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Report

drawn up on behalf of the Committee on Energy and Research

on European space policy

Rapporteur: Mr A. TURCAT

English Edition

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On 19 December 1980 Mr Calvez submitted to the European Parliament, pursuant to Rule 25 of the Rules of Procedure, a motion for a resolution on European space policy (Doc. 1-764/80).

On 19 December 1980 the European Parliament referred this motion to the Committee on Energy and Research as the committee responsible and on 15 June 1981 referred it to the Committee on Youth, Culture, Education, Information and Sport for its opinion.

On 19 March 1981 the Committee on Energy and Research appointed Mr André Turcat rapporteur.

It considered this motion at its meetings of 27 March 1981, 14 May 1981 and 18 June 1981.

At its meeting of 18 June 1981 it unanimously adopted the motion for a resolution and the explanatory statement.

Present : Mrs Walz, chairman; Mr Gallagher, vice-chairman; Mr Normanton, vice-chairman; Mr Turcat, rapporteur; Mr Adam, Mr Beazley, Mr Calvez (deputizing for Mr Pintat), Mr Estgen (deputizing for Mr Sälzer), Mr Früh (deputizing for Mr Sassano), Mr Fuchs, Mr Galland, Mr Ghergo, Mr Herman (deputizing for Mr Croux), Mr Linkohr, Mrs Lizin, Mr Moreland, Mr Price, Mr Purvis, Mr Rinsche, Mr Seligman, Mr Vandemeulbroucke (deputizing for Mr Capanna), Mr Vandewiele, Mr Veronesi and Mr Wedekind (deputizing for Mr Müller-Hermann).

The opinion of the Committee on Youth, Culture, Education, Information and Sport will be presented orally.

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The Committee on Energy and Research hereby submits to the European Parliament the following motion for a resolution together with explanatory statement:

MOTION FOR A RESOLUTION

on European space policy

The European Parliament,

- having regard to the motion for a resolution tabled pursuant to Rule 25 of the Rules of Procedure (Doc. 1-764/80),

- having regard to the report of the Committee on Energy and Research (Doc.1-326/81),

- having regard to its resolution of 25 April 1979 on Community participation in space research[1],

- having regard to the scientific, material and human structures and resources which the Member States of the Community and the European Space Agency have developed in the field of space activities,

- having regard to the proposals submitted by the Agency and by Eurospace respectively,

- having regard to the limited scope of current and projected programmes within the Agency, in the individual Member States and in the framework of agreements between them,

- having regard also to the low level of European financial commitment in the field of space activities compared to the considerably higher amounts allocated by the USA, by the USSR and also, proportionately, by Japan,

- whereas a new space era has been initiated by the launching of the American Space Shuttle and there are now definite prospects for the placing in orbit of heavy loads and the construction of multi-purpose space stations, which offer prospects far beyond Europe's present plans for the future,

- aware of the importance of space activities for the people of the Community in terms of employment, prosperity, independence, health, science, communication, culture and international cooperation with the industrial powers as well as the developing countries,

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[1] OJ No. C 127, 21.5.1979, p.42 (Ripamonti report - Doc. 2/79)

1. Applauds Europe's achievements in space;

2. Considers nevertheless that the individual nations and the Community should devote still greater efforts than in the past to space activities;

3. Declares that the presence and the role of Europe in space can be maintained and developed in the last decade of the century only by means of the immediate formulation of a powerful and coherent long-term policy on space applications, and only if the necessary material and intellectual resources are made available; this policy and the necessary early decisions must also obey the fundamental objectives of peaceful activity, which, therefore, implies separation from the military industry, the improvement of possible applications in the fields of telecommunications and television, navigation and position-finding, earth observation and meteorology and the manufacture of materials in space; the needs of the developing countries must also be taken into account.

4. Considers that the main aim of such a policy should be to take early decisions with a view to :

   (a) beginning the ARIANE IV programme,

   (b) acquiring the key technologies for performing rendezvous and docking in space, controlled and unmanned space flights, re-entry into the the atmosphere and recovery operations,

   (c) developing a European heavy launcher, as a sequel to the Ariane programme, and heavy satellite stations in geostationary or low orbit before 1990;

5. Urges the Council to discuss these problems at the earliest possible moment by calling a European Space Conference at ministerial level, and to call on the European Space Agency (ESA) and the research centres of the Member States to formulate and implement projects capable of achieving these ambitions;

6. Calls on the Commission to submit within six months proposals for a more ambitious space policy to be formulated by the Agency, for more effective cooperation between the organs of the Community and for all the necessary financial instruments to be placed at the disposal of European space projects;

7. Calls upon the Commission to report to Parliament, if possible within a year, on the action which mightbe undertaken by the European Community in the fields of space research and exploitation including :

   (a) an analysis of the scope for Community action and, in particular, a summary of the advantages, disadvantages and cost ranges of each option;

(b) the range of possible applications of satellites, with an assessment of potential benefits to Europe as a whole, to the Community in the fulfilment of its sectoral policies and to the Third World and an indication of priorities within this range;

(c) a review of the consequences of such a Community programme on technological innovation within European industries and the possible economic benefits which might be gained; and

(d) the time scale when the funding might be required, whether this should be met entirely through the Community budget and what financial contribution or return might be expected from the users or beneficiaries;

8. Is convinced that only major projects of this nature can stimulate industry to greater efforts, improve its structure and persuade men of the need for a peaceful and civilizing presence in space;

9. Instructs its President to forward this resolution and the report of its committee to the Council and Commission.

B

EXPLANATORY STATEMENT

CHAPTER I - EUROPE AND SPACE - SURVEY OF THE PRESENT SITUATION

1. - Space in industry and commerce

- In 1981 space is more than a field of scientific adventure; the extraordinary photographs of Saturn's rings or Jupiter's satellites transmitted to earth by the American interplanetary space probes should not distract our attention from the wider applications of satellites. Satellite photographs are used for weather-forecasting, satellites are used for long-distance telephone links, for giving the position of ships at sea, for cartography and mining prospection; the developing countries are setting up educational TV systems using satellites. Space has become a prime target for industry and commerce, with opportunities created by satellites, launchings and by the sheer range of services space activities can provide.

- In 1981 space is no longer the monopoly of the two superpowers, the United States and the Soviet Union. For twenty years Europe has made forceful and determined efforts which are now bearing fruit. With the Ariane launcher and the KOURO test range, with an aerospace industry capable of producing competitive satellites, with the European Space Agency and the various national research centres, Europe at present stands as a space power in its own right. The orders placed by the Intelsat organization for satellite launches by the Ariane launcher and the decisions taken by Europe in 1979 on telecommunications and earth observation satellites are ample evidence of this.

- In 1981, however, following the launch of the American Space Shuttle and in the face of competition from other countries such as Japan, Europe must consolidate its position. As far as space applications are concerned, Europe now has the means to be independent and it must seek to maintain this independence, particularly in the field of new applications. It must also strive to increase its competitiveness on the major international markets, where fierce battles will be fought.

- As a starting point, it is worth remembering how Europe reached its present status.

2. – Historical background

Four main periods can be distinguished:

- 1962-1966 – Sensitive to the prestige attached to the scientific knowledge of space and to the spectacular moon race between the Americans and the Russians, the European nations began to create space organizations of their own, ESRO and ELDO, to develop scientific satellites and launchers respectively. At the same time France set up a national body of its own, the CNES.

- 1967-1973 – By now America was turning its attention to the application of the techniques already acquired. This move towards utility was viewed unfavourably on this side of the Atlantic. With the exception of meteorological offices, European administrations had no faith in the practical use of space for their own needs. While France was embarking on a national programme to develop the Diamant launcher and Germany and France were cooperating on a bilateral telecommunications programme, Symphonie, only the METEOSAT, and later the OTS satellites were being developed at European level. The scientific programme, on the other hand, remained of the highest standard at both national and European level, with projects like the British Ariel series.

- 1973-1976 – European governments gradually came to recognize the possibilities afforded by space systems, though not yet to the point of taking action. The key development was the setting up between 1973 and 1975 of the European Space Agency, which included science, applications and launching systems in its programme. The ARIANE, SPACELAB and MARECS programmes were all part of this new framework; certain national programmes were abandoned (Diamant) and some national resources were transferred to the Agency, which was still expanding at this time.

- from 1977 onwards – European governments began to take an interest in operational space applications, while at the same time doubts began to appear as to the role of the ESA.

  With national and commercial constraints proving an obstacle to the integration of all European space activities, the more powerful Member States decided to pursue national space applications programmes or to cooperate in bilateral or multilateral programmes outside the Agency framework. The failure to Europeanize the SPOT programme (earth observation), for example, led France to pursue the project at national level alone; similarly, the market outlook led Germany to abandon the Agency's complex H-SAT programme (television) in favour of a bilateral programme with France. This then left Great Britain to take the leading role in the rival L-SAT programme within the Agency.

Applications programmes like ECS (communications), MAROTS/MARECS (maritime navigation) and METEOSAT, however, remained within the Agency.

The industrialization and commercialization of the Ariane launcher, also developed as part of the Agency programme, was undertaken on a flexible basis by ARIANESPACE, an industrial company grouping together thirty-three European firms.

3. From this historical development - which was straightforward technically, though rather problematic at institutional level - a number of facts relevant to the present situation emerge:

   a) In terms of launchers and satellites, Europe possesses the necessary means for the study and exploitation of space; more will be said of this in Chapter IV;

   b) The European governments who dispose of these resources are aware of their potential;

   c) Space activities remain divided between, on the one hand, the ESA, whose role is mainly in the field of research and development, and, on the other, the national industries who have now come of age and are operating on the markets.

The most important question, however, is the utility of space activities and of the markets to which they give rise.

CHAPTER II - THE USES OF SPACE

4. – Science

The most striking aspect of space activities is the role played by science. Indeed, scientific reality loses nothing by comparison with the world of science-fiction.

Even before the launching of the first artificial satellites, space sciences had begun to advance with the development of space probes, modelled on German war rockets - AEROBEE in America, VERONIQUE and CENTAURE in France and SKYLARK in Great Britain. But these investigations only touched on a restricted sphere of geophysics, the study of the earth's immediate environment, that is the neutral or ionized upper atmosphere. The instruments used were relatively primitive - in 1958, for example, a single Geiger counter had enabled VAN ALLEN to discover the high energy charged particles which constitute the magnetosphere of our planet.

The remarkably rapid development of space techniques, with the initial emphasis being placed mainly on an increasingly ambitious programme of scientific missions, made this an exceptionally dynamic sector of research and completely transformed the traditional perspectives of astronomy and the environmental sciences. Today space observatories are an essential instrument in stellar and extra-galactic astronomy. Satellites and planetary space probes are responsible for almost all our knowledge of the solar system and have given a new impetus to solar astrophysics.

Today Europe is developing a satellite (EXOSAT) for the study of cosmic X-rays and another (GIOTTO) for the close-range photography and study of the composition of Halley's Comet when it next passes in 1986. It is also planning to take part in the exploration of the neighbouring planet of Venus as well as the more distant one of Jupiter, using modules which will land on the actual surface of these planets.

In the same way scientific space missions have proved a powerful stimulus to technological progress. New techniques which began as scientific projects have also found, or will find, economic space applications in conjunction with operational space vehicles. These include hyper-frequency low-noise amplifiers (radioastronomy), space telescopes (astronomy), photon and high energy particle detectors (geophysics and astronomy), on-board computers and attitude control and precision direction-finding systems (astronomy), and robot sciences and telemanipulation (planetary exploration), not to mention the corresponding developments which have taken place in the field of electronic components.

From this point of view, scientific and technological developments can genuinely be said to be progressing hand in hand in the field of research, where technical constraints are costly but results are abundant.

5. But on the planet earth, inhabited - it has been said - by four thousand million cosmonauts, the stage has now been reached where space activities have direct applications in four main sectors:

Telecommunications
Navigation and location
Earth observation and meteorology
Manufacture of materials.

6. – Telecommunications by satellite

Telecommunications by satellite were the first area of space applications in terms of chronology as well as social and economic impact. They can be divided into three categories: fixed network, mobile network and direct broadcasting - the same headings used for drawing up regulations.

The fixed network is made up of links between fixed points on earth - telephones, telex, telematics and also includes the transmission of television programmes from one network to another. These links stretch right across the world (international air-traffic is controlled by the Intelsat organization). Their efficiency has been increased and their cost reduced to such good effect that the actual space link-up accounts for less than 15% of the cost of a transatlantic communication.

The mobile network is designed to provide similar links between fixed stations on earth and ships, planes and even road transport when it is equipped for the purpose. For ships the Inmarsat organization is to put into operation Intelsat V satellites and European MARECS satellites. Initially the service will be provided for owners and operators of mainline commercial shipping, but will subsequently be extended to include ships of more modest size.

Direct broadcasting concerns radio and television programmes intended for direct reception by users (individual or collective aerials). Radio broadcasting, as a forerunner to television, is an important educational instrument for the developing countries. In Europe the first television satellites will be in operation in 1983, each broadcasting on two or three channels. Eventually, by virtue of international conventions, operational satellites will be able to broadcast on up to five channels.

The next ten years will also see the creation of new space telecommunications services, in many cases supplementing existing terrestrial facilities. These will include the transmission or diffusion of information or professional data, tele-informatics, video-conferences, video-broadcasting, electronic mail and tele-medicine. In future decades the rapid progress of telematics should lead to the substantial development of high-volume inter-establishment digital links using satellites.

7. – Earth observation

Earth observation is a new activity mainly concerned with photography and does not yet have comparable economic importance. By virtue of the services it can offer, however, rather than through potential satellite sales, earth observation is becoming of vital importance for the nations of the world.

Earth observation draws together all the space techniques which enable us to increase our knowledge and understanding of the natural phenomena which occur in the neighbourhood of the earth's surface and it provides us with the capacity for the continuous monitoring both of these phenomena and of those which have a human origin.

It embraces such varied disciplines as meteorology (which will be dealt with separately), oceanography, glaciology, climatology, geology, cartography, plant ecology, agronomy, hydrology and regional development.

The satellite photographs are intended to provide the user with synoptic and usually successive views of the phenomena which interest him.

- The high-precision observation of land masses is intended for use in cartography (in the broadest sense) and in the study of geological formations and ecological phenomena (vegetation, water, the effects of human activities on the natural environment).

Its use will make it possible to improve the management of arable lands and to monitor the state of crops and vegetation on a world scale. This, together with climatological studies (also using satellites), ought eventually to enable effective action to be taken on crops and vegetation and so progressively help to resolve the problem of hunger.

High-precision observation will also make it possible, of course, to monitor for peaceful purposes the distribution of strategic weapons and installations over the globe; indeed, it is possible that serious armed conflicts may already have been avoided recently as a result of satellite observation, which removes the element of secrecy from military preparations and makes it easier for a supervisory body to operate.

- The systematic observation of the surface of the ocean contributes to our scientific knowledge (ocean currents, interaction between sea and atmosphere) and has practical applications (location of plankton-rich zones, particularly suitable for fishing).

8.- Space meteorology is no longer in its infancy

Operational meteorological observation, which has been a model of international cooperation for several years within the framework of the World Meteorological Organization, consists of a network of satellites in low orbit and observation satellites in geostationary orbit providing half-hourly pictures of the earth's surface in several wave-lengths, particularly in the visible and in the infra-red zone. Europe's contribution to this network is the METEOSAT satellite, the first model of which was operational from November 1977 to November 1979; the second is due to be launched at the third Ariane test launching.

Thanks to geostationary satellites, space meteorology has also distinguished itself through its ability to detect and monitor great natural disasters. Progress is expected to be made in the continuity of surveillance and the detail of observation attainable (from tropical cyclones to hailstorms!).

9.- Navigation and location

Satellite systems for navigation, location and data acquisition are noted for their ability to cover the whole globe as well as for the great diversity (ships, buoys, balloons, terrestrial vehicles) and the large number (up to hundreds of thousands) of mobile elements able to participate.

Those navigation systems which are operational, or about to become so, were originally intended for military purposes, although access is now granted to civilian users for less sophisticated operations (ships, oil prospection on continental shelves).

Location and data acquisition systems have mainly civilian and humanitarian applications, for example the SARSAT programme designed to aid the location and rescue of ships in distress, which has been a model of cooperation between America, Canada, the USSR and France, and the ARGOS system, which is now operational.

10. The manufacture of materials in space is likely to remain at the experimental stage for some time to come.

The absence of gravity in orbital conditions means that it is feasible to contemplate the production of samples of materials of a different quality and composition to those produced on earth. In fact, the first spectacular results obtained during successive missions by American astronauts on the SKYLAB orbital space station (the manufacture of giant monocrystals), the imminent completion of the Space Shuttle and SPACELAB programmes and the crystalline synthesis being performed on a regular basis on board the Soviet orbital station SALYUT are all indications that the capacity for conducting experiments under conditions of microgravity acquired by the two space superpowers is going to be fully exploited to explore this new field which, although still at the scientific stage, has every likelihood of becoming industrial. It would be dangerous to neglect this sector as it also includes the fields of electronics and magnetism.

Crystalline synthesis

The forces of gravity exert an important influence on the formation of crystals, particularly around the critical moments when atomic structures change their physical form and several phases - solid, liquid or gaseous - can coexist, with the associated phenomena of convection. Outstanding results are expected in these transitions from the liquid or gaseous phase, and with a high degree of purity. One example is the development of mercury iodide (Hgl2) from the gaseous phase to give crystals of a 'strategic' material (used to make high energy particle detectors), which is produced on earth in small quantities and at very great expense; the current cost of a mercury iodide crystal is about 250 EUA per gramme.

Given that the cost of manufacturing such materials in space is equivalent to the cost of the space transport involved, it is clear that the space production of crystals like mercury iodide could easily become viable, once the quality of crystals produced in space became superior to that of those produced on earth. However, the world market for products of this type is very limited (a few dozen or a few hundred kilogrammes per year) and on its own it would hardly justify the massive investments involved.

New alloys

There is a wide variety of alloys for which a certain degree of concentration cannot be achieved under terrestrial conditions. because the constituents when melted form two non-miscible liquids of different densities which separate like water and oil under the action of gravity. It is perfectly feasible to use conditions of microgravity to stabilize an 'emulsion' of the two liquid phases and produce after crystallization an intimate mixture with original mechanical or electronic properties. Encouraging results have already been obtained in this area during short ballistic flights, though using very small samples. Conditions of microgravity should also produce significant effects on the phenomena of surface tension.

Fusion without a crucible

Microgravity also opens up the possibility of the remote stabilizing and manipulation of samples of matter in levitation, through the action of acoustic or electromagnetic forces, without physical contact with a support of any kind and, for liquids in fusion, without a crucible. We know that the manufacture of a great many refractory materials - glass, ceramics, special alloys - often comes up against the impossibility of achieving fusion without simultaneously producing unwanted chemical reactions, whatever type of crucible is used. Processes where the material itself is used as a support are employed successfully on earth, particularly when purification (recrystallization of silicon by zone fusion) rather than synthesis is involved. But the cost of these processes can be as high as that of space flights - monocrystalline silicon, for which there is a world market of thousands of tons, can cost anything up to 20,000 EUA/Kg.

It is clear that the production of each product must be shown to be profitable. Profitability depends to a very large extent on the cost of space transport and could only be achieved if the ratio of price to weight of materials were very high and if the 'space quality' made for much greater efficiency.

However, among the extensive range of new products and projected space experiments on board SPACELAB and SALYUT, there cannot fail to be some materials with potential applications, particularly in the field of semiconductors, supraconductors and magnetic and optical materials.

11. – It is possible that there will be similar developments in bio-engineering, an area in which the Russians in particular have conducted experiments. However, your rapporteur had no reliable information available on this subject.

12. – This chapter on space applications would not be complete without some mention of the idea, put forward in various quarters, that solar energy could be collected by means of orbital stations of photovoltaic cells and retransmitted to earth in the form of microwaves. Leaving aside the difficult problem of retransmission, the prospect of solar energy orbital stations ever becoming viable seems less and less likely. To achieve a station with the equivalent output of a conventional four-reactor nuclear power station would require a load of at least 30,000 tons in geostationary orbit, that is almost 10,000 launchings of the Space Shuttle. Nevertheless, this area of research has made possible the study of a number of general purpose technological developments. Furthermore, the fact remains that, even twenty years hence, the future cannot be predicted with any certainty.

13. – Markets and space

Space, then, is closely bound up with science, defence and commerce.

As far as science is concerned, a spirit of generosity prevails, frontiers are open and aggression does not prevent good relations from existing between the different world agencies. In the military sphere, however, secrecy and autonomy are the order of the day, of course.

As regards commerce, there are markets available and suppliers prepared to fight over them.

Two markets are already protected:
- the Socialist bloc countries,
- the American authorities.

But there is a vast free market stretching across the rest of the world: Europe, South America, Africa, the Arab countries, the Far East, Australia and the Pacific.

Your rapporteur was unable to find an in-depth assessment of how the world space market is likely to develop, even over the next ten years. Indeed, in a sector such as the manufacture of materials, it is difficult to gauge what is likely to happen. On the other hand, it can be predicted with some certainty that by 1990/1995 there will be between one and two hundred telecommunications satellites and approximate turnovers can be calculated on that basis.

The best forecast for the European space industry over the next decade would be in the region of at least ten thousand million EUA.

Rough estimates of the possible development of some markets will be found attached.

Three or four suppliers of space resources will share these markets between them, with America in the forefront, Russia operating in the confines of its own closed market, Europe attempting to challenge American supremacy and Japan entering the field.