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THE COMMUNITY AND SPACE : A COHERENT APPROACH

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(Communication from the Commission)

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EXPLANATORY MEMORANDUM AND SUMMARY

1. Space is an area in which the Community now seems destined to play a broader and more active role for a combination of reasons:

- The era of the conquest of space has given way to an era of space exploitation. Against a background of growing involvement leading to more opportunities for cooperation but also increased competition, a whole series of already well established applications (telecommunications, Earth observation) or emerging applications (microgravity) have given rise to new challenges. Today space is far more than just a specific sector of activity; it will affect more and more the whole economic, industrial and cultural life of European society.
- Relying on the expertise developed especially as a result of the cooperation within the framework of the European Space Agency (ESA), Europe has now reached the stage of commercial exploitation in a number of sectors such as launch vehicles or telecommunications. In fact, through the decisions taken at The Hague in December 1987, it has continued the existing momentum by embarking on an ambitious space programme geared to the year 2000, structured around the Ariane V, Hermes and Columbus programmes.
- With the adoption of the Single Act the Community has recently acquired wide-ranging and explicit competences in the field of research and technological development. Above all, it is already mobilizing for the completion of the large internal market by 1992, a process which has implications for many sectors concerned by space activities and which cannot be divorced from Europe's pursuit of its ambitions in space.

2. When it comes to realizing its ambitions Europe has a large number of strong points to its credit, as demonstrated by the string of successes with Ariane, Spacelab, Giotto, etc. However, alongside the strengths to which these

successes testify, Europe's space effort also suffers from a number of weaknesses. While a great deal of effort has been put into the development of space systems, there is still a need for a matching effort to encourage exploitation of the potential offered by these techniques. Europe is still without a cogent overall policy which incorporates technological, industrial, commercial, social and even defence aspects.

3. Taking into account these weaknesses on the one hand and the institutional nature of the Community on the other, it would appear that Community action in space is both possible and desirable and that such action would indeed make a significant contribution to Europe's space effort, provided that the Community endeavours

- to put the full weight of its democratic legitimacy and its established role in European society behind the ambitious new programmes which the ESA has decided to undertake and to further enhance, by strengthening its links with the ESA, the political credibility of Europe's space effort on the international stage;
- to frame policies that create favourable conditions for the development of the technologies needed for access to space and for optimum exploitation of space applications, on the one hand, and for the integration of these applications in the socio-economic fabric of the Community and for the strengthening of the European space industry's presence in the world, on the other;
- to ensure, through organic consultation mechanisms, that action by the Member States, the ESA and other European organizations (Eutelsat, Eumetsat, and so on) in the space sector remains consistent with Community law on competition, trade policy, opening up of public procurement, intellectual property, etc.

4. More specifically the Commission is proposing for the purposes of future Community action in space, six action lines intended to provide a coherent framework for the development of its activities. These action lines are as follows:

- (1) Research and technological development (R&TD): to promote greater complementarity and synergy between Community R&TD strategy and the programmes of the space agencies. In particular, this will entail improving coordination between the relevant Community programmes, (Esprit, Brite, Euram, RACE, a number of JRC programmes, etc.) and European space programmes; to define and give effect to Europe's contribution to the international study programme on "global change" on our planet; to stimulate under the existing programmes projects involving microgravity experiments and to promote the development of applications (telecommunications and Earth observation).
- (2) Telecommunications: to develop a coherent approach by ensuring that satellite technology is included in the development of European networks and services and by optimizing the complementary relationship of satellite and terrestrial systems; to create the political, regulatory and standardization conditions conducive to the development of new services and equipment; to promote the use of satellite communication systems in the implementation of Community policies on regional development, development aid, education, transport etc.;
- (3) Earth observation: to stimulate the applications market particularly by extending and intensifying the integration of satellite information in the implementation of Community policies (agriculture, environment, regional development, development aid, etc.); by promoting cooperation and coordination in R&TD with regard to techniques for processing and interpreting satellite data.
- (4) Industrial development: to study in greater depth in conjunction with the relevant bodies concerned the implications of the single market with regard to space activities and space-related activities.
- (5) Legal environment: to contribute to the creation of favourable conditions for the development of European space activities by studying and proposing appropriate measures in the field of commercial and competition policy, tax and customs arrangements and harmonization of legislation.
- (6) Training: to encourage under the Comett programme the development of European advanced training schemes related to space science and technology and their applications.

5. In formulating and executing the specific tasks relating to these action lines the Community will naturally be mindful too of the need to ensure coherence and complementarity between its own activities and those of the ESA and other European organizations in this field. The Commission will pay particular attention to strengthening and developing its cooperation with the ESA on a more systematic basis and with mutual respect for each other's competences.
6. Taking into consideration the request made by Parliament in its resolution of 17 June 1987 on European space policy, the Commission is putting forward in this communication its analysis of the Community's role in space and gives a detailed account of the six action lines in question. It will be submitting specific proposals for the implementation of these action lines in due course.

## I. EUROPE AND SPACE:

### A. EUROPE'S SPACE EFFORT IN THE WORLD CONTEXT

For a number of years now, the international space scene has ceased to be dominated by the United States and the Soviet Union. Although they still command the stage, pushing ahead with their major civil and military programmes and preparing ambitious plans for manned flights and for the exploration of deep space (Mars), the two superpowers no longer have exclusive control of the exploitation and commercialization of space.

New growth centres have appeared(\*) and this increase in activity has to be seen in relation to the gradual emergence of applications with considerable socio-economic importance (telecommunications, Earth observation, microgravity) and to the desire on the part of many countries to develop their own technological and industrial capabilities in this area.

Over the past few years, for instance, China and, to a lesser extent, India, Canada and Brazil have been stepping up their national space efforts. Over the next decade Japan, which is currently expanding its space budget, is likely, by acquiring greater autonomy and playing a more important part in the major international programmes, to establish itself as a power to be reckoned with in the field of space exploitation.

However, Europe is still the longest-standing and most serious rival of the superpowers in space, the only power which in certain fields can still be counted as their equal. Over the last ten years Europe has recorded one success after another and is now set on further strengthening its autonomy and improving its competitive position in the field of space.

Essentially Europe owes its position as third most important space power to the existence and action of the ESA, the European Space Agency.

Created in 1975 out of the merger of the first European cooperative structures (ESRO and ELDO), the task of the European Space Agency is to develop and promote, for exclusively peaceful purposes, cooperation among European

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(\*) See the international breakdown of space budgets in Annex 3

states in space research and technology and their space applications, with a view to their being used for scientific purposes and for operational space applications systems.

In addition to the signatory states (Federal Republic of Germany, Belgium, Denmark, Spain, France, Ireland, Italy, the Netherlands, Sweden, Switzerland and the United Kingdom), the ESA was enlarged in 1987 to include Austria and Norway. Finland is an associate member and Canada takes part in certain programmes under a special cooperation arrangement. Greece, Portugal and Luxembourg - although Member States of the Community - are not members of the ESA.

The first generation of programmes developed by the ESA amply attained their objectives giving Europe technological and industrial capability, in particular through the Ariane launcher and the applications technology (telecommunications and meteorology). The success of these programmes led to the creation of operational systems management organizations such as Eutelsat for telecommunications and Eumetsat for weather forecasting, and the setting up of a private company, Arianespace, which manufactures and markets the European Ariane launcher.

By deciding in The Hague in 1987 to launch a new generation of programmes, Europe firmly established its presence and its ambitions in the field of space. The new ESA long-term plan (\*) not only maintains the continuity of the scientific research programmes and the continued development of applications technology, but also represents a leap forward in both qualitative and quantitative terms. Qualitative because by the end of the century it will provide the means for manned space missions to enter and return from space and will enable man to work in space. These resources will be used in particular for research in space and the industrial applications that could result from it, as well as the repair and maintenance of satellites in orbit. The quantitative aspect will be the increase in the ESA's budget from some 1 600 million ECU in 1988 to around 2 600 million ECU in 1993.

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(\*) See the breakdown of the ESA long-term plan by programme in Annex 3



The ESA budget accounts for a little over 50% of Europe's space effort. The national programmes, which developed at the same time as the cooperative venture, are mainly concerned with the definition and technological preparation of new European programmes and applications work.

The national programmes tend to specialize.

- France has a full and ambitious space programme run by the Centre National d'Etudes Spatiales (CNES). It has a budget of around 860 million ECU (\*), of which 40% is allocated to the ESA. Its programmes concentrate on launchers, telecommunications and Earth observation; its activity also covers the industrialization and commercialization of applications. For instance it has set up the company Spot-Image which markets remote sensing data from its SPOT satellite.

- The Federal Republic of Germany has a space budget of around 490 million ECU (\*), of which 60% goes to the ESA; it too is involved in the field of telecommunications and specializes in manned space stations (Spacelab) and the applications of microgravity. A national space agency is being set up.

- Italy, which is establishing itself as the third European space power with a budget of around 470 million ECU (\*) has also specialized in manned space stations and in the field of telecommunications payloads. A national space agency has just been established.

- The United Kingdom, which was one of the foremost space powers in 1960, has cut its space research budget stressing the need for greater participation by the private sector in the space effort. Its budget currently stands at about 180 million ECU (\*) and it has concentrated above all on the telecommunications field.

- The other European countries contribute virtually their entire space budgets to the ESA, with the exception of Sweden and the Netherlands who have national programmes. Their contributions account for approximately 15% of the ESA's overall budget.

## B. STRENGTHS AND WEAKNESSES OF EUROPE'S SPACE EFFORT

As things stand, therefore, the overall verdict on Europe's space activities seems to be altogether positive: space is

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(\*) Figures for 1987

an area in which, by establishing the ESA, Europe opted from the outset for cooperation, and that cooperation has rapidly led to some spectacular successes.

Thanks to the efforts by the ESA and the national space agencies, Europe, with a long string of successes to its credit, troubled only by the inevitable element of risk involved in any highly sophisticated technology, has established a solid and envied position for itself in certain sectors. The market share acquired by Arianespace in the field of medium payload launches, the outstanding quality of the pictures from the Earth observation satellite SPOT, the importance of the Spacelab laboratory in preparing the use of the future space station, the success of the Giotto probe mission all bear witness to the capability Europe has acquired in the field of space transport systems and its expertise in those areas of space exploitation into which it has ventured. In addition, this expertise makes Europe a sought-after partner for the major new space projects, a prime example being the international space station project.

However, alongside the strengths to which these successes testify, Europe's space effort also has what can only be described as certain weaknesses:

- Europe's efforts remain in some respects selective. Europe holds a strong position in the areas it has targetted but it is less active and more dependent in others. For example, Europe depends on the US for some operations in space and it has not yet embarked on the development of very heavy or recoverable launch vehicles, a factor which may restrict its autonomy of exploitation of space in the future;
- Europe is still neither active enough nor sufficiently well organized when it comes to exploiting the applications of space technology, for which the ESA does not have the necessary resources at present. The ESA is first and foremost a research and development organization, even though the Convention which set it up allows it to undertake operational activities. So far these activities have been entrusted to organizations set up for that purpose (Eutelsat and Eumetsat), in the same way as the commercialization of Ariane was given to Arianespace. Although the transition from the preoperational stage to the operational or commercial stage has worked well up to now, problems are emerging with new space applications involving a clientele that is diversified and difficult to organize at European level

and which require the additional development of ground use techniques. This is especially true of Earth observation satellites and space facilities for microgravity experiments;

- in spite of its high level of technological expertise, European industry is still finding it difficult to be competitive in the telecommunications satellite sectors and the ground segment: fragmentation of the internal market, inadequate integration of the industrial structure, regulations which hamper the development of new services, the relatively small size of the existing European market (civil and, above all, defence) (\*) contribute to this low level of competitiveness relative to American industry chiefly in the space segment and to Japanese industry in the ground segment;
- despite the increase in space budgets as a result of the decisions at The Hague, for the immediate future Europe will still only be spending one-tenth of what the United States spends on space; it is therefore imperative to strengthen consistency and complementarity between ESA programmes and activities and those of the Member States, an objective laid down in the ESA Convention;
- in contrast to the situation for civil applications, Europe's defence effort in space is still essentially conducted on a national basis. Europe has no proper framework within which to discuss the issues raised by the need to coordinate civil space cooperation in Europe with possible future defence cooperation;
- lastly (a weakness which to a large extent underlies the previous five), Europe still lacks a cogent overall policy on these matters: a policy which incorporates economic, social, industrial and even defence considerations; a policy to which all parties concerned can refer; a policy designed to strike a better balance and achieve greater

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(\*) Note the growing share of the military market in the United States in Annex 3

consistency between the development of technologies and their applications, between the space segment and the ground segment, between joint ventures and national activities; a policy which helps to ensure that better use is made of the technological and industrial expertise acquired both within and outside the Community.

### C. A ROLE FOR THE COMMUNITY

As both the clearest expression and most powerful instrument of European integration, and a major political structure firmly anchored through Parliament in Europe's democratic life, the Community is being called on to take part in the definition and implementation of such an overall policy and thereby to play a broader and more active role in realizing Europe's ambitions and aspirations in space.

- space has contributed in the past and will undoubtedly continue to contribute in the future to the building of Europe: it serves both as a focus for the European identity, a frontier which has a mobilizing influence on technology and the economy and a measure of political power;
- in Europe today space is far more than just an isolated sector of activity or a specific technology: by virtue of its current and potential applications, it has a bearing on a growing number of human activities in the Community, and will come to have an increasing impact on many aspects of the economic, industrial and cultural life of European society;
- there are many different areas in which the Community has exclusive or joint competences and ambitions, and on which space activities have or are likely to have a bearing: these include research, telecommunications, industrial development, agriculture, the environment, development aid and regional development;
- the Community has taken on the ambitious task of completing the internal market by 1992 - a process which will have implications for numerous sectors directly concerned by space activities at their various levels.

Given the weaknesses outlined above, which constitute an impediment to the realization of Europe's ambitions in space on the one hand and the institutional nature of the Community, the political significance of its existence and its action and the nature of its competence on the other, it would appear that Community action in space is both possible and desirable.

Community action could indeed make a significant contribution to Europe's space effort, in the form of specific "added value", provided that the Community endeavours

- to put the full weight of its democratic legitimacy and of its established role in European society behind the ambitious new programmes which the ESA has decided to launch, and to further enhance, by strengthening its links with the ESA, the political credibility of Europe's space effort on the international stage;
- to frame policies that create favourable conditions for the development of the technologies needed for access to space and for optimum exploitation of space applications, on the one hand, and the integration of these applications in the socio-economic fabric of the Community and giving Europe's space industry a stronger presence in the world on the other;
- to ensure, through organic consultation mechanisms, that the action by the Member States, the ESA and other European organizations (Eutelsat, Eumetsat, etc) in the space sector remains consistent with Community law (on competition, trade policy, opening up of public procurement, intellectual property, etc).

When formulating and carrying out the specific tasks under these three main headings, the Community must naturally be mindful of the need for consistency between its own activities and those of the ESA and of other European organizations in this field, which have primarily specialized in the development of space systems or operational system management.

## II. THE EXPLOITATION OF SPACE: THE CHALLENGES AND EUROPE'S POSITION

The fact that the Community is prompted to take a more active role in space is due to the new significance that space has gradually been assuming: the transition from the heroic age of space conquest to that of the exploitation of space has given rise to a whole series of new challenges which have fundamental implications for the social and economic fabric. What are the difficulties Europe has to overcome in order to face these challenges? To illustrate the implications of these various developments, we shall distinguish between three main areas (telecommunications, Earth observation and microgravity) and three dimensions (industrial, legal and educational).

### A. TELECOMMUNICATIONS:

With their multiple applications ranging from telephony to teleinformatics and direct broadcasting, satellite telecommunications are currently the main commercial user of space technology. Since the development of the first European satellites in the 1970s, the major source of financing for the development of these systems has been the public sector. In Europe, responsibility for operating satellite telecommunications systems lies with the national PTTs and with Eutelsat; their technological development, on the other hand, requires development agencies such as the ESA and considerable financial resources. These investments have led to the setting up of a European satellite industry which, though technically on a par with its competitors, nevertheless recognizes the need to improve its competitive position.

#### 1. Current applications

Satellite communication systems now represent an essential part of Europe's telecommunications network. They already provide a flexible and competitive response to problems of long-distance telephone links and television and radio broadcasting. Satellites are particularly competitive in cases where transmissions are used to link up with the least-developed regions with low population densities. Communications by satellite between mobile terminals represent another growth area, which has developed mainly to handle voice communication between large ships.

Although these systems are still basically publicly funded, private investment is beginning to be forthcoming for television broadcasting.

## 2. Future applications

Technological progress has meant that satellites are now powerful enough to allow firstly the installation of simpler and cheaper ground equipment and secondly, the growth of new services and new markets.

As a result, new fixed services such as dissemination of data, business communications for SMEs (especially in rural areas of the Community), videoconferencing and distance learning will become part of the daily routine. There are implications too for direct broadcasting by satellite which, if it becomes pan-European, is likely to open up national frontiers to a large market for ground equipment and lead to the growth of competitive services. As for mobile services, the extension of voice communication systems not only to ships of all sizes but also to planes and mobile land terminals will open up yet another promising potential market. Lastly, telecommunications in the rural areas of the developing countries represent yet another important area of application.

Despite these encouraging prospects for new services, serious obstacles nevertheless remain, preventing the new markets from developing and weakening the competitive position of European industry vis-à-vis the United States and Japan.

## 3. Obstacles

In order fully to appreciate the nature of these obstacles, it is essential to distinguish between the three main areas of satellite application: fixed services, direct broadcasting and mobile services.

### 3.1. Fixed services

In Europe telecommunications satellites are used chiefly for the broadcasting of television programmes and only to a limited extent for intra-European telecommunications services (telephony and data transmission).

The regulations in force in the Member States do not allow unrestricted use of the space segment for data communications services and value-added services.

As announced in the Green Paper the Commission intends to discuss with the Member States how far European telecommunications satellites will play a part in providing a wider range of telecommunications services in the Community.

### 3.2 Direct broadcasting services (DBS)

A number of factors still stand in the way of the achievement of a large market for direct broadcasting by satellite.

The allocation of frequencies and orbits by the International Telecommunications Union (ITU) on a national basis in 1977 led to the growth of a number of non-interchangeable systems which, because of their limited geographical cover, are difficult to operate profitably.

At the same time the demand for satellite broadcasting channels continues to grow to the point where it now exceeds supply. Particular attention will have to be paid to resolving this problem, even though the arrival of new larger capacity satellites may help to absorb this excess demand.

Another effect of this foreseeable multiplication of television channels will be the need for more quality audiovisual production (cinema and television) which will ultimately determine the usage of the new equipment. Special attention has been paid to this question in the framework programme on "Television without frontiers" proposed by the Commission and under the Media programme of measures to encourage the development of the audiovisual industry.

As a final point of interest, high-definition television, which will considerably improve the quality of television



pictures, will require in the coming years an effort by Europe to achieve a common standard; this common standard which has already been identified will enable Europe to guarantee compatibility with existing equipment, from production to reception by the general public, including transmission, and secondly to resist attempts to impose the Japanese standard.

### 3.3 Mobile services

The demand for mobile communications services in Europe is a pressing problem. If excessive fragmentation of this particular market is to be avoided mobile terminals in both the marine and aeronautics sector will have to be standardized as soon as possible.

Analyses will need to be made, particularly in the case of land-mobile systems, of the "niche" markets for telecommunications satellites applications (mainly long-distance lorries and private systems) in order to complete the pan-European system of mobile cellular radio which will be introduced in Europe beginning in 1992. At the same time a political decision will need to be taken as to which institutional organization will be made responsible for supplying the space segment of land-based mobile systems.

## B. EARTH OBSERVATION

Another major area of space exploitation, although one which is still in its infancy, is Earth observation. This area has potential applications of major economic and social, and even strategic importance. Earth observation satellites generate information which, by virtue of its synoptic and uniform and repetitive nature, opens up the prospect of more efficient management of the Earth's resources, better monitoring of the environment and, in the longer term, the global study of our planet (especially the "greenhouse effect" and the ozone layer) and the impact of human activity on it.

Satellite information covers a wide range of activities, weather forecasting, scientific research (Earth sciences), agricultural and forestry management, mineral, energy and water resource management, land use and urban development, forecasting of exceptional events (natural disasters) and accident management (oil spills, forest fires etc.).

These applications therefore concern both the developed countries and developing countries, for whom problems of self-sufficiency of food supply and management of natural resources are crucial.

Much of this technology is now in Europe's grasp - with the Meteosat (weather observation) satellite, SPOT (the French optical satellite in operation since 1986) soon to be joined by ERS-1 (a satellite with microwave sensors developed by the ESA which will be put into orbit in 1990) - despite the fact that it embarked on the development of Earth observation techniques some ten years after the United States.

Programmes for the development of more sophisticated observation systems are underway in the shape of SPOT 2 and 3 (France) and the European (ESA) programmes for the development of polar platforms and of a new generation of weather satellites.

Moreover, with Earthnet, Eurimage and Spot-Image, Europe also has the structures for the distribution of satellite data.

Overall, however, the supply of data produced by existing Earth observation systems has not been matched by applications which are intensive or extensive enough for such systems to operate profitably.

While the use of remote sensing data has come of age for the purposes of weather forecasting and, to a lesser extent, for cartography, prospecting for mineral resources and scientific research, on the whole little use has so far been made of its practical potential.

The development of applications markets is delayed or hampered by several factors, chiefly:

1. End users

With the exception of certain major institutional and private users, potential users - who fall into a wide variety of categories - are often unaware or poorly informed of possible applications and benefits of satellite data; as a result they are neither organized nor trained in the techniques for interpreting these data.

2. Data processing and interpretation

A major obstacle to the emergence of operational applications is the underdevelopment of methods, techniques and equipment. What European efforts are being

made in this area are scattered. Too frequently techniques are developed for the initiated, with no concern for ruggedness, portability or cost-saving. There is therefore clearly a need for public support and better coordination of effort.

The sector for value-added services, which offers processed and interpreted data in response to the needs of various end users, could play a key role in the growth of applications markets. The fact is, however, that the firms in this still relatively undeveloped sector often have to compete with other bodies (public research establishments or universities) using their specific knowhow to exploit a particular segment of the market. This reduces the size of the potential market open to value-added services firms and their economic prospects. This in turn reduces their capacity for financing their own development of methods and techniques for processing and interpreting remote sensing data.

### 3. In-orbit observation and ground data reception systems

Guaranteed continuity in the availability of data -relating to the space segment and the corresponding ground segment -for a minimum requirements of ten years is an essential precondition for the development of applications.

The continuity of the French SPOT programme is now assured and the continuity in the availability of data from the ERS satellite system of the ESA should be guaranteed as soon as possible;

Other factors that will influence the emergence of certain operational applications include advances in sensor performance (all-weather observation and greater geometrical and spectral resolution), acquisition times and data frequency.

Other factors will also have an influence on the use of Earth observation systems: the legal climate (regulations governing access to data, protection of intellectual property), product standardization, pricing policy and international cooperation particularly for the major programmes investigating the global changes affecting our planet. The lack of sufficient data receiving stations is also a restricting factor in Third World countries.

Consequently, if Europe wishes to be able to hold its own in both international cooperation and international competition,

it is high time that European efforts in this area were given a new dimension and coherence, capitalizing on its technical achievements by acting on those factors affecting the development of applications markets, while at the same time pushing ahead with the development of European space techniques.

### C. MICROGRAVITY

The use of the microgravity environment found in space is the third major area for space applications after telecommunications and Earth observation. However, it is far less advanced than the other two in the sense that it will require major investment in research for many years to come before it leads to any commercial applications.

Microgravity (which cannot be obtained on Earth for prolonged periods) is an emerging area of technology which has potentially important strategic implications in terms of expanding the frontiers of scientific knowledge and its industrial applications. The technology of high-performance materials for structural applications or for electronics and optics, pharmaceuticals, biotechnology and biochemistry manufacturing and better understanding of the life sciences are the areas in which microgravity appears to offer the best potential benefits.

Microgravity research can lead either to improvements in manufacturing processes on Earth or to the development of new products specific to space. Because of the extremely high cost of working in microgravity conditions, the latter products will necessarily have a high added value.

Europe's overall situation in this area is good relative to that of the United States and Japan, with the combined efforts of the ESA and the Member States matching those of the US.

The ESA funds orbital infrastructure development, the cost of missions and multi-user equipment; the ground preparation of experiments, including the development of specialized equipment, is dealt with at national level, particularly in France and the Federal Republic of Germany. Building on its experience of the Spacelab development, Germany is concentrating its efforts in relation to the exploitation of space applications in the field of microgravity, in which it plays a leading role in Europe.

Like the United States and Japan, Europe is putting a great deal of funding, within the ESA framework, into the establishment of an orbital infrastructure (Eureca and some European components of the International Space Station) which will considerably increase the opportunities for microgravity experiments in both quantitative and qualitative terms (duration, frequency of experiments and level of residual microgravity).

However, it is clear that additional efforts, complementary to existing national and ESA programmes, will be needed in order to make optimum use of this experimental potential and in particular to enlarge and begin preparing the user community, which is heterogeneous and generally poorly informed.

It will take a decade at least to acquire the experience and establish the scientific foundations essential to the launching of industry-oriented projects.

A longer-term user strategy and a more coordinated European approach would enable Europe to cater more efficiently for the information, training and funding needs of users.

The Community encourages cooperation in a number of areas concerned by microgravity through its research programmes and is therefore naturally well placed to help promote the use of microgravity in particular by integrating microgravity experiments into a ground research strategy.

#### D. INDUSTRIAL DEVELOPMENT

An analysis of the structure and organization of the European space industry must draw a distinction between the space segment, which is still characterized by a large public sector presence, and the ground segment which by its nature is closer to large-scale manufacturing industries.

##### 1. Space segment

Acting as a catalyst and coordinator of European efforts, the ESA has endeavoured to enhance the autonomy and competitiveness of the European space industry.

This action has had important positive effects:

- first, the contracts concluded by the ESA result in a high level of intra-European cooperation in Europe's space industry organized around a small number of major aerospace companies;
- secondly, these cooperation agreements entail specialization by European firms consistent with the objectives defined by national industrial policies.

However, while the aim of the ESA programmes, namely to develop a competitive European space industry on the world market, has been attained in technical terms, the commercial situation is a rather mixed one.

In the field of launch vehicles, the transition from technological development to commercialization and production has been successfully carried through. Europe now has 50% of the world launch services market, chiefly as a result of the stable industrial structure represented by Arianespace. Europe, which has profited from a series of failure and hitches in American transportation systems, will in the coming years have to face tougher competition with the return in force of American launch vehicles and the appearance of other competitors on the market (USSR, Japan and China). Two important factors will determine the competitiveness of European launch systems: first, the efforts already being made by the industry to reduce costs and, secondly, a lasting command of reliability, which is essential to the development of space applications.

In the field of one-off scientific satellites and meteorological or remote sensing satellites manufactured in small quantities, the European space industry is competitive in both technical performance and price. This situation can be put down to the lower-cost engineering environment and lower cost of scientific work in Europe compared with the United States. Unfortunately, the limited size of the international market makes it impossible to capitalize on this competitive advantage.

In the telecommunications field, which is currently the main market for commercial applications in the space segment, the transition from the R&D to the commercialization stage has not been accompanied by the rationalization necessary for the emergence of European leaders. The main reason is that the

major firms are excessively dependent on their national administrations which, acting both as market regulators and customers, tend to favour their own national industry. They have a decisive influence on defining the specifications of space products, thereby hindering the standardization of subsystems and affecting production costs.

In relative terms, therefore, the space industry is handicapped on both the European and world markets since without a true European dimension it cannot take advantage of economies of scale.

The "juste retour" principle enshrined in the ESA Convention which guarantees the participating states industrial contracts commensurate with their level of contributions, combined with the size of public procurement contracts, has had the effect, in the large countries, of concentrating space activity within a few firms specialized in the aerospace sector and the large R&D programmes.

This situation prompts industrialists to focus on the technological challenges at the expense of a genuine commercial strategy.

There would appear to be a case for less rigorous application of the ESA's "juste retour" arrangement, particularly since the concept of juste retour is alien to the basic principles of the Community. This would permit greater competition without prejudicing the interests of the Member States.

## 2. Ground segment

In the ground segment, a market with far greater potential for commercial development than the space segment, the weakness of European industry is even more in evidence.

The United States and Japan control 80% of the world market for the ground equipment which is essential to the operation of telecommunications satellites. The weakness of European industry in this area can be put down to three basic factors: the fragmentation of the European market, national regulations and the slow pace of harmonization of technical standards.

The obstacles to the competitiveness of the ground segment industry are described in the earlier section on telecommunications.

## E. LEGAL ENVIRONMENT

The participation of the Member States of the Community in the legal structure of European space organizations, especially the ESA, raises a number of problems inasmuch as the Member States have conferred on the Community exclusive or joint competence according to the matters involved. Now that the Single Act has reaffirmed the Community's competence in the field of research and the environment, in addition to its original competence particularly in commercial matters and competition, there are areas in which there is a potential overlap between the actions of organizations in the space sector and those of the Community. This requires an organic form of coordination. Naturally there is nothing to prevent the Member States from settling between themselves or with non-member countries issues that fall outside the scope of the Treaty. However, if that is the case, the Community's competence must be preserved.

The most important areas where Community competence overlaps with space issues include:

- commercial policy
- competition
- taxation and customs arrangements
- harmonization of legislation

### 1. Commercial policy

In the context of the multilateral trade negotiations, the Commission is negotiating on behalf of the Community a multilateral overall agreement on trade in services (Uruguay Round) covering all types of services liable to figure in international transactions, which includes space services.

Certain general provisions of the agreement on services will have a particular significance for the space sector and it will probably be necessary to adopt specific provisions for implementing them in this sector, for example as regards right of access to the space services market. As space services become more diversified with technological progress, it will be especially important to ensure that the provisions of the services agreement are adapted to that situation.

Whatever the case, the provisions of the agreement on services will have to be compatible with Europe's interests in the space sector.

The rapid development of competition in this sector will also make the question of subsidies into an increasingly sensitive



issue and the concept of a reasonable level of subsidy will become more and more restrictive. It is important that the Community should retain its full competence in this regard, particularly on commercial defence matters

## 2. Competition

The development of space technology and applications has led to the setting up of private companies such as Arianespace and Spot-Image, whose purpose is to commercialize space services and products. At the present stage of the development of space technology, this marketing activity is still underpinned by publicly funded R&D.

It would be in the interest of these companies to ensure that their activities have a secure basis in Community law, in view of the competition rules applicable within the Community.

## 3. Taxation and customs arrangements

While clarification of the relevant Community provisions may be desirable, there are no major problems in this area. The conventions establishing the ESA, Eutelsat and Eumetsat confer privileges and immunities on these organizations for the purpose of exercising their official activities, in particular with regard to tax and customs arrangements, to enable them to carry out the tasks conferred on them by their member states. Community law does give Member States the possibility of granting such exemptions.

## 4. Harmonisation of legislation - legal arrangements applicable to activities carried out from space

The development of activities carried out from space and, especially, in future space stations allowing man to live and work in space, will call for a rethinking and change of emphasis in the field of space law, which up to now has essentially been a branch of public international law drawn up under the auspices of the United Nations.

Space - a field not subject to national appropriation - will be used on an increasingly large scale for new economic activities requiring the framing of space law and legislation applicable to the products of space activities.

The main issues to be addressed include:

- protection of satellite data used for commercial purposes (remote sensing data);
- formulation and harmonization of laws on intellectual property (protection of inventions or counterfeiting in space), civil and penal law (astronauts), taxation and movement of goods between Earth and space;
- protection of the circumterrestrial environment (space debris, etc.).

#### F. TRAINING

The rapid advances in space technologies and their industrial and commercial applications are creating a demand for personnel highly-qualified in these new interdisciplinary fields, since these are emerging technologies requiring high-level qualifications. Appropriate training programmes will help to strengthen the competitive position of the European space industry.

### III. CURRENT COMMUNITY ACTIVITIES

Up to now Community activities have developed gradually but haphazardly without any overall strategy. They have been diversified as the space programmes have opened up new prospects of using space for socio-economic purposes. They have been concentrated on two major applications, earth observation and telecommunications, and they cut across several Community policies.

#### A. TELECOMMUNICATIONS

The Community received a mandate from its Member States to promote the establishment of an advanced and harmonized infrastructure for European telecommunications and to work towards the establishment of a single Community-wide market for services and equipment. Communications satellite techniques contribute towards the establishment of these new services (direct broadcasting, mobile services) and the development of new ground segment equipment.

The use of satellite communications techniques, as in the case of Earth observation techniques, contributes towards the implementation of sectoral Community policies.

In the sector of aid to developing countries, the Commission conducts financial and technical cooperation projects to assist various African, Caribbean and Pacific (ACP) countries which are signatories of the Lomé Convention, and the Andean Pact countries.

Under its regional development policy, for example in the framework of the STAR programme, the Commission finances ground stations for satellite communications with the assistance of the Member States taking part in the programme so as to improve long-distance links to the less-favoured Community countries.

For education and training, the Comett programme is designed to improve advanced training levels, using satellites where appropriate. It is backed up by the Delta programme recently adopted by the Council, which in the area of research is designed to promote the development of new information and communications technologies applied to education and training.

Under the RACE programme, a study conducted by a consortium of communications satellite manufacturers is intended to clarify and optimize, as far as services are concerned, the role of communications satellites in a pan-European integrated broadband network (ICBN).

In its effort to establish common European standards, the Commission has played a vital role in the adoption by the Member States of the MAC/packet family of standards for direct satellite television broadcasting. This is no more than a first stage towards high-definition television on which the Commission, national administrations and industry are conducting studies and specific actions.

## B. EARTH OBSERVATION

Community activities in this field include research and development, pilot projects, a start on the operational use of space data and training projects.

Research and development in the field of remote-sensing, one of the JRC programmes, is focused essentially on methods of interpreting satellite data (current and future sensors) with

a view to their optimum use in land or marine applications. Significant though they are, the funds spent and results obtained are still inadequate when measured against European requirements.

Data from Earth observation and other space techniques are also used in research programmes on the environment, climatology, raw materials and marine science and technology.

The pilot projects are designed to demonstrate applications on a larger scale that could be useful in the implementation of several Community sectoral policies.

In agriculture and forestry, pilot projects in progress or about to be launched concern the cataloguing of forest damage caused by fire, the estimation of acreages and crop yield estimates and forecasts.

The existing pilot projects relevant to development aid concern the monitoring of natural resources, in particular in the Sahel and in Guinea.

At operational level, remote sensing from space is used to draw up land-cover maps for the Community (Corine project). The Commission is also supporting the establishment of the ground segment needed to receive satellite data in tropical Africa and the setting-up of national remote sensing centres.

As far as training is concerned, the Comett programme had already made a significant contribution to the launching of a number of joint technological training projects bringing together companies and universities on specific topics related to Earth observation.

#### IV. SIX ACTION LINES FOR THE FUTURE

In the light of its analyses which will be pursued and consultations with the European Space Agency and other relevant organizations and parties, the Commission considers that Community action could contribute in a significant way to removing a number of obstacles to the optimal exploitation of Europe's space potential. It is therefore proposing six action lines for the consistent development of its space activities.

##### A. RESEARCH AND TECHNOLOGICAL DEVELOPMENT (R&TD): PROMOTING GREATER COMPLEMENTARITY AND INTERACTION BETWEEN THE COMMUNITY R&TD STRATEGY AND THE PROGRAMMES OF THE SPACE AGENCIES

Three sectors should be distinguished:

##### 1. Space: a technological frontier

Implementation of the new ESA programmes (Ariane V, Hermes and Columbus in particular) will call for the acquisition of new knowledge and technological expertise in a number of generic fields also relevant to other industrial sectors: information and communications technologies, robotics, advanced materials, aerodynamics, aerothermodynamics, man-machine interface, reliability and safety of complex systems, quality control, energy sources, medical sciences and technologies, etc.

A comparative analysis of the technological requirements of the ESA programmes and the objectives of the Community's research programme shows many points of convergence. A large number of Community programmes are concerned: Esprit, Brite, Euram, RACE, medical and health research, radiation protection, non-nuclear energy, several JRC programmes and new programmes in the aeronautical sector and on robotics in hostile environments (Teleman).

Regular exchanges of information and coordination with the ESA are therefore indispensable both at the planning level and in the implementation of research programmes so as to avoid duplication and facilitate use by the space industry of the technologies developed under Community programmes.

The space programmes also generate new knowledge and technologies that could be used by non-space industries.

The space agencies' efforts to exploit technological opportunities could benefit from the experience and support from the Community activities to promote technology transfer and innovation.

## 2. Space technologies and facilities: tools at the service of research

### 2.1 Study of our planet: climate, environment and global change

Earth observation satellites are a major source of information for the development of climate models and the study of the impact of human activities on climate and environment.

The development of new remote sensing techniques and the gradual establishment of a world space observation network make it possible to plan for the systematic study of the planet and its global change (in particular greenhouse effect and depletion of the ozone layer) leading to the acquisition of knowledge vital to the more efficient management of our environment and of human activities.

Since this is a problem that has international implications and raises major issues for society, Europe must organize itself so as to play an active and consistent role in international programmes relevant to these areas. It must rapidly define its objectives and priorities and set up the necessary mechanisms and resources enabling it to participate on a more even footing with the United States and the USSR.

Considering that Community action would be the most efficient way of stimulating and coordinating efforts at European level, the Commission intends to submit, for the next review of the framework programme on research and technological development, a proposal for action which follows up the programmes now under way or in preparation. It will also see to it, in cooperation with the ESA, that there is a proper balance between space missions and the requirements of the scientific community.

### 2.2 Microgravity: encouraging preparations for the use of the orbital infrastructure

Like the United States and Japan, Europe is spending large amounts, mainly within the ESA, on setting up an orbital infrastructure which will greatly increase the opportunities for microgravity experiments.

The ESA activities are focused essentially on the financing of platforms, mission costs and multi-user equipment; a major additional effort is therefore needed to prepare for the use of this experimental potential.

Under existing research programmes the Commission intends to encourage a few collaborative projects that will bring together various user groups on particularly promising subjects. At the same time it will continue its consultations with the ESA and other parties concerned in order to determine more precisely the priority objectives and procedures for a possible Community programme, on a wider and more ambitious scale, that would complement the activities of the ESA and the Member States.

### 3. Research and development to promote applications of space systems

This point is dealt with under action lines B. Telecommunications and C. Earth observation.

#### B. SPACE AND TERRESTRIAL TELECOMMUNICATIONS: NEED FOR A CONSISTENT APPROACH TO THE NETWORK, TO THE DEVELOPMENT OF NEW SERVICES AND TO REGULATIONS

In line with the Community's overall telecommunications policy, which regards the strengthening of European telecommunications as one of the essential conditions for a competitive market in the Community, the Commission put forward in June 1987 its Green Paper on the future development and liberalization of telecommunications. One of the reasons for this document is the need to reach common positions on the modification of the regulatory environment for telecommunication satellites in Europe; its objective is in particular the complete and gradual opening of the terminal market to competition and the definition of common European positions within various international bodies.

The Commission intends to pursue these aims as regards telecommunications satellites by developing the following activities:

1. Ensuring that satellite techniques are taken into consideration in the development of networks and services at European level and optimizing the complementarity of satellite and terrestrial systems

Coordination will be necessary between the Commission, the telecommunications administrations, satellite operators and the ESA. Ongoing technological progress towards more powerful satellites and hence less costly ground terminal equipment is a trend that is likely to continue, at least for some time, and could lead to an in-orbit switching capability. To make full use of the advantages of this technological development, careful planning of the overall network will be necessary so as to ensure continuous complementarity and compatibility between terrestrial techniques and the new generations of satellites.

2. Creating the political, regulatory and standardization conditions necessary for the development of new services and equipment to ensure maximum exploitation of space systems

Here the Commission proposes to act at three levels: harmonization of standards for communication systems (satellite access) and ground equipment, promotion of the study of regulatory systems likely to provide favourable conditions for the development of value added services and political action to ensure the setting up of a European telecommunications network with optimum complementarity of the various telecommunications techniques (see details in Annex 1).

3. Promoting the use of satellite communication systems in the implementation of Community policies

The Commission will continue and step up its efforts to achieve the following objectives:

- Rural and regional development: improvement of the advanced telecommunications infrastructure in the less-favoured regions of the Community (STAR) and in the Mediterranean basin.



- Aid to developing countries: helping to finance studies, technical assistance and the space communications infrastructure.
  - Education and training: promotion of the use of new technologies to improve levels of skills in the Community.
  - Transport: improvement of land and sea communications, especially for small firms, and study of the potential of space techniques for surveillance and management systems for land, air and sea traffic.
  - Fishing: analysis of the various satellite options for communications and the positioning of fishing boats.
4. R&D to promote the development of space system applications

Through its R&D activities the Commission will help to promote the development of applications of satellite systems, whether under the RACE programme (development of technologies for a pan-European integrated broadband telecommunications network), the new Delta programme (distance learning applications) or specific projects concerning the adaptation of ground equipment to the Third World market.

#### C. EARTH OBSERVATION: STIMULATION OF THE APPLICATIONS MARKET

The use of space data will become an important, if not indispensable, aid in the implementation of several Community policies: agriculture, environment, fisheries, regional development and development aid. The use of these data in scientific research (studies of our planet in particular) is covered in section A.2.

The Commission intends to extend and intensify the integration of satellite information in the implementation of Community policies.

Because of the extent, continuity and variety of the Community's demand, both as a final user and as an intermediary for final users such as regional or local authorities and developing countries, the Community is bound to have a decisive effect on the establishment of a stable applications market.

Consequently the Commission proposes a coordinated set of actions designed not only to develop operational applications meeting its own requirements but also to stimulate the development of applications markets in general.

1. Promoting European cooperation and coordination in R&D on methods and techniques for processing and interpreting satellite data

The Community is already active in this field with the JRC's remote sensing programme which is already helping to improve the consistency of national efforts. However, they are still too scattered. The gradual broadening and expansion of Community activities is necessary not only for the requirements of its own policies but also, through a network of laboratories associated with the JRC's work and by shared-cost projects, to stimulate European cooperation amongst all those concerned, whether laboratories or industry. In the context of that cooperation the Commission will also endeavour to promote product standardization.

2. Stepping up the demonstration of operational applications (pilot projects), promoting feasibility studies and implementing operational systems in Europe

This mainly, although not exclusively, concerns applications relevant to the Community's sectoral policies mentioned earlier. An initial analysis of the applications of space data in Community policies is given in Annex 2.

3. Familiarization, training and assistance for users

A Community action plan for training in remote sensing techniques based on existing programmes (the JRC's Ispra courses, Erasmus, Comett and Science) appears useful and should be carried out in cooperation with national activities. The JRC will also endeavour to exploit better its experience by being more active in the areas of receiving research scientists and giving assistance in the implementation of projects. This would apply in particular to European countries not having the necessary infrastructure and to the developing countries. For the latter, coordinated projects involving financial and technical support for local training should also be developed.

4. Setting up, in cooperation with the space agencies, European experimental facilities (in particular airborne sensors) needed to prepare for the use of data produced by the new types of sensor (in particular ERS 1 which will be operating from 1990). As Europe has no facilities of its own, it is dependent on the United States or Canada.
5. Contributing to the definition of future space missions that meet the requirements of the various categories of users and promoting the establishment of user associations
6. Identifying together with the parties concerned (in particular space system operators and the European Association of Remote Sensing Laboratories) and in collaboration with the ESA, the necessary measures at European level to support the emergence of a commercial supply of value added services

Market research (public and private) and studies on economic conditions for the development of markets (organization of supply, pricing policy, etc.) should provide essential information needed by the various parties concerned.

7. Promoting common positions by the Member States in international negotiations on problems relevant to the legal and economic environment for remote sensing (legal questions linked to the access to and use and protection of space data, pricing policy, etc.)

#### D. INDUSTRIAL DEVELOPMENT: FURTHER STUDY OF THE IMPLICATIONS OF THE SINGLE MARKET

Unlike the position for launchers, in telecommunications (space and ground segments) the space industry is fragmented and is therefore not able to exploit the economies of scale inherent in markets of that size.

The achievement of a genuine internal market in 1992, the opening-up of access to public contracts and the liberalization of national regulations should play a vital role in improving European competitiveness, since it could benefit from economies of scale of the same order of magnitude as those which have helped to make American industry so successful. This change in the economic environment of the European space industry will create favourable conditions for structural adaptations leading to greater competitiveness.

In cooperation with the parties concerned, the Commission will continue to study the implications of the large single market for space and space-related activities so as to identify any specific measures to be taken to allow their optimum development.

E. LEGAL ENVIRONMENT: CONTRIBUTING TO THE ESTABLISHMENT OF FAVOURABLE CONDITIONS FOR THE DEVELOPMENT OF EUROPEAN SPACE ACTIVITIES AND ENSURING THAT THESE ACTIVITIES ARE IN HARMONY WITH COMMUNITY LAW

The Community effort should concentrate on the following action lines.

1. Commercial and competition policy

The Community must define its commercial policy for goods and services in the field of space, making sure that it obtains opinions from all the European parties involved. In the general interest it is desirable, in the arrangements to be made for the performance of their task, to prevent these parties from creating precedents liable to prejudice this section of commercial policy.

2. Taxation and customs arrangements

In view of its competences in this field, even though Community provisions of a general nature exist, the Commission might wish to lay down specific provisions for the privileges of space organizations.

3. Harmonization of legislation

The Commission intends to take steps to harmonize national laws relating to the activities conducted from space, thus establishing the legal security needed for the development of space activities. It also intends to encourage common positions by the Member State in international negotiations on space law.

## F. TRAINING: PROMOTING THE DEVELOPMENT OF HIGH-LEVEL EUROPEAN TRAINING

Community action in this field under the Comett programme and in association with the academic and industrial worlds will help to develop high-level European training.

It also appears useful to encourage consideration of the European dimension in training activities already in progress nationally, whether they concern initial or in-service training.

## V. IMPLEMENTATION OF THE ACTION LINES

A. In the light of the request made by the European Parliament (Resolution of 17 June 1987 on European space policy), this communication sets out the Commission's analysis of the Community space role and defines appropriate action lines.

In due course the Commission will put forward specific proposals for the implementation of these action lines.

B. This implementation will call for:

- systematic consideration of the various dimensions of space activities in the definition and implementation of Community policies;
- continuation and expansion of space or space-related activities initiated by the Community and definition of new activities to be undertaken under existing instruments.

This should be done in close consultation with the Member States and with all the parties involved in space in Europe, so as to ensure the consistency of European space activities while ensuring that Community competences are exercised in a legally incontrovertible fashion.

C. In particular, cooperation between the ESA and the Community must be developed gradually on a more systematic basis.

In practical terms, without prejudging solutions that may later be necessary in order to provide an appropriate formal basis for relations between the ESA and the Community, cooperation could comprise the following:

- the setting up of working groups, similar to the existing one for telecommunications, for exchange of information and coordination and for precise identification of cooperation areas and procedures;
  - participation of Commission representatives in the advisory structure of the Director-General of the ESA and, in return, participation of ESA representatives in the Community's advisory bodies dealing with space-related matters;
  - where necessary, Commission support, through its external delegations, for ESA international activities outside the Community;
  - the organization of joint studies on questions of common interest related to the optimum use of space technologies;
  - secondment of Commission staff to ESA and vice versa;
  - in agreement with Community Member States, representation of the Commission on the ESA Council.
- D. As the links between the Community policies and space are bound to increase, it is necessary to set up in the Commission a "policy and coordination" unit to ensure the necessary consistency, both in-house between the various Commission departments concerned and externally in relations with other space organizations.
- E. Finally, the Commission intends to put forward in 1990, before the next ministerial meeting of the ESA Council, a report to the Council and the European Parliament on the development of the European space situation and on all Community activities in this field. This report will be drawn up in consultation with the ESA.

## VI. CONCLUSION

The Commission requests the Council to:

- accept the analysis put forward and the need for the Community to play a wider and more active role in space matters;
- approve the action lines on the basis of which the Commission will put forward practical proposals for action.

FINANCIAL IMPLICATIONS

This communication in itself has no financial implications. These will be made clear if and when the Commission puts forward specific proposals for the implementation of the proposed action lines.

IMPLICATIONS FOR SMALL AND MEDIUM-SIZED ENTERPRISES (SMEs)

The implementation of the action lines proposed in this communication will have a beneficial impact on all the sectors connected with space activities and in particular on SMEs, which already make a significant contribution to the achievements of the European space industry. SMEs in fact receive nearly 50% of the ESA's payments to the industry for the execution of its programmes.

The proposed activities will contribute to the development of markets for the products and services from the sectors directly and indirectly associated with space, and will benefit those SMEs that are directly concerned either as users (telecommunications services, for example) or as producers (of components for space systems, value-added services in connection with the interpretation of Earth observation data, and so on).



ANNEX 1TELECOMMUNICATIONS

Elements to be discussed with Member States to create the political regulatory and standards conditions necessary for the development of new services and new equipment for the optimum exploitation of space techniques.(\*)

Fixed Service

## Standards:

- harmonize standards for small ground terminals, in order to enlarge the common market of such terminals.

## Regulatory:

- deregulate progressively small terminals for fixed service (reception and possibly reception/transmission);
- envisage a progressive move towards competition at Community level for data broadcast by satellite.

## Political:

- define a European network which optimizes the exploitation of the different telecommunications techniques and identifies niches for satellite use.

Broadcast Service

## Standards:

- maximize the use of MAC television standards for direct broadcast satellites, and encourage the adoption worldwide of the European standard for evolutionary high definition television.

## Regulatory:

- promote the rapid adoption of regulations which permit pan-European television.

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(\*)The proposed discussion will have to be held in particular within the SOGT (Senior Officials Group on Telecommunications)

**Political:**

- ensure that the option for direct television broadcast systems from pan-European satellites is accepted at international level, both technically and institutionally (discussion in the WARC group of the ITU);
- encourage the analysis of different satellite options in order to reduce the cost per television channel, whilst limiting the cost to individual viewers; eventually, work towards a revision of the current WARC agreements;
- contribute to the establishment of Community positions within international organizations to ensure the above objectives are attained.

**Mobile Service****Standards:**

- promote harmonization of the standards for shipborne equipment.

**Regulatory:**

- reduce the regulatory constraints to permit a broader use of satellites for mobile services.

**Political:**

- promote, in conjunction with national maritime authorities, the optimal exploitation of space techniques for maritime communications, particularly when they may be useful for the implementation of Community policies (fisheries, transport, ...);
- contribute to discussion on the identification of a European regional land-mobile satellite system;
- evaluate, in collaboration with the competent authorities (EUROCONTROL), the possibilities for satellite systems to contribute to the needs for communications and traffic control of the air transport sector.

ANNEX 2EARTH OBSERVATION

## Applications in the Community's sectoral policies

The pilot projects under way will be continued and expanded. New projects will be defined and launched on other promising applications. The fields covered are:

Agricultural statistics: estimation of acreages for the main crops in the Community, final estimation and forecasting of crop yields. This project is already defined and will be carried out in cooperation with national statistical departments and other bodies; it should lead to the first operational transfers within three years.

Management of less-favoured areas: documentation of agro-ecological changes and allocation of Community aid on the basis of indicators of regional agro-ecological changes.

Forest management: improvement of information on forest areas by broad categories of species, on forest areas damaged by fire and on the health of forest populations. The pilot projects already launched (fire damage) will be expanded.

Environment

- Land:
- monitoring of changes in land cover : activity already in progress, in particular under the Corine Land Cover project
  - monitoring of changes affecting natural areas and protection of areas at risk
  - evaluation of the impact of major development works.
- Sea:
- monitoring of hydrocarbon and chemical pollution
  - monitoring of coastal pollution; the feasibility of operational systems should be studied.
- Atmosphere: evaluation of the impact of human activities (greenhouse effect and depletion of the ozone layer).

### Fish stocks

- improvement of knowledge of the migration and concentration of certain marine species, especially tuna, so as to predict advantageous fishing grounds in order to reduce costs without running counter to the conservation policy;
- aid for aquaculture.

### Regional development

The Commission will study more systematically the possible contribution that space data can make to regional planning and development on a Community scale. These applications are also of interest to regional and local authorities. Because of their potential scale and diversity, they constitute a promising market for the development of operational systems.

### Development aid

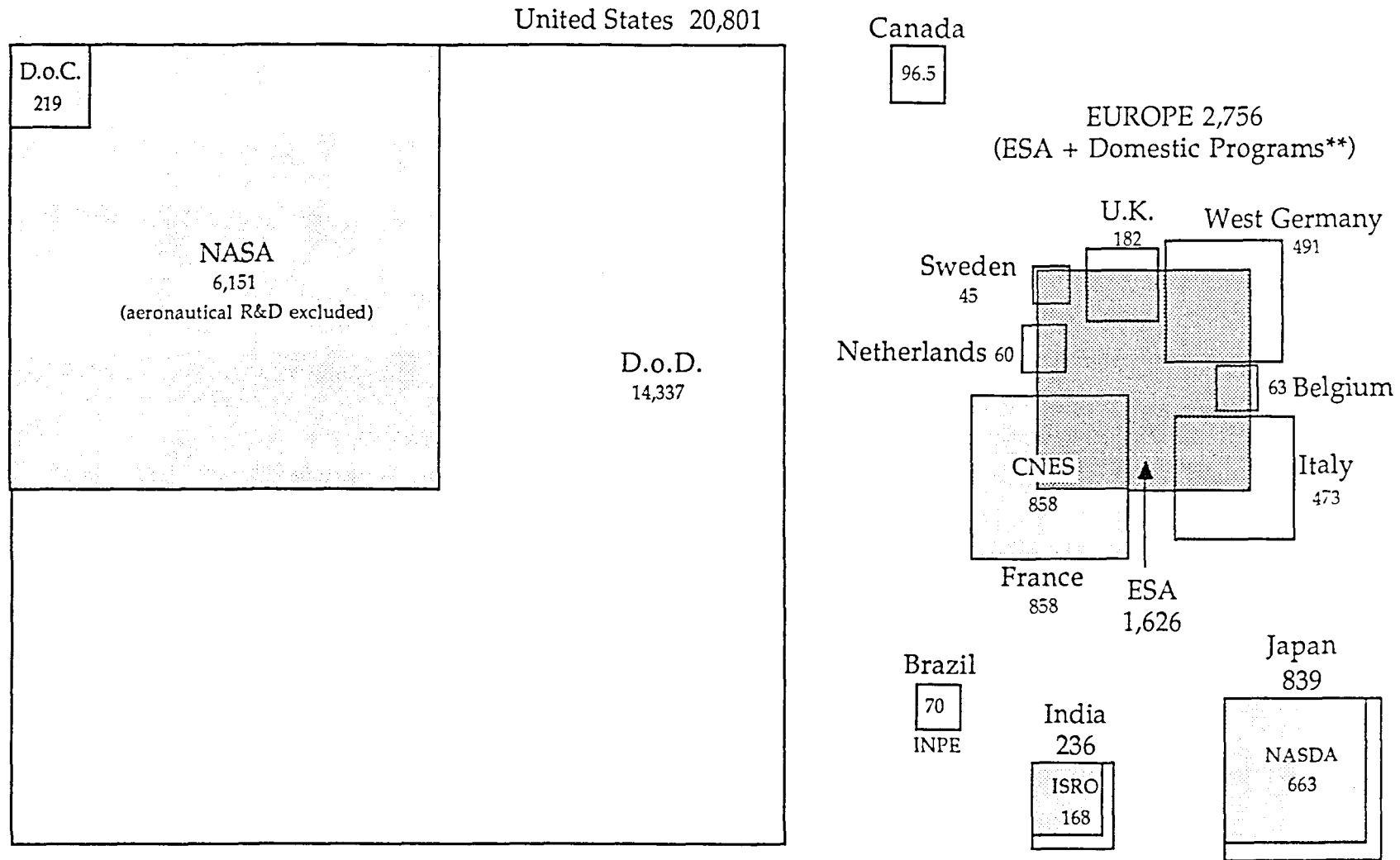
The Commission intends to continue and extend its investigation of remote sensing potential, especially for the surveillance of renewable resources: farm production, hydrological resources, monitoring of plant cover and the prevention of desertification. It will also continue its support for training and the development of the infrastructure needed to ensure data availability.

While continuing its work in Africa, the Commission is planning to extend its activities to Latin America and Asia.

ANNEX 3 :

**TABLES**

# 1987 Budgets for Space\* throughout the World (ECU in millions)

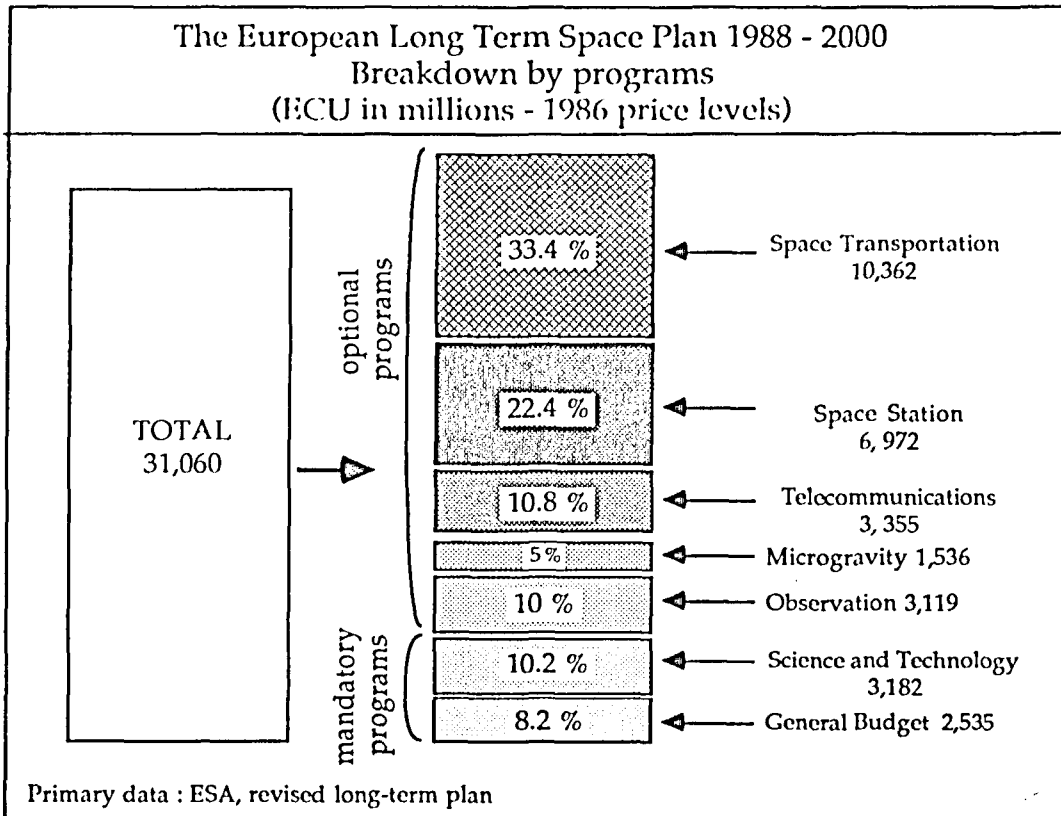


\* budget authorization for the USA and payment authorization for ESA

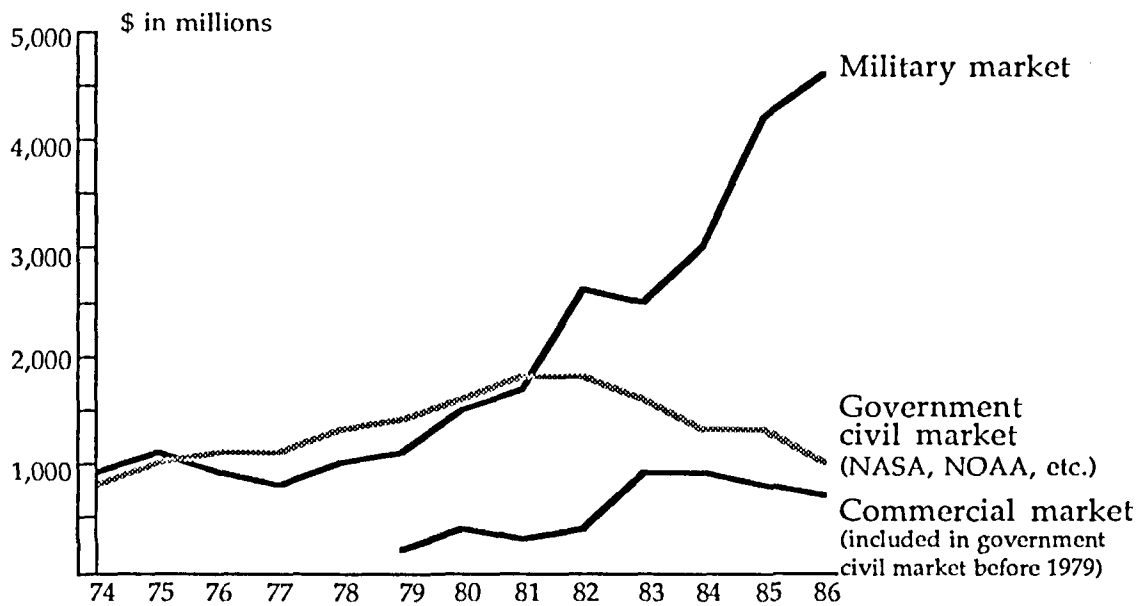
\*\* military programs excluded

Euroconsult's data base ECOSPACE

Non-government user's contributions included for CNES and NASDA



## American Space Production 1974 - 1986 \*



\* excluding space vehicle propulsion systems, ground segment and services

Euroconsult's data base ECOSPACE

Primary data: Department of Commerce