA and the DoD play complementary roles in all of the space fields, with a continuous exchange of technologies and developments in telecommunications and Earth-observation systems.

Since 11 September, the DoD has directed its capabilities towards success in the global war against terrorism. The DoD has fashioned a new approach to defence planning that initiates a capabilities-based approach, as opposed to simply a threat-based approach. Its capabilities are thus being exploited to enhance national security.

CIVILIAN

Civilian programmes include:

- *Space Science:* space-based astronomy and exploration of the Solar System. NASA and ESA cover most of this field, with the financial problems of the Russian programme persisting. NASA has traditionally had an advantage in planetary exploration thanks to the availability of nuclear power sources and heavier launch vehicles. However, with just one fifth of the budget of its American counterpart, ESA has managed to achieve World leadership in specific fields of space science such as cometary science or astrometry.
- *Telecommunications:* relaying, broadcasting and generating signals from space are the main commercial field in space activities. However, public investments are still significant, whether for fulfilling public services

(above all in the defence field in the USA), or for sharing advanced-technology development in partnership with industry (Europe).

- *Satellite Navigation and Positioning:* with the final approval given by the European Union and ESA Ministers, Galileo will be the first fully civilian satellite navigation system to be deployed, in 2008.
- *Earth Observation:* space-based optical, infrared and radar sensors have become fundamental tools for weather prediction, resource management, agricultural and urban planning, and environmental monitoring. The field still holds commercial promise, but of the applications is not yet mature.
- *Launchers:* while the earlier generation of launchers was directly derived from strategic weapon systems, the growth of space activities drove civilian launcher developments. As the cost of access to space remains one of the main drivers, R&D in this field is one of the main elements in all agencies' spending.
- *Manned Space:* the International Space Station developed by the American, European, Russian, Japanese and Canadian Space Agencies is due to orbit the Earth with a permanent astronaut presence as of 2004. Today, after the Columbia accident, the US's capability for transporting man into space is in question and the ISS can be accessed only through Russian vehicles.

USA

The US space civilian budget for FY2003 was estimated to be **16.5 billion US$**, of which 15.3 billion US$ was for NASA (+11% over FY2002), 762 million US$ was for NOAA (+8%), and approximately 400 million US$ for other organisations involved in space (i.e. DoC, DoE).

The NASA budget can be divided into two main parts:

- Human spaceflight (6.173 billion US$)
- Science, aeronautics and technology (8.918 billion US$).

The most significant changes and amendments introduced into the FY2003 budget were the following:

- The restructuring of the NASA's Space Launch Initiative SLI) and the development of a new Integrated Space Transportation Plan, including the new crew transfer vehicle called the Orbital Space Plane (OSP).
- The guarantee that scientific research priorities on the International Space station will be achieved through an agreed complete US core configuration.

As far as the NASA budget evolution is concerned, the overall NASA FY2004 budget request, prepared before the loss of STS 107, is 15.5 billion US$ (an increase of 1.3% with respect to the FY2003 15.3 billion US$). The Space Science budget request, increasing from 3.4 billion US$ in FY 2003 to 4 billion US$ in FY 2004, represents the most significant NASA budget-request increase for this year. Major emphasis has been put on the Prometheus Project, aimed at utilising nuclear power for future spacecraft capabilities. NASA could look at international cooperation in some areas of the project. Worth noting also is the total budget request for Education at 170 million US$, not including the additional 55 million US$ of education-related funding in other enterprises.

On 29 October 2003, a letter regarding NASA was sent to the US President by 101 members of the US House of Representatives (57 Republicans and 44 Democrats). In the

letter, the US Congressmen recognised that NASA has lost 13% of its purchasing power over the last decade (1993-2002) and expressed 'their strong interest in reinvigorating NASA and turning this funding trend around'. Although the letter represents significant support for NASA from the US Congress, it does not request the US President to take any specific measures regarding the Fiscal Year 2005 NASA budgetary request.

EUROPE

The total European public expenditure for civilian activities is the sum of the ESA budget, the national budgets, and the European countries' contributions to Eumetsat. It is estimated at about **5.3 billion Euro** in 2003, i.e. 5% lower with respect to 2002. This is due to the heavy budgetary constraints being experienced everywhere in Europe, affecting research and development activities in particular and therefore space.

The accompanying table gives a breakdown comparison between US 2003 civil space expenditure (NASA+NOAA) and that of Europe (ESA, Eumetsat and national).

Table 2 - US and European 2003 budget-allocation comparison (Source: ESA)

Activity	***USA***	***Europe***
Human Space Flight[24]	*32.8%*	*13.3%*
Space Science	*24.3%*	*11.5%*
Launchers[25]	*0.7%*	*17.0%*
Earth Observation	*8.2%*	*17.2%*
Meteorology[26]	*4.7%*	*5.8%*
Telecommunications	*0.6%*	*6.9%*
Navigation	*0%*	*7.2%*
Technology	*17.4%*	*5.7%*
Microgravity	*2.2%*	*2.9%*
General Budget	*9.1%*	*12.5%*
Other	*0.7%*	*0%*

[24] **US: ISS and Shuttle.**

[25] **Europe: Ariane and CSG.**
US: excluding Shuttle and expendable launch vehicle developed by the DoD.

[26] **Europe: including the contributions to Eumetsat of major countries.**

New European Commission funds coming from the recently launched 6th Framework Programme and from the Trans European Networks basket for Galileo have been taken into account.

MILITARY

Military programmes were the drivers of the 'space race' between the USA and the Soviet Union during the Cold War period. They have been at the core of US and Russian space systems development.

Still today, the US Department of Defense (DoD) is the second largest 'official' space agency, without accounting for 'black' budgets. It has developed space systems for the whole range of defence applications:

- *Intelligence Satellites:* these include all the typical Earth-observing sensors, plus electronic listening-in to telecommunications traffic. The only European capability in this field is represented by the French-led Helios optical imaging system.
- *Navigation:* all current space-based navigation systems were developed primarily to guide weapon systems. The European Galileo system, when deployed, will be the first civilian satellite navigation system.
- *Secure Telecommunications:* geostationary (GEO) and low-Earth-orbit (LEO) telecommunications systems for exclusively military/strategic use. Three European systems are currently used in the field: the British Skynet, French Syracuse and Italian Sicral.
- *Early Warning:* systems able to detect the launch of strategic weapons. Europe does not have this kind of system.

USA

The estimated US space military budget for FY 2003 is 7.5 billion US$, which greatly exceed civilian space expenditure for the same fiscal year. The Air Force receives over 90% of the military space budget and accounts for 93% of space personnel.

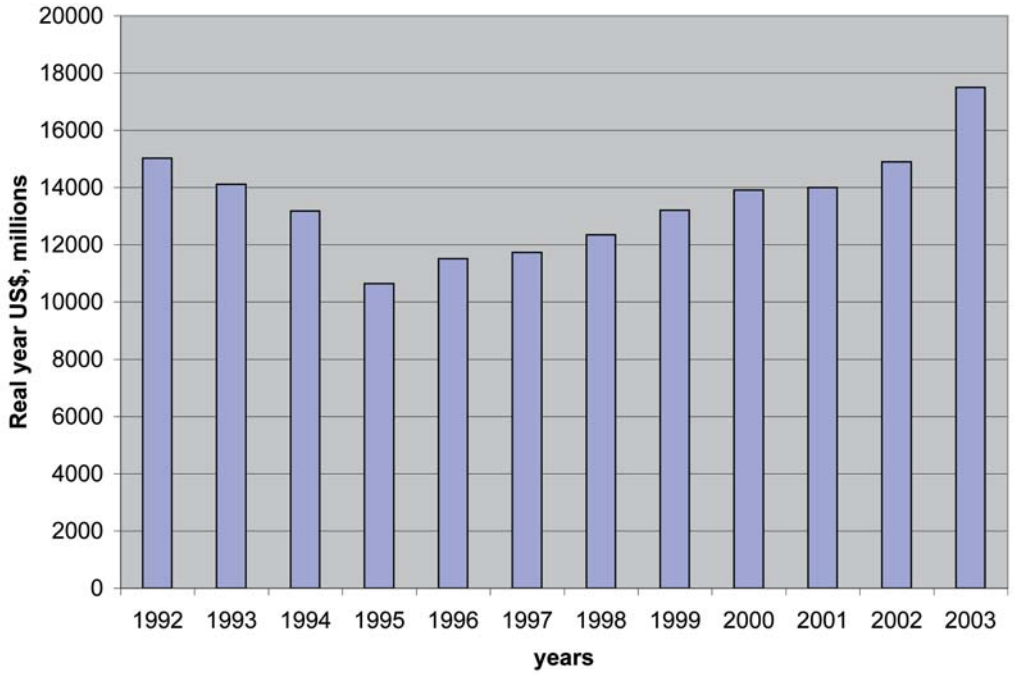


Figure 11 - Total estimated DoD space budget evolution (Source: Euroconsult)

It is hard to divide the overall estimated DoD budget across different activities, more than half of it being allocated to classified projects (about 10.5 billion US$ in 2003). The remaining non-classified part (7 billion US$) can be divided by source of funding and by allocation as shown in the accompanying table.

	RTD&E	Procure-ment	Ops & Maint.	TOTAL	%
ARMY	*57.8*	*167.7*	*0.0*	*225.5*	*3.3%*
NAVY	*117.9*	*282.1*	*0.0*	*400.0*	*5.7%*
AIR FORCE	*2803.0*	*2085.0*	*1451.0*	*6339.0*	*91.0%*
TOTAL	***2978.7***	***2534.8***	***1451.0***	***6964.5***	***100%***
%	*42.8%*	*36.4%*	*20.8%*	*100%*	

Table 3 – Allocation of DoD funds for non-classified projects in 2002 (Source: Euroconsult)

The war against terrorism has inevitably had consequences for the organisation of the defence budget in the USA. The Presidential FY2003 budget request included the largest increase in defence spending in two decades. It proposed 369 billion US$ for the DoD plus 10 billion US$, if needed, to fight the war on terrorism, i.e. a total of 379 billion US$, an increase of 14% over FY2002. Research and development at the DoD was increased by 5.4 billion US$ to a total of 54 billion US$ (+11%).

More specifically on space DoD activities, non-classified budget authorities are expected to grow from 6.2 billion US$ in FY2002, to 10.2 billion US current $ in FY2012 (8.1 billion in 2012 of constant 2002 $).

EUROPE

There is a dramatic difference between the attention devoted to military space systems in the US and in Europe. This difference is not only relevant to the budget allocated to space military programmes as such, but also concerns the attention paid to the space infrastructure for security and defence purposes.

The events linked to the war against terrorism and to the Iraq crisis have influenced the European process, leading to a common security and defence policy, but the European Union is still far from having a common approach to the military use of space.

Nevertheless, the accomplishment of the so-called 'Petersberg Tasks' relies only in a very limited way on space infrastructure data, which are usually bought by the Torrejon Satellite Centre. Therefore the initiative is still left at national level, without real central coordination. The estimated budget of the European countries for military space activities was about 650 million Euro in 2003. These activities involved only six countries that have declared space projects for military purposes. This budget is almost equally divided between Earth observation and telecommunications programmes, with a balance of national and limited multinational (2 or 3 countries) activities.

In spite of the slowness of the process possibly leading to a European common approach to security and defence, the Council High Representative for the Common European Foreign and Security Policy's office has performed an inventory of the European military capabilities. Space capabilities, as the sum of national ones, were included in such an analysis. They include telecommunications systems as Syracuse 3 (F), Skynet 5 (UK), Spainsat (E) and Sicral (I), and observation systems such as Helios 2 and Pleiades (F), Cosmo-SkyMed (I), and SAR-Lupe (D).

This capacity, still judged to be partial and not at the same level as that in the US, should be completed by the navigation capabilities offered by Galileo, and by new intelligence, surveillance and early-warning systems.

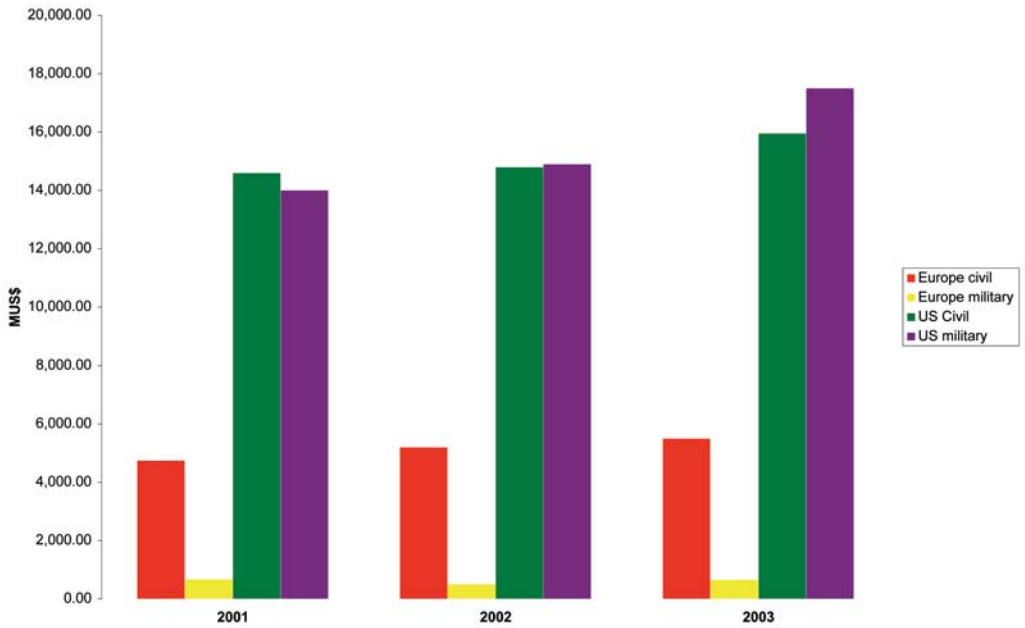


Figure 12 - Evolution of civil and military space expenditures in Europe and the USA (Source: ESA and Euroconsult)

4.2.2 Commercial markets

Commercial space applications in the domains of telecommunications, Earth observation, and navigation generated some 106 billion Euro in 2002, according to various estimates. The great majority of such revenue from space services comes from the telecommunications satellite market, and in particular the value-added telecommunications services (about 50 billion Euro). In fact, these markets mostly benefit the value-added service industries and the traditional space manufacturing companies.

Commercial revenues made up only 20% of the space industry revenues in 2002 (i.e. 5.8 of over 29 billion US$), with the interesting proviso that they represent about 14% of revenues for the US companies, but 48% for the European companies.

BY SECTOR OF APPLICATION

Commercial ***satellite communications*** are by far the most valuable sector with about 90 billion Euro of revenues generated in 2002, about 8% less than in 2001. Preliminary estimates of 2003 results are confirming this yearly decline of about 7%.

The sales of terminals for private and business users (30 billion Euro) and of value-added services (50 billion Euro) already make up 88% of the total revenues.

Factors that have influenced the market reductions are the general crisis in the telecommunications and information-technology markets in 2001, the overcapacity due to the mergers of satellite operators at global level, and the digitisation and compression of the transmissions, which are only partially compensated by the increasing demand for new services and applications (i.e. digital radio, multimedia, rural telephony, etc.).

The ***satellite navigation*** sector, with 11 billion Euro of revenues in 2002, is the second largest commercial space field. It is worth noting that nothing was invested in 2002 in the space segment or launch services (which are totally funded by public entities in Europe, the USA and Russia).

Ground equipment generated revenues of some 7 billion Euro, and value-added services some 4 billion Euro, a minor increase with respect to 2001.

Finally, although ***Earth observation*** generated some 4 billion Euro of revenues in 2002, it must be noted that deployment of the space segments (representing 60% of the total revenues) is often financed by institutional actors.

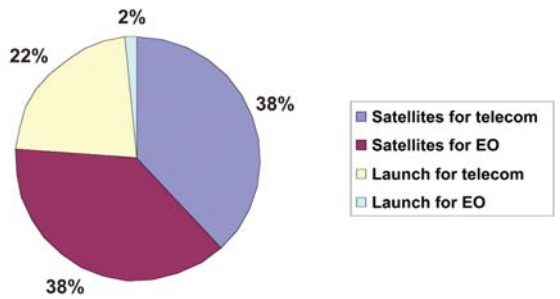


Figure 13 - Breakdown of space-segment value for commercial satellite applications in 2002 (Source: Euroconsult)

BY SEGMENT OF VALUE CHAIN

Each of the three commercial space fields has its own value-chain peculiarities. Nevertheless, some conclusions can be drawn on a general basis. For instance, the space segment (i.e. satellite manufacturing and launch services) accounts for only 6% of the total commercial satellite applications revenues in 2002. The breakdown in the value of the space segment for these applications is given in the accompanying figure.

Sales of satellite capacity, on the contrary, only apply to the telecommunications market, where it represents revenue of about 7.6 billion Euro (i.e. 8.5% of the total).

4.3 European and US space industry comparison

Major industries offering space infrastructures and services are located either in the United States or in Europe. They are the result of years of consolidation and merging activities and of the adaptation of the offer to the request of the commercial and institutional markets. In general, they are linked with the aerospace and defence sector, and this is the reason why it is worth analysing the wider context of the aerospace industry before entering into the detail of the space industry.

4.3.1 The aerospace industry context

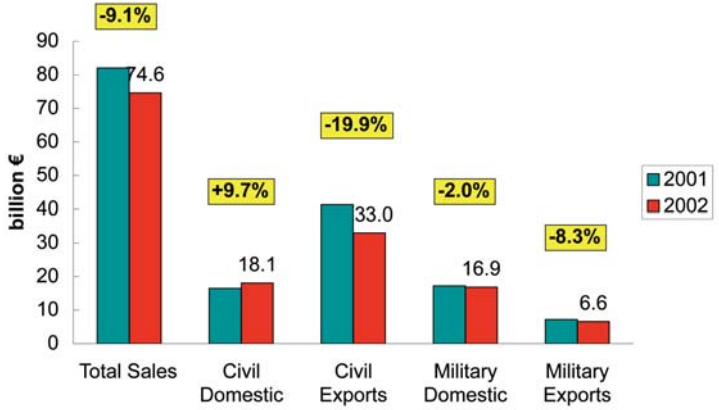


Figure 14 - Evolution of civil and military turnover in the European aerospace industry between 2001 and 2002 (Source: AECMA)

IN EUROPE

In 2002 the European aerospace industry earned 74.6 billion Euro in consolidated revenues, 53% of which were exports, and operating profits were equal to 4.6% of revenues. R&D expenditure totalled 13.9% of revenues. The order book and order intake amounted to 317 billion Euro and 99% of revenues, respectively.

European aerospace employed 407 800 people in 2002. Since 1995, the revenues of the European aerospace industry have increased by 64%, and employment by 5%. In constant terms, the turnover per employee increased from 115 000 Euro in 1991 to 177 000 Euro in 2002 or 54%. Between 2001 and 2002, revenues in the European space sector fell for the first time, after six years of sustained growth, by 9%, or 7 billion Euro in constant terms, mainly due to the contraction in civil exports (-19.9%).

Unlike the United States, the growth in the military market did not balance the fall in civil exports. The worldwide economic downturn, the recession in the telecommunications market, and the restructuring of the European aerospace industry forced job cuts of 6% between 2001 and 2002.

Three main sectors generate the European aerospace industry's turnover. Systems and airframes account for more than half of the revenues. Equipment yields one quarter, and one fifth is generated by engine sales.

The space industry generates 5% of total sales. Aircraft-related products (fixed and rotary wing) account for 92% of the European aerospace market. Missiles generate 3% of the turnover.

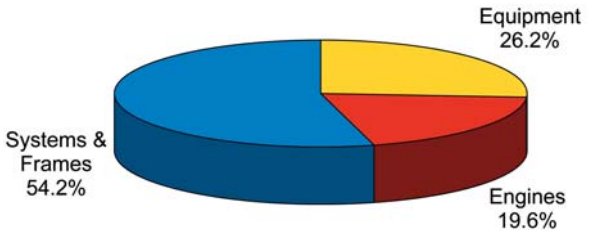


Figure 15 - Relative weights of the three sectors of the European aerospace industry in 2002 (Source: AECMA)

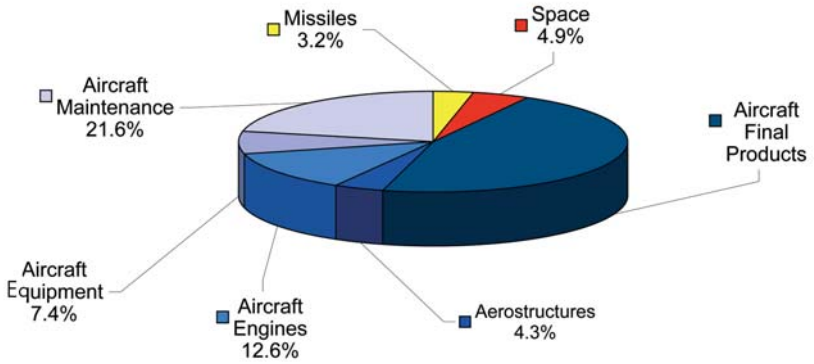


Figure 16 - Relative weights of the products of the European aerospace industry in 2002 (Source: AECMA)

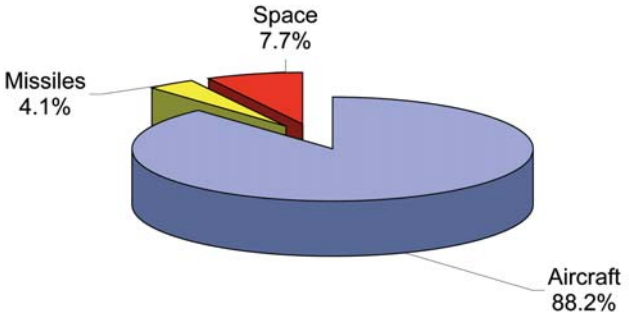


Figure 17 - Employment in the European aerospace industry per product in 2002 (Source: AECMA)

Total workforce: 407,800 employees

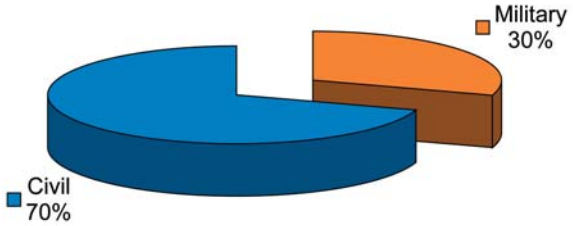


Figure 18 - Employment in the European aerospace industry for civil and military products in 2002 (Source: AECMA)

Aircraft products account for 88% of the employment in the European aerospace industry, missiles 4% and space 8%. The employment for civil and military products is 70% and 30%, respectively.

In 2002, 70% and 30% of the workforce were employed in the production of civil and military products, respectively.

In 2002, 62% of space products were sold to EU governments and 38% to other customers. 85% of missile sales reached EU governments and 15% other customers. Revenues related to aircraft products were 32% from governments within the European Union and 68% from other customers.

In 2002, the trade surplus of the European aerospace industry was 27.9 billion Euro, 11.6 billion of which was towards the United States and the remaining 16.3 billion towards the rest of the World, confirming the competitiveness of the European industry worldwide. This surplus allowed the trade deficit of the overall European aerospace sector to be limited to 400 million Euro.

The total funding for Research and Development (R&D) in 2002 amounted to 10.4 billion Euro, or 13.9% of the European aerospace industry's revenues in that year.

The workforce of the European aerospace industry in 2002 included 76 108 jobs in R&D (19%), 234 564 in production (57%), and 97 155 in other activities (24%).

In 2002, the European aerospace industry consisted of a total of 750 companies. Seven of the companies, or 1%, had more than 10 000 employees. Two-thirds were small companies with fewer than 250 employees. One fifth were medium-sized companies employing between 250 and 1000 people.

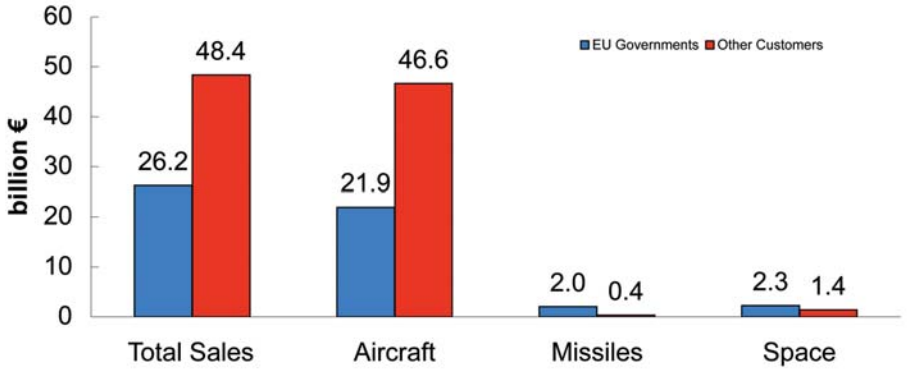


Figure 19 - Turnover of the European aerospace industry from Governments of the European Union and other customers in 2002 (Source: AECMA)

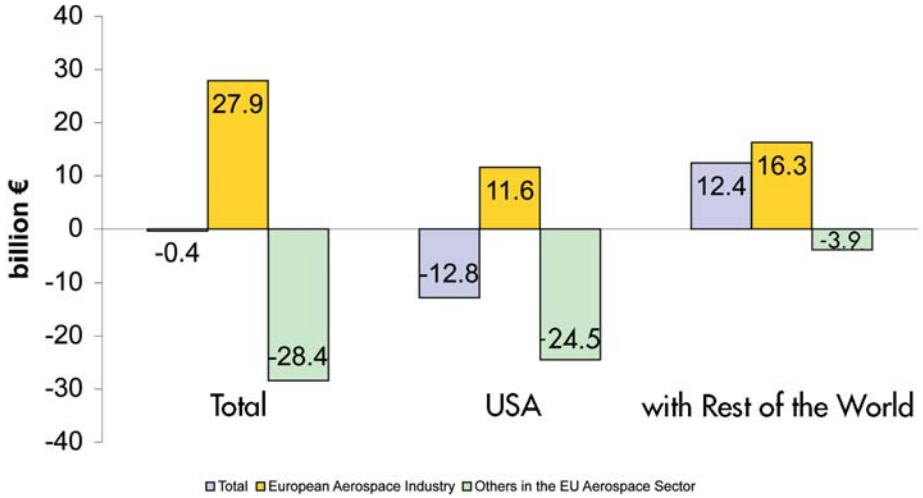


Figure 20 - Trade balance of the European aerospace industry compared with the rest of the aerospace sector in 2002 (Source: AECMA)

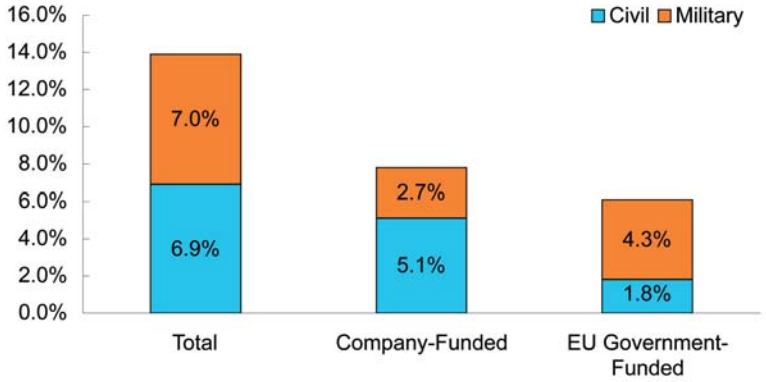


Figure 21 - Sharing of R&D funding between civil and military products of the European aerospace industry in 2002 (Source: AECMA)

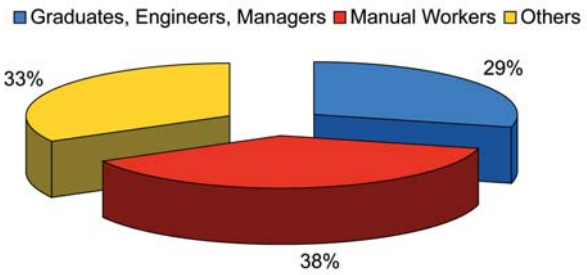


Figure 22 – Sharing of R&D funding between civil and military products of the European aerospace industry in 2002 (Source: AECMA)

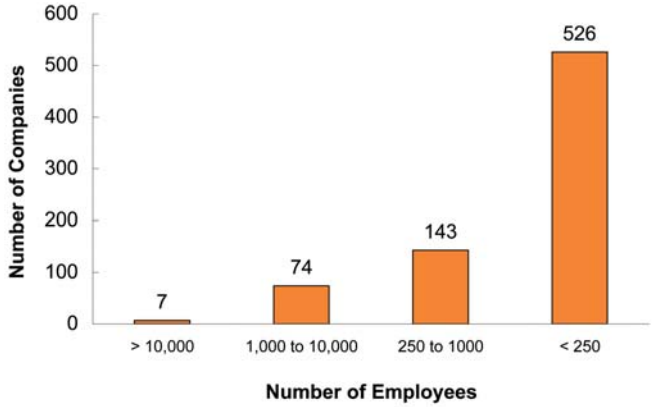


Figure 23 - Structure of the European aerospace industry in terms of company size in 2002 (Source: AECMA)

In addition to the European firms whose core interests lay in the aerospace industry, 80 000 suppliers were estimated to be delivering goods and services to the European aerospace sector, 20 000 being small and medium-sized enterprises.

IN THE USA

Profoundly affected by the war on terrorism and the war in Iraq, in 2003 the US aerospace industry struggled to maintain profitability while dealing on one hand with a significant increase in defence spending and on the other with the dramatic meltdown in the commercial aerospace sector.

Total aerospace industry sales fell for the second year in a row after having reached near-record levels in 2001, and the industry's profits hit their lowest levels in eight years. The defence-market share increased substantially to represent about half of the total US aerospace industry's sales in 2003, confirming a trend of changing customer distribution that started in 1998 and has speeded up over the last two years sustained by the strong rebound in military aircraft and missiles sales.

Turning to the global perspective, the US aerospace industry's share of the World market decreased from 49% in 2001, to 48% in 2002. For 2003[27], this proportion is expected shrink further, although the effects in the global market of the devaluation of the dollar are still difficult to gauge.

The two major US aerospace players, Boeing and Lockheed Martin, increased their focus on the defence market in 2003. The short-term realities at Boeing, however, continue to be very much affected by the drastic fall-off in the commercial business, and the end-of-year results show a significant decrease in sales (about 7%) for 2003. Lockheed Martin confirmed its leading position as top defence contractor, with its end-of-year results showing a major increase in sales of about 20% for 2003.

[27] **Data on worldwide aerospace sales in 2003 are not yet available.**

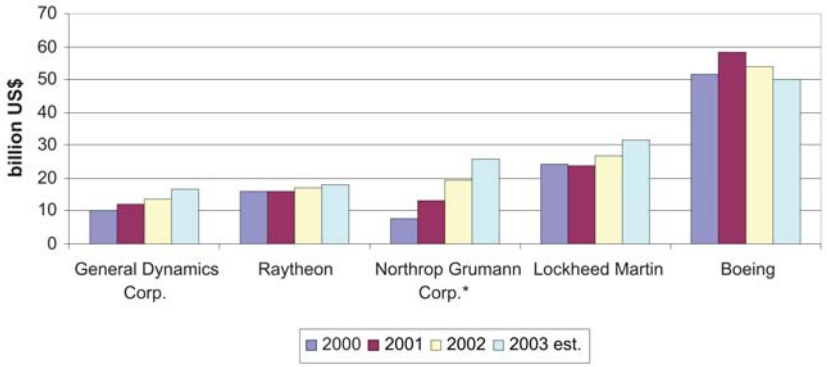


Figure 24 - Evolution of US aerospace industry's revenues for the period 2000-2003 (Source: company reports)

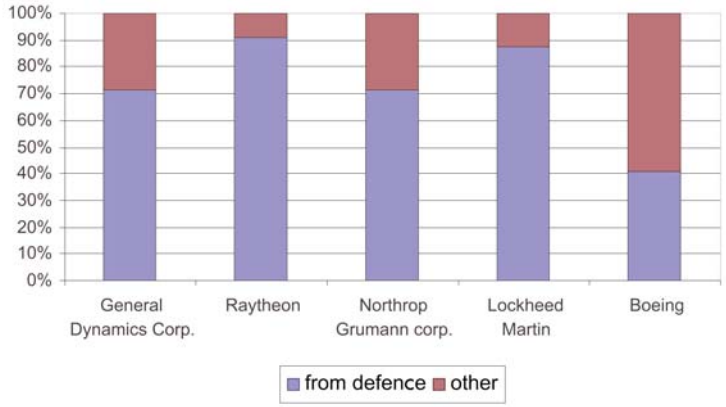


Figure 25 - US aerospace industry's revenues in 2002 coming from the defence sector (Source: Space News)

With respect to their space divisions, both companies reported recently improved financial performances as result of increased work for the US Defense Department. Looking to 2004, the decline in the commercial market is expected to slow significantly, while the increase in military sales should maintain the average pace of the past years, resulting in an industry-wide growth of less than one percent by the end of 2004. Then, the aerospace industry should experience modest growth over the next three years, reflecting the gradual recovery for civil aviation and increased DoD spending.

SALES BY PRODUCT GROUP

Fuelled largely by increased sales to the Department of Defense, the US aerospace industry generated 147 billion US$ in sales during 2003, down 4.0% or 6 billion US$, from the previous year's 153 billion US$. Although military sales (military aircraft and missiles) grew by about +4%, they could not offset the sharp decline in civil aircraft sales, which fell by 20%, following a drop of 17% in 2002, partially reflecting the sensitivity of the industry to the general economic slowdown. Space-sector sales increased only marginally (+1%) following the increase in space sales to the DoD (+3%) and to NASA and other non-DoD federal agencies (+1%), which balanced the sharp decline in commercial spending (-10%).

For 2004, US aerospace industry sales are expected to rise by a fraction of 1%, or 1 billion US$, to 148 billion US$ as the DoD's aerospace purchase enters its sixth year of growth, and commercial transport sales reach the bottom of the current cycle. For the period 2005-2006, the decline in civil aircraft is expected to stabilize, while solid growth should characterise the evolution of all the other sectors between now and 2006.

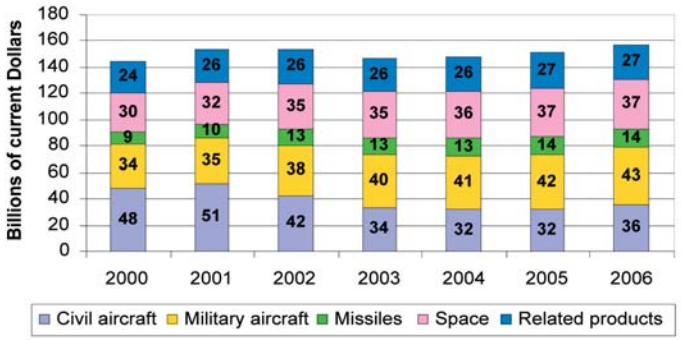


Figure 26 - Evolution of the US aerospace industry's sales per product for the period 2000-2006 (Source: AIA)

SALES OF AEROSPACE PRODUCTS AND SERVICES BY CUSTOMER

In 2003, the Department of Defense confirmed its position as the US aerospace industry's main customer. Military sales to the DoD increased by almost 4% compared to 2002, reaching a total of 59 billion US$, only partially offsetting the significant drop, about 16%, in sales to non-governmental customers. NASA and other governmental US agencies increased their spending by 1% in 2003. The adjacent figure shows the evolution in aerospace industry sales by customer from 1989 to 2004.

Looking at the evolution in the customers' relative weights from 1989 to 2004 (see figure), it can be concluded that, during the first ten years, the US aerospace industry shifted from one reliant upon defence sales, to one where a significant portion of sales were commercial. Aerospace sales to the military fell from 61% of the total in 1989, to 35% in 1998. However, since then, aerospace procurements by the DoD have begun to rebound, with the growth rate from 2001 to 2002 peaking at about 14%.

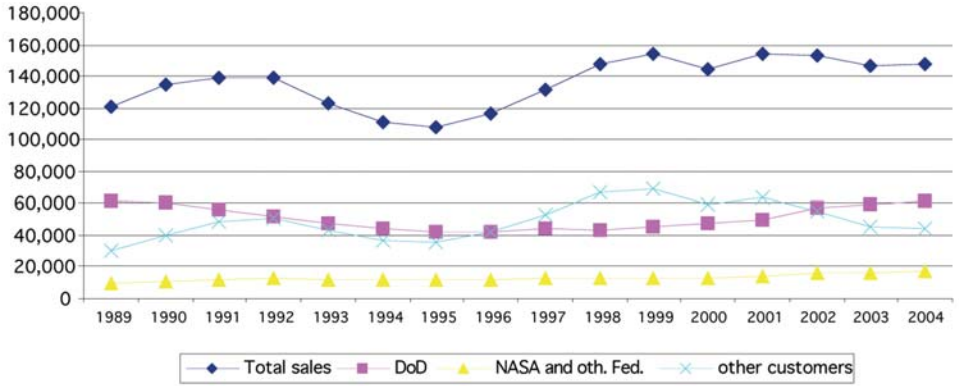


Figure 27 - Evolution of the US aerospace industry's sales per customer (Source: AIA)

US aerospace sales industry-wide will grow by less than 1% in 2004 - 1 to 148 billion US$. Sales to the Defense Department in 2004 are projected to increase by about 3.3% to 61 billion US$, and the same trend is expected for sales to NASA and other non-defence federal agencies, thus offsetting the reduction in sales to customers other than the US government, which are expected to drop by 4% to 44 billion US$.

Looking at employment, US aerospace industry has lost about 50% of its jobs since 1990. These layoffs initially began as a result of reduced defence spending following the end of the Cold War. The subsequent contraction of the industry through mergers and acquisitions made the situation worse. Finally, the events of 11 September deepened the industry's economic downturn. It should be noted that although employment had been falling since the beginning of the 90's, after 11 September 2001 the contraction became very rapid. In the following 12 months the US aerospace employment level dropped by 12%. Due to orders still in the 'pipeline', however, the effects on total sales were not visible in 2001, the year in which the US aerospace industry's sales increased to near-record levels.

Over the period 1990–2003, the US aerospace industry's revenues, in real terms, declined by about 16% and employment has fallen by about 50%, to roughly half a million workers.

The decrease in demand - due both to the reduction in US defence spending and loss of global market share - and productivity improvements are considered to be the major causes for the decline in US aerospace employment. The available data do not allow separation with confidence of the effects of rising productivity from the effects of weakening demand.

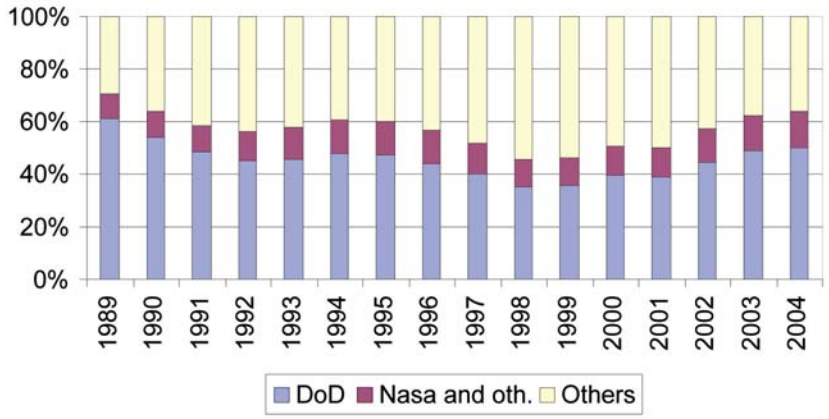


Figure 28 - Evolution of the US aerospace industry's sales by customer and as a percentage of the total (Source: AIA)

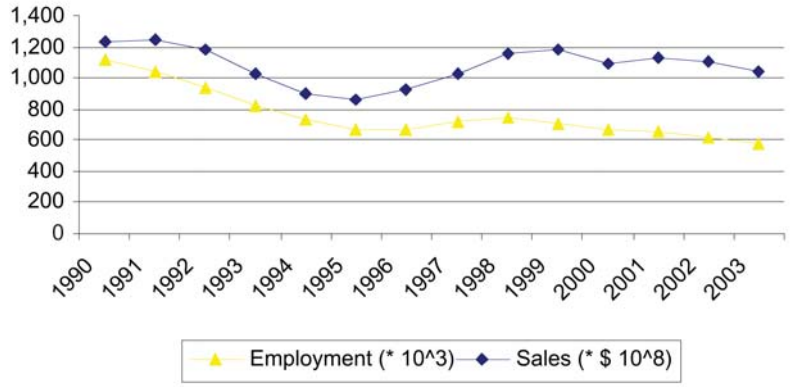


Figure 29 - Evolution of the US aerospace industry's employment record between 1990 and 2003 (Source: AIA)

However, it can be said[28] that: if the share of imports had remained constant, US aerospace employment would be at least 15.3% higher than it is today; if domestic demand, particularly in the military sector, were unchanged in 2001, relative to 1991, aerospace employment would be 17.5% higher.

The productivity growth in the aerospace sector is, however, considered the main cause of a significant portion of the loss of jobs between 1989 and 2001. It is almost impossible to estimate the effects of overall productivity growth, but several studies show that the 'productivity' explanation could account for about two-thirds of the jobs lost over the last decade.

Turning to the future, US aerospace employment projections are not encouraging. The increased competition in global markets, the expansion of outsourcing practices beyond domestic borders, and the increasing trend towards offset agreements[29] are the main factors behind the expected continued decline in US aerospace employment over the coming years. If the current scenario of declining US global market share and increasing foreign content of US aerospace products is confirmed, the US space sector could lose about 40% of its current jobs between 2003 and 2010.

4.3.2 Space industry

Space industry can be divided into two main segments, the upstream and downstream markets. The upstream market includes the space and ground segments of space programmes and the relevant operations. Regular actors in this market are the component manufacturers, equipment and space software-application suppliers, small-system integrators (SSI), large-system integrators (LSI), space institutions, satellite and launcher operators, and the ground-terminal manufacturers.

[28] Data from the Economic Policy Institute.

[29] Offset practices are arrangements to transfer high-skilled jobs and valuable technologies to other countries in exchange for market access for US aerospace products.

The downstream market includes all of the ground-based value-added applications and services enabled by the space programmes in the fields of telecommunications, Earth observation and navigation. This segment is essentially owned by the satellite service providers and is to be considered highly commercial and globally oriented.

UPSTREAM

The upstream space sector is particularly linked to the aerospace industrial sector. Manufacturing companies, above all large-system integrators, are often part of big aerospace and defence industrial groups.

Of the first five space companies ranked by Space News by their sales in 2002 (see Table 4), only one is not part of a aerospace and defence industrial giant.

Table 4 – World's top ten satellite manufacturers (Source: Space News)

Company	***Sales* 2002***	***Versus 2001***
Boeing Co.	*11 000*	*+5.8%*
Lockheed Martin Corp.[30]	*7500*	*+21.2%*
Northrop Grumman Corp.[31]	*2672*	*+281.8%*
EADS Space	*2323*	*+7.5%*
Alcatel Space	*1363*	*-3.9%*
Loral Space & Comms. Ltd.	*853*	*+4.7%*
Mitsubishi Electric Corp.	*835*	*+9.4%*
Orbital Science Corp.	*552*	*+33.0%*
Alenia Spazio SpA	*525*	*+19.3%*
Ball Aerospace & Techn. Corp.	*448*	*+17.9%*

**Millions of US$*

[30] **Includes 50% share of United Space Alliance.**

[31] **Includes TRW revenues.**

In the United States and in Europe, the process of restructuring started late in the nineties, is still going on, and reflects today the changes in the political and socio-economic scenarios, as well as the role of space applications and services in society.

The number of major US aerospace prime contractors shrank from more than 50 to just five: Boeing, Lockheed Martin, Raytheon, General Dynamics and Northrop Grumman. Boeing is the only remaining US commercial manufacturer of large aircraft.

As far as Europe is concerned, the large-system integrators shrank in number from more than five to just three: EADS Astrium, Alcatel Space, and Alenia Spazio.

A more detailed analysis of Table 4 will be provided in the following paragraphs.

EUROPE

The worldwide consolidation of the aerospace industry and of the space sector shaped by the economic and political environment began in the nineties and is still in progress. The quest for improved economic efficiency and technical specialisation has driven a diversification within the European space organisations. Although continuing restructuring and competition keep modifying the definition of the market and the activities of individual actors, a segmentation of the European space sector is emerging, which enables the mapping of major products and activities within the space sector. Table 4 provides the mapping of the space products and activities to actors in the European space sector.

Space products and services can be segmented into the following elements:

1. Components, for the ground and space segments.

2. Equipment, software and otheritems, for the ground and space segments of the space infrastructures.

3. Design and Integration (D&I) of subsystems, payloads and or small satellites.

4. D&I of large satellites, launch systems and orbital infrastructures.

	Components	***Equipment Software***	***Design and Integration of Subsystems, Payloads, Small Satellites***	***Design and Integration of Satellites & Launchers***	***Design and Integration of Systems of Systems***	***Spacecraft Operations***	***Ground-Segment Terminals***	***Service Delivery***
Component Manufacturers	✓							
*Equipment, Software Suppliers (Space)**	✓ *few cases*	✓						
Small System Integrators		✓ *few cases*	✓		✓ *one case*			
Large System Integrators		✓	✓	✓	✓	✓		✓
Space Institutions		✓ *Prime Control Centre*	✓ *Payloads*			✓ *Scientific Mission*		
Satellite & Launcher Operators				✓ *Launchers*		✓		✓ *FSS Operators*
Ground Terminal Manufacturers							✓	
Satellite Service Providers								✓

Table 5 - Mapping of space products and services to the European space organisations (Source: ESA)

5. D&I of 'systems of systems', encompassing a space infrastructure and data handling, processing, storage, distribution to multiple including numerous ground users and (COTS) infrastructures.

6. Launch operations, operation of systems of systems, satellite operations, including the sale of satellite capacities and the sale of services associated with those satellite capacities.

7. Ground-segment equipment (manufacturing, distribution or specialised integration) relevant to fixed satellite services, for B2B or B2C applications, or to navigation services. Some examples are VSAT, TV receiving antennas, GPS terminals and audio receivers.

8. Service providers and content managers, such as for broadband Internet access, television broadcasting and digital audio broadcasting.

In 2002 the European space industry earned 4.73 billion Euro with 34 727 employees. After a 5.8% decrease in consolidated turnover between 2000 and 2001, the revenues of the European space sector fell further in 2002, by 11.3%, or 520 million Euro mainly driven by the recession in the sales of civil products to commercial customers (-39.2%). Sales of civil products to institutional customers and of military products also suffered significant reductions.

The decline in revenues affected Europe as a whole. Only five out of fifteen countries (Belgium, Denmark, Austria, Ireland and Portugal) experienced marginal to positive increases. The remaining ten countries suffered a decrease. The reduction exceeded 5% in eight countries, including Germany, Spain and Switzerland. France and Norway suffered more than a 10% reduction. Italy and Sweden suffered a drop in excess of 15%, and the Netherlands experienced a fall of more than 20%.

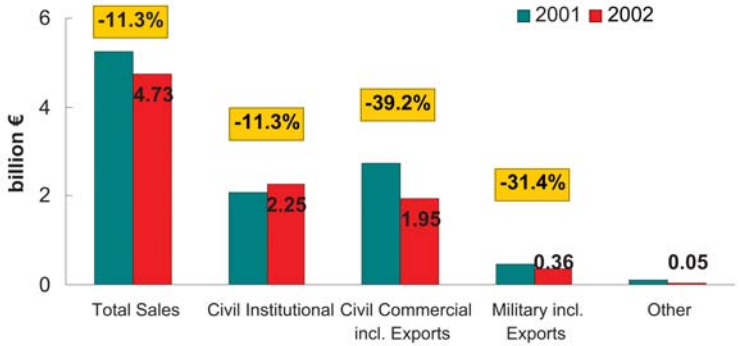


Figure 30 - Evolution of civil and military turnovers in the European aerospace industry between 2001 and 2002 (Source: Eurospace)

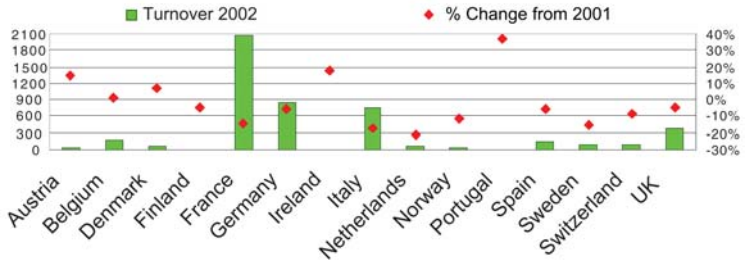


Figure 31 - Turnover of the European aerospace industry between 2001 and 2002 (Source: Eurospace)

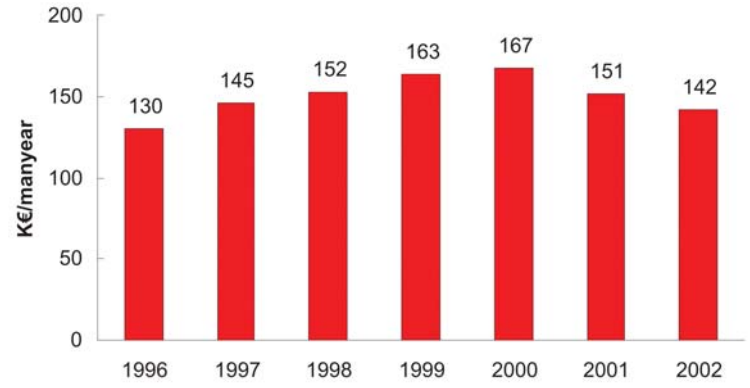


Figure 32 - Productivity (turnover/employment) in the European space industry from 1996 to 2002 (Source: Eurospace)

After a steady increase up to the peak of 167 000 Euro/man-year in 2000, the productivity of the European space industry dropped to 142 000 Euro/man-year in 2002, i.e. below the level of 1997.

In 2002, the European aerospace industry earned 183 000 Euro in revenue per employee. Space and missiles generated 142 000 Euro and 143 000 Euro in sales per employee, respectively. Compared to aircraft, space and missiles reflect the high amount of labour required to generate the same revenue (+33%).

The European upstream market addresses the following main products:

1. Launchers
2. Satellites
3. Space Infrastructure
4. Ground Segment
5. CAE/CASE and other Software.

In the period 1999–2001, satellite products had a dominant 46% market share, followed by the launch vehicles (29%) and the ground segment (12%). Space infrastructure, including the International Space Station and microgravity, accounted for 10% of the sales, and software applications for 3%.

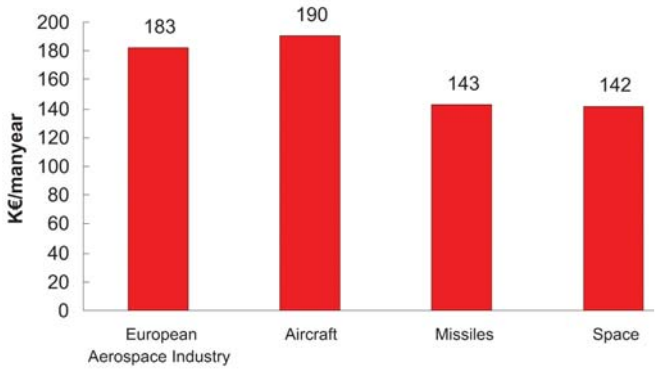


Figure 33 - Productivity (turnover/employee) in the European space industry from 1996 to 2002 (Source: ESA, AECMA & Eurospace)

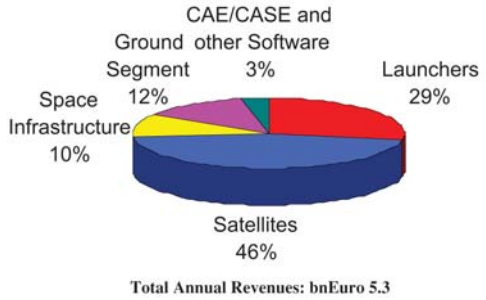


Figure 34 - Products of the upstream market segment in Europe in the period 1999–2001 (Source: ESA, Bertin Technologies & Euroconsult)

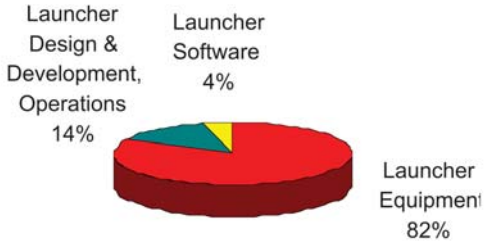


Figure 35 - Launcher products in Europe in the period 1999-2001 (Source: ESA, Bertin Technologies & Euroconsult)

Equipment accounts for more than 80% of the European launcher products. The launcher equipment market in Europe is largely defined by the Ariane industrial structure and most suppliers are completely dependent on the Ariane business. A few European manufacturers have succeeded in exporting special products.

Satellite equipment represents two-thirds of the European satellite products. Design, development, assembly, integration and testing account for less than a third of the revenues, and the remaining 5% of sales are generated by onboard and EGSE software. The trade balance in the period 1999–2001 was marginally positive. However, the competitive advantage of numerous pieces of European equipment relying on technologies subject to US export control or licensed by US competitors is questionable in the longer term. The European large-scale integrators and their subsidiaries dominate the European market for satellite equipment. They generate more than 70% of the overall revenues, and all of the sales for the commercial telecommunication satellites.

Equipment accounts for about two-thirds of the European ground-segment market, the remaining third being attributed to software. The competition is worldwide, with US firms seeking advantage through lower costs and superior component technology.

The industrial structure of the European equipment and software suppliers for satellites and ground segments is highly fragmented. Several smaller firms largely rely on the ESA programmes and the associated rules for geographical return, and on the national institutional programmes.

European manufacturers of electronic components for space are in a comparatively difficult competitive position with respect to US suppliers. European equipment suppliers depend on US manufacturers for advanced-technology components. Travelling-wave-tube amplifiers and batteries are prominent exceptions.

The European suppliers of ground terminals compete in a worldwide market dominated by US firms. European suppliers specialise in niche markets. Few are successful in the US. So far, European suppliers have found scant support in the institutional markets. US suppliers have instead built-up significant competitive advantage by developing technologies and products within US defence programmes before entering the commercial markets.

The main European space operators are Arianespace, Eutelsat and SES Global, and Eumetsat, delivering launch, commercial telecommunications and meteorological services, respectively. Arianespace is facing a difficult business cycle due to the concurrent downturn in the global commercial telecommunications market, the competition from Russian launchers, and the overcapacity in the launcher vehicle industry.

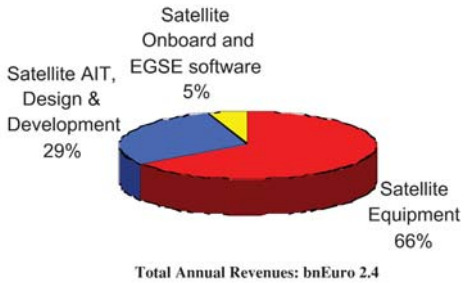


Figure 36 - Satellite products in Europe in the period 1999-2001 (Source: ESA, Bertin Technologies & Euroconsult)

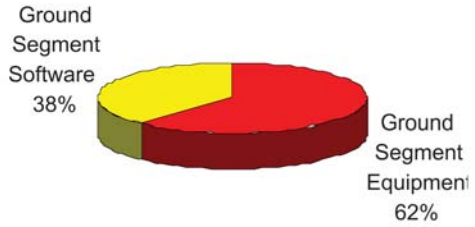


Figure 37 – Ground-segment products in Europe in the period 1999-2001 (source: ESA, Bertin Technologies & Euroconsult)

Institutional organisations involved in European space activities participate at different levels. In addition to its primary procurement function, CNES, the French space agency, also undertakes development and integration tasks for satellite payloads and platforms. CNES has also played an important role in the development of the family of the Ariane launchers, the ground segment and the operations of the Guyana Space Centre. CNES is also operating Earth-observation and telecommunications satellites. DLR, the German space agency, and Swedish Space Corporation also develop and operate satellites. ESA's main roles are the development, procurement and operation of scientific, Earth-observation and manned-spaceflight missions. The efficiency of the national space agencies, their industrial policies and the coordination of these policies with other agencies, influence ESA's efficiency to a large extent. Initiatives aimed at increasing the consistency of ESA's and national programmes are essential to increasing the efficiency of institutional funding from different sources. The Network of Centres initiative calling for co-operation between national agencies, and the harmonisation of the European space technologies are instances of the on-going cooperative effort being made by ESA.

USA

In 2002, global satellite-industry revenues continued to grow despite a general downturn in the telecommunications sector and a weak overall global economy. The industry experienced a moderate revenue growth of 10% despite the financial stress experienced by many of its major players. Government spending and strong consumer demand for satellite video services were responsible for almost all of this growth. According to figures provided by Futron Corporation, orders for commercial geosynchronous (GEO) satellites dropped from 28 in 2001 to 7 in 2002, rebounding to 19 in 2003.

The World satellite-industry revenues broken down into the four main segments - satellite services, launchers, satellite manufacturing and ground-equipment manufacturing - shows (see figure) that every sector experienced growth in 2002 and that the satellite services' share of total revenue has grown over the period from 42% of the total in 1996, to 57% of the total in 2002. However, the satellite and launcher sectors continue to be hampered by overcapacity. It should be noted that the revenues reported here are from both private and public sources.

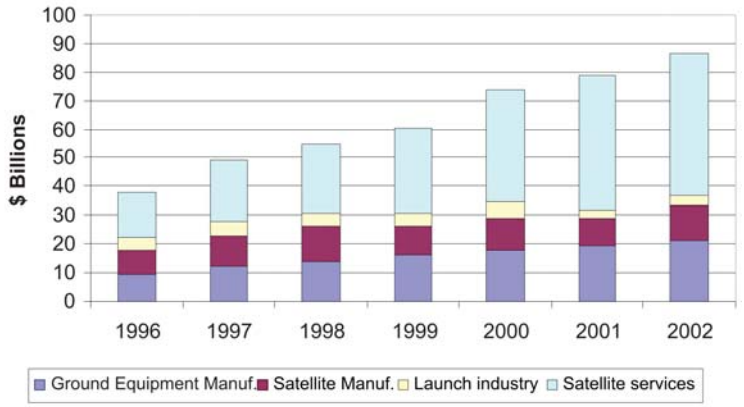


Figure 38 - Evolution of the satellite industry's revenues by product (Source: Futron Corp.)

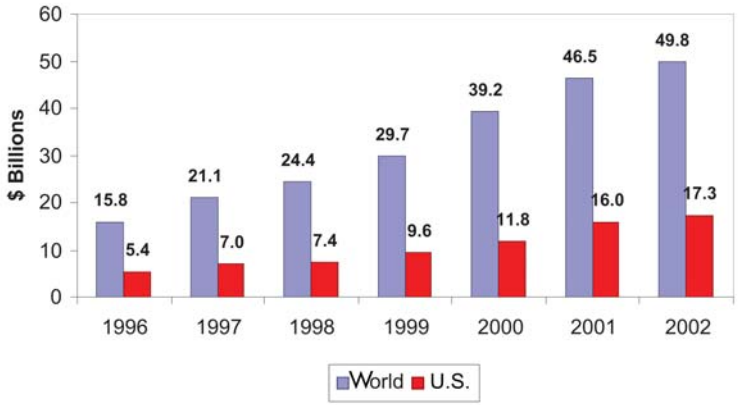


Figure 39 - Evolution of the satellite services share of revenues (Source: Futron Corp.)

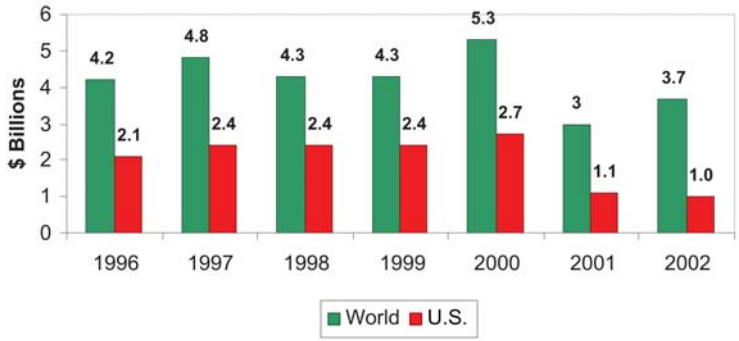


Figure 40 - Evolution of the launch industry share of revenues (Source: Futron Corp.)

SATELLITE SERVICES

The satellite services sector has nearly tripled in size from 1996 to 2002. However, revenue growth in the sector slowed to 7% in 2002, compared with 19% growth in 2001. Approximately the same trend applies to the US portion of satellite-industry revenues (see figure).

LAUNCH INDUSTRY

While global launch-industry revenues grew by 23% in 2002, those in the US declined by 9%. According to analysts, US revenues declined because of fewer US launches, but also because of lower launch prices.

The evolution of the US launch industry revenues over the period 1996-2002, by source of funding[32], is shown in the accompanying figure.

SATELLITE-MANUFACTURING REVENUES

In 2002, global satellite-manufacturing revenues increased by 27%, while the US portion grew by 16%. The 2002 growth in the global sector is partially attributable to the launches of two 1 billion US$ satellites (Milstar 5 and Envisat), increased launches for Asia, and the launch of 7 Iridium payloads. Increased manufacturing revenues reflect the large number of contracts awarded in 2000 and 2001. The significant decline in orders for 2002 is expected to be reflected in the 2004 revenues.

[32] These figures are not publicly available, but were provided by Futron as a courtesy to the ESA Washington Office.

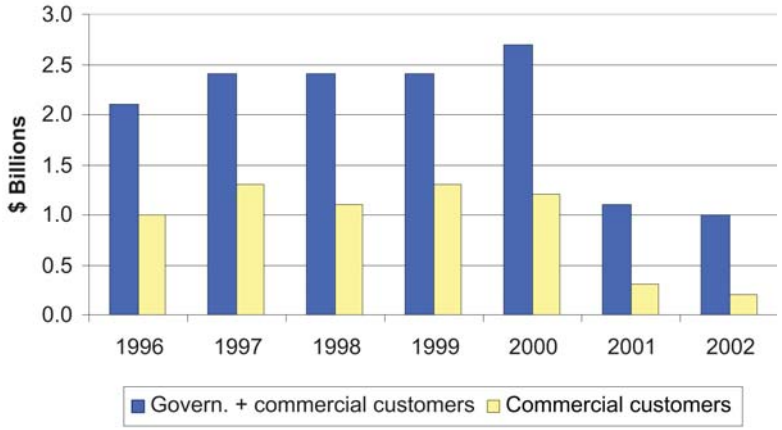


Figure 41 - Evolution of the US launch industry's customer base (Source: Futron Corp.)

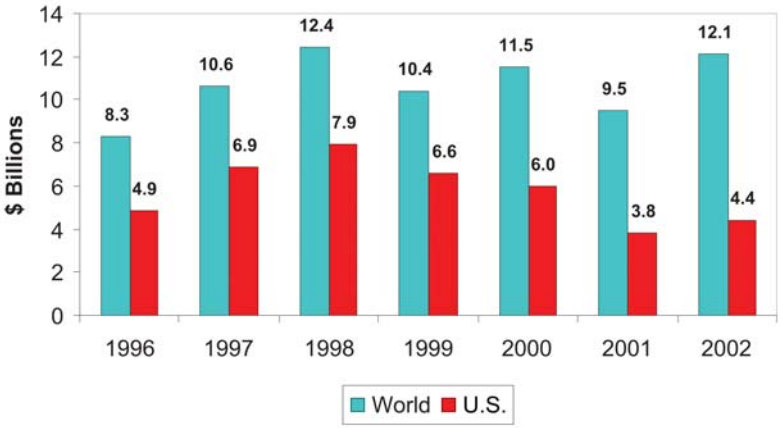


Figure 42 - Evolution of the satellite-manufacturing revenues (Source: Futron Corp.)

The reduction in the US launch and manufacturing market share reflects a number of complex factors, including the increased competitiveness of foreign suppliers as well as a continued perception that US satellite export-control policies are a barrier to commerce.

In 2002, revenues from commercial customers accounted for about 45% of the total US revenues for satellite manufacturing[33].

[33] This figure is not publicly available, but was provided by Futron as a courtesy to the ESA Washington Office.

Among the subcontractors, or second-tier vendors, in the space sector, it is interesting to note the case of the components suppliers. At the end of the 90's, driven by the shrinking of activities due to the sharp decline in orders and increased competition, the US prime contractors started to focus their internal production only on strategic elements - such as propulsion technologies - outsourcing the manufacturing of basic components, such as batteries, etc., to external firms (often recently created by former employees). The business of space components is considered by the analysts as a growing activity and therefore, at the moment, contrary to what is happening at the prime-contractor level, there is no push for mergers. It should be underlined that DOD policy in the early to mid-90s was largely responsible for the rush to merge. This Administration does not have the same policy - even the Clinton Administration began to back away from that policy in its later days. Business factors and commercial conditions will determine whether subcontractors need to merge or not to compete.

Even if is not correct to use the term 'subsidies', it is likely that the Air Force, which at the moment is concerned about US reliance on other countries' manufacturing, will use 'investment techniques' to strongly recommend to prime contractors that they buy components from a specific company.

US SPACE INDUSTRY BY COMPANY

The four largest US space manufacturers - Boeing, Lockheed Martin, Raytheon and Northrop Grumman - accounted for about two-thirds of the total US space revenues in 2002. Their space business profile, compared with 2001, shows that despite the decline in the commercial space business, they have all recorded increased revenues due to DoD boosting its spending on satellites and launch services.

[34] The decline in BSS business cannot be quantified in budgetary terms (the IDS Space and Communication budget line is not broken down to lower levels) and is rather based on 'qualitative' evidence. In fact BSS secured just two satellite orders in 2002, both additions to existing contracts, of which only one was commercial.

[35] Combination of TRW's 2.1 billion US$ in space-related sales with Northrop Grumman's own space revenue of 572 million US$.

Space sales in 2002 also represented a higher proportion of the overall sales for all four companies, compared to 2001.

In 2002 Boeing maintained its leadership position in space-related operations, despite continued problems in its commercial satellite and launch operations. Space and communication revenues within Boeing's Integrated Defence System (IDS) business increased by about 6% in 2002, to a total of 11 billion US$, but commercial operations, such as Boeing Satellite Systems (BSS) suffered from the sharp downturn[34] in the commercial-satellite business. While Boeing's commercial sales are declining, its government sales are on the rise. Boeing has a major role in the US military's transformation (e.g. the award of the Wideband Gapfiller satellite contract and the major role in the Pentagon's missile-defence initiative known as the 'ground-based mid-course defence segment') and continues to be NASA's largest contractor.

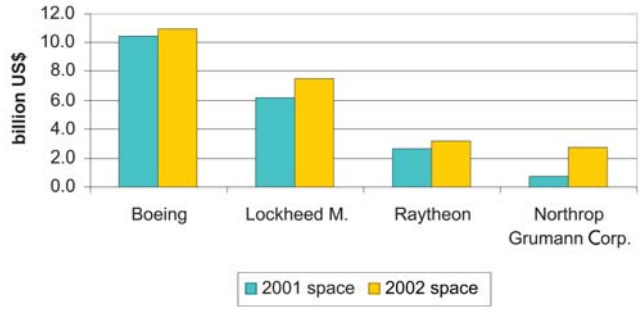


Figure 43 - Top US space companies in 2002 (Source: Space News)

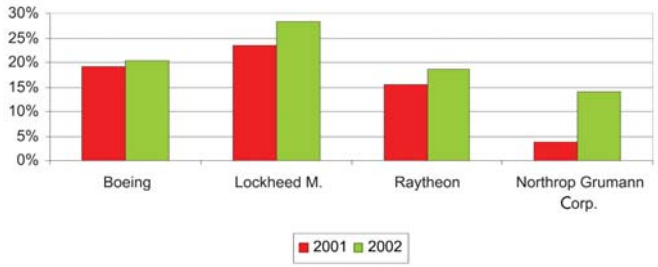


Figure 44 - Ratio between space and total revenues for US companies (Source: Space News)

In 2002, Lockheed Martin space operations grew by about 21% to 7.5 billion US$. That figure includes 2.6 billion US$ (34%) stemming from satellites built for the US government, which is the company's most profitable space activity. While Boeing is moving to reinforce is government work, Lockheed Martin is consolidating its position in launch services and satellite manufacturing for the commercial market. The Atlas 5 rocket, which debuted in August 2002, remains the only US vehicle competing for EELV commercial launches. Lockheed Martin is the largest US military space contractor. The company's military work includes the Milstar communications-satellite programme and the next-generation Advanced Extremely High Frequency system. Lockheed Martin is also the prime contractor for the GPS IIR system and the Space Based Infrared System (SBIRS).

The Raytheon Corp.'s space business grew by about 20% in 2002, mainly on the government funding which includes a variety of sensors for military spacecraft, missile defence equipment and satellites owned by NASA.

In 2002, Northrop Grumman Corp. with its 2.7 billion US$ in sales[35], virtually all from government programmes, became the World's fourth largest space company. Its acquisition of TRW gives Northrop Grumman a strong presence in the government space business, equipping it to be a complete system integrator for the Department of Defense. TRW provides skills as a supplier of advanced communications payloads that complement Northrop Grumman's strengths in sensors and other systems critical to military space work.

Turning to 2003, Lockheed Martin and Boeing reported recently improved financial performances by their space divisions, mainly as the result of growing US Defence Department work. Civil government and military work made up at least two-thirds of Boeing's satellite business in 2003, and this is expected to be maintained in 2004. Over the next few years, Boeing expects

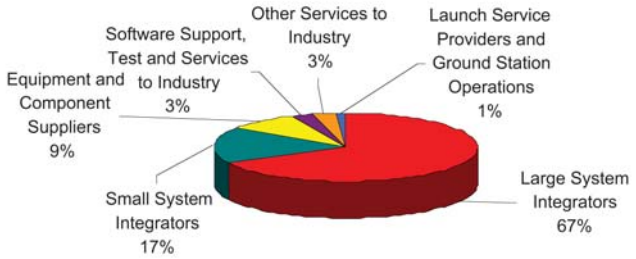


Figure 45 - Organisation of the European space industry in 2002 based on consolidated revenues (Source: Eurospace)

the military work to grow somewhat faster as a percentage of the company's business.

The volume of space business represented by the military market can be partially quantified by looking at the variety of unclassified military space programmes funded by the DoD. In FY 2003, military space programmes received funding of 3.2 billion US$, and they are scheduled to receive extra funding in FY 2004 bringing the total to 3.4 billion US$.

The Air Force led the majority of major DoD space programmes, accounting for almost 3 billion US$ in 2003. The funding for those programmes is expected to decrease to 2.6 billion US$ in 2004. It should be recalled that the total DoD space budget for 2003 amounted to about 18 billion US$.

On the commercial side, in 2003 the orders for commercial geosynchronous (GEO) satellites[36] experienced a substantial rebound, from the very low level of 7 orders in 2002 to 19 in 2003. In 2001, there were 28 orders for commercial geosynchronous (GEO) satellites.

EVOLUTION OF SYSTEM INTEGRATORS

The European space industry is highly concentrated, with the Large System Integrators (LSIs) accounting for two-thirds of the market in 2002. The Small System Integrators (SSIs) provide one sixth, and the equipment and component suppliers close to a tenth of total sales. Software, test and other services including launch and ground operation services, generate the remaining 7% of total sales. The vertical integration of the European space industry is confirmed by the revenue concentration ratio (i.e. the ratio of consolidated to total turnover), which has increased steadily from 0.58 in 1997 to 0.73 in 2002.

In 2002, the LSIs, SSIs and suppliers of software support, test and services experienced a consistent drop in earnings in the range of 12%. Equipment and component suppliers suffered a 4% decline.

Besides structural and technological factors affecting pricing, the difference in productivity reflects the different competitive positions within the European space industry, particularly the bargaining power exerted on customers and suppliers, the concentration of the industry, and the price sensitivity of customers. LSIs generate revenues per employee 8% higher than the European space industry and 16% above those of SSIs, equipment and component suppliers, and launch-service providers. These categories, in turn, are showing a 26% higher productivity than software support, testing and other services to industry.

The distribution of turnover provides further evidence of the degree of concentration within the European space industry, with EADS Space accounting for two-thirds of the LSIs' non-consolidated revenues, Alcatel Space for one quarter, and Alenia Spazio for one eighth, in 2002

Employment within the SSI group indicates that EADS Space leads also in terms of productivity, with a non-consolidated turnover per employee of 211 000 Euro/man-year, followed by Alenia Spazio with 185 and Alcatel Space with 180. The average productivity of the LSIs is 199 000 Euro/man-year.

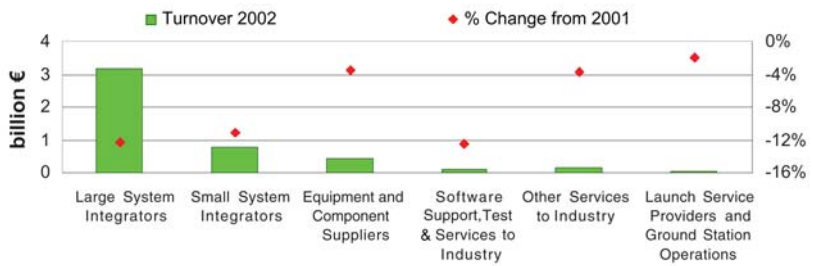


Figure 46 - Turnover distribution within the European space industry between 2001 and 2002 (Source: Eurospace)

[36] Figures provided by Futron Corp.

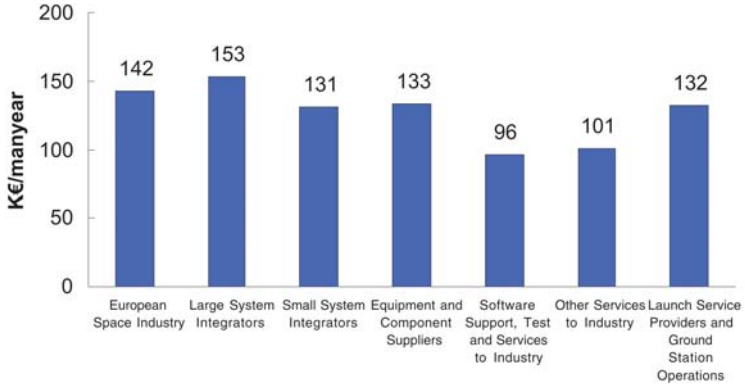


Figure 47 - Productivity (turnover/employment) within the European space industry in 2002 (Source: ESA, AECMA & Eurospace)

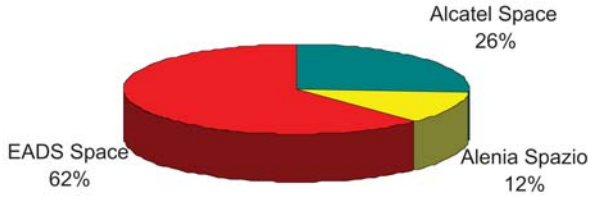


Figure 48 - Distribution of non-consolidated turnover within the Large System Integrators in 2002 (Source: Alcatel Space, Alenia Spazio & EADS Space)

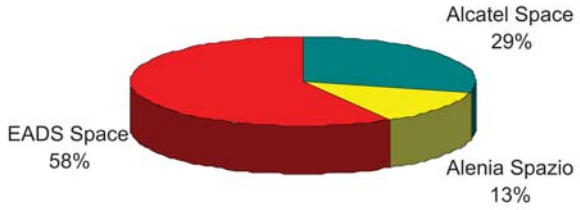


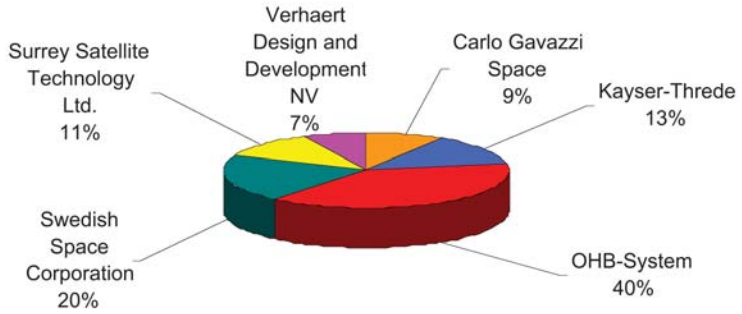
Figure 49 - Employment within the Large System Integrators in 2002 (Source: Alcatel Space, Alenia Spazio & EADS Space)

The SSI group includes six European players: Carlo Gavazzi Space, Kayser-Threde, OHB-System, Surrey Satellite Technology Ltd., and Verhaert Design and Development NV. Space activities generate nearly 90% of the SSI total revenues, and five of the six firms earn 80% or more of their sales from their space operations. OHB-System led the SSIs with a 40% market share in 2002.

In the same period, Swedish Space Corporation was the top employer, accounting for about one-third of the total SSI workforce. OHB-System achieved the largest turnover per employee with a productivity of 360 000 Euro/man-year, twice the SSI average of 176 000 Euro/man-year.

Over the last few years, competition between LSIs and SSIs has intensified in the markets for subsystems, payloads, and particularly small satellites in the 300 kg range for scientific and remote-sensing missions. The increasing participation of institutional organisations (e.g. CNES and Swedish Space Corporation) and research organisations contributes to the growing complexity of the industrial structure associated with these markets. It may be questioned whether the fragmentation of the suppliers of subsystems, payloads and small satellites is compatible with the economic downturn worldwide and in the European institutional budgets.

Figure 50 - Estimated distribution of the turnover within the Small System Integrators for space activities in 2002 (Source: Vista Advisers)



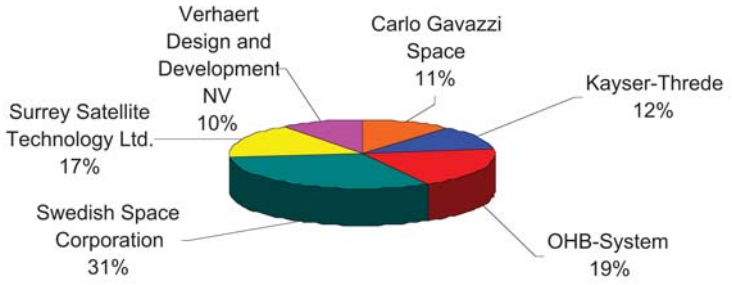


Figure 51 - Employment on space activities within the Small System Integrators in 2002 (Source: ESA & Vista Advisers)

In the United States, in 2002 Boeing maintained its leading position in space-related operations, despite continued problems at its commercial-satellite and launch-operations subsidiaries. The space and communication revenues within the Boeing Integrated Defence System (IDS) business increased by about 6% in 2002, to a total of 11 billion US$, but commercial operations, such as Boeing Satellite Systems (BSS) have suffered from the sharp downturn[37] in the commercial-satellite business. While Boeing's commercial sales are declining, its government sales are on the rise. Boeing has a major role in the US military's transformation (e.g. the award of the Wideband Gapfiller satellite contract and the major role in the Pentagon's missile defence initiative known as the 'ground-based mid-course defence segment') and continues to be NASA's largest contractor.

In 2002 Lockheed Martin's space operations grew by about 21%, to $7.5 billion. That figure includes 2.6 billion US$ (34%) stemming from satellites built for the US government, which is the company's most profitable space activity. While Boeing is moving to reinforce is government work, Lockheed Martin is consolidating its position in launch services and satellite manufacturing for the commercial market. The Atlas 5 rocket, which debuted in August 2002, remains the only US rocket competing for EELV commercial launches. Lockheed Martin is the largest US military space contractor. The company's military work includes the Milstar communications satellite programme and the next-generation Advanced Extremely High Frequency system. Lockheed Martin is also the prime contractor for the GPS IIR system and the Space-Based Infrared System (SBIRS).

Raytheon Corp.'s space business grew about 20% in 2002, mainly on the back of government funding which includes a variety of sensors for military spacecraft, missile defence equipment and satellites owned by NASA.

In 2002, Northrop Grumman Corp. with its 2.7 billion US$ in sales[38], virtually all from government programmes, became the World's fourth largest space company. The acquisition of TRW gives Northrop Grumman a strong presence in the government space business, equipping it to be a complete system integrator for the Department of Defense. TRW provides skills as a supplier of advanced communications payloads that complement Northrop Grumman's strengths in sensors and other systems critical to military space work.

Looking to 2003, Lockheed Martin and Boeing recently reported improved financial performances by their space divisions, mainly the result of growing US Defense Department. Civil government and military work made up at least two-thirds of Boeing's satellite business in 2003 and this is expected to be maintained in 2004. Over the next few years, Boeing expects the military work to grow somewhat faster as a percentage of the company's business.

DOWNSTREAM

The downstream value-added market includes three main segments:

1. Telecommunications
2. Earth Observation
3. Navigation.

Telecommunications value-added services represent the most mature segment in the industry and the most developed commercially. In 2002, satellite-based value-added telecommunications services have generated 50 billion Euro worldwide, half of which was related to Direct-to-Home services. Satellite-based telecommunications services are provided worldwide by more than 1000 operators, 1500

[37] The decline in BSS business cannot be quantified in budgetary terms (the IDS Space and Communication budget line is not broken down to lower levels) and is rather based on 'qualitative' evidence. In fact BSS secured just two satellite orders in 2002, both additions to existing contracts, of which only one was commercial.

[38] Combination of TRW's 2.1 billion US$ in space-related sales with Northrop Grumman's own space revenue of 572 million US$.

Internet service providers, 500 VSAT and professional service providers over more than 10 000 channels and 50 digital TV platforms.

The consolidation within the suppliers of downstream value-added services worldwide is also reshaping the European industry. SES Global was born through the merger of SES Astra with GE-Americam to form the largest global commercial telecommunications company. SES-Global, like other operators, is moving in Europe from its Direct-to-Home core business to global broadband services through geographic expansion, and product and service diversification. This move corresponds with the relative decline in the Direct-to-Home market. Eutelsat was recently the target of a hostile bid from Intelsat and Panamsat. Considering the past procurement policy of these firms, a take-over by one of these companies may prove detrimental to the European commercial telecommunications industry.

Concentration characterises the commercial telecommunications value-added market worldwide, with 70% of all transponders owned and operated by five large suppliers. Central to the competitive strategy of these firms is their quest for the largest possible share of service users worldwide. Consolidation and mergers can be expected to continue and form even larger global operators surrounded by smaller regional operators. Mergers are likely to drive the rationalisation and standardisation of the satellite fleets.

Very large operators and fleet standardisation will increase the customer's bargaining power, and increase the downward pressure on the prices for telecommunications satellites and launch services. Direct-to-Home television service providers dominate the European satellite service market. Satellite service providers such as Globalcast (a subsidiary of France Telecom), British Telecom, Kingston and Netsat Express/GSI, manage satellite hubs and provide access to it via partners. The business is global and therefore requires a worldwide presence and coverage. Satellite service providers are tending to come closer to the user by providing software and seamless integration of services. Content managers for business TV, e-learning, file broadcasting, etc. are forward-integrating their service delivery by providing data-centre services, server hosting, integration, hardware, and end-user system maintenance. Few European firms participate in this market.

Earth-observation value-added services yielded 800 million Euro worldwide in 2002. The Earth-observation service industry within Europe is fragmented and consists of different organisations:

- Several small, privately owned value-adding companies offering products and services.
- Some government-funded agencies.
- Some subsidiaries of large aerospace companies.
- Some medium-sized subsidiaries of large market owners operating in the geo-information business.

The industry fragmentation is conducive to a very large variety of products and services with respect to the content and quality of the information, the processes applied to generate the information, and the maturity of the procedures used for the service delivery.

The value-adding companies and the market owners play an essential role in raising revenue within the Earth-observation value-added services. In general, the value-adding companies are small firms operating in niche markets providing highly specialised services for local or regional markets. Revenues are small, leaving only limited funds for strategic investments. The

value-adding companies are often the developers of innovative products and services. Several market owners are large private companies or government institutions and agencies supplying an established set of operational geo-information services to the users. The geo-information services offered by them are often mainly based on ground-based sources.

Some market owners run not-for-profit operations, e.g. civil protection, national and international mapping agencies. Commercial market owners include seismic survey companies, oil-field survey companies, airborne survey companies and re-insurance brokers. For European space-based Earth-observation data products, areas within Europe account for most of the sales. Exploitation of the capabilities of European Earth-observation service companies in markets with immediate prospects for market growth, e.g. South-East Asia and Latin America, is limited.

Earth-observation value-added services yielded 4 billion Euro worldwide in 2002.

EMPLOYMENT

In the upstream market, the European space industry employed 33 254 people in 2002, and suffered an overall 4.4% job reduction. The concentration of the European space industry is apparent in the distribution of employment.

Only four out of fifteen countries (Austria, Finland, Ireland and Portugal) experienced marginal to positive increases. The remaining eleven countries suffered job losses. The reduction exceeded the 4.4% European average in seven countries, including France, Germany, Belgium, Sweden and Denmark, and 10% in the Netherlands and Norway.

In the United States, since the late 80's it has been evident that the aerospace industry is facing a major workforce crisis. US aerospace industry employment fell in 2003 for the fifth straight year to its lowest end-of-year level since before 1953, to stand at an estimated 575 400. This represents a decrease of about 7% with respect to the previous year, and 22% when compared to 1998. Employment in the space and missile sector, which represents about 12% of the US aerospace workforce, declined about 4% compared to 2002, and by almost 60% when compared with the levels of the 1990's[39].

The decrease in demand - due both to the reduction in US defence spending and the loss of global market share - and productivity improvements are considered to be the major causes of the decline in US aerospace employment.

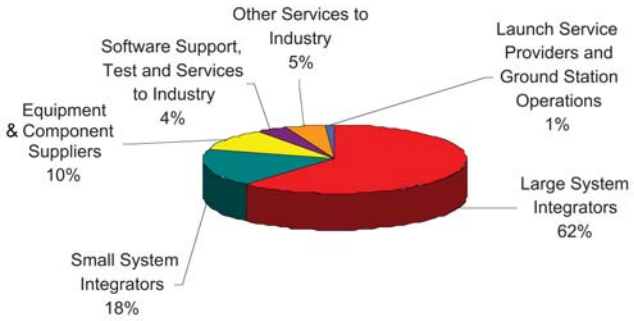


Figure 52 - Distribution of employment within the European space industry in 2002 (Source: Eurospace)

[39] MIT presentation on 'Preliminary Analysis of Global Aerospace Employment'.

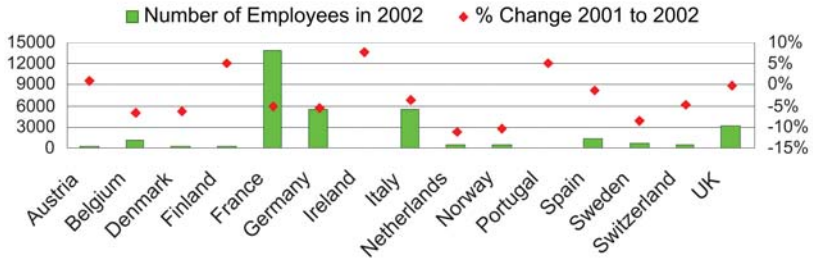


Figure 53 - Employment distribution in the European space industry in 2002 (Source: Eurospace)

4.4 The public-funded space-related infrastructures

The on-going restructuring of space industry has a particular bearing on the future role and capabilities of public space centres. Both European and US public administrations over the last decades have actively contributed to making space activities and space industry a reality, by supporting them with well-developed public infrastructures and capabilities. However, the general economic downturn, the resulting financial constraints, as well as the growing competence of industry, have raised questions about the consolidation of the public sector in Europe, and produced calls for a more rationalised approach in the US also.

4.4.1 Europe

As it is closely interconnected with the future respective roles of the agencies and industry, the technical centres issue is central to the process of re-engineering the role of the public sector in Europe. As such, it is incorporated into a European space strategy, whose overall objectives are to enhance the role of Europe in space activities, harmonise European and national resources and activities, and foster industry's development. Responding to the invitation of Ministers[40], identifying networking as the way ahead for technical centres in a context where Europe needs a strong technical capacity if it is to reinforce its position in space, in 1999 ESA launched the Network of Technical Centres initiative, whose overall objectives include the provision of benefits to Member States, the achievement of an overall balanced situation, and the assessment of potential risks. The overall initiative is coordinated and supervised by a Network Steering Group, composed of the Director Generals of the centres involved, monitoring the activities of the pilot projects and assessing the progress of the initiative according to the guidelines provided by the ESA Council.

The action plan[41] for implementation of the initiative includes the establishment of numerous networks according to the different technical capacities required for the realisation of space programmes. These individual networks are being developed in a phased approach with reviews prior to entering each next phase.

The *Project Reviews Integrated Pilot Network (PRINCE),* after several years of successful probation, entered its fully-fledged operational phase in October 2003. Six Agencies formally agreed to participate in the Network, namely ASI, BNSC, CDTI, CNES, DLR and ESA. During the Qualification Phase, 22 Reviews of a great variety of projects were opened to cross participation by reviewers from other Centres. 38 formal requests were issued by participating Centres and this led to 61 formal proposals from Centres, of which 37 were accepted.

[40] ESA/C/-M/CXLI/Res. 1 & 2 (Final).
[41] ESA/C(99)107.

The *Flight Operations Pilot Network,* involving 8 Agencies, namely ASI, BNSC, CDTI, CNES, DLR, ESA, NSC and SSC, is now in its consolidation phase (a pre-operational phase). The scope of its activities includes the management and provision of facilities, expertise and resources applicable to the preparation and conduct of satellite operations, ground-segment operations, and ground-station network operations, for a number of programmes such as Galileo, GMES and, in the future, the Digital Divide initiative. Currently, the Pilot Network federates 10 Control Centres Europe-wide, involving about 1100 technical staff.

The *Space-Debris Pilot Network* is currently in its qualification phase. Beyond the existing Inter-Agency co-ordination, a space-debris network is instrumental in defining possible reinforcement and/or evolution of the relevant European resources, considering, in particular, improved risk object tracking support services and, ultimately, the setting-up of a European surveillance facility. The Pilot Network, whose current members are ASI, BNSC, CNES, DLR and ESA, is carrying out activities in such areas as space-based Optical Observations, in-situ Detection and Material Returned from Space, Hypervelocity Impacts and Protection, and for the European Space Debris Mitigation and Safety Standards.

The *Environmental Test Facilities Pilot Network,* launched within the co-ordination of European Test Facilities (CETeF), fulfils the mandate to promote co-ordination of the ESA and national test centres. In the current setup, the cooperation between ESA-ESTEC, IABG (D), Intespace (F) and CSL (B) has proved to be of the utmost importance for bringing the European test facilities together, co-ordinating their use for ESA and national programmes, scrutinising new investments, and contributing to the understanding of the capabilities and limitations of the different centres.

The setting up of further new pilot networks, in the areas of data acquisition and archiving, launchers, test facilities and other technical fields, is currently under consideration.

4.4.2 USA

In order to cope with the management of the huge investments made in space operations control centres, the US administration pursued a different approach.

In 1998, when NASA combined most existing NASA-wide space operations contracts into what was called the 'CSOC' (Consolidated Space Operations Contract), it estimated that consolidation of existing space operations contracts under this single CSOC contract (under the stewardship of industry) would result in savings of 1.4 billion US$ over a 10-year period. In 1999, the Senate Appropriations Committee directed NASA to report to Congress every six months on the expected savings under the CSOC. The NASA Office of Inspector General audit of the CSOC found that NASA was unable to substantiate the 62 million US$ of cost savings reported to Congress for the first 2 years. Consequently, Congress and NASA were unable to evaluate the current cost savings for the CSOC effort and were unable to determine whether the contract would be able to achieve the anticipated 1.4 billion US$ cost savings through fiscal year 2008. Ultimately, NASA declined to extend options for the second five-year increment.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Analysis of the European Space Sector

Europe is the consolidated second power in space. Public European space expenditure is divided into civil and military activities, although the latter still remains very small.

Of the 15 ESA Member States, only a few fund military space activities and there are as yet no European military space programmes. In the last year, some co-operations have been initiated between European countries, mainly for the exchange of Earth-observation data.

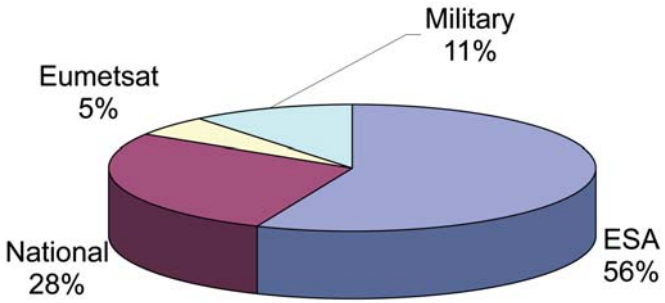


Figure 54 - European public space expenditures in 2003
(Source: ESA and Euroconsult)

As far as the nature of funds is concerned, it should be noted that about 80% of the actual European civil expenditure is coming from the Ministries of Research, Science or Technology, compared with about 10% from Trade and Industry, and 11% from others, including Defence for dual-use applications.

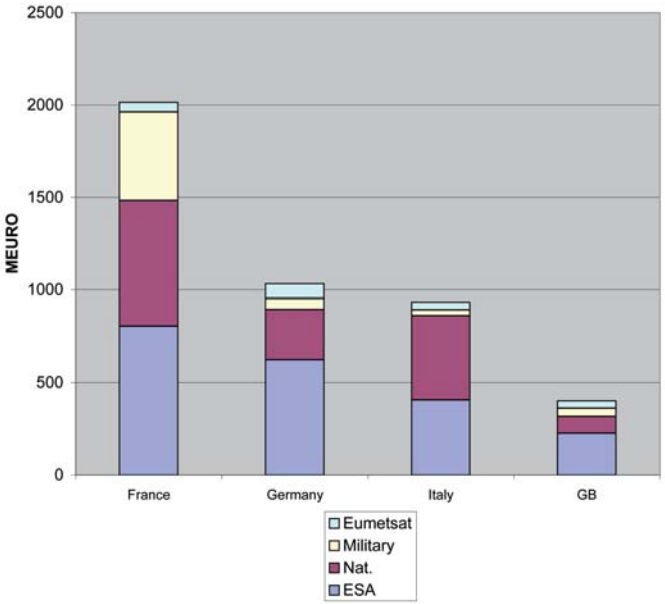


Figure 55 - Space budgets of four main ESA contributors for 2003
(Source: ESA, based on Member State primary data)

5.1 Institutional markets

5.1.1 Civilian space

Almost 90% of the 6.2 billion Euro allocated by European governments to space activities is dedicated to civilian activities. The European effort is mainly concentrated within ESA, whose budget represents 60% of the overall European civil space funding.

Public civil expenditure can be divided into three different categories:

1. The ESA expenditure, almost totally based on contributions received from its 15 Member States.

2. National expenditure, including national space agencies and other contributions to European organisations like Eumetsat.

3. European Commission expenditure on space-related activities, mostly concentrated in the R&D Framework Programmes budget, and the Trans-European Network funds allocated to the Galileo project.

Usually, the R&D Framework programme is planned over a five-year period. The 6th Framework Programme activities are planned for 2002 to 2006, with a total budget for space and aeronautics of about 1000 million Euro. Space could benefit from about 30% of this amount.

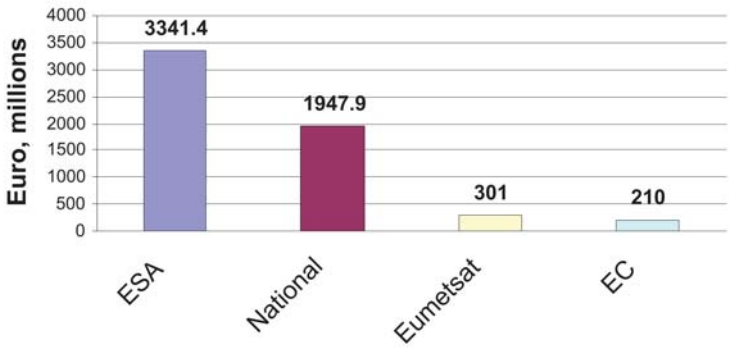


Figure 56 - Estimated civil public expenditures in Europe for 2003 (Source: ESA, Euroconsult)

Looking at the past five years, the accompanying graphs show the fund allocations of European countries in their expenditure on space projects both on a national basis and within the ESA framework.

Earth observation is the area of space in which European countries have invested more in the recent past. The sum of Earth science and applications has attracted 22% of the European investments in space-related programmes and activities.

Apart from the general running costs, which in total account for some 18% of the European civil expenditure, launchers represent the second largest expenditure for Europe in the period 1997-2001.

In 2003, contributions to ESA accounted for about 56% of its Member States' combined civil space expenditures (including contributions to Eumetsat). The main contributors to ESA are France, Germany, and Italy, which funded about 69% of the total ESA activities in 2003. The same countries represent 76% of the total European civil expenditure on space. Most of the space expenditure by other European countries is associated with their participation in the ESA programmes.

Although France is the European country that invests more in space in absolute terms as well as in comparison to its GDP and its population, other ESA Member States demonstrate a surprisingly important engagement in space with respect to their size. This is particularly the case for Italy and Belgium, whose investments per capita and in relation to GDP are above the ESA Member State average.

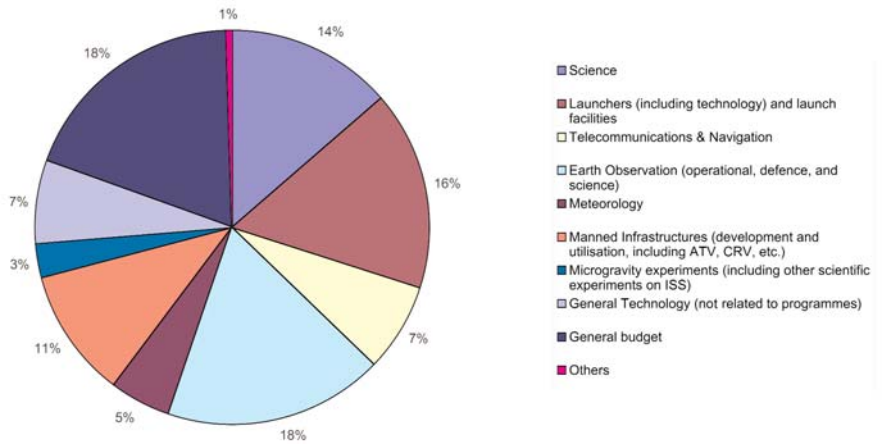


Figure 57 - Shares of public civil expenditure per sector (1997-2001)

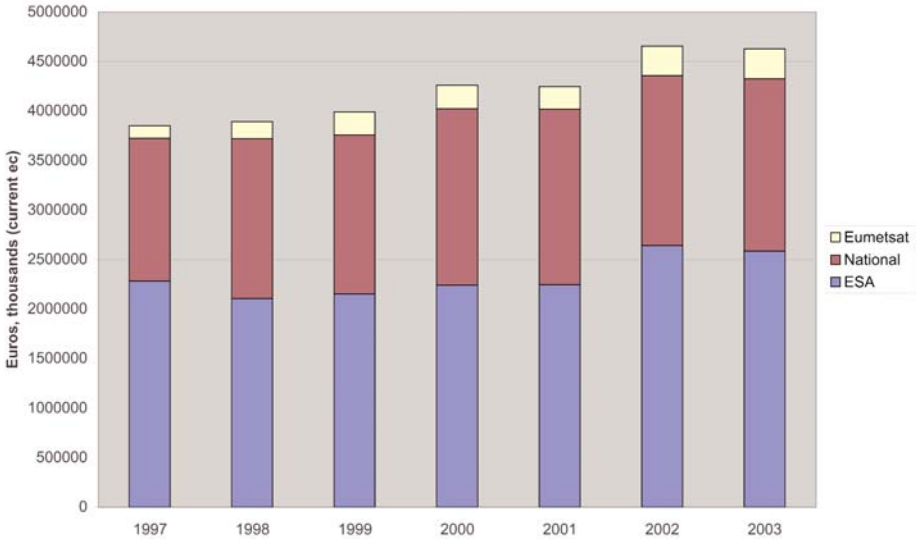


Figure 58 - Evolution of ESA Member States' civil public expenditures (Source: ESA)

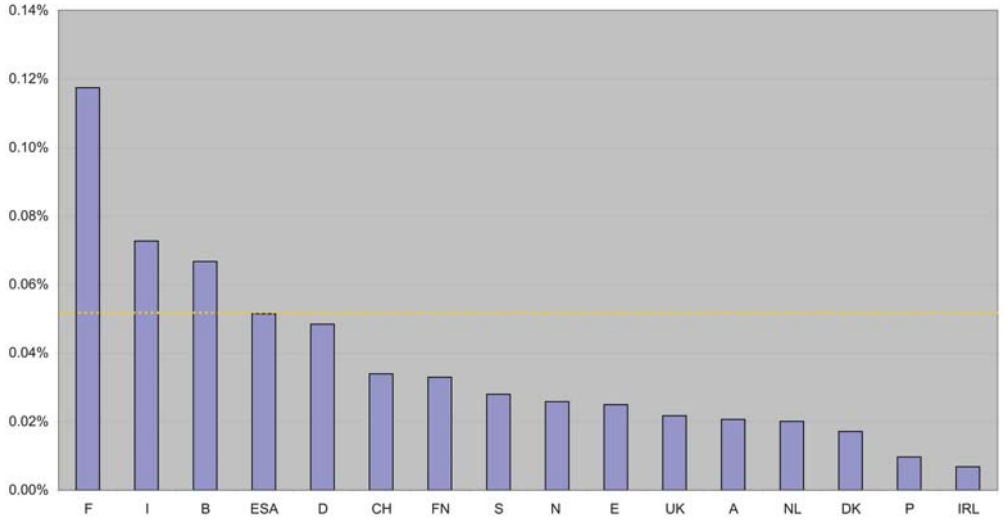


Figure 59 - 2002 public space civil expenditure as a function of GDP (Source: ESA)

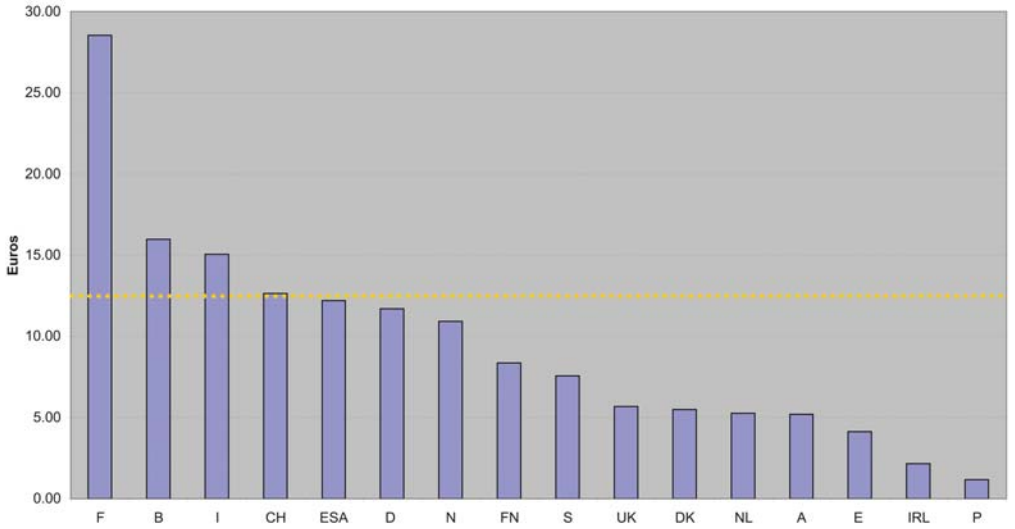


Figure 60 - 2002 public space expenditure per capita (Source: ESA)

ESA

The European countries' contributions to ESA's budget have remained flat during the last five years. On the other hand, the ratio between the Member States' contributions to ESA and the total civil European budget is decreasing slightly, even if is maintained over 50%.

There follows a comparison between ESA contributions and specifically national space activity expenditure for the last years.

In 2003, according to the ESA Budgets[42], the Agency spent about 3.3 billion Euro (payment appropriations), of which about 366 million Euro was for the Scientific Programme and 2.3 billion Euro for the totality of Application Programmes (launchers, telecommunications, Earth observation, navigation, manned infrastructures, and microgravity experiments).

NATIONAL AGENCIES

The estimated public civilian expenditure of the 15 ESA Member States on national or multilateral activities amounted to 1.7 billion Euro in 2003.

Almost all of the ESA Member States also have their own national expenditures on space activities and programmes. However, the great majority spend more contributing to the Agency than carrying out their national or bilateral activities, as the accompanying figure depicts.

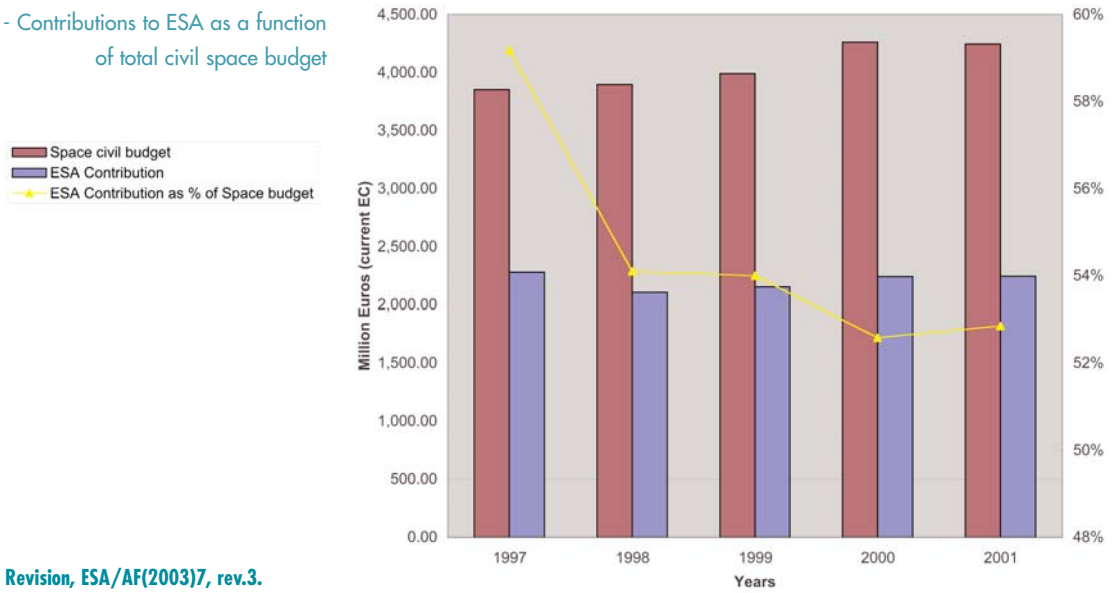
Nevertheless, looking at the national expenditure allocations, it is clear that there are still some activities that European countries consider it appropriate to carry out via separate agreements or even alone. This is the case for certain Earth-observation projects and microgravity experiments on board the International Space station (ISS), where ESA Member States invest in bilateral or multilateral programmes almost the same amount of money as they invest through the Agency.

In the case of generic technology developments, not directly related to a specific mission, ESA Member States invest nationally three times the amount dedicated to the same field within the Agency's framework.

In absolute terms, national Earth-observation projects receive the largest financial contribution, about 370 million Euro, followed by science programmes with about 260 million Euro, and generic technologies activities with 180 million Euro.

Scientific activities still remain a large part of the national expenditures. They include the funding of scientific experiments to

Figure 61 - Contributions to ESA as a function of total civil space budget



[42] ESA Budgets for 2003, Spring Revision, ESA/AF(2003)7, rev.3.

be embarked on ESA science missions, and purely national or bi- or multi-lateral co-operations at European or international level.

THE EUROPEAN UNION

In the past, the Community's Framework Programmes for Research and Development have funded several projects either directly dedicated to space applications and services or indirectly implying the use of space-related technologies and infrastructure for the scope of the research. In particular FP3, FP4 and FP5 funded projects in the fields of satellite communications, Earth observation and, since FP5, satellite navigation.

The amount of community funds directly or indirectly dedicated to space varies from one year to another as a function of the number of calls for proposals issued, the quality of projects presented, and their costs. For the last FP5, we can assume that an average of 70 million Euro per year has been spent over the period 1998-2002, making some 350 million Euro in total.

With the launch of FP6 (2002-2006), the European Union foresees a Thematic Priority dedicated to Aeronautics and Space, with a global financial allocation of about 1 billion Euro over the period. Space is therefore mentioned for the first time mentioned as a priority within the Framework Programme, and space-related projects will receive in total some 300 million Euro as a contribution from the Commission.

Three areas have been identified in the Work Programme: GMES (Global Monitoring for Environment and Security), Galileo, and satellite telecommunications.

On the top of such a budget, 450 million Euro from the Trans-European Network basket have been also dedicated to the financing of the Galileo development phase. It should be recalled that 100 million Euro had already been released to the project from the same basket in 2001.

The total of EC funds actually committed for space are summarised in the accompanying table.

In addition to the above, the recently adopted White Paper envisages three possible scenarios providing a further financial involvement of the Union in space-related projects, leading to an increase in the European yearly expenditure on space to 2700 million Euro in 2013.

EUMETSAT

Eumetsat, the European Meteorological Satellite Organisation, is an intergovernmental organisation created in 1986 to take over the responsibility for operating and exploiting the Meteosat satellites, developed and launched by ESA.

Today, there are 17 Member States (same States as ESA, plus Greece and Turkey) contributing to the Eumetsat budget according to a GDP-related scale. Eumetsat's budget for 2003 is about 280 million Euro, financed largely through its Member States' contributions.

Table 6 - Total EC spending (MEuro) on space-related activities (FP6 and TEN)

Area	***2002***	***2003***	***2004***	***2005***	***Total***
Earth Observation	*0*	*45*	*30*	*50*	*125*
Navigation	*170*	*150*	*100*	*70*	*490*
Telecommunications	*0*	*15*	*10*	*50*	*75*
TOTAL	***170***	***210***	***140***	***170***	***690***

5.1.2 Dual use of space

As in other sectors, the European defence budgets have been suffering from stagnation in the last years and forecasts for the future are not encouraging. On the other hand, efforts to have a common European approach to security and defence issues have not yet delivered the expected results, as noted above.

The space component of the European security and defence infrastructure, in spite of strong pressure from the European aerospace companies, still relies on national capabilities. Some progress has been achieved, notably in the observation field, where France, Italy and Germany have reached agreement on the use of the data coming from their future radar systems (Pleiades, Cosmo-SkyMed, and SAR-Lupe).

In other sectors, like telecommunications, recent initiatives in Spain, the United Kingdom, and Italy (Sicral 2) still demonstrate how fragmented the military space scenario in Europe really is.

Nevertheless, current estimates for building up a full European military capability, including infrastructures for telecommunication, observation, navigation, intelligence, surveillance and early warning, quote some 8.8 billion Euro of investments over ten years.

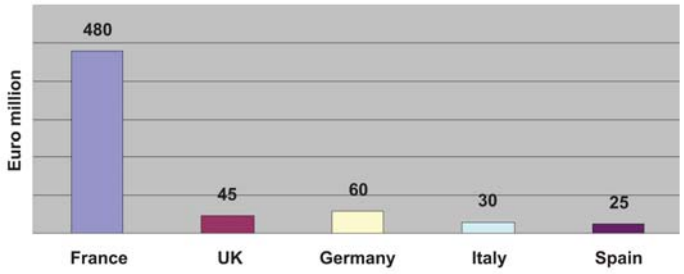


Figure 62 - Estimated European budgets in 2003 for military space programmes (Source: Euroconsult)

System	*Total cost (million Euro)*
Telecommunications	*3100*
Observation	*2300*
Navigation	*0*
Intelligence	*1220*
Surveillance	*760*
Early Warning	*1500*
Total	***8880***

Table 7 - Total cost of a full European space military capability (Source: French Army)

For the moment, the military space budget for 2003 is estimated at some 650 million Euro, which means about a 20% increase over 2002, but still a 13% decrease compared with 2001.

5.2 European share of worldwide commercial markets

According to the application sectors and value-chain segments for commercial demand analysed in Chapter 4, the following markets are potentially accessible to European companies:

[43] Figures provided by Futron Corp.

1. Telecommunication Satellites (manufacturing)
2. Launchers (services)
3. Telecommunications Services (selling capacity and value-added services)
4. Navigation and Positioning (terminals and value-added services).

As far as satellite manufacturing is concerned, orders in 2003 for commercial geosynchronous (GEO) satellites[43] rebounded substantially, from the very low level of 7 orders in 2002 to 19 in 2003. In 2001, 28 orders were placed for such commercial GEO satellites.

European companies (EADS Astrium and Alcatel Space) reported six orders in 2003, i.e. 31.5% of the accessible market.

The accompanying figure (overleaf) shows the evolution in GEO satellite orders over the last three years.

As far as launchers are concerned, three large operators are competing on the worldwide commercial market: Arianespace, Boeing Launch Services and International Launch Services (ILS). Apart from Arianespace, both the US operators also offer Russian rockets commercially.

The accompanying charts show the distribution of the 2003 commercial launches (total 17 launches) by vehicle family and operator nationality. It is worth noting that in 2002, with over 18 commercial launches, Arianespace secured about 42% of the market (9 launches).

In the selling of capacity sector, the four big operators resulting from the last years of acquisitions and mergers, namely SES Global, Intelsat, Panamsat, and Eutelsat, owned about 41% of the in-orbit capacity in 2002. SES Global owns 13% of the in-orbit capacity, which together with the 8% of Eutelsat, giving Europe 21% of the transponder capacity.

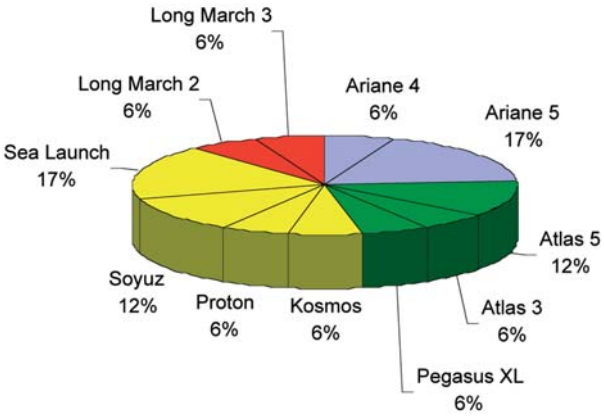


Figure 63 - Commercial launches by vehicle family in 2003 (Source: ESA)

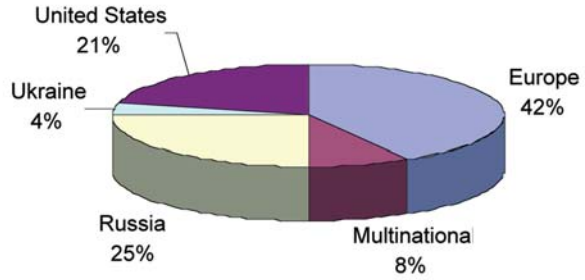


Figure 64 - Worldwide commercial market shares in 2002 (Source: ESA)

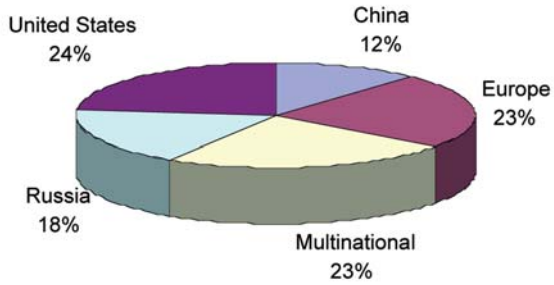


Figure 65 - Worldwide commercial market shares in 2003 (Source: ESA)

Looking at the satellites under construction, 17% have been ordered by SES Global, followed by Panamsat with 6% and Eutelsat with 4%.

As far as the satellite navigation and positioning market is concerned, it is largely dominated by US industries for the GPS terminals, with few exceptions, e.g. Europe's Thales which has acquired the Magellan producer.

A final remark on the Earth-observation sector: although it remains a captive market for the space segment as well as for the rest of the value chain, it is worth noting that in recent years the number of countries involved in the procurement and launch of Earth-observation satellites increased from 10 (2000) to 21 (estimated in 2005), with a worldwide annual public expenditure of about 3 billion Euro.

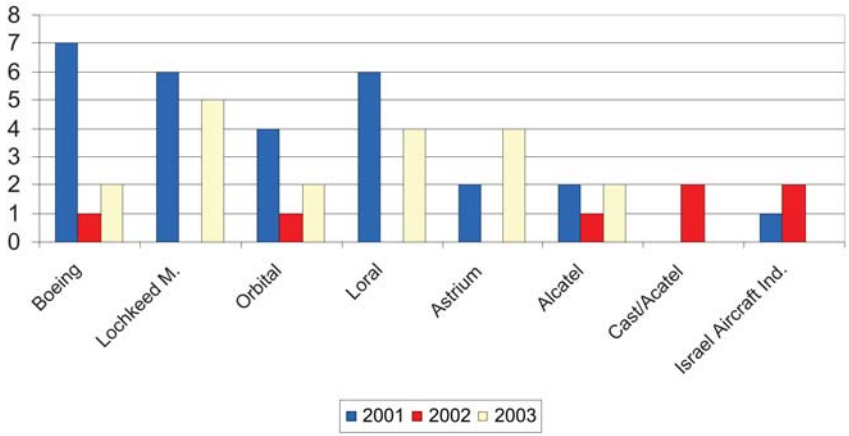


Figure 66 - Evolution of GEO satellite orders per company (Source: Futron)

6

Future Global Perspectives

6.1 Policies and strategies

2003 was characterised by the further emergence of the Peoples Republic of China as an important space actor and by the consolidation, in terms of financial commitment, of the leadership of the United States as a 'space superpower'. Europe, on the other hand, is trying to organise itself to take maximum benefit from the existing limited public investments, while India is quietly pursuing its chosen objectives in space.

In the coming years, it is very likely that we will see China more and more at the leading edge of a new 'space race', which has recently been 're-launched' by the US President stating the objective of having man on Mars and beyond in the next decades. However, contrary to the space race in the fifties, this time cooperation is likely to take the place of competition. The role of Europe between China and the USA could be key.

Military space is another issue, which is likely to be more and more important in the immediate future. The differences in approach to dual use and to military space activities in the US and Europe will probably be increased by the terrorist threats still increasing after the military campaigns in Afghanistan and Iraq.

The role of space infrastructure in the defensive and offensive US military system is not comparable with those of any other military power, and it will be further boosted in the next years by a considerable increase in the DoD's expenditure on space items.

6.2 Markets

TELECOMMUNICATIONS

Analysts are currently reporting that the growth in the satellite-communication market is not over. New services and applications are stimulating demand for capacity, partially covered by savings made by the large operators through their merger and acquisition activities, as well as by means of new compression and digitisation techniques.

According to analysts, demand for satellite-communication services will keep growing, with a total increase of about 60% over the ten years 2003-2012. Digital radio, DTH multimedia platforms, infotainment services, Internet access, as well as general broadband fixed and mobile services are expected to drive the market's growth.

Unfortunately for the manufacturing industry, such a growth in the service demand will not push satellite operators to expand their fleets before 2005, when new orders will be placed with industry.

EARTH OBSERVATION

Earth-observation commercial markets are expect to grow by integrating products coming from remote sensing, such as GIS and weather forecasts, with other space-related products like satellite positioning, broadcasting and mobile communications. The integration of all of these products into a single satellite integrated information system will allow added-value service providers to develop services for a large number of potentially valuable applications.

NAVIGATION AND POSITIONING

The final launch of the development phase of Galileo in 2003 has definitively opened the door to emerging demand for terminals (compatible with GPS) and services to be delivered from 2008. European companies that already operate in the GPS terminal sector and in value-added service provision could expect to increase their revenues, and play a key role also in the US market.

NEW MARKETS

Space tourism can be considered as an already existing market, thanks to the various tourist flights to the International Space Station sold to billionaires by the Russian Federation. Nevertheless the prices remain so high that only few persons in the World can afford to pay for such a 'ticket to space'. Actually, with the uncertainty currently surrounding manned spaceflight in the US, as well as in other space-faring countries, the potential of such an emerging market is unpredictable.

6.3 Industry

As analysed in Chapter 4.3, the evolution of the industrial space sector depends on many different factors.

Historically linked to the aerospace and defence industry for its upstream segment, the space industry has often followed the reorganisation of the wider parent sector, and sometimes it has suffered from decisions taken by parent companies focused on businesses other than space.

With the rationalisation of the big industrial aerospace and defence groups in the USA (5 companies) and Europe (3 companies) almost completed, their space branches are expected to take further initiatives to consolidate, primarily for establishing a better position in commercial markets.

This further evolution is likely to centre around the two largest, purely space companies in the USA and Europe, which are less (even not) involved in the aerospace and defence business, namely Space Systems Loral (SS/L) and Alcatel Space.

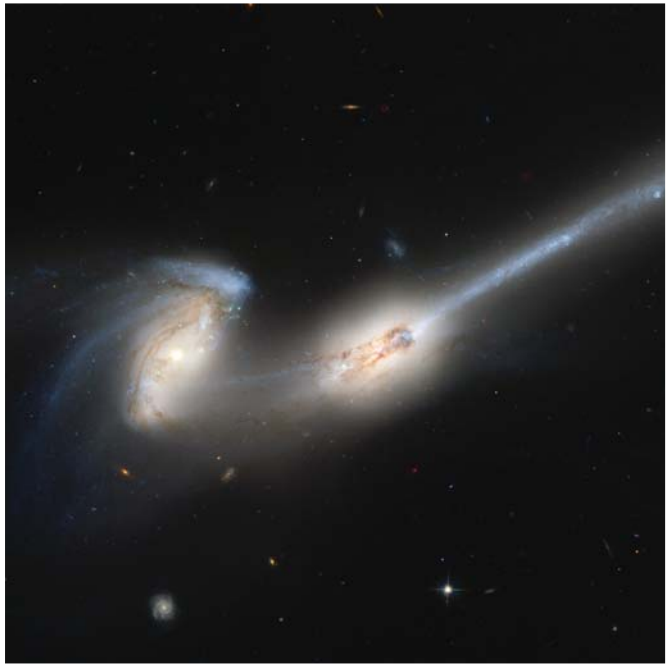
In the USA, SS/L could be acquired by one of the three giants of the upstream segment (Boeing, Lockheed Martin or Northrop Grumman), or by one of the satellite operators (Echostar, Direct TV, or SES Global) much more interested to the downstream operations of the company than the manufacturing. In Europe, Alenia Spazio (Finmeccanica) is likely to be merged with Alcatel Space, reinforcing the latter as a client of institutional customers in the field of space infrastructures and scientific satellites.

In conclusion, looking at the future of the space manufacturing industry, the number of primes might be further squeezed in the coming years to three in the USA and two in Europe. This further evolution will be influenced by several factors: the strategy of the parent company, the role of institutions, and the evolution in demand.

In the USA, most of the demand is institutional and it is likely to keep being the driver for strategic choices made by the stakeholders of large companies, which do not want to step back from the richest public space market in the World (see Chapter 3).

In Europe, where the public demand is stagnant, the parent companies' decisions might vary greatlymuch from one country to another, and are difficult to predict. Nevertheless, it is likely that the stakeholders' future decisions will be influenced by the evolution in institutional demand: two Large System Integrators, though necessary for the sake of competitiveness in public tenders, might only continue to be supported if the best-case scenario depicted in the EC White Paper and in the ESA Director General's Agenda 2007 is realised, with a significant increase in the institutional funds. Stronger institutional support, with a substantial European involvement in military space programmes, might provide the sufficient guarantees for European big industry to retain its space-manufacturing assets.

As far as the downstream is concerned, the emergence of new services associated with the need to achieve a critical mass in the market, might push operators to become more and more global. Following the same trend, regional operators might also be pushed to consolidate, resulting in a reduction in the total number of players in the coming years.



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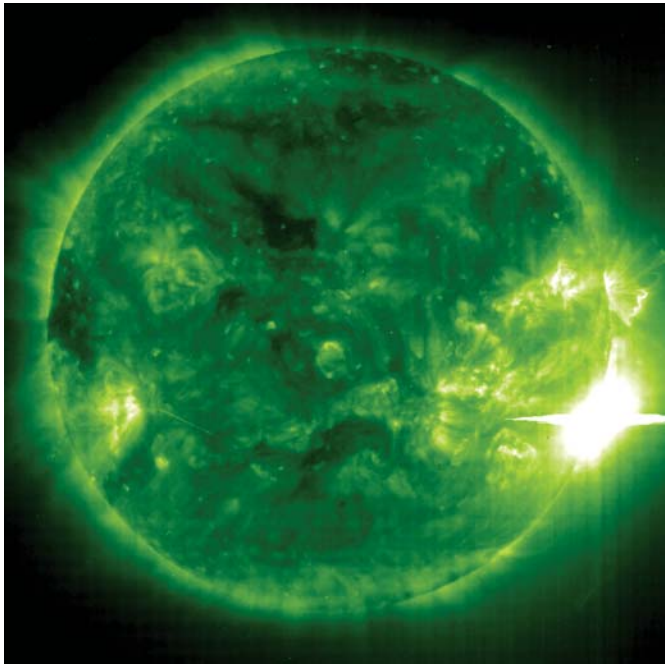
Acronyms

AECMA	European Association of Aerospace Industries
CAP	Common Agricultural Policy
CFSP	Common Foreign and Security Policy
CSG	Centre Spatial Guyanais
DAB	Digital Audio Broadcasting
DARS	Digital Audio Radio Systems
DBS	Direct Broadcast Satellites
DoD	Department of Defense
DoE	Department of Energy
DTH	Direct To Home
EC	European Commission
ECAP	European Capabilities Action Plan
ECB	European Central Bank
EDA	European Defence Agency
EELV	Evolved Expendable Launch Vehicle
ERA	European Research Area
ESA	European Space Agency
ESDP	European Security and Defence Policy
EUMETSAT	European Meteorological Satellite Organisation
FAA	Federal Aviation Administration
FCC	Federal Communication Committee
FSS	Fixed Satellite Services
GDP	Gross Domestic Product
GEO	Geostationary Earth Orbit
GIS	Geographical Information Services
GLONASS	GLObal NAvigation Satellite System
GMES	Global Monitoring for Environment and Security
GNSS	Global Navigation Satellite Services
GPS	Global Positioning System
GTO	Geostationary Transfer Orbit
IGC	Inter-Governmental Conference
ISS	International Space Station
JTF	Joint ESA/EC Task Force
LEO	Low Earth Orbit
LSI	Large System Integrator
MEO	Medium Earth Orbit
MSS	Mobile Satellite Services
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organisation
NIMA	National Imagery and Mapping Agency
NOAA	National Oceanic and atmospheric Administration
NRO	National Reconnaissance Office
NSA	National Security Agency
OECD	Organisation for Economic Co-operation and Development
PRS	Public Regulated Service
R&D	Research and Development
SGP	Stability and Growth Pact
SSI	Small System Integrator
VSAT	Very Small Aperture Terminal
WEU	Western European Union
WRC	World Radiocommunication Conference
WSSD	World Summit on Sustainable Development
WTO	World Trade Organisation



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References

Apart from documents and reports already referred to in the text, we acknowledge the use of the following references:

[1] World Market Prospects for Public Space Programs - 2002 Edition - Euroconsult, 2002

[2] State of the Space Industry 2003 - International Space Business Council, 2003

[3] Satellite Communications and Broadcasting Markets Survey - 2002 Edition - Euroconsult, 2002

[4] 2001-2002 Satellite Industry Indicators Survey - Futron for SIA, 2002

[5] Eurospace Facts & Figures - The European Space Industry in 2001 - Eurospace, 2003

[6] Satellite Industry Statistics 2002 - Futron for SIA, 2003

[7] European Aerospace Industry Facts and Figures 2002 - AECMA, 2003

[8] 2003 European Space Directory - 18th Edition - SEVIG Press and Eurospace, 2003

[9] The European Space Long-Term Plan - Issue 0 - ESA/C(2002)157, December 2002

[10] Assessment of the European Launcher Industry - Bertin Technologies and Euroconsult for ESA, 2002

[11] The Space Launch Industry - Recent Trends and Near-Term Outlook - Futron, 2003

[12] Global Analysis of Satellite Transponder Usage and Coverage - Futron, 2003

[13] OECD Information Technology Outlook - OECD, 2002

Annex ESA Missions

Scientific Satellites

	Programme[44] or grouped missions[45]	Development costs [46]	Launch date	No. of procurements	Operator
Scientific Satellites	EXOSAT	537	1983	1	NA
	GIOTTO	258	1985	1	NA
	HIPPARCOS	689	1989	1	NA
	ULYSSES	392	1990	1	NA
	HUBBLE	648	1990	1	NA
	ISO	926	1995	1	NA
	SOHO	456	1995	1	NA
	CLUSTER	552	1996	4	NA
	HUYGENS/CASSINI	335	1997	1	NA
	XMM-NEWTON	730	1999	1	NA
	CLUSTER–II	333	2000	4	NA
	SMART-1	72	2002	1	NA
	INTEGRAL	360	2002	1	NA
	ROSETTA/MARS EXPRESS/VENUS EXPRESS	1165	2003/2004/2005	3	
	LISA PATHFINDER	142	2007	1	
	HERSCHEL/PLANCK	867	2007/2007	2	
	JWST	273	2011	1	
	BEPI COLOMBO	450	2012	1	
	LISA	199	2012	1	
	GAIA	450	2012	1	
			Total scientific satellites	**29**	

	Programme[44] or grouped missions[45]	Development costs [46]	Launch date	No. of procurements	Operator
Telecommunications	OTS	996	1977-1991	2	Eutelsat
	MARECS	840	1981-1984	3	Inmarsat
	TELECOM ECS	704	1983-1984-1985 -1987-1988	5	Eutelsat
	OLYMPUS	1258	1989	1	
	ARTEMIS	1023	2001	1	
Earth Observation	METEOSAT	771	1977-1981-1988	3	
	MOP (METEOSAT)	882	1988-1989-1991 -1993	4	Eumetsat
	ERS-1	1250	1991	1	
	ERS-2	631	1995	1	
	MTP METEOSAT–7	137	1997	1	Eumetsat
	ENVISAT-PPF	2328	2001	1	
	MSG	833	2002-2005-2008	3	Eumetsat
	METOP-1 & 2/3	781	2005 & 2005-2015	3	Eumetsat
	CRYOSAT	120	2004	1	
	GOCE	276	2006	1	
	SMOS	158[47]	2007	1	
	ADM-AEOLUS	290	2007	1	
			Total application satellites	**33**	

[44] Major ESA programmes from 1983 plus Ariane. Four more scientific missions were launched between 1977 and 1978, originating from developments started by ESRO.

[45] ESA is proceeding towards grouped scientific missions. Rosetta/Mars Express/Venus Express and Herschel/Planck constitute two integrated mission groups with a cost-at-completion for the totality of each mission group.

[46] Cost-at-completion in millions of Euro at 2002 EC (2003 EC for not yet launched missions/groups of missions).

[47] Of which 112 million Euro on the Envelope Programme 1 (at 2003 EC).

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